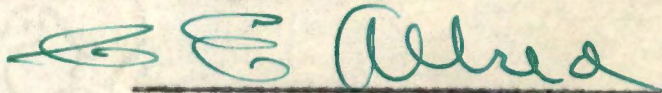


July 27, 1938

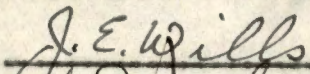
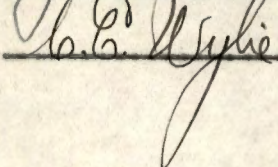
To the Committee on Graduate Study:

I submit herewith a thesis written by Mr. Paul T. Sant and entitled "Farm Management in Relation to Land Use, Soil Conservation and Soil Type, Crockett County, Tennessee", and recommend that it be accepted for eighteen quarter hours credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

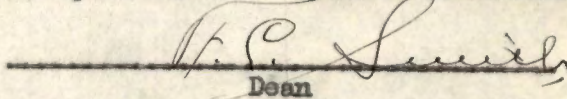


Major Professor

At the request of the
Committee on Graduate Study,
we have read this thesis,
and recommend its acceptance.

Accepted for the Graduate Committee


Dean

FARM MANAGEMENT IN RELATION TO LAND USE, SOIL CONSERVATION
AND SOIL TYPE, CROCKETT COUNTY, TENNESSEE

- o -

A THESIS

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

By

PAUL T. SANT

August 1938

ACKNOWLEDGEMENTS

The writer wishes to thank Professor C. E. Allred, Head of the Department of Agricultural Economics, and J. E. Wills, Associate Professor of Agricultural Economics, for many helpful suggestions, and for the privilege of using facilities of the Department of Agricultural Economics in carrying on this investigation.

The writer also wishes to acknowledge the credit due B. H. Luebke, D. H. Esry, and W. E. Hendrix of the Agricultural Experiment Station staff for field work in securing the farm management and soil conservation records, to R. E. Devereaux and James Caudel for mapping the soils of the farms; to H. H. Morse for calculating the percentages of soil and the area in each classification; and to S. W. Atkins for making preliminary checks and calculations.

The writer is also indebted to Mrs. Genevieve Wingo for assistance in tabulation and to Mrs. Mildred G. Cate for typing.

13 Jan. 39 M.B. 90

CONTENTS

	Page
INTRODUCTION	xi.
Reliability of Data	xiii.
Definitions	xv.
CHAPTER I. CHARACTERISTICS OF PRESENT FARMING CONDITIONS	
IN CROCKETT COUNTY	1.
Location of County	1.
Early History	1.
Topography	4.
Climate	5.
Population	6.
Markets	6.
Roads	7.
Railroads	8.
Land Utilization	8.
Livestock	11.
Soils	12.
Description of Major Soil Types	15.
Per Cent of Slope by Soil Types	19.
Soil Erosion	23.
Extent of Erosion in Type of Farming Area III	27.
Erosion in Tennessee	30.
Soil Depletion	30.
Value of Land, Buildings, and Machinery	31.
Value of Crops, Livestock and Livestock Products	32.
Description of Type of Farming Area III	33.
CHAPTER II. LAND USE AND ITS PROBLEMS IN CENTRAL	
WEST TENNESSEE	36.
Soil Erosion: Relation to Soil Types, Slope, Land	
Use, and Other Factors	36.
Relation to Soil Type	36.
Relation of Erosion to Slope	43.
Relation of Erosion to Land Use	48.
Other Factors Influencing Erosion	54.
Extent of Erosion on Each Soil Type	55.
Extent of Erosion on Each Slope Class	58.
Land Use Suggestions	60.
Crop Rotations	65.
Pasture	69.
Bermuda grass	71.
The lespedezas	71.

Pasture (continued)	
White clover	72.
Redtop	72.
Red clover	72.
Winter Cover Crops	72.
Reforestation	75.
CHAPTER III. FERTILIZERS FOR CROCKETT COUNTY AND WEST TENNESSEE	81.
CHAPTER IV. RECOMMENDED SOIL CONSERVATION PRACTICES	89.
CHAPTER V. LAND USE RECOMMENDATIONS TO CONSERVE THE SOIL	96.
CHAPTER VI. ECONOMIC EFFECT OF SOIL CONSERVATION RECOMMEN- DATIONS ON INDIVIDUAL FARMS SELECTED FROM EACH GROUP	110.
CHAPTER VII. SOME FARM ORGANIZATION IN RELATION TO FARM TENURE	124.
CHAPTER VIII. RELATION OF VARIOUS FACTORS TO FARM INCOME	133.
Size of Farm	133.
Yields	136.
A Large Percentage of Land in the Higher Profit Crops	136.
Crop and Livestock Production Balance	138.
Relation Between Number of Sources of Income and Labor Income	138.
Influence of Livestock on Farm Earnings	142.
Power Costs	148.
Operating Capital	149.
Farm Layout	149.
Relation of Farm Records to Labor Income	150.
Relation of Education to Farm Earnings	151.
Other Factors	152.
CHAPTER IX. PROFITABLE FARM COMBINATIONS	154.
CHAPTER X. SUMMARY OF RECOMMENDATIONS AND CONCLUSIONS	185.
BIBLIOGRAPHY	199.
APPENDIX	203.

TABLES

No.		Page
I.	Number and Percentage of Farms Located on Different Kinds of Roads, Crockett County, 1930	7.
II.	Land Use in Crockett County, Tennessee, As Reported in The Census of Agriculture, 1925-30-35	10.
III.	Livestock in Crockett County, Tennessee, 1930 and 1935	12.
IV.	Percentage and Acreage Distribution of Farm Land by Soil Type, 112 Farms, Crockett County, Tennessee, 1936 ..	13.
V.	Average Slope in Each Soil Group, Soil Conservation Survey, 112 Farms in Crockett County, 1936	19.
VI.	Percentage Distribution of Each Soil Type in a Given Slope Class, Entire Area, 112 Farms, Crockett County, Tennessee, 1936	21.
VII.	Extent of Erosion on Crockett County Soils, Soil Conservation Survey, 112 Crockett County Farms, Tennessee, 1936	24.
VIII.	Percentage of Cultivated Land in Each Slope Class and Erosion Class, 112 Crockett County Farms, Tennessee, 1936	27.
IX.	Distribution of Major Soil Types, Sample Farms Compared with Type-of-Farming Area III	28.
X.	Percentage of Farm Land in Various Slope Classes, Sample Farms Compared with Type-of-Farming Area III, Soil Conservation Service Survey, 1936	29.
XI.	Percentage of Farm Land in Each Erosion Class Sample Farms Compared With Type-of-Farming Area III	29.
XII.	Extent of Erosion in Tennessee	30.
XIII.	Average Yield per Acre of Cotton, Corn and Hay in Crockett County by Census Periods	31.
XIV.	Value of Land, Buildings, and Machinery, Crockett County, Tennessee, 1930	32.
XV.	Value of Crops, Livestock, and Livestock Products, Crockett County, Tennessee, 1929	33.
XVI.	Relation of Erosion to Soil Type, 112 Farms, Crockett County, Tennessee, 1936	38.
XVII.	Relation of Erosion to Soil Type on Land of "A" Slope (0-5%) Producing Cultivated Crops, Crockett County, Tennessee, 1936	43.
XVIII.	Relation of Erosion to Slope	47.
XIX.	Relation of Slope to Erosion on Memphis Silt Loam Producing Cultivated Crops, Crockett County, Tennessee, 1936	48.

No.		Page
XX.	Relation of Erosion to Land Use	52.
XXI.	Relation of Land Use to Erosion on "B" Slopes (3-6%), by Soil Types, Crockett County, Tennessee, 1936	53.
XXII.	Percentage Distribution of Each Soil Type in a Given Erosion Class, Entire Area 112 Farms, Crockett County, Tennessee, 1936	57.
XXIII.	Percentage Distribution of Each Slope According to Erosion Class, Cultivated Land, 112 Farms, Crockett County, Tennessee, 1936	59.
XXIV.	Suggested Land Use on Memphis Silt Loam, by Slope Class and Erosion Group	63.
XXV.	Suggested Land Use on Grenada and Henry Silt Loams, By Slope Class and Erosion Group	64.
XXVI.	Suggested Land Use on Collins, Waverly and Vicksburg Silt Loam, By Slope Class and Erosion Group	64.
XXVII.	Suggested Land Use on Oliver, Calhoun, and Lintonia Silt Loam, by Slope Class and Erosion Group	64.
XXVIII.	Suggested Rotation for Memphis and Grenada Silt Loam Soils, Crockett County, Tennessee	66.
XXIX.	Suggested Rotation for Oliver, Calhoun, and Lintonia Silt Loam Soils, Crockett County, Tennessee	67.
XXX.	Suggested Rotations for Collins and Waverly Silt Loam Soils, Crockett County, Tennessee	68.
XXXI.	Pasture Establishment on 112 Farms, Crockett County, Tennessee, 1936	69.
XXXII.	Suggested Permanent Pasture Mixture for Upland Soils, Crockett County, Tennessee	70.
XXXIII.	Suggested Permanent Pasture Mixtures for Bottom Land Soils, Crockett County, Tennessee	71.
XXXIV.	Costs of Establishing Cover Crops on 30 Farms Surveyed, Crockett County, Tennessee, 1936	73.
XXXV.	Cover Crops	74.
XXXVI.	Reforestation Practices in Crockett County, Tennessee, 1936	75.
XXXVII.	Soils Data by Type, Slope, Erosion, and Land Use, 112 Farms, Crockett County, Tennessee	77.
XXXVIII.	Fertilizer Recommendations for Red Land of West Ten- nessee and Yellow Land of Eastern Third of West Tennessee	84.
XXXIX.	Fertilizer Recommendations for Yellow Land of Western Two Thirds of West Tennessee	84.
XL.	Fertilizer Recommendations for White Land of West Tennessee	85.
XLI.	Fertilizer Recommendations for Memphis Silt Loam Soil	85.
XLII.	Fertilizers for Cotton in West Tennessee	86.
XLIII.	Limestone Treatment, Crockett County, Tennessee, 1936	87.
XLIV.	Summary of Terracing on 44 Farms, Crockett County, Tennessee, 1936	91.

No.		Page
XLV.	Acres and Per Cent of the Total Land Area Surveyed Needing Soil Conservation Practices, by Farms of Domi- nant Soil Types, 112 Farms, Crockett County, Tennessee, 1936	93.
XLVI.	Percentage Distribution of Land Needing Soil Conservation Practices by Farms Classed According to Dominant Soil Type, 112 Farms, Crockett County, Tennessee, 1936	95.
XLVII.	Number of Farms Classified According to the Percentage of Total Area in Bottom Land, Crockett County, Tennessee, 1936 .	97.
XLVIII.	Size: Average Man Work Per Farm According to Percentage of Farm Area in Bottom Land, 112 Farms, Crockett County	97.
XLIX.	Summary of Some Farm Management Factors per Farm According to Percentage of Total Area in Bottom Land, 112 Farms, Crockett County, Tennessee, 1936	98.
L.	Present Land Use per Farm on 112 Farms, Crockett County, According to Per Cent of the Total Land Area in Bottom Land..	99.
LI.	Average Number of Livestock per Farm According to Percentage of Farm Area in Bottom Land, 112 Farms, Crockett County, 1936	101.
LII.	Present and Recommended Farm Land Use to Effect Soil Conser- vation on 20 Farms in Crockett County, All Having 60 Per Cent or More of the Total Farm Land Area in Bottom Land	103.
LIII.	Present and Recommended Farm Land Use to Effect Soil Conser- vation on 13 Farms in Crockett County, All Having from 40 to 59 Per Cent of the Total Farm Land Area in Bottom Land ...	104.
LIV.	Present and Recommended Farm Land Use to Effect Soil Conser- vation on 31 Farms in Crockett County, All Having from 20 to 39 Per Cent of the Total Farm Land Area in Bottom Land ...	105.
LV.	Present and Recommended Farm Land Use to Effect Soil Conser- vation on 48 Farms in Crockett County, All Having Less Than 20 Per Cent of the Total Farm Land Area in Bottom Land	106.
LVA.	Present and Recommended Farm Land Use to Effect Soil Conser- vation on 112 Farms in Crockett County, Tennessee	107a.
LVI.	Present and Recommended Farm Land Use to Effect Soil Con- servaion in Sample Area, Crockett County, Tennessee	108.
LVII.	Present and Recommended Farm Land Use to Effect Soil Conservation in Type-of-Farming Area III	109.
LVIII.	Individual Farms Selected for Budgetary Analysis, Crockett County	110.
LIX.	Recommended Row Crop Acreage on Selected Farms Compared With 1935 and 1936 Actual Acreage	111.
LX.	Yield per Acre of Cotton and Corn on Selected Farms, Crockett County, Tennessee	112.
LXI.	Summary of Physical Factors in Per Cent on Selected Farms, Crockett County	113.
LXII.	Land Use on Largest and Smallest Farms Selected from Each Group, Crockett County, Tennessee, 1936	114.

No.		Page
LXIII.	Land Use on Median Sized Farms Selected from Each Group, Crockett County, Tennessee, 1936	115.
LXIX.	Livestock on Selected Farms from Each Group, Crockett County, Tennessee, 1936	117.
LXI.	Financial Summary of Selected Farms from Each Group, Crockett County, Tennessee, 1936	119.
LXXI.	Comparison of Financial Summary of 150 Farms Operated by Owners, Part-Owners, and Tenant Farms, Crockett County, Tennessee, 1936	131.
LXXII.	Comparison of Farms Operated by Owners, Part-Owners, and Tenants, Crockett County, Tennessee, 1936	132.
LXXIII.	Relation of Per Cent of Farm in Row Crops to Labor Income, 51 Farms of Upland Soil, Crockett County, 1936	137.
LXXIV.	Relation Between Number of Sources of Income and Labor Income, 150 Farms, Crockett County, Tennessee, 1936	141.
LXXV.	Influence of Livestock on Farm Earnings, 149 Farms, Crockett County, Tennessee, 1936	147.
LXXVI.	Relationship of Farm Records to Labor Income, 150 Farms, Crockett County, Tennessee, 1936	150.
LXXVII.	Relationship of Operator Education to Labor Income, 150 Farms, Crockett County, Tennessee, 1936	151.
LXXVIII.	Comparison of Farms on Basis of Ten Factors, Crockett County, Tennessee	165.
LXXIX.	Comparison of More Profitable Farms, Crockett County	166.
LXXX.	Comparison of Farms on Basis of Land Use and Numbers of Livestock, Crockett County	167.
LXXXI.	Production and Disposition of Crops on Farm A	171.
LXXXII.	Livestock Record on Farm A	171.
LXXXIII.	Livestock Products on Farm A	171.
LXXXIV.	Feed and Supplies on Farm A	172.
LXXXV.	Summary on Farm A	172.
LXXXVI.	Summary on Farm C	178.
LXXXVII.	Summary on Farm D	182.

FIGURES

No.		Page
1.	Map of West Tennessee Showing the Location of Crockett County, Survey Area, and Type-of-Farming Area III	2.
2.	Map of Crockett County Showing Location of 150 Farms Surveyed	3.
3.	Percentage Distribution of Farm Land by Soil Types, 112 Farms, Crockett County, Tennessee, 1936	14.
4.	Average Slope in Each Soil Group, Soil Conservation Survey, 112 Farms in Crockett County, Tennessee, 1936	14.
5.	Per Cent of Slope by Soil Types, 112 Farms, Crockett County, Tennessee, 1936	20.
6.	Per Cent of Land in "A" Slope (0-3%) by Soil Types, 112 Farms, Crockett County, Tennessee, 1936	22.
7.	Extent of Erosion on Crockett County Soils, Soil Conservation Survey, 112 Farms, Tennessee, 1936	25.
8.	Percentage of Cultivated Land in Each Erosion Class, 112 Crockett County Farms, Tennessee, 1936	26.
9.	Percentage Distribution of Land Surveyed, by Erosion Classes, 112 Farms, Crockett County, Tennessee, 1936	37.
10.	Percentage Distribution of Land With No Erosion by Soil Types, 112 Farms, Crockett County, Tennessee, 1936	40.
11.	Percentage Distribution of Land With Severe Sheet Erosion, by Soil Types, 112 Farms, Crockett County, Tennessee, 1936	40.
12.	Relationship of Erosion to Soil Type on Land of "A" Slope (0-3%) Producing Cultivated Crops, 112 Farms, Crockett County, Tennessee, 1936	42.
13.	Percentage of Uneroded Land by Slopes, 112 Farms, Crockett County, Tennessee, 1936	44.
14.	Percentage of Very Severe Sheet Erosion by Slope Classes, 112 Farms, Crockett County, Tennessee, 1936	44.
15.	Percentage Distribution of Land Showing No Apparent Accelerated Erosion by Land Use, 112 Farms, Crockett County, Tennessee, 1936	49.
16.	Percentage Distribution of Land Showing Heavy Sheet Erosion, by Land Use, 112 Farms, Crockett County, Tennessee, 1936	49.
17.	Relationship of Sheet Erosion to Land Use on Memphis Silt Loam of "B" Slope, 112 Farms, Crockett County, Tennessee, 1936	51.
18.	Extent of Erosion by Soil Types, 112 Farms, Crockett County, Tennessee, 1936	56.
19.	Profitable Crop Yields Are Based on Proper Land Use, Erosion Control, Crop Rotation, Addition of Humus and the Application of Mineral Elements as Needed	82.

No.		Page
20.	Percentage of the Surveyed Land Needing Soil Conservation Practices, Crockett County, 1936	90.
21.	Percentage Distribution of Farms by Dominant Soil Type Needing Soil Conservation Practices, Crockett County, 1936	94.
22.	Investment Comparison of Farms Operated by Owners, Part-Owners, and Tenants, 150 Farms, Crockett County, Tennessee, 1936	127.
23.	Comparison of Total Farm Receipts and Expenses on Owner Operated, Part-Owner Operated, and Tenant Operated Farms, Crockett County, Tennessee, 1936	129.
24.	Relation of Cotton Yields to Labor Income, 147 Farms, Crockett County, Tennessee, 1936	135.
25.	Relation Between Number of Sources of Income and Labor Income and to Man Work Units, 150 Farms, Crockett County, Tennessee, 1936	140.
26.	Influence of Livestock on Labor Income on 149 Farms Grouped According to Per Cent in Bottom Land, Crockett County, Tennessee, 1936	144.
27.	Influence of Livestock on Labor Income per Acre on 149 Farms Grouped According to Per Cent in Bottom Land, Crockett County, Tennessee, 1936	144.
28.	Average Farm Investment in Crockett County, Tennessee, 150 Farms, 1936	157.
29.	Average Farm Receipts in Crockett County, Tennessee, 150 Farms, 1936	159.
30.	Average Farm Expense in Crockett County, Tennessee, 150 Farms, 1936	159.
31.	Financial Summary of the Average Farm in Crockett County, Tennessee, 150 Farms, 1936	160.
32.	Value of Products Used by Family Average, 150 Farms, Crockett County, Tennessee, 1936	162.
33.	Map of Farm A, Crockett County, 1936	169.
34.	Business Analysis of Farm A, Crockett County, Tennessee, 1936	173.
35.	Map of Farm B, Crockett County, 1936	173.
36.	Business Analysis of Farm B, Crockett County, Tennessee, 1936	177.
37.	Business Analysis of Farm C, Crockett County, 1936	179.
38.	Composite Symbol Map of Two Similar Farms of Different Incomes, Crockett County	183.

INTRODUCTION

Farm management is the science dealing with the organization of farm enterprises and the management of farm practices so as to provide the largest continuous farm income. The ultimate goal of an agricultural policy is to provide a secure foundation for the sound development of farm life. To do this, it is desirable that the economic returns in farming be made more attractive than they have been in the recent past.

In some sections of the country agriculture has not been able to keep pace with industry and commerce in the advance of living conditions and cultural opportunities; and in some sections agriculture has become extractive in character, rather than a permanently sustained industry. This is not conducive to the best permanent development of farm life, nor in harmony with the principles of farm management and agricultural policy.

The purpose of this study is to analyse farm organization and farm practices in West Tennessee, in relation to land use, and determine their effect on the soil, with a view to determining the different kinds and amounts of the several crops and classes of livestock that may best be combined in order to secure the most continuous profitable operation of the farms. To do this it has been necessary to study needed soil conservation practices, proper land use, desirable fertility measures, approved crop rotations, profitable degree of diversity, and other farm practices in relation to the region and so far as possible to individual farms.

Farm management and soil conservation surveys were conducted by the Tennessee Agricultural Experiment Station, Department of Agricultural Economics, in cooperation with the Bureau of Agricultural Economics and the United States Soil Conservation Service. Other supporting evidence from the Agricultural Census, and from other sources specifically acknowledged by footnotes. The surveys were taken by farm management and soil specialists during July and August, 1936, on schedules similar to those in the appendix. The farm management survey included 150 Crockett County farms selected at random, while the soil conservation survey included 112 of the same farms. Preliminary soils data were also gathered for the other 38 farms. Since the farms selected were to be representative of farming conditions in Type-of-Farming Area III, an area composed largely of cotton farms in the West Tennessee Brown Loam Belt, Civil Districts 1 to 4 inclusive were excluded inasmuch as farmers there practice a different type of farming. There were 2,538 farms in the area (Civil Districts 5-15, inclusive) according to the 1935 Census of Agriculture, 695 of which were cropper farms. The cropper farms were not considered as separate units of operation in this survey.

Data were secured regarding size of farms, crops grown, livestock produced, farm receipts, farm expenses, income, farm practices, and other information relative to the farm business. The farms covered by the soil conservation service were mapped by type of soil, slope of land, depth of sheet erosion, kind and extent of gullying, and types of cover.

Reliability of Data

An agricultural survey, in its various phases, is a recognition of the large fund of information which is obtainable as a result of experience on farms. Practically all the farmers were willing to give all information requested, and endeavored to make their answers accurate. If individual errors occurred the group averages are likely to be accurate since the errors are compensating. An adequate number of cases is necessary, and in this study very few conclusions have been drawn from groups approaching an inadequate sample.

The area in Crockett County was selected as representative of Type-of-Farming Area III. Hence its reliability, as measured by its representativeness, in significant factors, is important. The surveyed area is somewhat more thickly populated than the entire type-of-farming area, with a larger per cent of farm land in crops. This is partially offset by a slightly larger per cent of bottom land and land less steep and less eroded. With these differences largely compensating, and allowance made for variation in the suggestions made, it is believed that this study is quite representative, and applicable to the entire region designated as Type-of-Farming Area III (see table on following page).

RELIABILITY OF SAMPLE DATA, 1935

Item	Sample Area	Type-of-Farming Area No. III
Rural farm population per square mile	57.9	40.9
Number of farms per square mile	14.0	9.4
Per cent of total land area in farms	92.0	79.0
Per cent of farm land area in crops	69.0	53.5
Per cent of total crop land that is harvested	93.8	83.8
Per cent of farm land area in pasture	21.3	23.1
Per cent of area harvested in cotton	27.3	35.8
Per cent of area harvested in corn	36.0	39.2
Per Cent of Farm Land Area		
Soil Type		
Group I - Loess Upland		
Memphis silt loam	43.0	} 17.0
Memphis silty clay loam	3.2	
Grenada silt loam	21.9	} 27.0
Henry silt loam	0.5	
Lexington silt loam	*	9.0
Group II - Second Bottom		
Lintonia silt loam	0.2	} 1.0
Oliver silt loam	1.1	
Calhoun silt loam	0.1	
Group III - First Bottom		
Vicksburg silt loam	0.3	} 116.0
Collins silt loam	24.9	
Waverly silt loam	4.3	
Collins silty clay loam	0.2	
Meadow	0.3	
Total	100.0	100.0
* Less than 0.1 per cent.		
Per Cent of Farm Land Area		
Slope Class		
A	34.9	29.0
B	47.0	25.0
BB	4.7	21.0
C	2.5	16.0
D	0.8	9.0
Total	100.0	100.0
(continued)		

RELIABILITY OF SAMPLE DATA, 1955 (continued)

Item	Sample Area	Type-of-Farming Area No. III
Erosion Class	Per Cent of Farm Land Area	
No apparent accelerated erosion	29.7	2.2
Slight sheet erosion	4.2	0.1
Moderate sheet erosion	9.1	11.4
Heavy sheet erosion	19.2	30.3
Severe sheet erosion	5.1	28.8
Very severe sheet erosion and large gullies	0.7	2.2
Occasional gullies	28.8	23.3
Frequent gullies	5.1	-
Very frequent gullies	0.1	1.7

DefinitionsErosion Classes and SymbolsSheet erosion:

- 4. - Recent alluvial and colluvial deposition incident to erosion above the area.
- 1. - No apparent accelerated erosion.
- 2. - Slight sheet erosion - less than 25 per cent of "A" horizon removed.
- 3. - Moderate sheet erosion - 25 per cent to 50 per cent of "A" horizon removed.
- 33. - Heavy sheet erosion - 50 per cent to 75 per cent of "A" horizon removed.
- 4. - Severe sheet erosion - more than 75 per cent of "A" horizon removed and part of "B" horizon.
- 5. - Very severe sheet erosion - sheet erosion of lower "B" horizon and the "C" horizon or parent material.

Gully erosion:

- 7. - Occasional gullies - average of three gullies or less per acre or gullies 100 feet or more apart laterally. Used in conjunction with sheet erosion symbols.
- 8. - Frequent gullies - average of three or more gullies per acre, or gullies less than 100 feet apart laterally but less than 75 per cent of the area included within the gullies. Used in conjunction with sheet erosion symbols.
- 9. - Very frequent or destructively large gullies. An intricate network of gullies that has dissected an area so thoroughly that 75 per cent or more of the area delineated is included within gullies. Used without other erosion symbols but with all other factors given.

Definitions (continued)

Soil horizons:

Soil is made up of several horizons, called, collectively, the soil profile. The principal horizons of the soil profile are A (surface soil), B (subsoil), and C (upper portion of the substratum to the extent penetrated by plant roots).

Slope limits:

- A = 0 to 3 per cent
- B = 3 to 6 per cent
- BB = 6 to 9 per cent
- C = 9 to 12 per cent
- D = Over 12 per cent

Conservation Survey Composite

Symbol:

Erosion - Land Use

Slope - Soil

Present Soil Conservation

Practices on Farms:

- T - Terracing
- S - Strip cropping
- C - Contour tillage
- CF - Contour furrow in pasture
- FI - Locust plantings

Land Use Classification:

- L - Cultivated land
- L₁ - Row crops
- L₂ - Small grains
- L₃₁ - Good meadow
- L₃₂ - Medium meadow
- L₃₃ - Poor meadow

Soils legend:

Loess Upland

- 1. - Memphis silt loam
- 2. - Grenada silt loam
- 3. - Henry silt loam
- 4. - Memphis silty clay loam

Second Bottom

- 11. - Lintonia silt loam
- 12. - Oliver silt loam
- 13. - Calhoun silt loam

First Bottom

- 21. - Vicksburg silt loam
- 22. - Collins silt loam
- 23. - Waverly silt loam
- 24. - Collins silty clay loam

Shallow Loess and Coastal Plain

- 51. - Lexington silt loam
- 52. - Pheba silt loam

Bottoms

- 80. - Meadow

- P - Pasture land
- F - Forest pasture
- P₁ - Good pasture
- P₂ - Medium pasture
- P₃ - Poor pasture

- F - Woodland
- FI - Locust plantings
- X - Idle land
- H - Farmsteads

Definitions (continued)Pyralin Symbols:

- R - Rotation only
- C - Contour tillage
- T - Terracing
- S - Strip cropping
- G - Gully control; structural vegetative, or both.
- I - Improvement of cover (pasture meadow and idle lands that are washing)
- A - Removal from cultivation, put in pasture or trees
- N - Use for close-growing crops only
- P - Put in pasture
- F - Put in trees

CHAPTER I
CHARACTERISTICS OF PRESENT FARMING CONDITIONS IN CROCKETT
COUNTY

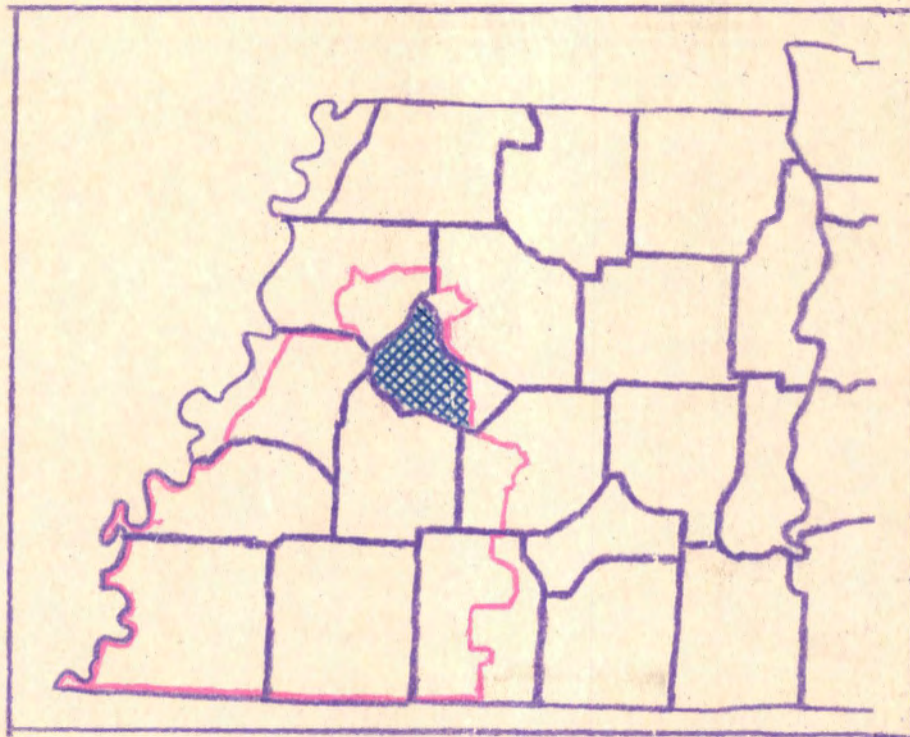
Location of County

Crockett County is located in central West Tennessee in the drainage basin of the Mississippi River. Alamo, the county seat, is near the center of the county and approximately 70 miles northeast of Memphis and 20 miles northwest of Jackson.

Early History

"Crockett County was formed in 1870 from Gibson, Haywood, Dyer, and Madison counties. Its formation was due to topography rather than political activities. When citizens of the section which is now Crockett County found it necessary to attend Court or transact business which took them to their County Seat they had to cross the bottom lands of Forked-Deer river, which often, for considerable periods through winter, were covered with water. Because of few bridges and poor roads it was extremely inconvenient, very often impossible, for them to reach their County Seat. The new county as formed lies between the two forks of the Forked-Deer river, and the County Seat is therefore much more accessible." (1)

(1) Duggan, B. O., Armentrout, W. W., Jones, W. B., Educational, Economic and Community Survey, Crockett County, University of Tennessee Extension Series Vol. 1, No. 3, 1924.



Legend:

 Survey Area in
Crockett County

 County Boundary

 Type-of-Farming
Area Boundary

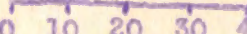
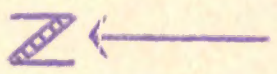
Scale:  0 10 20 30 40 miles

Figure 1. Map of West Tennessee Showing the Location of
Crockett County, Survey Area, and Type-of-Farming Area III



Scale: 1" = 3 miles

Legend:



Farms

Figures are Civil District Numbers

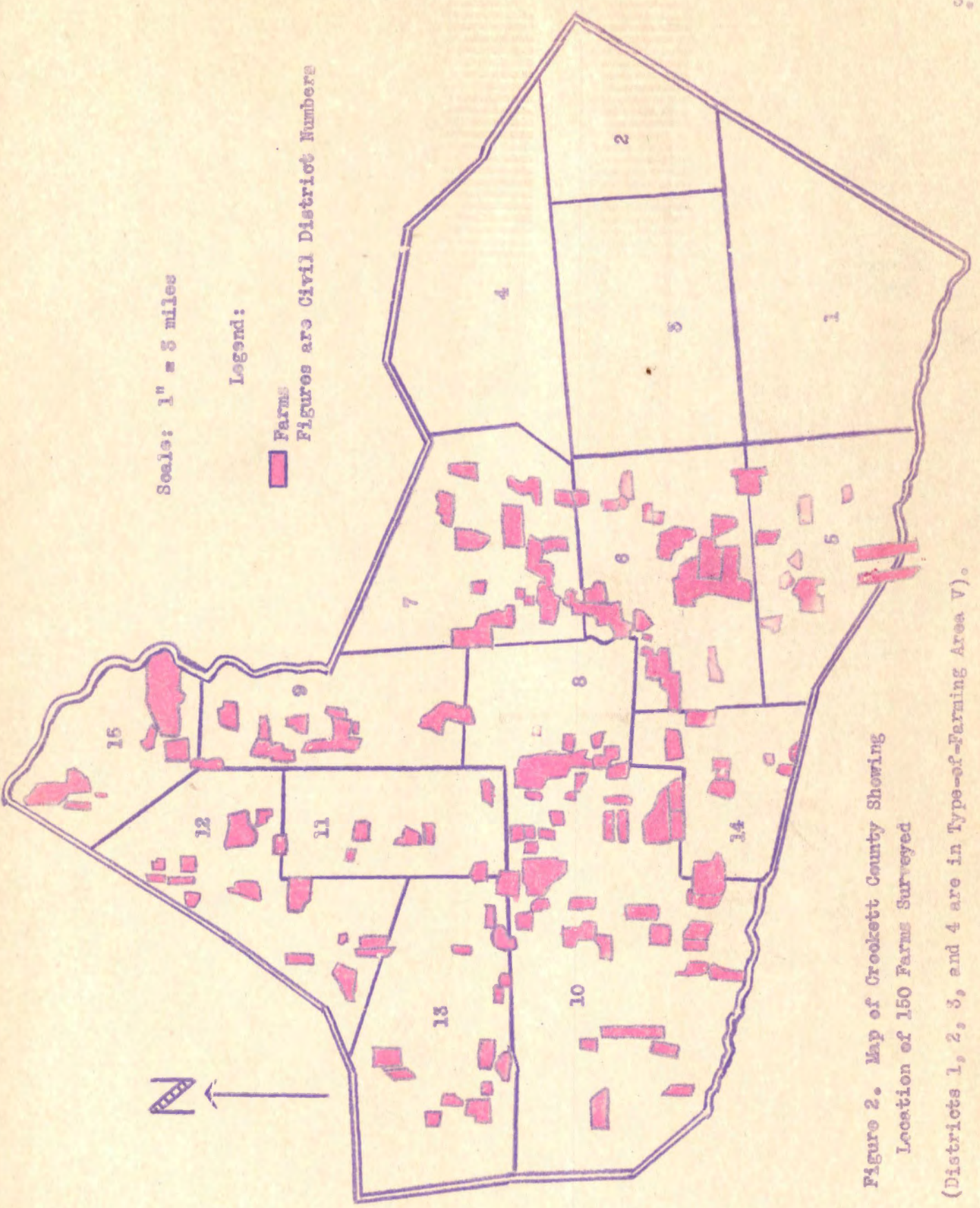


Figure 2. Map of Crockett County Showing
Location of 150 Farms Surveyed

(Districts 1, 2, 3, and 4 are in Type-of-Farming Area V).

As early as December 20, 1835, commissioners were appointed and the voters of the newly assigned territory voted to establish a separate county, though Judge Read of Madison County the following year, 1846, decided Crockett was not constitutionally a county. The Legislature on July 7, 1870, passed another act identical with the 1846 caption and Crockett County was then officially established.

Many injunctions, especially from Madison County, were filed but Crockett County remained intact.

In 1872 on March 9th an election was held for county and district officers and the county court with I. M. Johnson as chairman was organized in March, 1872. The circuit court was held in Alamo on April 8th of the same year.

The first pioneers came to this section in 1823. The names of John B. Boykin, Robert Johnson, Giles Hawkins, Cornelius Bunch, John Bowers, E. Williams, and John Yancey appear in Tennessee histories as names of some of the outstanding pioneers. These family names are still very permanent in the county. The county was named for the celebrated David Crockett, who spent some time here, and its county seat was called Alamo after the "Alamo" in Texas where Crockett lost his life.

The county was divided into 15 districts, which division is still retained.

Topography

The general topographic features are gently rolling, with but little of the land that cannot be cultivated. Elevation ranges from 285 feet to 350 feet above sea level and averages approximately 300 feet.⁽²⁾

(2) Allred, Atkins, Cotton, Economic Aspects of Agriculture, Land Utilization and Forestry in Tennessee, Agricultural Experiment Station, University of Tennessee, August 1933.

The land is nearly everywhere well drained. The principal streams which carry the major part of the run-off are the South Fork and the Middle Fork of the Forked Deer River, which flow along the southern and northern county boundary lines respectively. They overflow their bottom lands frequently during the winter, and occasionally in summer. The streams have moderately slow currents.

Climate

The climate of Crockett County is mild, humid, and in general well suited to agriculture. Sudden and decided changes in temperature are rare; the mean monthly temperature ranging from 40.2° F in January to 79.6° F in July. The mean annual temperature averages near 60.5° F. The normal growing season extends from April 3 to October 24, a period of 204 days, but killing frost has been recorded as late in the spring as May 2 and as early in the fall as October 2.⁽³⁾ The thermometer falls as low as 10° F above zero only about twice in the average winter, and zero temperatures do not, on the average, occur oftener than once a year. In summer periods of hot weather occasionally occur, and a maximum of 110° F has been reached.

The average annual precipitation is 47.63 inches.⁽⁴⁾ The rainfall is favorably distributed from month to month and in normal years is adequate for all properly cultivated crops. The heaviest rains come in the late

(3) U.S.D.A., Climatic Summary of the United States and Climatological Data as collected at the Jackson Station.

(4) Ibid.

winter or early spring, and driest season is mid-autumn. Heavy down-pours sometimes occur, with 2.5 inches or more of rain falling in 24 hours. Droughts occasionally occur, generally late in the summer or early in the fall. They may last from 15 to 30 days.

The average annual snowfall is only about 9 inches, and the ground is rarely covered for more than a few days at a time. ⁽⁵⁾

Population

The entire population of Crockett County, Tennessee, is rural. There is no town of 1000 people, according to the 1930 Census. Alamo, the county seat, has a population of 907 and Bells 919. Two other incorporated towns, Friendship and Maury City, have a population of 487 and 425 respectively.

There is a total population of 17,359 in the county, of which 13,917 are white and 3,433 negroes, or 80 per cent white and 20 per cent negro. The total population has increased slowly, but consistently, from 1880. The negro population, however, has decreased. In 1890 there were a total of 4,186 negroes compared with 3,433 in 1930.

There were 3,148 farm operators in 1930 of which 18 per cent were negroes. In 1930 65 per cent of the farm operators were tenants, 26 per cent full owners, and 9 per cent part owners.

Markets

While farmers have little difficulty in buying things they need, they find in the towns practically no market for surplus farm produce. A

(5) Ibid.

majority of people living in the towns have their own gardens, chickens, and many have cows, though quite a large percentage of the people are not entirely self supporting in this respect. A market for most farm products must be found outside the county, since the population is small and mostly rural.

All of the cotton produced in Crockett County is shipped out of the county to be consumed in other parts of the state, or outside the state, after being sold by farmers in local markets.

Some agricultural produce in Crockett County is sold cooperatively and a small amount of farm supplies are purchased through cooperatives, but when compared with the total amount of goods purchased, those sold through cooperatives constitute but a minor factor in the trade of the county.

Roads

Approximately 90 per cent of all farms in Crockett County are located on improved or unimproved dirt roads. Only 4.8 per cent of the farms are located on hard surfaced roads, and 2.8 per cent on gravel roads (Table I).

TABLE I. NUMBER AND PERCENTAGE OF FARMS LOCATED ON DIFFERENT KINDS OF ROADS, CROCKETT COUNTY, 1930

Kind of Road	State Average		Crockett County	
	Number of Farms	Per Cent of Total	Number of Farms	Per Cent of Total
Hard surfaced	23,433	9.5	151	4.79
Gravel	56,857	23.1	90	2.85
Improved dirt	44,879	18.5	1410	44.79
Unimproved dirt	104,724	42.7	1438	45.67
All other (and not reported)	15,764	6.4	59	1.87
Total	245,657	100.0	3148	100.00

Source: 1930 Census of Agriculture.

Since farmers are dependent upon roads, in moving their farm produce by trucks and wagons to the market or railroad, it is readily seen that Crockett County farmers are severely handicapped, and must contend with mud and much of the time an almost impassible roads some of the time. Such a situation forces many growers to sell when roads are dry which often results in their receiving less or a lower price than they might, had they sold at some other time.

In the entire county there was in 1930 approximately 40 miles of paved road and 19 miles of gravel road.

Railroads

Two railroads touch the county. The Gulf, Mobile, and Northwestern runs lengthwise through the county northwest from Bells to Friendship. The Louisville and Nashville Railway runs along the edge of the county from Bells north to Gadsden. This gives the county 36 miles of railroad. In addition, the Illinois Central runs south from Dyersburg to Memphis only a few miles west of the county. The Birmingham and Northwestern has its terminals at Jackson and Dyersburg, while the Louisville and Nashville gives an outlet to Memphis and points South and to points North. No person in the county lives more than eight or ten miles from a railroad.

Land Utilization

The prevailing type of agriculture is the growing of cotton as the money crop in conjunction with the production of corn and lespedeza used chiefly as feed for the work stock. Cotton occupied 28,937 acres or 19.6 per cent of all land in farms in 1935 while corn was grown on 31,606 acres which is 21.4 per cent of all land in farms. Most of the cotton produced

is short staple. A considerable number of farmers do not produce sufficient corn to supply the farm needs. Comparatively few farmers, except a few on bottom-land soils, sell corn, and the total quantity sold is relatively small.

The average yield of corn per acre for the periods 1923 and 1932 was 22.2 bushels; cotton averaged 240 pounds of lint per acre. ⁽⁶⁾

The yields for cotton and corn, the two major crops of the county, were both slightly above the state average.

All crop land occupied two thirds of the area in farms in 1934; pasture land 22 per cent; and woodland not pastured approximately five per cent.

During the ten-year period, 1925-1934, the percentage of crop land decreased, while the percentage of pasture land increased in about the same proportion.

Cotton, corn, and lespedeza are the major crops grown throughout the county and Area III. Cotton is the principal cash crop. Corn and lespedeza hay are largely fed to livestock.

Five-sixths or 83.3 per cent of all the farms in Crockett County, Tennessee, are cotton farms. Six per cent are general farms; 1.9 per cent are self-sufficing; 2.7 per cent are unclassified; and all other farms constitute but 5.9 per cent of the total, as classified by the 1930 Census of Agriculture.

Slightly more than five-sixths, 83.8 per cent, of all crop land harvested is planted to cotton. Corn is next in importance but compared to

(6) United States Department of Agriculture, Division of Crop and Livestock Estimates.

cotton it plays a very subordinate part.

The approximate land area of Crockett County, Tennessee, is 170,880 acres of which 86.6 per cent, or 147,939 acres are divided among 3390 farms which average 43.6 acres in size. Two thirds (66.5 per cent) of the farm land is in crops other than pasture, 21.2 per cent in total pasture, 5.3 per cent in woodland not pastured and 7.0 per cent in other land (Table II).

During the period 1925-34 the number of farms increased, the per cent of land in farms increased, while the average size in acres slightly decreased. The per cent of farm land in crops decreased some while the percentage of pasture land increased (Table II).

It is interesting to note that during the relatively more prosperous

TABLE II. LAND USE IN CROCKETT COUNTY, TENNESSEE, AS REPORTED
IN THE CENSUS OF AGRICULTURE, 1925-30-35

Land Use	1935	1930	1925
Approximate land area	170,880	170,880	170,880
Number of farms	3,390	3,143	3,379
Per cent of land in farms	86.6	82.9	83.6
Average size of farms	43.6	45.0	42.3
Acres in farms, total	147,939	141,782	142,880
Available for crops	120,728	113,151	113,168
Total crop land harvested, failure, fallow, idle	98,362	97,110	98,452
Crop land harvested	91,213	89,553	93,019
Crop failure	2,239	1,111	1,054
Idle or fallow land	4,910	6,446	4,379
Pasture land, total	31,394	28,285	26,410
Plowable pasture	22,366	16,061	14,716
Woodland pasture	6,942	7,809	10,195
Other pasture	2,086	4,415	1,499
Woodland not pasture	7,885	8,145	8,274
All other land in farms	10,298	8,262	9,744
Per cent of farm land in:			
Crop land, total	66.5	68.5	68.9
Pasture, total	21.2	19.9	18.5
Woodland not pasture	5.3	5.7	5.8
Other land in farms	7.0	5.8	6.8

condition of city dwellers as compared to farmers in 1925 to 1930 was accompanied by a decrease in number of farmers and an increase in the size of the average farm. While from 1930 to 1935 very unfavorable circumstances in the city drove many back to rural life resulting in an increase in the number of farms and a decrease in the average size of the farm. This of course is closely tied up with land use problems for it is generally known that in such periods of increasing number of farms much marginal land is brought into cultivation which is but slowly retired even after favorable conditions return. Such practices result in increased soil erosion and lessened productivity and an accumulation of farm difficulties, including farm indebtedness.

Livestock

On most farms in Crockett County livestock are few in number, there being only an average of 6.29 animal units per farm. The average farm in 1935 had 3.38 cattle and calves of all ages, 1.59 mules 2 years old or over, .49 horses 2 years old or over, 3.20 swine of all ages, 39.35 chickens over 3 months old, and .39 sheep and lambs all ages.

Since 1930 the number of cattle and calves of all ages, the number of chickens, and the number of swine have slightly increased, while the number of sheep and lambs, mules and horses have decreased (Table III).

A system of farming which places so little emphasis on livestock is not conducive to the most continuously profitable farm organization and management. It results in a maladjusted labor distribution, soil depletion, increased costs of production, and a lessened income.

TABLE III. LIVESTOCK IN CROCKETT COUNTY, TENNESSEE,
1930 AND 1935

Unit	1935		1930	
	Total	Per Farm	Total	Per Farm
Cattle and calves of all ages	11,463	3.38	7,330	2.32
All cows and heifers 2 years old and over	6,852	2.02	4,079	1.29
Cows of all kinds milked during all or part of the year	5,076	1.49	3,859	1.22
Sheep and lambs all ages	1,325	.39	1,396	.44
Chickens over 3 months old	133,352	39.33	69,857	22.19
Swine all ages	10,866	3.20	9,827	3.12
Horses 2 years old and over	1,688	.49	2,073	.65
Mules 2 years old and over	5,278	1.59	5,077	1.61

Source: Census of Agriculture.

Soils

The soils of Crockett County are divided naturally into two general groups -- the upland soils and the bottom-land soils. The upland soils are derived from the bed of silty material, known as loess, which covers practically all the upland, and extends over a large area covering about one-fifth of the western part of the state. The loess deposit overlies a series of sand, clay and gravel beds belonging to the widespread coastal plain deposits of late geological age. These beds are exposed in areas of severe washes, cuts and gullies.

The soils of the first bottoms and second bottoms consist of stream-transported material, or alluvium, of recent or relatively recent deposition. That in the first bottoms is being added to by each overflow. The second bottoms or terraces were similarly formed, but at a time when the overflows reached higher levels than at present. The sandy strata of the

basal beds are distinctly of water-transported origin. The gravel present, consisting mainly of chert, is well rounded by water action, and the beds are stratified.⁽⁷⁾

The upland soils are of loessial origin, being derived from a bed of silty material which covers practically all the upland. The loess deposit overlies a series of sand, clay and gravel beds belonging to the widespread coastal plain deposits of late geological age. These beds are exposed in the valley slopes. The soils are well supplied with all of the elements of plant food, but under cultivation they have, with some exceptions, become poor in nitrogen and humus. These soils are very easily eroded and have suffered much in soil depletion.

TABLE IV. PERCENTAGE AND ACREAGE DISTRIBUTION OF FARM LAND
BY SOIL TYPE, 112 FARMS, CROCKETT COUNTY, TENNESSEE,
1936

Soil Type		Acreage	Per Cent
# 1	Memphis silt loam	4,458.9	38.68
# 22	Collins silt loam	2,584.0	22.41
# 2	Grenada silt loam	2,277.8	19.76
# 23	Waverly silt loam	450.8	3.91
# 4	Memphis silty clay loam	336.8	2.92
# 12	Oliver silt loam	113.2	.98
# 3	Henry silt loam	36.3	.32
# 90	Meadow	33.9	.29
# 21	Vicksburg silt loam	28.6	.25
# 11	Lintonia silt loam	21.6	.19
# 24	Collins silty clay loam	21.7	.19
# 13	Calhoun silt loam	7.4	.06
# 56	Lexington silt loam	3.0	.03
Woodland and farmsteads (unmapped*)		1,154.7	10.01
Total		11,528.7	100.00

* The part of woodland and farmsteads acreages which was mapped is not included in this figure.

(7) U.S.D.A. Soil Survey of Shelby County, Tennessee, Bureau of Soils, 1919.

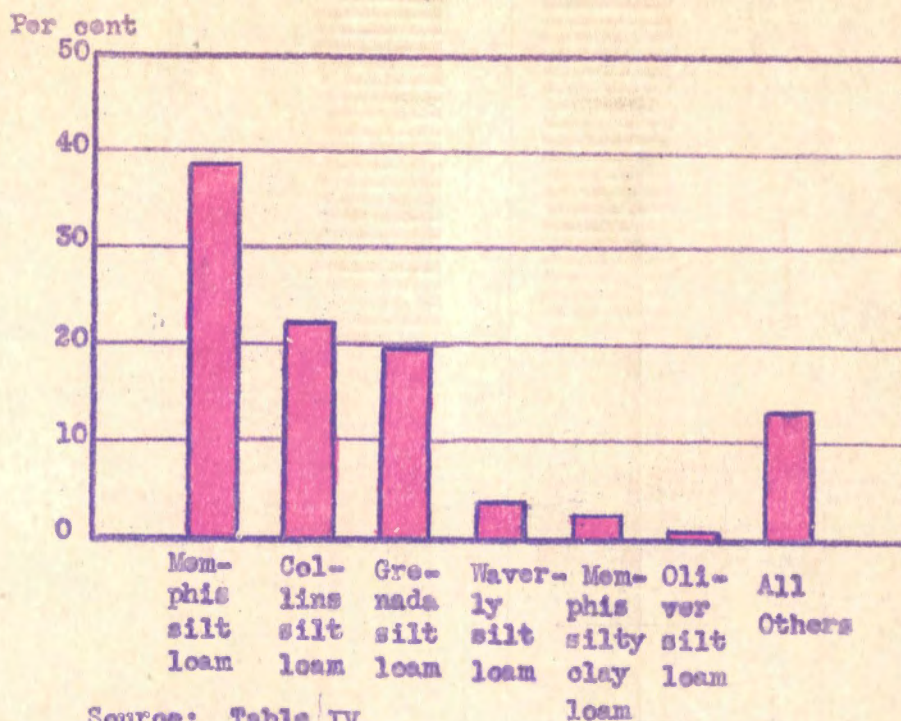


Figure 3. Percentage Distribution of Farm Land by Soil Types, 112 Farms, Crockett County, Tennessee, 1936

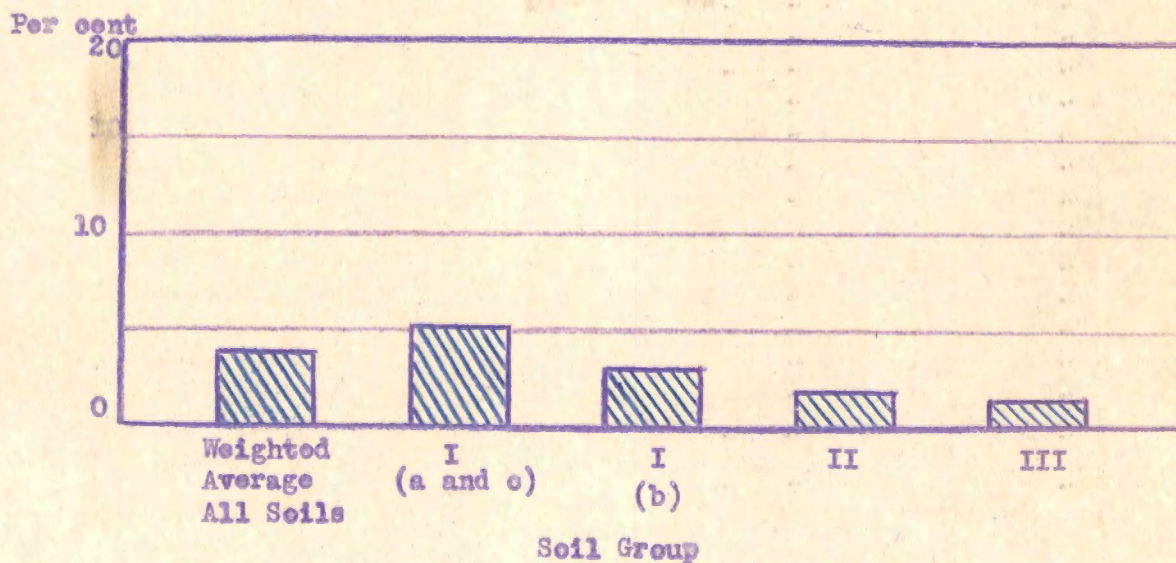


Figure 4. Average Slope in Each Soil Group, Soil Conservation Survey, 112 Farms in Crockett County, Tennessee, 1936

Over two-thirds (68.6 per cent) of the land area is in upland soils (Table IV). Of these, the Memphis and Grenada types are most extensive. Collins silt loam is the principal bottom soil, and is perhaps the most productive to be found on the sample farms.

Description of Major Soil Types. The Memphis silt loam consists of a light-brown to brown silt loam, underlain at about 5 to 10 inches by buff-colored, brownish-red, or reddish-yellow silty clay or silty clay loam, passing quickly into silty clay. With increase in depth there is a decrease in the clay content and an increase in silt, and the material is more friable, but is not less compact, and in places it is more compact at this lower depth. This change becomes noticeable at depths of about 16 to 20 inches, and below 20 inches the lower subsoil usually is distinctly more friable. Generally the color is more yellowish and less reddish in the lower subsoil, but in some places there is not much change in color within the 3-foot section. Locally the lower part is yellow or even pale yellow, but there seldom is any gray mottling. Some dark-colored concretionary material is noticeable in the lower subsoil in places, even where there is not much change in the color or in the degree of compaction. Typically the lower subsoil is a silty clay loam. Stratified beds of the Coastal Plain deposits, usually consisting of red to reddish-yellow sandy clay, are reached at depths of about 4 to 8 feet. In places the substratum consists of light-colored compact material, but generally this kind of material is overlain by Grenada or Pheba silt loam. Locally in forested tracts the soil is yellowish-brown at or near the surface. (8)

(8) Wildermuth, Robert, Soil Survey of Henry County, p. 91, U. S. Department of Agriculture, Bureau of Soils, 1922.

The Grenada silt loam is a light-brown to brown or yellowish-brown silt loam, usually slightly lighter in color at the surface than the surrounding Memphis silt loam, underlain at about 8 to 10 inches by yellowish-red to buff-colored or brownish-red silty clay loam to silty clay, which passes at depths ranging from about 12 to 30 inches into light-gray, bluish-gray, or mottled gray and yellow or brown silty clay or silty clay loam usually containing dark-colored and rusty-brown splotches of concretionary material and also small roundish concretions. Concretions in smaller amounts frequently are found on the surface and disseminated through the soil and subsoil. The lower subsoil typically is moderately to quite compact, especially when dry. In places the upper is yellowish brown on the more nearly level areas.

This type differs but little from the Memphis silt loam in surficial appearance or in crop adaptation and productivity, where the gray layer is deeper than about 24 inches. When this layer lies much nearer the surface than this the type is not so productive nor so well suited to the legumes, especially clover and alfalfa, and warms up later in the spring. None of the type is quite so good, however, as the Memphis silt loam. The mottled compact layer appears to influence the moisture content of the soil considerably. Where it is near the surface the soil tends to bake in dry weather, drying out more completely than the Memphis silt loam or those areas of the Grenada silt loam which have the gray layer at depths of 2 feet or more. (9)

The Collins silt loam is a brown or light-brown silt loam frequently

(9) Ibid., pp. 94 and 95.

faintly mottled with gray and rusty brown, grading at about 6 to 12 inches into mottled brown and gray heavy silt loam to silty clay loam, and underlain at about 18 to 20 inches by light-gray or bluish-gray silty clay or silty clay loam, mottled in varying degrees with yellow. Locally the texture of the lower light layer is quite silty; again clay of an impervious nature may be found at about 36 to 40 inches. Dark-colored concretions and concretionary material are generally present in the subsoil. There are places where the content of these is high enough to give the lower subsoil a compact hardpanlike character. Some areas, on the other hand, have a rather sandy subsoil, with brown and rusty-brown mottlings. In dry weather the immediate surface soil has a gray to whitish appearance.

..... The Collins Silt loam occupies the first bottoms of most of the small streams and the creeks. It is all subject to overflow. The surface is essentially level, having of course, a slight downstream gradient and often a rise toward the uplands. The bottoms vary from narrow strips near the sources of the streams to areas one-half mile to a mile or more in width along the larger creeks. The soil represents recent alluvium, that is, material deposited by streams in time of overflow. In places there is an admixture of colluvial material washed down from adjacent slopes of the uplands. (10)

The Lexington silt loam, as distinguished from the Memphis, is developed where erosion has removed some of the superficial material or where the original layer of loess was shallower, so that sandy, basal, water-laid deposits come within the 3-foot section, or material from them is mixed with the loessial material at the lower subsoil depth. The Lexington soil generally

(10) Ibid., pp. 103 and 104.

occupies much more rolling areas and erosion is decidedly more active, so that in time the thin layer of silty material, becoming thinner all the while, will be completely removed, and the more sandy textured or quartzose beds or stiff clay beds, as the case may be, of the basal water-laid deposits will be exposed. As it is, the areas of Lexington silt loam on the eroded slopes at present include patches of the latter kind of soil in gullies and other washes.

Waverly silt loam⁽¹¹⁾ consists of about 10 inches of silt loam, varying in color from light to dark brown, according to the quantity of organic matter present. The subsoil grades into a heavy silt loam of a gray color, usually mottled with yellow iron stains. Varying quantities of iron concretions are found scattered over the surface and disseminated through both the soil and subsoil.

While the type, as a whole, is quite uniform, the texture of the soil is sometimes modified by local conditions. Areas bordering the uplands are occasionally influenced by material washed from the upland formation. Areas of this phase of the soil are usually better drained than much of the type, and are not so subject to overflow. The sand content varies considerably. Promiscuously scattered through the Hatchie River bottom are small areas known as "buckshot" or "crawfish" land. This soil is a grayish-white, fine, silty loam, underlain by a plastic, impervious, heavy, silty clay of a drab color mottled with yellow iron stains. But few of these "buckshot" areas are found along the two forks of Deer River.

The main bodies of this type are found in strips varying from one-half

(11) Bennett and McLendon, Soil Survey of Madison County, Tennessee, U.S.D.A., Bureau of Soils, 1907, page 14.

mile to 1 1/2 miles in width along the Middle Fork and South Fork of Deer River.

The Waverly silt loam is poorly drained and subject to annual overflow from the streams traversing it, which have an average fall of about 3 feet per mile. It is an alluvial soil formed from material deposited by these streams.

A and B slopes, 0-3% and 3-6% respectively, occupy 81.9 per cent of the area. They are found principally as Collins and Waverly silt loams. Practically all of the BB, C, and D slopes occur in Memphis silt and clay loams. The better drained upland soils have steeper slopes in addition to better subsurface drainage.

TABLE V. AVERAGE SLOPE IN EACH SOIL GROUP, SOIL CONSERVATION SURVEY, 112 FARMS IN CROCKETT COUNTY, 1936*

Soil Group	Average Per Cent of Slope
I (a and c)	5.3
I (b)	3.6
II	1.9
III	1.5
Weighted average of all soils	3.7

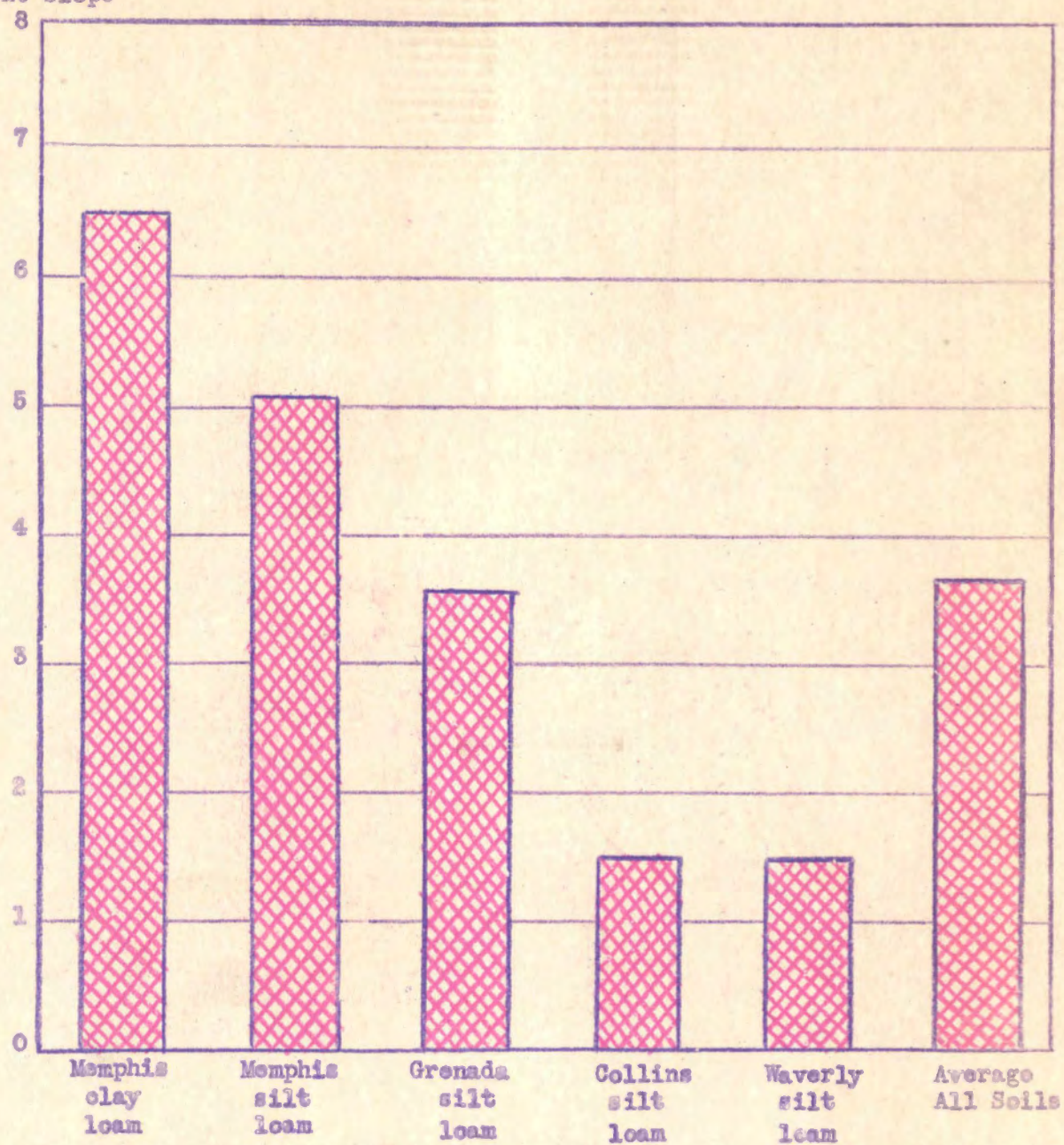
* To facilitate dealing with the large number (13) of soil types, the soils were placed in three groups as shown above. Group I, a, b, and c, are upland soils; Group II, second bottom soils; and Group III, first bottom soils.

Per Cent of Slope by Soil Types

Erosion is directly correlated with slope and in presenting slope by soil types, a partial explanation is given for the erosion as found on the different soils.

The average slope of all soils in the surveyed area of Crockett County is 3.7 per cent, with 34.90 per cent of the land in "A" slope (Table V).

Per cent Slope



Source: Table VI.

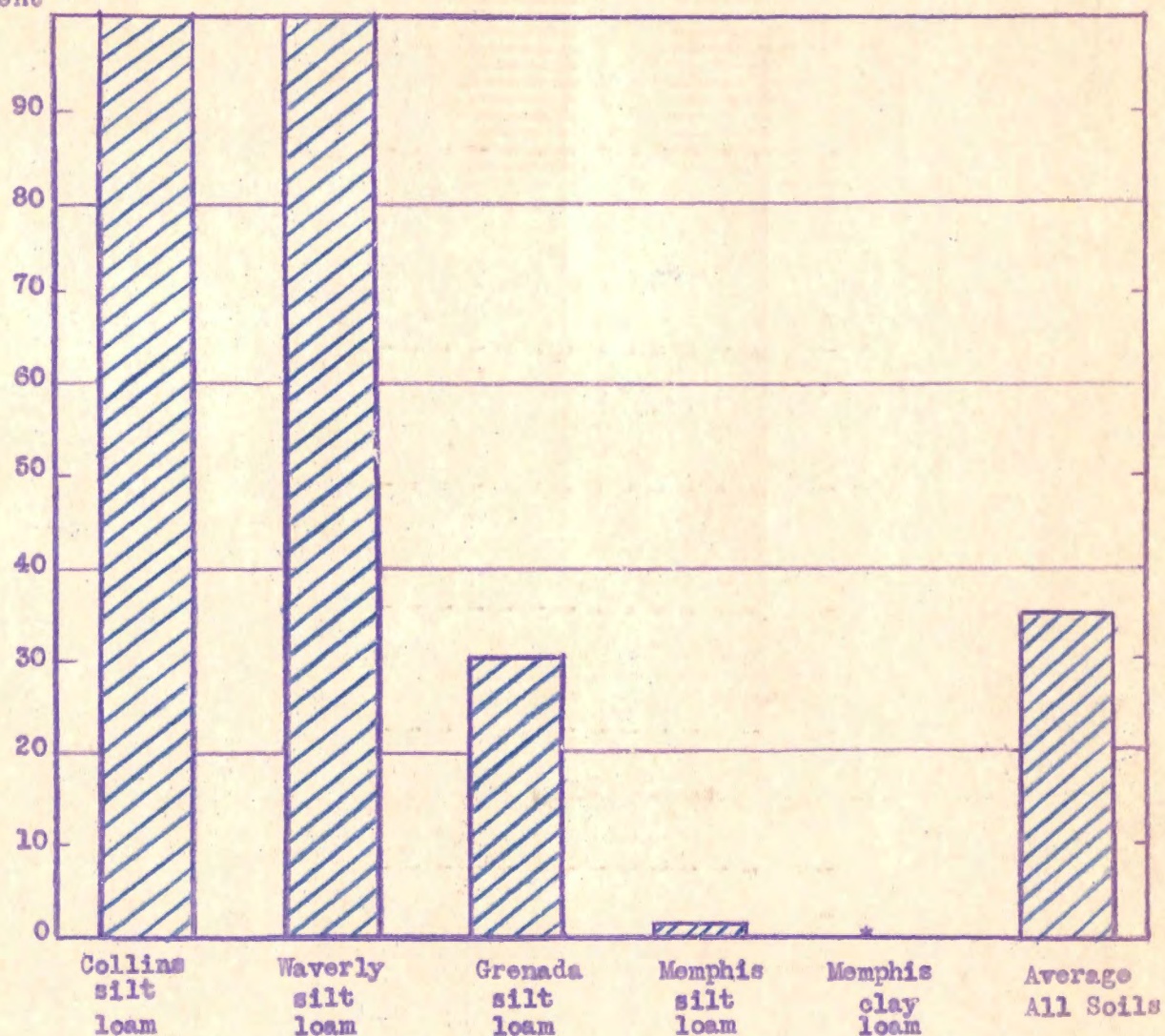
Figure 5. Per cent of Slope by Soil Types, 112 Farms, Crockett County, Tennessee, 1936

TABLE VI. PERCENTAGE DISTRIBUTION OF EACH SOIL TYPE IN A GIVEN SLOPE CLASS, ENTIRE AREA,
112 FARMS, CROCKETT COUNTY, TENNESSEE, 1936

Soil Type	Soil Type		Slope Class					Average % of Slope
	Acres	% of Area	A (0-3%)	B (3-6%)	BB (6-9%)	C (9-12%)	D (Over 12%)	
Memphis silt loam	4459	38.68	1.59	80.81	10.96	4.63	2.03	5.2
Grenada silt loam	2278	19.76	30.34	69.66	-	-	-	5.6
Henry silt loam	36	.32	75.20	24.80	-	-	-	2.2
Memphis clay loam	337	2.92	-	59.60	14.40	24.80	1.16	6.5
Lintonia silt loam	22	.19	75.50	24.50	-	-	-	2.2
Oliver silt loam	113	.98	90.55	9.45	-	-	-	1.3
Calhoun silt loam	7	.06	85.15	14.85	-	-	-	1.9*
Vicksburg silt loam	28	.25	100.00	-	-	-	-	1.5
Collins silt loam	2584	22.41	100.00	-	-	-	-	1.5
Waverly silt loam	451	3.91	100.00	-	-	-	-	1.5
Collins silty clay loam	22	.19	100.00	-	-	-	-	1.5
Waverly silty clay loam	3	.03	-	-	-	100.00	-	8.5*
Meadow soil	34	.29	100.00	-	-	-	-	1.5
Total area	11529	100.00	34.90	47.00	4.70	2.50	.80	3.7

* Inadequate sample.

Per cent



Source: Table VI.

*None

Figure 3. Per cent of Land in "A" Slope (0-3%) by Soil Types,
112 Farms, Crockett County, Tennessee, 1936

Memphis clay loam is the steepest land and averages 6.5 per cent slope, though a 3-acre patch of Lexington silt loam averages 8.5 per cent slope. Memphis silt loam, the major soil of West Tennessee, averages 5.2 per cent slope in the surveyed area of Crockett County, with 80.81 per cent of this soil being in "B" slope, and 10.96 per cent in "BB" slope (Table VI). Grenada silt loam soil averages 3.6 per cent slope. Collins and Waverly silt loam soils average 1.5 per cent slope and all soil is in "A" slope of less than 3 per cent.

Land use planning must first make use of soil in "A" slopes for cultivation, and as shown in Figure 5, it is Collins and Waverly soil that should be used as much as possible for the production of cultivated crops. Since very little of Memphis silt loam is in "A" slope this soil presents a more difficult problem.

Soil Erosion

The productive topsoil - the living surface - on most of the West Tennessee farms is being damaged more severely by erosion than by all other deteriorating processes combined. It is now known that, along with the body of the soil itself, erosion carries away many times as much plant food as is lost through leaching and crop removal together.

Nearly half of the top soil of the farms surveyed has been washed away by sheet erosion, 6 per cent in the A slopes, 68 per cent in the B slopes, and over 85 per cent on the BB, C, and D slopes (Table VII).

The principal factors influencing soil erosion are: (1) amount, distribution, and intensity of rainfall; (2) the topography of the land, which includes the degree of slope, the length of slope, and the total slope area

drained by the individual drainageways; (3) the erodibility⁽¹²⁾ of the particular soil type; (4) the type of soil management practices; and (5) the vegetative cover.

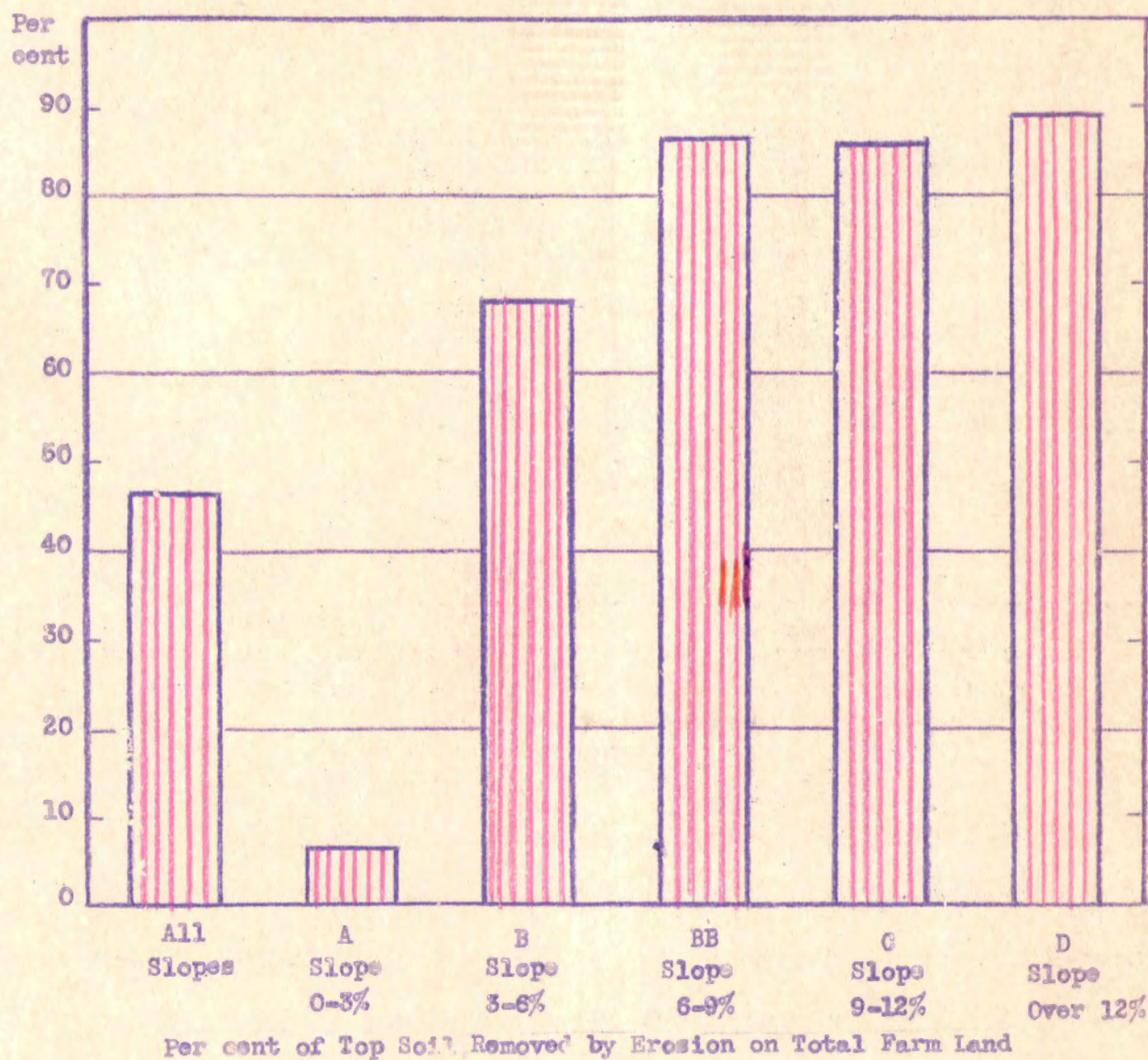
TABLE VII. EXTENT OF EROSION ON CROCKETT COUNTY SOILS, SOIL CONSERVATION SURVEY, 112 CROCKETT COUNTY FARMS, TENNESSEE, 1936

Soil Group	Per Cent of Top Soil Removed by Erosion on Total Farm Land					
	All Slopes	A Slope 0-3%	B Slope 3-6%	BB Slope 6-9%	C Slope 9-12%	D Slope Over 12%
I (a - c)	72.4	38.4	69.8	86.5	86.0	88.7
I (b)	51.9	25.9	63.8	87.5	-	-
II	20.6	14.5	53.4	-	-	-
III	0.9	0.2	-	-	-	-
Weighted average of all soils	46.5	6.3	68.2	86.5	86.0*	88.9

* The smaller percentage of surface soil removed on C slopes than in BB slopes is probably due to a difference in soil cover, rather than a difference in erosivity of soils on these slopes.

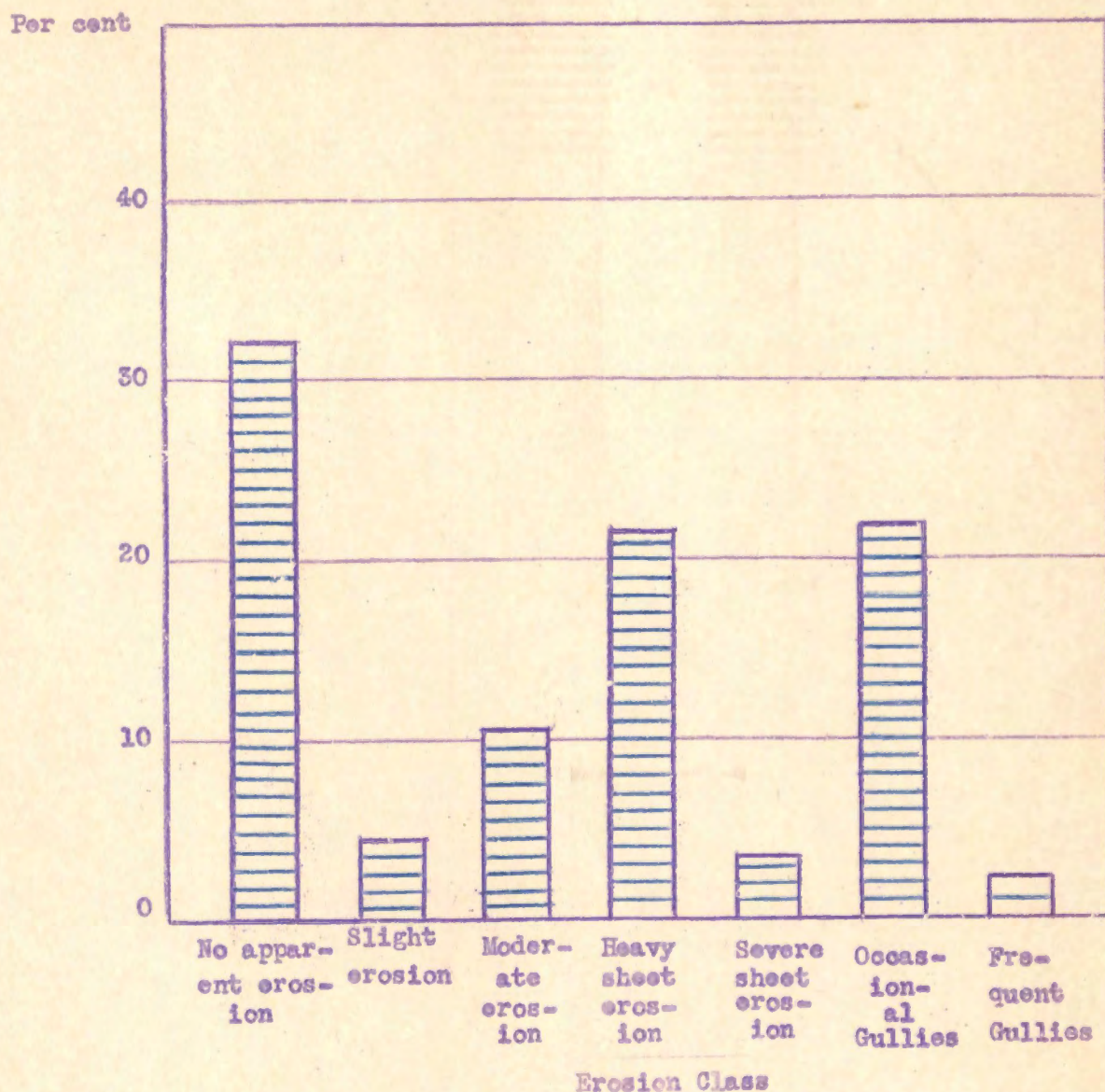
Approximately one third (32.2 per cent) of the cultivated land has no apparent accelerated erosion. This land is almost entirely on A slopes. The remaining 67.8 per cent of the land is subject to sheet erosion and gullying and needs erosion control measures. Practically all the cultivated land on BB, C, and D slopes has lost from 50 to 100 per cent of the top soil. Furthermore, these steeper slopes are more often badly gullied than A and B

(12) Erodible - susceptible to erosion; e.g., soil is erodible.



Source: Table VII.

Figure 7. Extent of Erosion on Crockett County Soils, Soil Conservation Survey, 112 Farms, Tennessee, 1936



Source: Table VIII.

Figure 8. Percentage of Cultivated Land In Each Erosion Class, 112 Crockett County Farms, Tennessee, 1936.

slopes. The most severe sheet erosion is on the upland and better drained soils. Gullying is directly correlated with sheet erosion, and becomes more severe as sheet erosion increases.

TABLE VIII. PERCENTAGE OF CULTIVATED LAND IN EACH SLOPE CLASS AND EROSION CLASS, 112 CROCKETT COUNTY FARMS, TENNESSEE, 1936

Erosion Class*	Slope Class					
	A	B	BB	C	D	Total
1. No apparent accelerated erosion	31.9	.3	-	.02	-	32.2
2. Slight erosion. Less than 25% of "A" horizon removed	4.5	.1	-	.01	-	4.6
3. Moderate sheet erosion, 25% to 50% of "A" horizon removed	3.9	6.9	-	-	-	10.8
33. Heavy sheet erosion, 50% to 75% of "A" horizon removed	.3	21.3	.1	.04	.04	21.8
4. Severe sheet erosion more than 75% of "A" horizon removed, and part of "B" horizon removed	.01	2.9	.4	.4	.03	3.7
7. Occasional gullies	.2	20.8	2.3	1.1	.1	24.5
8. Frequent gullies	-	1.0	.7	.5	.2	2.4
Total	40.8	53.3	3.5	2.1	.3	100.0

* No erosion classes numbers 5 or 9. Number 5 indicates a very severe sheet erosion - of lower "B" horizon and the "C" horizon or parent material. Number 9 indicates very frequent or destructively large gullies.

Extent of Erosion in Type of Farming

Area III

The soils of the Type of Farming Area III are loessial in origin, as are those of the sample area. The loessial soils thin out along the eastern border of Area III so there are many places where the loessial mantle of soil is thinner, and the coastal formation more exposed, than on the sample farms.

The Lexington soils, which represent the areas where the coastal sands and clays appear, are estimated by the Soil Conservation Service to cover approximately 9 per cent of Area III compared with less than 0.1 per cent found on the Sample Farms (Table IX). There is less Memphis silt loam, less Collins silt loam and First Bottom land soils in Type-of-Farming Area III and a greater percentage of Grenada and Henry silt loams as compared to the sample farms.

TABLE IX. DISTRIBUTION OF MAJOR SOIL TYPES, SAMPLE FARMS COMPARED WITH TYPE OF FARMING AREA III

Soil Type	Drainage	Per Cent of Farm Land Area	
		S.C.S. Survey of Sample Farms	Type of Farming Area III, Estimate by S.C.S.
<u>Group I - Loess Upland</u>			
a(Memphis silt loam	Well drained	43.0	} 17.0
(Memphis silty clay loam	Well drained	3.2	
b(Grenada silt loam	Intermediate	21.9	} 57.0
(Henry silt loam	Poor	0.5	
c(Lexington silt loam	Well drained	*	9.0
<u>Group II - Second Bottom</u>			
Lintonia silt loam	Well drained	0.2	} 1.0
Oliver silt loam	Intermediate	1.1	
Calhoun silt loam	Poor	0.1	
<u>Group III - First Bottom</u>			
Vicksburg silt loam	Well drained	0.3	} 16.0
Collins silt loam	Intermediate	24.9	
Waverly silt loam	Poor	4.3	
Collins silty clay loam	Poor	0.2	
Meadow	Well drained	0.3	
Total		100.0	100.0

* Less than 0.1 per cent.

Loessial soils thin out along the eastern border of Area III.

A greater proportion of the farm land in the type of farming area as a whole is in the steeper slopes than on the sample farms (Table X).

TABLE X. PERCENTAGE OF FARM LAND IN VARIOUS SLOPE CLASSES, SAMPLE FARMS COMPARED WITH TYPE OF FARMING AREA III, SOIL CONSERVATION SERVICE SURVEY, 1936

Slope Class	Per Cent of Farm Land Area	
	Sample Farms S.C.S. Survey	Type-of-Farming Area S.C.S. Estimate
A (0-3%)	34.9	29.0
B (3-6%)	47.0	25.0
BB (6-9%)	4.7	21.0
C (9-12%)	2.5	16.0
D (Over 12%)	0.8	9.0
Total	100.0	100.0

A greater proportion of the surface soil has been removed by erosion in the Type-of-Farming Area than on the Sample Farms (Table XI). Heavy sheet erosion and severe sheet erosion especially are more common on the type of farming area, though frequent gullies are less common.

TABLE XI. PERCENTAGE OF FARM LAND AREA IN EACH EROSION CLASS SAMPLE FARMS COMPARED WITH TYPE OF FARMING AREA III

Erosion Class	Per Cent of Farm Land Area	
	Sample Farm (S.C.S. Survey)	Type of Farming Area (S.C.S. Estimate)
No apparent accelerated erosion	29.7	2.2
Slight sheet erosion	4.2	0.1
Moderate sheet erosion	9.1	11.4
Heavy sheet erosion	19.2	30.3
Severe sheet erosion	3.1	28.8
Very severe sheet erosion and large gullies	0.7	2.2
Occasional gullies	28.8	23.3
Frequent gullies	5.1	-
Very frequent gullies	0.1	1.7
Total	100.0	100.0

Erosion in Tennessee. Soil erosion has damaged more than 85 per cent of all the land in Tennessee, according to a survey made by the Soil Conservation Service of the U. S. Department of Agriculture. Gullies have practically destroyed 3,000,000 acres for profitable cultivation and on approximately 11,000,000 acres sheet erosion has been so severe that from 75 to 100 per cent of the top soil has been removed.

TABLE XII. EXTENT OF EROSION IN TENNESSEE

	Acres	Per Cent of Total
Total area in farm and timber land	26,851,632	100.00
Area with little or no erosion	3,679,866	13.7
Area affected by sheet erosion		
One-fourth to three-fourths top soil lost	6,160,089	22.9
Over three-fourths of the top soil and some subsoil lost	10,984,212	40.9
Total sheet erosion	17,144,301	63.8
Area affected by gullies		
Occasional gullies	3,070,974	11.5
Severe and destructive gullies	2,956,491	11.0
Total area gullied	6,027,465	22.5

Source: U. S. Department of Agriculture.

Soil Depletion

Land under cultivation on most farms declines in natural fertility because plant nutrients leave the farm on one-way tickets. Seldom are soils managed in such a way that an equivalent amount of plant nutrients is returned to offset the losses. Too much is going off the farm, and too

little is being returned. This loss is not so apparent on the naturally fertile soils. Yet even on these, if cultivation is continued, the day is sure to come when yields will decline if fertility is not conserved.

Superficially considered, crop yields in Crockett County give little cause for apprehension. If the annual yield of cotton in 1880 to 1930 is compared very little decrease or increase is shown. Corn yields remained about the same, while yields of hay have decreased (Table XIII).

TABLE XIII. AVERAGE YIELD PER ACRE OF COTTON, CORN AND HAY IN CROCKETT COUNTY BY CENSUS PERIODS

Commodity	Unit	1880	1890	1900	1910	1920	1925	1930	1935
Cotton	500 lb. bale	.52	.24	.35	.38	.42	.42	.55	.59
Corn	Bushels	24	22	23	24	19	22	26	21
Hay	Ton	1.0	1.2	1.1	.9	.9	.6	.8	.7

Source: Census of Agriculture.

The fact that yields have held up has been a source of comfort to many people. But only one phase of the problem has been considered. With improvements in varieties, with better cultural practices the yield should actually have increased had fertility remained the same. What would be the average yield today if farmers attempted to farm as our ancestors did in 1880? We must realize that the natural productive capacity of the land has been deteriorating at a rate almost fast enough to offset all of these improvements in soil and crop management.

Value of Land, Buildings, and Machinery

The average value of farm land and buildings in Crockett County in 1930 was \$2598.00 per farm. This is considerably below the state average of

\$3025.00. The value per acre in Crockett County is greater than the State, being \$57.68 and \$41.00 respectively, due to the smaller farms in Crockett County requiring a larger investment relative to the acres farmed and higher priced land. There was an average investment of \$799.59 per farm in all farm buildings, \$568.76 in farm dwellings, and \$200.98 in farm implements and machinery (Table XIV).

TABLE XIV. VALUE OF LAND, BUILDINGS, AND MACHINERY, CROCKETT COUNTY, TENNESSEE, 1930

	Farm Land and Build- ings	All Farm Build- ings	Farm Dwellings	Farm Imple- ments and Machinery
<u>Total</u> State Crockett	\$743,222,363 8,177,949	\$227,570,837 2,517,131	\$147,878,759 1,790,435	\$45,758,093 632,709
<u>Per Farm</u> State Crockett	\$3,025.00 2,598.00	\$926.00 799.59	\$601.97 568.76	\$186.26 200.98
<u>Per Acre</u> State Crockett	\$41.00 57.68			

Source: Census of Agriculture.

Value of Crops, Livestock and Livestock
Products

The annual value of all farm products per farm in Crockett County was \$1096.85 in 1929, which is above the average of the state. The distribution of income among the enterprises is quite different from that of the Tennessee average. Approximately 73 per cent comes from crops, chiefly cotton; 6.7 per cent from livestock; 4.7 per cent from livestock products; .3 per cent from forest products; and 15.2 per cent from products used by the

family (Table XV).

TABLE XV. VALUE OF CROP, LIVESTOCK, AND LIVESTOCK PRODUCTS,
CROCKETT COUNTY, TENNESSEE, 1929

	Total		Per Farm		Per Cent	
	State	Crockett	State	Crockett	State	Crock.
Value of farm products	\$219,256,472	\$3,452,885	\$892.53	\$1096.85	100.0	100.0
Crops sold or traded	90,414,617	2,525,386	368.05	802.22	41.2	73.1
Livestock sold or traded	35,415,023	231,309	144.16	73.48	16.2	6.7
Livestock products sold or traded	32,297,238	162,740	131.47	51.69	14.7	4.7
Forest products sold or traded	4,256,302	9,593	17.33	3.05	1.9	.3
Products used by family	56,873,242	523,857	231.52	166.41	25.9	15.2

Source: Census of Agriculture.

Description of Type of Farming Area III

(13)

Type of farming Area III contains 1,935,232 acres of farm land. Of the farm land 1,147,000 acres, or nearly 60 per cent, is in crop land; 435,000 in total pasture land; 193,000 in wood land not pastured; and 163,000 in all other crop land. Total pasture land amounted to 22 1/2 per cent of all farm land and approximately one-half of the total pasture land is in plowable pasture. Woodland not in pasture amounted to 10 per cent of all farm land and all other farm land 8.4 per cent.

In 1930 a total farm population of 179,838 people were living on 40,772 farms, the average size of which was 47.4 acres.

(13) Agricultural Extension Service, University of Tennessee.

The acreage of harvested crops in 1929 was as follows: Cotton, 538,597; corn, 325,963; hay, 113,071; and all other crops, 169,463. Land in cotton amounted to 52.9 per cent of all land harvested in 1930. Corn acreage was 32.4 per cent of harvested land; hay, 11.1 per cent and all other crops 3.6 per cent. Eighty-seven and nine-tenths per cent of all harvested acres were in row crops.

During the last forty-five years the acreage of corn for grain has remained fairly constant. The 1934 Census enumeration shows an increase of some 20 per cent over 1929 figures. The acreage of wheat threshed began decreasing about 1900 and continued downward through 1929. The 1934 figures, however, show a slight increase over the 1929 figures. The acreage of hay showed a steady increase from 1869 through 1924, decreasing between 1924 to 1929, but almost doubling between 1929 and 1934. Cotton acreage was above normal from 1909 to 1919 - had decreased by 1924 - increased again at the 1929 enumeration, but showed a sizable decrease between 1929 and 1934. The acreage of both sweet and Irish potatoes showed a substantial increase between the 1929 and 1934 Census enumeration.

Livestock numbers in Area III in 1930 were as follows: Horses and mules, 78,424; all cattle, 114,520; dairy cattle, 86,834; beef cattle, 27,686; hogs, 113,978; sheep, 8,199; and chickens, 782,025. The number of horses has been decreasing steadily since 1910. On the other hand, the number of mules increased at each Census enumeration from 1900 to 1930, but dropped slightly between 1930 and 1935. The number of cattle was high in 1920 but had decreased by 1925 - the decrease continued through 1930. By 1934, a substantial increase in cattle numbers had occurred,

however. The trend in sheep numbers was steadily downward from 1890 through 1925. Since then it has remained fairly constant. Hog numbers dropped 50 per cent between 1920 to 1925, continued low until 1930, but showed an increase of slightly over 10 per cent between 1930 and 1935.

The major enterprises in Area III in 1929 were as follows: Cotton and cottonseed, \$10,050,000; dairy, \$1,491,000; poultry and eggs, \$446,000; beef, \$401,000. These cash enterprises are listed from the viewpoint of gross cash income to the area. That explains why certain enterprises, such as hog productions, are not included since the area is considered as a deficient pork-producing area. Considerable pork is sold but more is imported into the area as live pork or pork products for home consumption than is sold out of the area.

Very erosive soils planted to row crops increasing soil depletion, lack of diversity, and an unsatisfactory standard of living all emphasize the urgent need for a broad program of land use planning and improved farm management practices.

CHAPTER II

LAND USE AND ITS PROBLEMS IN CENTRAL WEST TENNESSEE

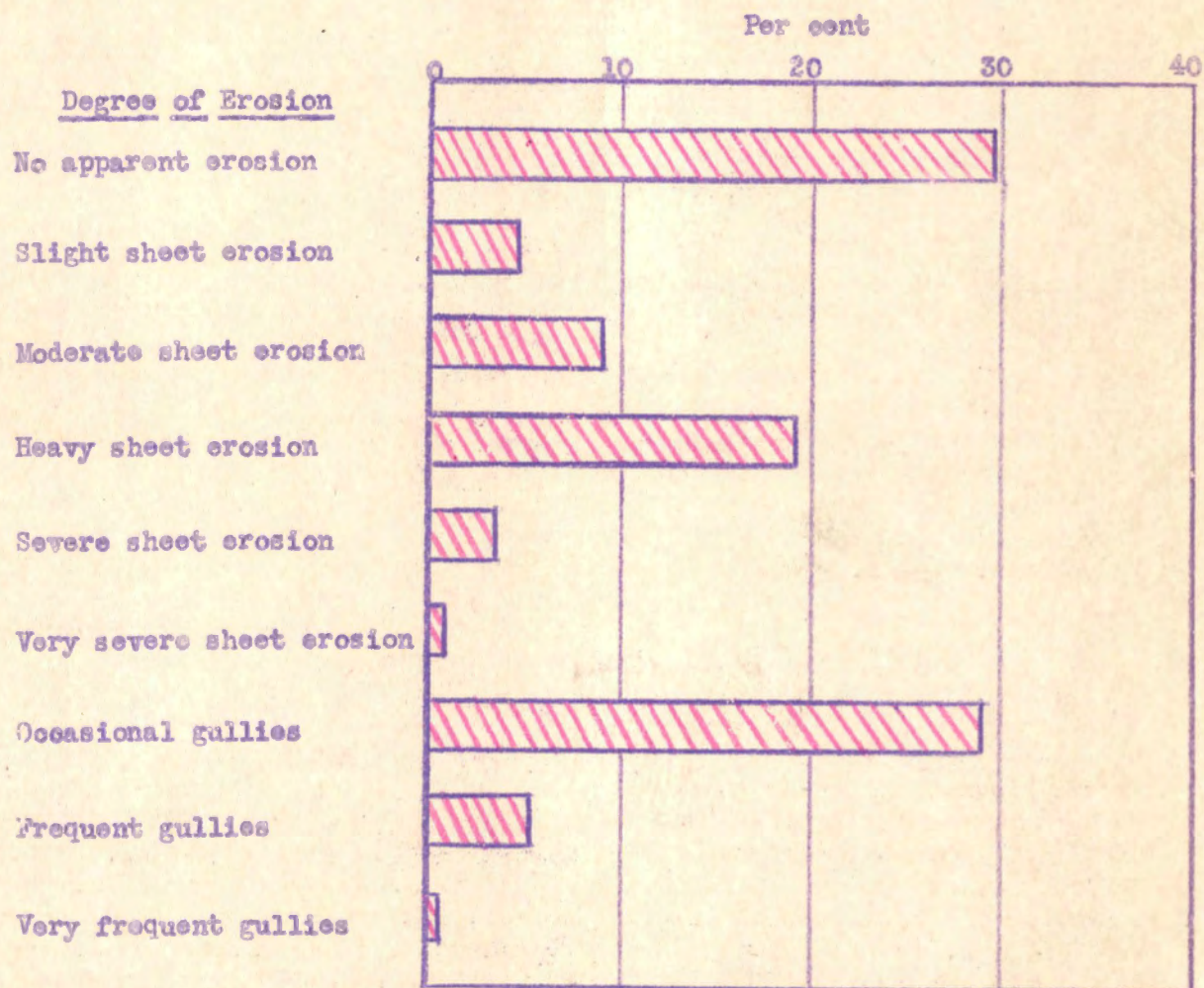
Soil Erosion: Relation to Soil Types, Slope, Land Use, and Other Factors

Relation to Soil Type. (1) The soils of West Tennessee vary in susceptibility to erosion. Of the total land area surveyed, that showing "no apparent accelerated erosion" was 95.56 per cent First Bottoms, namely: Collins silt loam, Waverly silt loam, Collins silty clay loam, and Vicksburg silt loam (Table XVI). Less than one per cent of the uneroded soil was either Memphis silt loam or Memphis silty clay loam; and only 3.55 per cent was Grenada and Henry silt loams combined.

(1) The degree of soil erosion is influenced by a combination of several factors. Among these is the susceptibility to erosion of the particular soil type, which in turn is dependent upon the combined effect of structure, texture, and organic matter. Coarse-textured soils tend to resist erosion because they permit water to penetrate readily, thus reducing the amount of run-off. However, some sandy soils have an impervious subsoil, which permits rather severe erosion. Individual particles in a coarse-textured soil (sand and sandy loam) are heavier and larger than those in fine-textured soil. This additional weight makes it more difficult for water to dislodge the particles. Soils having a characteristic granular or crumblike structure are also resistant to erosion.

Some soils puddle easily on the surface. When this is the case water will not penetrate readily, and must stand on or run off the surface.

Impervious subsoils increase erosion since the water must run off or stand in puddles when the topsoil has absorbed all that it will take.



Source: Table XVI.

Figure 9. Percentage Distribution of Land Surveyed, by
Erosion Classes, 112 Farms, Crockett County,
Tennessee, 1936

TABLE IV. RELATION OF EROSION TO SOIL TYPE, 112 FARMS,
CROCKETT COUNTY, TENNESSEE, 1936

All Soil Classes	Extent of Erosion									Total
	No Ero- sion	Slight Sheet Erosion	Moderate Sheet Erosion	Heavy Sheet Erosion	Severe Sheet Erosion	Very Severe Sheet Erosion	Occasion- al Gullies	Frequent Gullies	Very Fre- quent Gullies	
Acres	3008.0	421.4	920.7	1941.6	318.6	67.2	2927.2	519.3	10.0	10134.0
Per cent	29.68	4.16	9.08	19.16	3.14	.66	28.66	5.12	.10	100.00
Each Soil Class										Per Cent of Total Acres
Memphis silt loams	.85	1.19	35.53	74.19	81.74	100.00	74.71	92.82	100.00	47.41
Grenada + Henry silt loams	3.55	70.50	61.41	25.49	18.26	-	24.38	7.18	-	22.43
Oliver, Lintonia, Cal- houn silt loams	.04	25.82	2.22	.32	-	-	.20	-	-	1.40
Collins, Waverly, Vicksburg silt loams	95.56	2.49	.84	-	-	-	.61	-	-	28.73
Lexington + Phebe silt loam	-	-	-	-	-	-	.10	-	-	.03
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Soils with only "slight sheet erosion" (less than 25% of "A" horizon removed) were 70.50 per cent Grenada and Henry silt loams; 25.82 per cent Lintonia, Oliver and Calhoun silt loams; and 1.19 per cent Memphis silt loam.

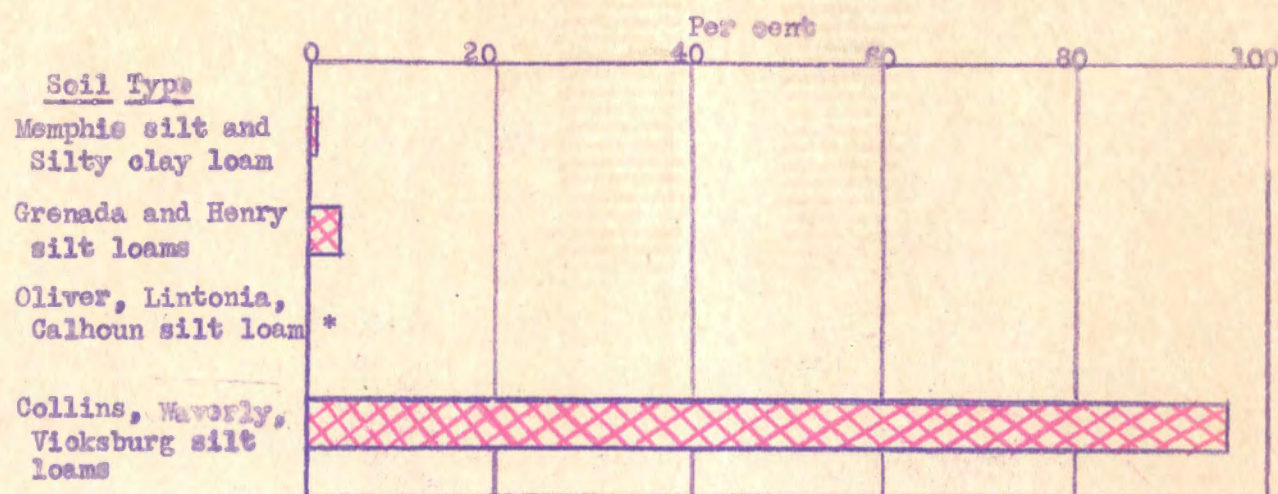
Of the area showing "moderate sheet erosion" (25% to 50% of "A" horizon removed), 35.53 per cent was Memphis silt loam and Memphis silty clay loam; 61.41 per cent Grenada and Henry silt loams; and approximately 3 per cent in all other soil types.

"Heavy sheet erosion", which had removed 50% to 75% of the "A" horizon, was found on 1941.6 acres, of which 74.19 per cent was Memphis silt loam and Memphis silty clay loam; 25.49 per cent Grenada and Henry silt loams; and only a negligible quantity on all other soil types.

Land with "severe sheet erosion" (more than 75% of "A" horizon and part of "B" horizon removed) was composed of 81.74 per cent Memphis silt and Memphis silty clay loams and 18.26 per cent Grenada and Henry silt loams. No other soil types were so severely eroded.

Memphis silt and Memphis silty clay loams constituted 97.53 per cent of all land with "very severe sheet erosion" (sheet erosion of lower "B" horizon and the "C" horizon or parent material). Only 2.47 per cent was found on Grenada and Henry silt loams, and none on the other types.

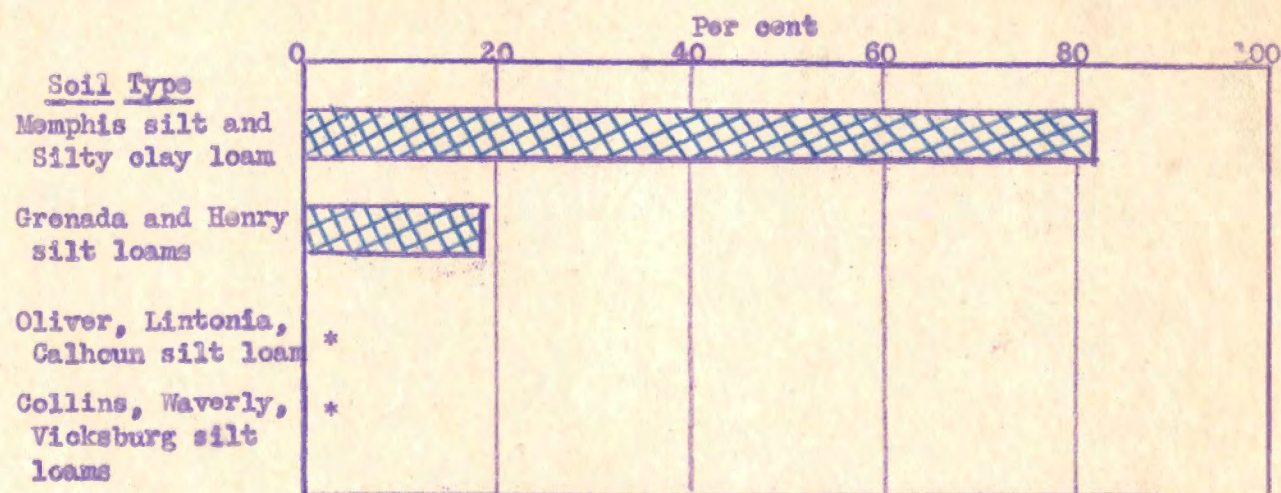
Gully erosion was found on all soil types, though most severe on the upland soils. Memphis silt and Memphis silty clay loams contained 74.71 per cent of all "occasional gullies" (average of three gullies or less per acre, or gullies 100 feet or more apart laterally) while 24.58 per cent of such gullies were found on Grenada and Henry silt loams. Other soil



*Less than 1 per cent.

Source: Table XVI.

Figure 10. Percentage Distribution of Land With No Erosion by Soil Types, 112 Farms, Crockett County, Tennessee 1936



*Less than 1 per cent.

Source: Table XVI.

Figure 11. Percentage Distribution of Land With Severe Sheet Erosion, by Soil Types, 112 Farms, Crockett County, Tennessee, 1936.

types did not have significant amounts of gullies.

There were 519.3 acres with "frequent gullies" (average of three or more gullies per acre, or gullies less than 100 feet apart laterally, but with less than 75% of the area delineated included in gullies), of which 92.82 per cent was found on Memphis silt and Memphis silty clay loams. The remaining 7.18 per cent was found on Grenada and Henry silt loams.

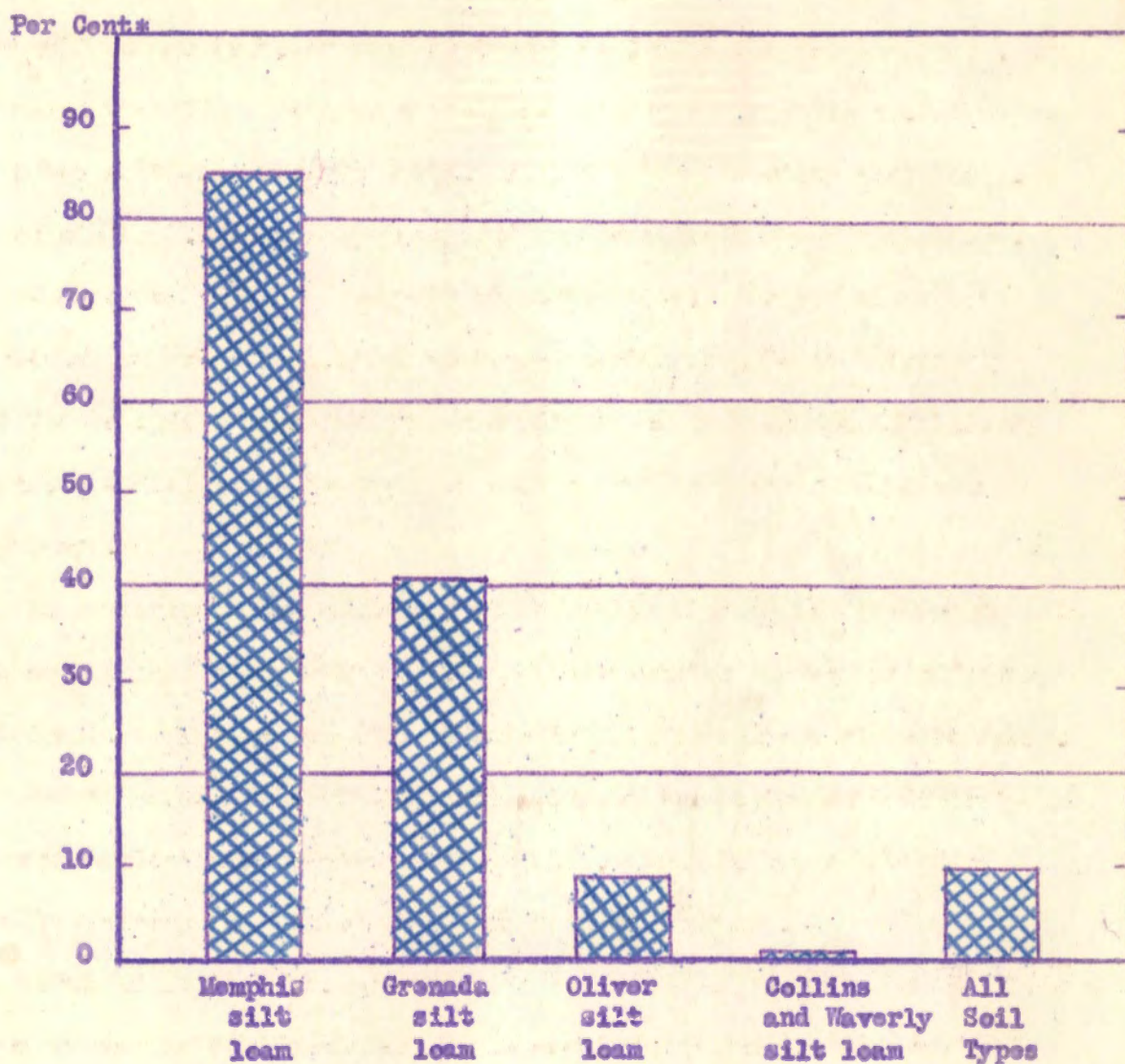
Ten acres had very "frequent or destructively large gullies" (an intricate network of gullies that has dissected an area so thoroughly that 75 per cent or more of the area delineated is included in gullies) and all such gullies were found on either Memphis silt or Memphis silty clay loams.

To summarize, most of the sheet and gully erosion is found on Memphis silt and Memphis silty clay loam, with some erosion on Grenada and Henry silt loams. The uneroded land is chiefly Collins and Waverly silt loams.

Since the erodibility of a particular soil type is not definitely shown when slope and land use are variable, the soil types have been further analyzed by holding these two factors constant.

When all soil types, on land of "A" slope (0-3%), producing cultivated crops are compared wide variations in erosion are found. Of such land, 1.0 per cent of the Collins and Waverly silt loams has accelerated erosion, 84.8 per cent of the Grenada silt loam, 96.4 per cent of the Memphis silt loam, and 99.0 per cent of the Oliver, Lintonia and Calhoun silt loams show accelerated erosion, the average for all soil types being 22.0 per cent (Table XVI).

On the same classification, 85.1 per cent of the Memphis silt loam, 40.7 per cent of the Grenada silt loam, and 9.0 per cent of the Oliver



Source: Table XVII.

Figure 12. Relationship of Erosion to Soil Type on Land of "A" Slope (0-3%) Producing Cultivated Crops, 112 Farms, Crockett County, Tennessee, 1936

*Per cent of each soil type having moderate sheet erosion.

Lintonia, and Calhoun silt loams have moderate sheet erosion (25% to 50% of "A" horizon removed), Figure 12. Gullying is also more severe on Memphis silt and Grenada silt loam soils.

TABLE XVII. RELATION OF EROSION TO SOIL TYPE ON LAND OF "A" SLOPE (0-3%) PRODUCING CULTIVATED CROPS, CROCKETT COUNTY, TENNESSEE, 1936

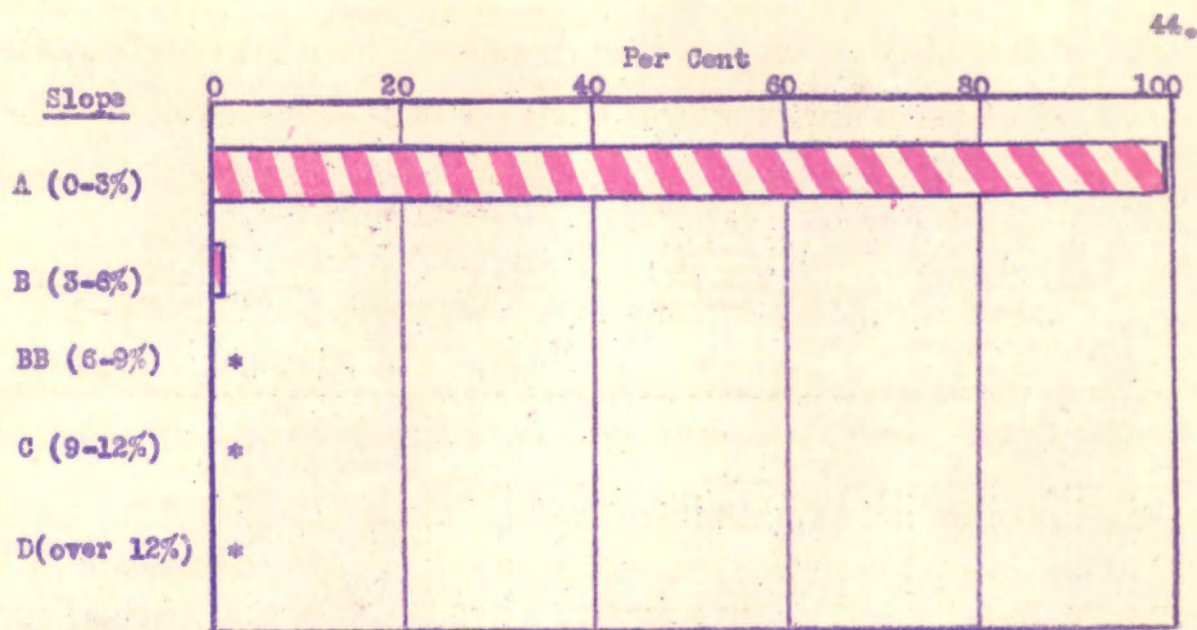
Soil Type	Number of Acres	Per Cent of Each Soil Type in Each Erosion Class								
		1	2	3	33	4	5&9	7	8	9
1-4 Memphis silt loam	58.6	3.6	-	85.1	11.3	-	-	-	-	-
2-3 Grenada silt loam	592.3	15.2	40.7	40.7	2.5	0.2	-	0.7	-	-
21-22 Collins and Waverly silt loams	2392.4	99.0	0.4	0.2	-	-	-	0.4	-	-
11-12-13 Oliver, Lintonia, Calhoun silt loams	111.0	1.0	90.0	9.0	-	-	-	-	-	-
All soil types	3154.3	78.0	11.1	9.7	0.7	0.03	-	0.5	-	-

Under the same or similar conditions, the order of erodibility from greatest to least is Memphis silt loam, Grenada silt loam, Oliver, Lintonia, and Calhoun silt loams, and Waverly and Collins silt loams.

Relation of Erosion to Slope. Since erosion is proportional to the length and steepness of the slope ⁽²⁾ it might be expected that erosion on the

(2) When the flow of water is speeded up the eroding or cutting power increases many times. Theoretically if the velocity of water is doubled the scouring capacity is increased 4 times, the carrying capacity 32 times and the size of the soil particles carried 64 times. Length of slope is important because it determines the volume and velocity of run-off. Long slopes permit water to gain velocity, and velocity plus increased volume accelerate eroding power. U. S. Department of Agriculture Farmers' Bulletin No. 1795.

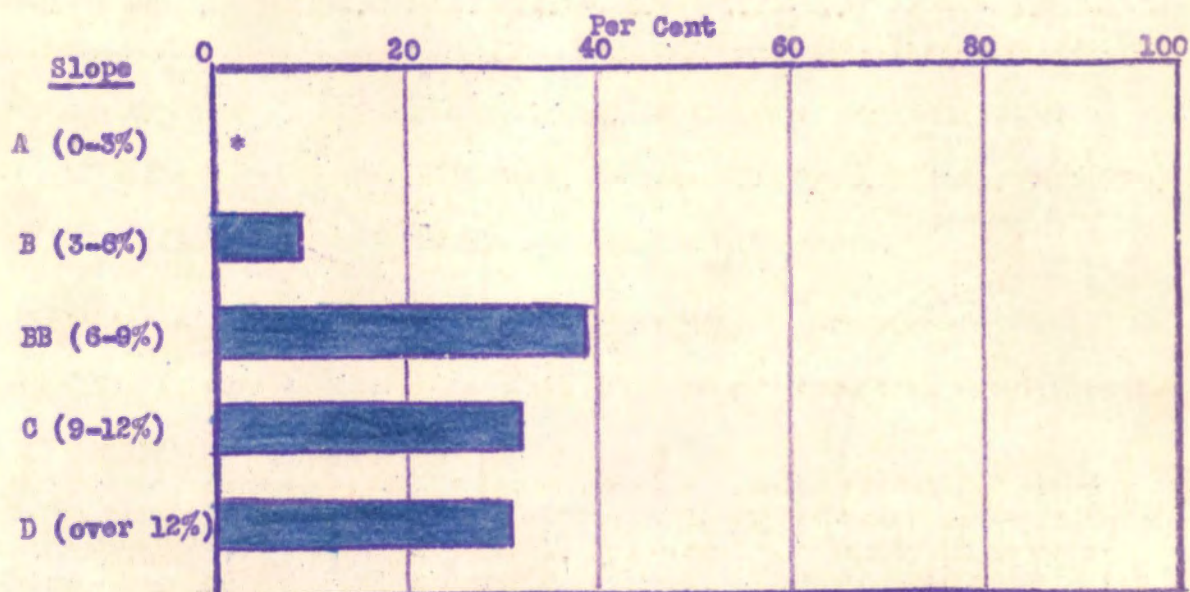
Figure 14. Percentage of Very Severe Sheet Erosion by Slope Classes, 112 Farms, Crockett County, Tennessee, 1936



Source: Table XVII.

*None

Figure 13. Percentage of Uneroded Land by Slopes, 112 Farms, Crockett County, Tennessee, 1936



Source: Table XVIII.

*None

Figure 14. Percentage of Very Severe Sheet Erosion by Slope Classes, 112 Farms, Crockett County, Tennessee, 1936

farms of Crockett County would be in proportion to the contour of the land. However, inasmuch as the average slope for the farms surveyed is only 3.7 per cent, considerable divergence from the averages found in other areas may occur. Of 3008 acres on which no apparent accelerated erosion was found, almost all the land (98.92 per cent) was on slopes of less than 3 per cent. On the other hand, practically all (98.54 per cent) of the heavy sheet erosion (on 1941.6 acres) occurred on land possessing more than 3 per cent slope (Table XVIII).

No instances of very severe sheet erosion was found on land of A slope (0-3%). Over 50 per cent of all severe sheet erosion (more than 75% of "A" horizon and part of "B" horizon removed) occurred on land of over 9 per cent slope, though land of over 9 per cent slope constituted but 3.45 per cent of the entire area surveyed.

"Occasional gullies" were found on all slopes (average of three gullies or less per acre or gullies 100 feet or more apart laterally), though 84.38 per cent of all such gullies were found on B slopes (3-6%). While the degree of erosion classed as occasional gullies occurred with greatest frequency on B slopes, erosion classed as frequent gullies (average of three or more gullies per acre, or gullies less than 100 feet apart laterally but less than 75% of the area included with gullies) occurred with greatest frequency on BB slopes (6-9%). More than four-fifths (86 per cent) of all very frequent or destructively large gullies occurred on BB slopes.

As the percentage of steep land and longer slopes increases the extent of erosion increases, but at a much greater rate, since farmers who possess a minimum of level land, are forced to put in row crops land that is normally classed as unsuited for intensive cultivation.

Intermediate land, too steep for satisfactory tillage and cultivation relative to soil conservation, yet considered too valuable to be left in permanent pasture or woodland, often suffers most, erodes more rapidly and loses productivity fastest. The reason is that such land does not possess the slope advantage of level ground, when kept continually in cultivation, nor does it receive soil conservation practices comparable to land kept in permanent pasture or woodland. This is evidenced in Table XVIII, showing that land of B slope (3-6%) suffers most.

Thus in Crockett County, where most of the land is fairly level, such small areas of steep slopes as occur have been kept in permanent pasture or forest, which is conducive to soil conservation.

The relationship of slope to erosion is well illustrated on Memphis silt loam producing cultivated crops, for under these conditions other variables are largely eliminated. As the slope increases the percentage of each slope in each erosion class steadily shifts towards the more severely eroded class (Table XVIII). Moderate sheet erosion was found on 85.1 per cent of slope "A" and 8.4 per cent of slope B, the other slopes containing no land that is only moderately eroded. This is also true of gullies, for the percentage of land in frequent gullies steadily increased as the slope increased, ranging from none on slope A to 2.0 on slope B, 21.0 per cent on slope BB, 26.1 per cent on slope C, and 49.4 per cent on slope D.

TABLE XVII. RELATION OF EROSION TO SLOPE

Slope Class	Extent of Erosion								Total Acres	
	No Ero- sion	Slight Sheet Erosion	Moderate Sheet Erosion	Heavy Sheet Erosion	Severe Sheet Erosion	Very Severe Sheet Erosion	Occasional Gullies	Frequent Gullies		Very Fre- quent Gullies
Total acres	300.80	421.4	920.7	1941.6	318.6	67.2	2927.2	519.3	10.0	10134.0
Per cent	29.68	4.16	9.08	19.16	3.14	.66	28.88	5.12	.10	100.00
Per Cent of Each Erosion Class in Slope										Per Cent of Land by Slope
A (0-3%)	98.92	95.94	37.10	2.33	.28	-	2.11	-	-	37.75
B (3-6%)	1.02	4.65	62.58	98.54	79.75	9.22	84.38	32.06	-	53.31
BB (6-9%)	-	-	-	.52	10.20	38.83	9.52	38.23	86.00	5.48
C (9-12%)	.05	.19	.31	.16	8.97	26.63	3.65	13.44	-	2.54
D (Over 12%)	-	.04	-	.14	.75	25.29	.31	11.20	14.00	.91
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

TABLE XIX . RELATION OF SLOPE TO EROSION ON MEMPHIS SILT
LOAM PRODUCING CULTIVATED CROPS, CROCKETT COUNTY, TEN-
NESSEE, 1936

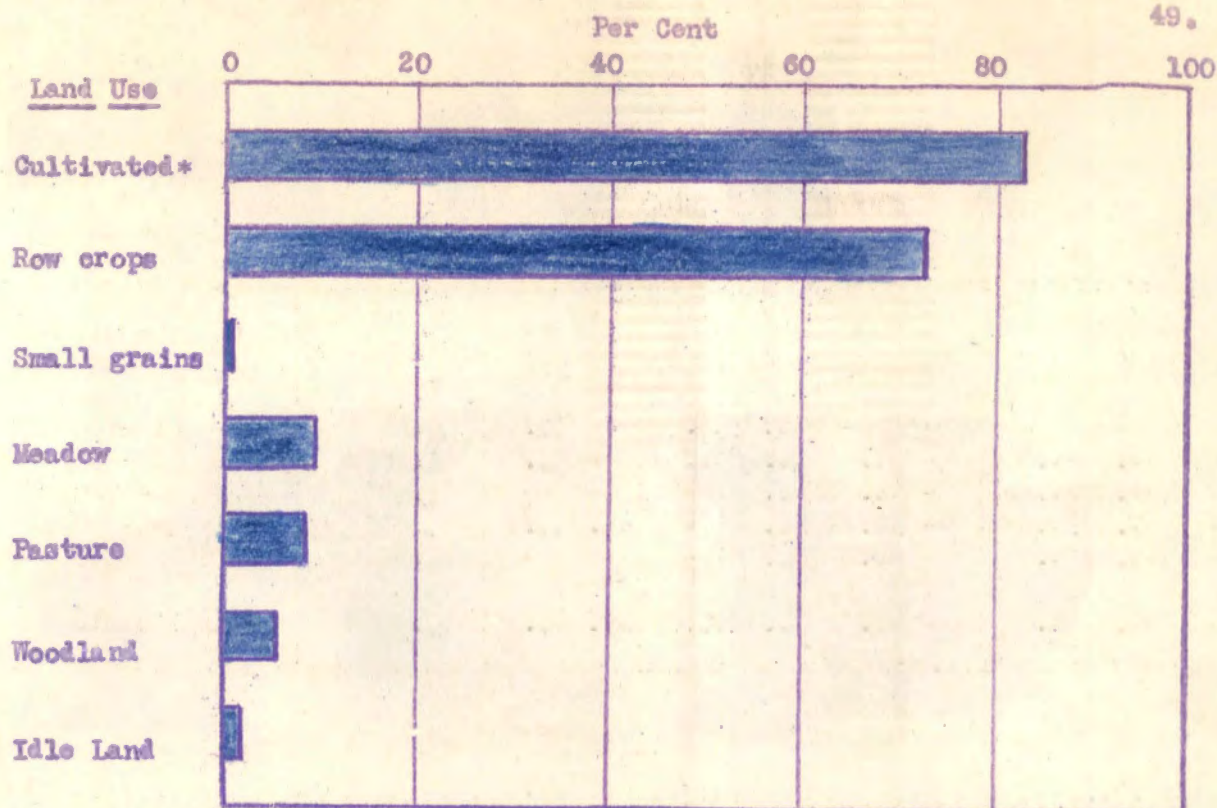
Slope	Acres in Slope	Per Cent of Each Slope in Each Erosion Class								
		1	2	3	33	4	5&9	7	8	9
A(0-3%)	58.6	3.6	-	85.1	11.3	-	-	-	-	-
B(3-6%)	2883.2	0.5	-	8.4	42.9	6.1	-	40.1	2.0	-
BB(6-9%)	269.8	-	-	-	2.1	10.9	-	66.0	21.0	-
C(9-12%)	160.5	1.1	0.5	-	2.0	17.8	-	52.5	26.1	-
D(12% & over)	24.5	-	-	-	11.4	9.8	-	29.4	49.4	-
All slopes	3396.3	0.5	.02	8.6	36.9	7.0	-	42.0	5.0	-

Relation of Erosion to Land Use. The formation and accumulation of soil is evidence that nature's method of land use in forests, prairie pastures and undisturbed surface soil is most conducive to soil conservation. Such a system of land use, however, will not meet the nation's demand for food and clothing.

Erosion is greatest on cultivated land, by a margin ranging from 50 to 90 per cent. Erosion is least on pasture and woodland. The acreage of small grains is not large enough to warrant deductions being made.

Of land showing no apparent accelerated erosion, 82.68 per cent was planted to cultivated crops. This was composed of 72.51 per cent row crops, 0.36 per cent small grains, 9.81 per cent meadow, 8.59 per cent pasture, 6.64 per cent woodland, and 2.09 per cent idle. This uneroded land, however, is chiefly Collins silt loam and other bottom land soils which would not erode much under any system of land use.

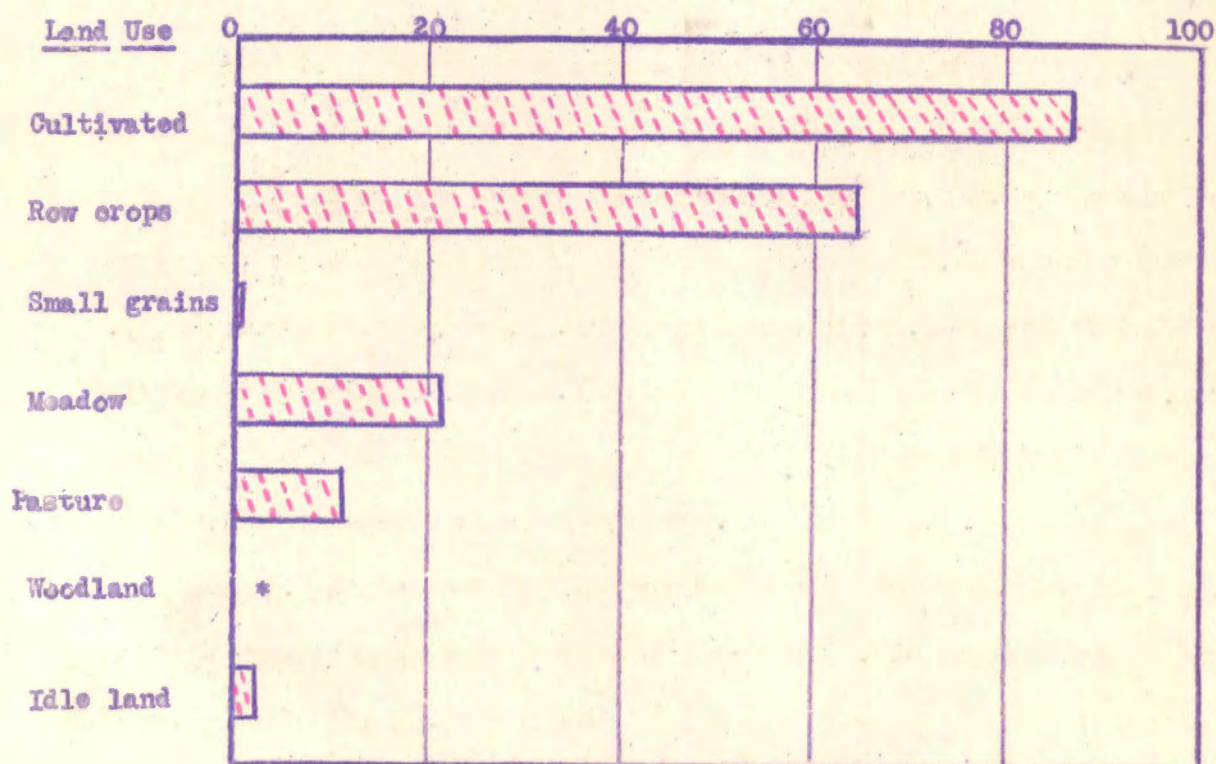
On 1941.6 acres on which heavy sheet eroded land had occurred, 86.69 per cent was planted to cultivated crops; and 64.76 per cent was in row crops. Similarly, 90.58 per cent of the severe sheet erosion occurred on



Source: Table XX.

*Combination of row crops, small grains and meadow

Figure 15. Percentage Distribution of Land Showing no Apparent Accelerated Erosion by Land Use, 112 Farms, Crockett County Tennessee, 1936



Source: Table XX.

*Less than .1 per cent

Figure 16. Percentage Distribution of Land Showing Heavy Sheet Erosion, by Land Use, 112 Farms, Crockett County, Tennessee, 1936

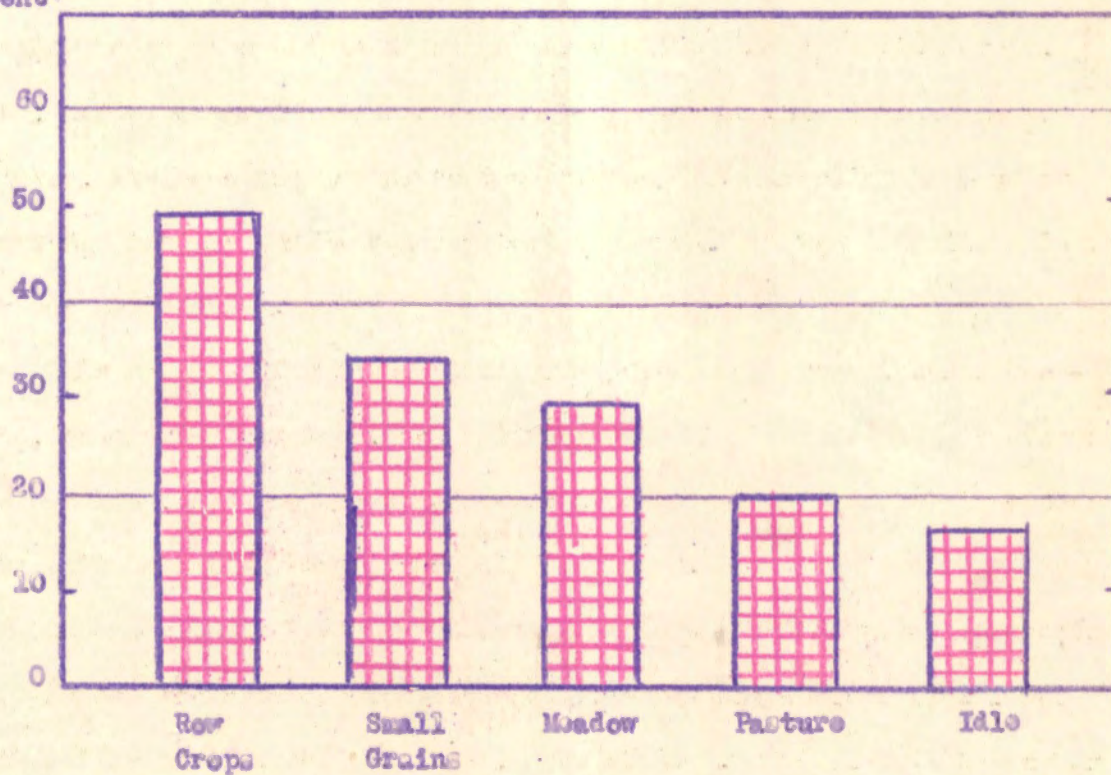
land in cultivated crops, this also being predominately planted to row crops.

The most severe erosion, which combined extensive sheet erosion with frequent and destructively large gullies, occurred principally on idle land, though much was found on pasture and woodland. Apparently, as erosion progresses the land use is forced into less intensive crops. Then, unless control measures are exercised especially in regards to gullies, the momentum may carry the process of destruction to a point where the land is unsuited for almost any crop, and may thus lie idle for further devastation.

This process of retiring land from cultivated crops towards woodland, as erosion develops, accounts for much of the erosion in pastures and woodland, and may sometimes cause this method of land use to appear more soil depleting than is actually the case.

In order to isolate the effect of land use on the extent of erosion, differences occurring on the same soil type and same slope class, but with differing land use practices, were studied. On all soil types for which adequate samples were available, erosion decreased as the land use changed from row crops toward less intensive crops, such as pasture (Table XXI). The percentage of Memphis silt loam of "A" slope in heavy sheet erosion steadily decreased as the crop intensity decreased, as follows: row crops 49.3 per cent, small grains 33.7 per cent, meadow 29.6 per cent, pasture 19.9 per cent, and idle land 16.5 per cent (Figure 17). The same relationship held for Grenada silt loam and the average of all soil types. However, the percentages were not so high on the other soils due to the greater erodibility of Memphis silt loam.

Per Cent*



Source: Table XXI.

*Per Cent of land use acreage
showing heavy sheet erosion

Figure 17. Relationship of Sheet Erosion to Land Use on
Memphis Silt Loam of "B" Slope, 112 Farms, Crockett
County, Tennessee, 1936

TABLE XX. RELATION OF EROSION TO LAND USE

Land Use	Extent of Erosion							Total Acres	
	No Ero- sion	Slight Sheet Erosion	Moderate Sheet Erosion	Heavy Sheet Erosion	Severe Sheet Erosion	Very Se- vere Sheet Erosion	Occasion- al Gul- lies		Frequent Gullies
Total acres	3008.0	421.4	920.7	1941.6	518.6	67.2	2927.2	519.3	10134.0
Per Cent	29.68	4.16	9.08	19.16	3.14	.66	28.88	5.12	100.00
Per Cent of Each Erosion Class in:									Per Cent of Total
Cultivated*	82.68	84.76	90.91	86.69	90.58	-	64.61	48.12	76.30
Row crops	72.51	57.47	71.39	64.76	61.52	-	38.29	7.55	56.19
Small grains	.36	4.72	1.64	.66	-	-	2.03	-	1.17
Meadow	9.81	22.57	17.88	21.25	29.06	-	24.30	28.65	18.95
Pasture	8.59	14.78	9.04	10.99	8.60	27.03	30.78	36.20	17.90
Woodland	6.64	.45	.05	.08	.34	23.96	.23	2.39	2.37
Idle land	2.09	-	-	2.23	.47	48.96	4.38	13.29	3.43
								100.00	

* Combined row crops, small grains and meadow.

It might be assumed that, since total erosion is greatest under a land use system of row crops, that gullying would likewise be most severe. This, however, is not strictly the case, as the largest percentage of land in gullies is in pasture. This is the result of changes in land use. As gullies become larger and more frequent the land use changes from row crops, through various stages, to pasture and to forest. The gullied land in pasture and forest is thus the result rather than the cause of gully erosion. Unfortunately historical land use data are not available for further study of this aspect.

TABLE XX. RELATION OF LAND USE TO EROSION ON "B" SLOPES
(3-6%), BY SOIL TYPES, CROCKETT COUNTY, TENNESSEE,
1936

Soil Type	Land Use	Acres in Land Use	Per Cent of Each Land Use in Each Erosion Class								
			1	2	3	33	4	5&9	7	8	9
Memphis silt loam 1-4	Row crops	1929.0	.7	-	10.2	49.3	6.0	-	33.7	0.1	-
	Small grain	38.3	-	-	28.2	33.7	-	-	38.1	-	-
	Meadow	915.9	-	-	4.0	29.6	6.6	-	53.7	6.1	-
	Pasture	828.6	-	0.3	2.3	19.9	2.4	-	68.5	6.6	-
	Forest	10.1	-	-	15.8	-	-	-	17.8	66.4	-
	Idle	96.3	5.7	-	-	16.5	0.8	6.5	60.6	9.9	-
Grenada and Henry silt loams 2-3	Row crops	834.7	1.0	0.8	25.3	34.2	5.0	-	32.9	0.8	-
	Small grain	45.6	-	-	1.8	-	-	-	98.2	-	-
	Meadow	335.6	-	-	19.6	36.8	2.6	-	57.1	3.9	-
	Pasture	272.3	0.9	3.7	8.0	16.8	2.1	-	64.4	4.1	-
	Forest	1.3	-	-	-	-	-	-	100.0	-	-
	Idle	68.6	-	-	-	1.0	1.0	-	88.1	9.9	-
Collins and Waver- ly silt loams 21-22-23- 24-90	Row crops	-	-	-	-	-	-	-	-	-	-
	Small grain	.8	-	-	100.0	-	-	-	-	-	-
	Meadow	3.2	-	-	100.0	-	-	-	-	-	-
	Pasture	-	-	-	-	-	-	-	-	-	-
	Forest	-	-	-	-	-	-	-	-	-	-
	Idle	-	-	-	-	-	-	-	-	-	-

(continued)

TABLE XXI. RELATION OF LAND USE TO EROSION ON "B" SLOPES
(3-6%), BY SOIL TYPES, CROCKETT COUNTY, TENNESSEE,
1936 (cont.)

Soil Type	Land Use	Acres in Land Use	Per Cent of Each Land Use in Each Erosion Class								
			1	2	3	33	4	5&9	7	8	9
Lintonia, Oliver and Calhoun silt loams 11-12-13	Row crops	13.1	-	-	55.7	-	-	-	44.3	-	-
	Small grain	-	-	-	-	-	-	-	-	-	-
	Meadow	5.3	-	-	-	100.0	-	-	-	-	-
	Pasture	3.9	-	-	79.5	20.5	-	-	-	-	-
	Forest	-	-	-	-	-	-	-	-	-	-
	Idle	-	-	-	-	-	-	-	-	-	-
All Soils	Row crops	2776.8	0.8	0.3	14.9	44.5	5.7	-	33.5	0.3	-
	Small grain	84.7	-	-	14.6	15.2	-	-	70.2	-	-
	Meadow	1260.0	-	-	8.4	31.8	5.5	-	48.9	5.4	-
	Pasture	1104.8	0.2	1.1	4.0	19.1	2.3	-	67.3	6.0	-
	Forest	11.4	-	-	-	14.0	-	-	27.2	58.8	-
	Idle	164.9	3.3	-	-	10.1	0.9	3.8	72.0	9.9	-

Other Factors Influencing Erosion. The size of farm is important, as more attention must be given to intensive farming and cash crops, in order to produce a reasonable income on small farms. These practices increase erosion.

Type of farming influences erosion. For example, livestock production requires more hay and pasture, and returns more manure to the land, which reduces erosion.

Farm indebtedness forces the farmer to carry a larger load, which may be reflected in more intensive farming and fewer conservation and fertility practices, resulting in greater erosion and soil depletion.

The short time interest of tenants on a particular farm may not be conducive to soil conservation unless their operations are supervised by the owner.

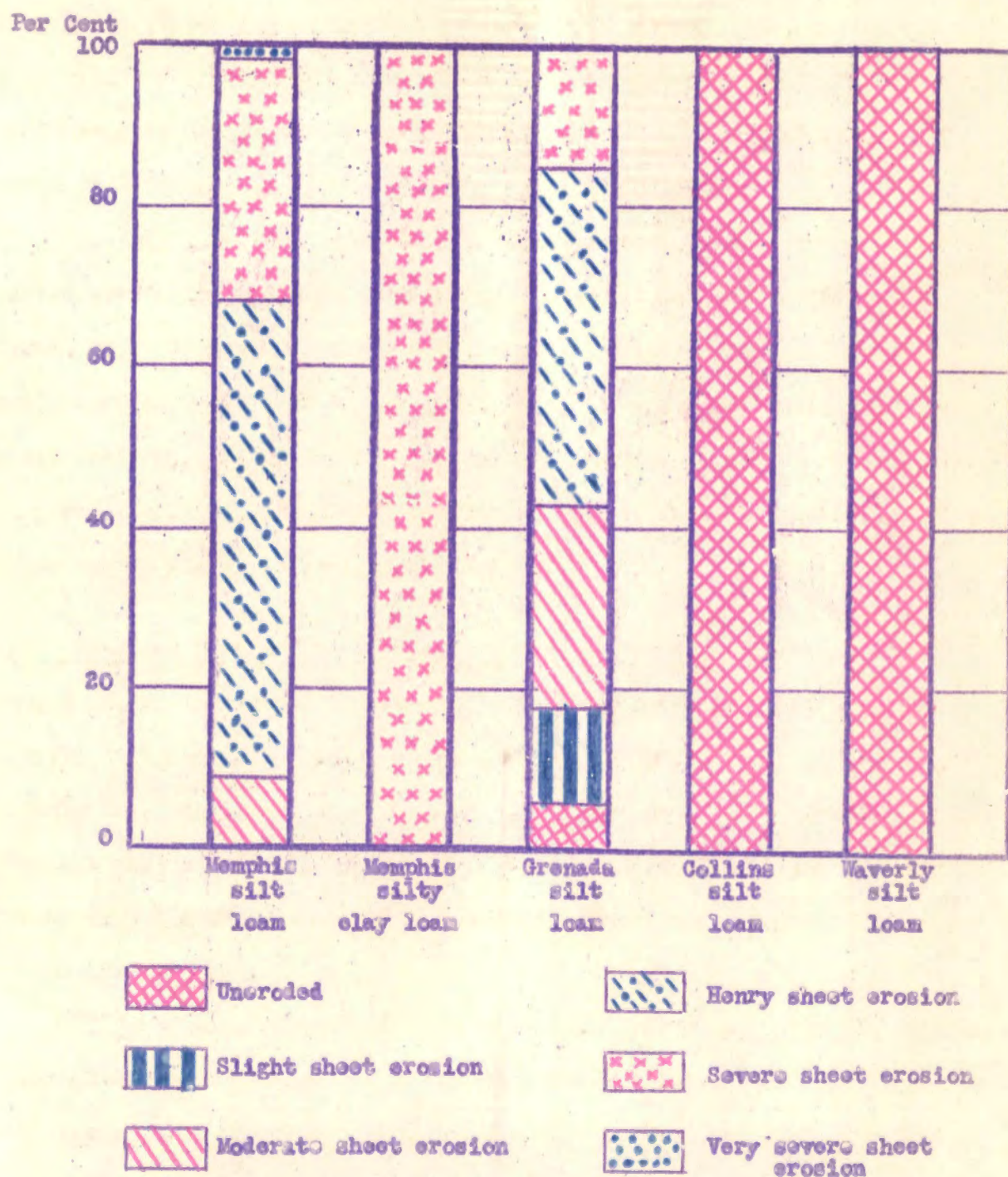
Since erosion is affected by the amount and quality of protective cover, and since this in turn is affected by soil fertility, the amount of fertilizer or lime used is a factor in erosion control. Relatively small amounts of lime and fertilizer were used in Crockett County, which makes it an important factor contributing to erosion.

Terracing, contour cultivation, strip cropping, and gully control affect erosion. Terracing of some form was practiced on 39 per cent of the farms, gully control on 61 per cent, contour tillage on 38 per cent. No strip cropping was found on any farm. Many other things might be done to check erosion, such as leaving grassed waterways in cultivated fields, stopping small gullies, and judicious grazing of pastures. These are especially important in the early stages of erosion.

Extent of Erosion on Each Soil Type. The various soil types differ in extent of erosion due to differences in slope, erodibility, and cover. Of Memphis silt loam only 0.54 per cent was not eroded. On the other hand, of Waverly silt loam, Collins silty clay loam, and Meadow soil practically 100 per cent was uneroded. Collins silt loam was uneroded on 99.52 per cent of its area, while the average of all soil types was only 28.30 per cent uneroded (Table XXII).

"Slight sheet erosion" was formed on 84.28 per cent of the Oliver silt loam; 62.04 per cent of the Lintonia silt loam; 46.01 per cent of the Henry silt loam; 11.32 per cent of the Grenada silt loam; less than 1 per cent of the Collins silt loam and Memphis silt loam. None was found on the other soil types. The average was 3.45 per cent of all soils.

An average of 8.36 per cent of the land surveyed showed "moderate sheet erosion" ranging from none to 7.78 per cent on the Memphis silt loam, 9.89



Source: Table XXII.

Figure 18. Extent of Erosion by Soil Types, 112 Farms, Crockett County, Tennessee, 1936

TABLE XIII. PERCENTAGE DISTRIBUTION OF EACH SOIL TYPE IN A GIVEN EROSION CLASS,
ENTIRE AREA 112 FARMS, CROCKETT COUNTY, TENNESSEE, 1936

Soil Type	Average Per Cent of Slope	Erosion Class								Average % of Soil Lost	
		+&1	2	3	33	4	5&9	7	8		9
Memphis silt loam	5.2	.54	.07	7.78	59.03	30.76	2.04	45.07	9.68	1.92	68.5
Grenada silt loam	3.6	5.71	11.32	25.77	41.26	14.93	-	32.72	1.54	-	50.6
Henry silt loam	2.2	-	46.01	11.02	24.52	18.46	-	26.17	6.34	-	41.3
Memphis silty clay loam	6.5	-	-	-	-	100.00	-	40.53	14.78	-	87.5
Lintonia silt loam	2.2	-	62.04	39.97	-	-	-	-	-	-	-
Oliver silt loam	1.8	-	84.28	9.89	5.83	-	-	5.12	-	-	17.8
Calhoun silt loam	1.9	14.35	-	-	85.05	-	-	-	-	-	-
Vicksburg silt loam	1.5	100.00	-	-	-	-	-	-	-	-	-
Collins silt loam	1.5	99.52	.45	.03	-	-	-	-	-	-	0.0
Waverly silt loam	1.5	100.00	-	-	-	-	-	-	-	-	0.0
Collins silty clay loam	1.5	100.00	-	-	-	-	-	-	-	-	-
Lexington silt clay	8.5	-	-	-	-	100.00	-	100.00	-	-	-
Meadow soil	1.5	100.00	-	-	-	-	-	-	-	-	-
Total	3.7	28.30	3.45	8.36	31.30	17.85	.78	25.25	4.53	.74	

per cent on Oliver silt loam, 11.02 per cent on Henry silt loam, 25.77 per cent on Grenada silt loam, and 39.97 per cent of Lintonia silt loam.

All soils averaged 31.30 per cent "heavy sheet erosion". In this erosion class Memphis silt loam and Calhoun silt loam were highest, being 59.03 and 85.05 per cent respectively.

"Gullied land" was most common on Memphis silt loam, such land being 45.07 per cent in occasional gullies, higher than any other for which adequate sample was secured. Memphis silt clay loam was 40.53 per cent in occasional gullies. Grenada and Henry silt loams were also very high in percentage of land in gully erosion.

Only Memphis silt loam contained frequent and destructively large gullies, which constituted 1.92 per cent of the area of this soil type. Memphis was also the only soil type to contain a combination of very severe sheet erosion associated with frequent and destructively large gullies. This combination class was found on 2.04 per cent of the area of Memphis silt loam.

In average per cent of the top soil lost, Memphis silty clay loam was 87.5 per cent, Memphis silt loam 68.5, Grenada silt loam 50.6, Henry silt loam 41.3, and Oliver silt loam 17.8 per cent.

Extent of Erosion on Each Slope Class. Erosion increases very rapidly as the per cent of slope increases. No erosion was found on 79.2 per cent of the land which was classed as "A" (0.3%) slope. The only other slope containing land which showed no erosion was "B" (3-6%), of which 0.6 per cent was free from erosion. On land of "A" slope 10.5 per cent had slight sheet erosion, 9.5 per cent was moderately sheet eroded, 0.7 per cent heavily sheet eroded, and 0.1 per cent in occasional gullies.

Of land having "B" slope, 14.0 per cent showed moderate sheet erosion, 64.6 per cent heavy sheet erosion, 20.7 per cent severe sheet erosion, and 39.4 per cent occasional gullies land with "BB" slope had 6.5 per cent in heavy sheet erosion, 93.5 in severe sheet erosion, 66.0 per cent in occasional gullies, and 21.0 per cent in frequent gullies.

The average per cent of soil lost on "BB", "C", and "D" slopes did not differ much, though "C" and "D" slopes contained the more severe classes of erosion. This resemblance is not due to similarity in erodibility, but to differences in protective vegetational cover, land in the steeper slopes often being in pasture and forest.

TABLE XXIII. PERCENTAGE DISTRIBUTION OF EACH SLOPE ACCORDING TO EROSION CLASS, CULTIVATED LAND, 112 FARMS, CROCKETT COUNTY, TENNESSEE, 1936

Erosion Class	Slope Class				
	A (0-3%)	B (3-6%)	BB (6-9%)	C (9-12%)	D (Over 12%)
No erosion	79.2	.6	-	-	-
Slight sheet erosion	10.5	.2	-	.5	-
Moderate sheet erosion	9.5	14.0	-	-	-
Heavy sheet erosion	.7	64.6	6.5	5.2	17.8
Severe sheet erosion	-	20.7	93.5	94.3	73.1
Very severe sheet erosion	-	-	-	-	8.2
Occasional gullies	.1	39.4	66.0	53.2	29.4
Frequent gullies	-	1.9	21.0	25.6	49.4
Very frequent gullies	-	-	-	-	-
Average per cent soil lost	5.4	63.8	85.9	85.8	83.8

Erosion increases rapidly on slopes steeper than A.

(3)
Land Use Suggestions

Memphis silt loam and Memphis silty clay loam constitute 41.60 per cent of all soil in Crockett County. They are well drained upland soils, with an average slope of 5.3 per cent. Grenada and Henry silt loams, also upland soils, make up 20.03 per cent of the land and have an average slope of 3.6 per cent. Oliver, Lintonia, and Calhoun silt loams, second bottom land, constitute 1.23 per cent of the soil, and average 1.9 per cent in slope. Collins, Waverly, and Vicksburg silt loams are bottom land, constitute 26.76 per cent of the area, with an average slope of 1.5 per cent.

Severe sheet erosion is limited to the upland soils. Gullying is directly correlated with sheet erosion, and becomes more severe following sheet erosion. Frequent and destructively large gullies indicate an urgent need for gully control on 5.3 per cent of the area, while occasional gullies indicates that attention to gullying is needed on areas comprising 25.2 per cent of the total acreage surveyed.

Since A and B slopes (0-3% and 3-6% respectively) occupy 81.9 per cent of the area, and only 67.00 per cent of the area is under cultivation, all of the crops could be placed on land having a slope less than 6 per cent, as practically all the cultivated land on BB, C, and D slopes has either heavy or severe sheet erosion (i.e., from 50 to 100 per cent of the topsoil has been lost) and since these steeper slopes are more badly gullied than A and B slopes, it appears desirable to retire these steeper slopes from

(3) These suggestions are based on those made by experts of the Soil Conservation Service who participated in the survey.

row crops so far as possible. It is recognized that on some farms this will be impossible because of their high percentage of BB, C, and D slopes, in which case probably the BB slopes must be cultivated. Care should be used, however, in cultivating these slopes, and erosion control measures used, to prevent their destruction.

As practically all of the BB, C, and D slopes occur on Memphis silt loam it is principally this soil that would be taken out of cultivation and devoted to pasture and forest.

Areas having A slopes, with less than 25 per cent of the topsoil lost and no gullies, need no particular control measures, except where stream banks are being cut by water. These areas occupy 36.5 per cent of the cultivated land. Areas of A, B, and BB slopes, with moderate to severe sheet erosion associated with occasional gullies, need terracing or strip cropping, with cultivation on the contour. These areas occupy 59.5 per cent of the cultivated land. The C slopes should be used for close growing crops only, and constitute 1.5 per cent of the cultivated land. The areas of D slope, and those having severe to very severe sheet erosion associated with frequent gullies, might well be taken out of cultivation and retired to pasture or forest. This group occupies 2.1 per cent of the cultivated land.

Group recommendations are difficult to apply to individual farms, and must be modified considerably when used as the basis for determining the land use on particular fields. For these reasons, specific land use suggestions are made according to soil type and slope class in association with degrees of erosion, together with suggested erosion control measures (Tables XXIV-XXVII). For instance, Memphis silt loam with A slope, with

less than 25 per cent of the "A" horizon removed, might be planted to row crops with no erosion control measures needed, while land with the same soil type and slope class which is severely sheet eroded might need to be planted to meadow and row crops in association with terracing or contour tillage. In this same group, land which is very severely eroded, and shows destructively large gullies, might be planted to permanent pasture or forest. Memphis silt loam of C slope is potentially pasture and woodland soil. The pasture land might have contour furrows. The least eroded parts could be planted to row crop if necessary, but only in connection with terracing, contour tillage, or strip cropping. Memphis silt loam of D slope is also potentially permanent pasture and woodland, the pasture to be contour furrowed.

For Grenada and Henry silt loams of B slopes, which are not eroded or are only slightly eroded, the suggested land use is row crops and meadow, with terracing or contour tillage. Land of this type and slope, showing occasional or frequent gullies, might be kept in meadows and pasture, and be terraced or contour furrowed.

Collins and Waverly silt loams are row crop soils, not in need of any particular erosion control measures, and may be used to produce as much as possible of the row crops.

TABLE XXIV. SUGGESTED LAND USE ON MEMPHIS SILT LOAM, BY
SLOPE CLASS AND EROSION GROUP

Slope Class	Extent of Erosion*	Suggested Use	Control Measure
A (0-3%)	1 - 2	Row crops	No control measures needed.
	3 - 33	Row crops and meadow	Contour tillage, terracing long slopes
	4 - 5	Row crops and meadow	Terracing and contour tillage.
	7 - 8	Meadow and row crops	Contour tillage, terracing, strip cropping.
	5 - 9	Pasture or woods	Permanent.
B (3-6%)	1 - 2	Row crops	Rotation and retire badly eroded land.
	3 - 33	Row crops and meadow	Contour tillage, strip cropping, terraces.
	4 - 5	Row crops, meadow and pasture	Terraces and contour tillage.
	7 - 8	Meadow and row crops	Terraces, contour tillage, strip cropping.
	5 - 9	Pasture and woods	Permanent.
BB (6-9%)	1 - 2	Row crops and meadow	Retire badly eroded land.
	3 - 33	Row crops, meadow and pasture	Terraces, contour tillage, strip cropping.
	4 - 5	Meadow, pasture, row crops, woods	Terrace, contour tillage, strip cropping.
	7 - 8	Meadow, pasture, row crops	Terrace, contour tillage, strip cropping, contour furrow
	5 - 9	Woods	Permanent
C (9-12%)	1 - 2)	Potential pasture and hay, row crops if necessary	Terrace, contour tillage, strip cropping
	3-33)		
	4 - 5	Pasture	Contour furrows
	7 - 8	Woods and pasture	Contour furrows if pastured
	5 - 9	Woods	Permanent
D (Over 12%)	1 - 2	Pasture	Contour furrows
	3 - 33	Pasture	Contour furrows
	4 - 5	Woods and pasture	Contour furrows if pastured
	7 - 8	Woods	Permanent
	5 - 9	Woods	Permanent

- * 1 - 2 No erosion to slight sheet erosion (0-25% of "A" horizon removed).
 3 - 33 Moderate to heavy sheet erosion (25-75% of "A" horizon removed).
 4 - 5 Severe to very severe sheet erosion (75% of "A" horizon and to part of "B" and "C" horizons removed).
 7 - 8 Occasional to frequent gullies (average of 3 or less gullies per acre).
 5 - 9 Very severe sheet erosion and destructively large gullies (average more than 3 and to destructively large gullies associated with very severe sheet erosion).

TABLE XXV. SUGGESTED LAND USE ON GRENADA AND HENRY SILT LOAMS, BY SLOPE CLASS AND EROSION GROUP

Slope Class	Extent of Erosion*	Suggested Use	Control Measures
A (0-3%)	1 - 2	Row crops and meadow	Protect from surface water.
	3 - 33	Row crops and meadow	Terrace and contour tillage.
	4 - 5	Meadow and row crops	Terrace and contour tillage.
	7 - 8	Meadow and row crops	Terrace and contour tillage.
	5 - 9	Pasture or woods	Permanent.
B (3-5%)	1 - 2	Row crops and meadow	Terrace and contour tillage.
	3 - 33	Meadow and row crops	Terrace and contour tillage.
	4 - 5	Meadow and row crops	Terrace and contour tillage.
	7 - 8	Meadow and pasture	Terrace and contour furrows.
	5 - 9	Pasture or woods	Permanent

* See Table

TABLE XXVI. SUGGESTED LAND USE ON COLLINS, WAVERLY AND VICKSBURG SILT LOAM, BY SLOPE CLASS AND EROSION GROUP

Slope Class	Extent of Erosion*	Suggested Use	Control Measures
Mostly A (0-3%)	No erosion to slight sheet and occasional gully erosion	Row crops	No treatment needed
Some B (3-6%)			

*See Table

TABLE XXVII. SUGGESTED LAND USE ON OLIVER, GAYBORN, AND LINTONIA SILT LOAM, BY SLOPE CLASS AND EROSION GROUP

Slope Class	Extent of Erosion	Suggested Use	Control Measures
A (0-3%)	1 - 2	Row crops	No control measures needed.
	3 - 33	Row crops	No control measures needed.
	4 - 5	Row crops and meadow	Terracing and contour tillage
	7 - 8	Row crops and meadow	Contour tillage, terracing, strip cropping
	5 - 9	Pasture or woods	Permanent

(continued)

TABLE XXVII SUGGESTED LAND USE ON OLIVER, CALHOUN, AND
LINTONIA SILT LOAM, BY SLOPE CLASS AND EROSION GROUP
(continued)

Slope Class	Extent of Erosion*	Suggested Use	Control Measures
B (3-6%)	1 - 2	Row crops	These areas where sufficient in size, terracing, and strip cropping should be used Permanent
	3 - 33	Row crops and meadow	
	4 - 5	Row crops, meadow and pasture	
	7 - 8	Meadow and row crops	
	8 - 9	Pasture and woods	

* See Table

On shallow loess and coastal plain soils trees are suggested on the C and D slopes, and on the badly eroded phases of BB, B and A slopes; pasture on the less eroded phases of BB, B, and A slopes; and row crops on the uneroded phases of B and A slopes.

Crop Rotations. The following suggested rotations are made for both cultivated and pasture land to accompany land use improvement.⁽⁴⁾ Particular circumstances may modify the application of these rotations on individual farms. Since bottom land is more productive, and subject to less erosion, a shorter and more intensive rotation is suggested for Collins and Waverly silt loam.

Memphis and Grenada silt loams, both upland soils, are loessial in origin, and have a steeper slope and more erosion than the average of the soils surveyed. For this reason they probably require a longer rotation, and a consistent use of cover crops. A four-year rotation might be used: cotton followed by a cover crop of crimson clover; corn and soybeans together; oats and lespedeza; and lespedeza (Table XXVIII). The crimson clover might be sown in the cotton rows at time of the last cultivation. Crimson clover as a cover

(4) Crop rotations suggested have been approved by O. W. Dynes, Professor of Agronomy, University of Tennessee.

crop might be improved by the addition of rye grass, to add to the pasture carrying capacity and increase the green manure crop in the spring; also to decrease the risk of failure by having but one plant in the cover crop.

Soybeans might be sown in the corn rows at the time of planting, to be used chiefly for pasture purposes. Oats sown in the fall provides cover, and can be harvested either as grain or hay, while lespedeza can be sown the following spring in the oats and left for two years without replowing. Soybeans for seed might be added after corn, thus increasing the rotation to five years.

TABLE XXVII SUGGESTED ROTATION FOR MEMPHIS AND GRENADA
SILT LOAM SOILS*, CROCKETT COUNTY, TENNESSEE

Year	Crop Rotation	Pounds of Seed per Acre (a)	Favorable Planting Dates (a)	Comments (a)
1	Cotton followed by cover crop of crimson clover	Cotton 20-40 Clover 12-18	May 1-10 July 20-Sept. 1	Use excessive quantity and thin to proper stand Generally sown too late
2	Corn and soybeans	Corn 3-9 Soybeans 5	Apr. 20-May 10 Apr. 20-May 10	Neal Paymaster, Jarvis Golden Prolific corn Tokio, Laredo beans for pasture
3	Oats and lespedeza	Oats 48-64 Lespedeza 5-25	Sept. 15-Oct. 1 March 1-30	Dwarf Culberson or Gray Turf oats No. 76 or Korean lespedeza
4	Lespedeza	-	-	Early spring plowed for cotton

(a) Source: Mooers, C. A., Rates and Dates for Planting Tennessee Farm and Garden Crops, University of Tennessee Agricultural Experiment Station Circular No. 11, February 1931.

* Upland soils. Note: Soybeans might be added after corn, making a five-year rotation.

Favorable planting dates are mentioned, with suggested pounds of seed per acre, and a few suggested varieties of crops.

A suggested rotation for Oliver, Calhoun and Lintonia silt loams second bottom land soils: corn followed by crimson clover, cotton followed by oats; lespedeza; lespedeza; soybeans. Instead of following cotton with crimson clover winter oats are mentioned which makes possible the spring sowing of lespedeza. The addition, or elimination, of soybeans makes the rotation either four or five years in duration, which may prove advantageous during certain years. The soybeans may be used either for hay or seed, thus adding greater flexibility to the farm production.

TABLE XXXX. SUGGESTED ROTATION FOR OLIVER, CALHOUN, AND LINTONIA SILT LOAM SOILS*, CROCKETT COUNTY, TENNESSEE

Year	Crop Rotation	Pounds of Seed per Acre (a)	Favorable Planting Dates (a)	Comments (a)
1	Corn, followed by cover crop of crimson clover	Corn 3-9 Clover 12-18	Apr. 20-May 10 July 20-Sept. 1	Neal Paymaster, Jarvis Golden Prolific corn Pasture and turned under
2	Cotton, followed by cover crop of oats	Cotton 20-40 Oats 48-64	May 1-10 Sept. 15-Oct. 1	Use excessive quantity and thin Pasture, hay or grain
3	Lespedeza	5-25	Mar. 1-30	No. 76 or Korean lespedeza
4	Lespedeza	-	-	Early spring plowed for soybeans
5	Soybeans	20-30 in rows 90 broadcast	Apr. 15 - May 15	Yokotem, Laredo or Tokio beans

* Second bottoms.

Note: Soybeans may be omitted, leaving a four-year rotation.

(a) Source: Mooers, C. A., Rates and Dates of Planting for Tennessee Farm and Garden Crops, University of Tennessee Agricultural Experiment Station Circular No. 11.

As Collins and Waverly silt loams are bottom lands, and subject to less erosion, a shorter rotation with more intensive crops might be used, as follows: cotton (a cover crop is not necessary but is desirable); corn and soybeans together; oats and soybeans followed by crimson clover. This rotation can be lengthened by the use of soybeans either for seed or hay, following oats or cotton.

TABLE XXX. SUGGESTED ROTATIONS FOR COLLINS AND WAVERLY SILT LOAM SOILS*, CROCKETT COUNTY, TENNESSEE

Year	Crop Rotation	Pounds of Seed per Acre (a)	Favorable Planting Dates (a)	Comments (a)
1	Cotton	20-40	May 1-10	Use excessive seed and thin
2	Corn and soybeans	Corn 3-9 Soybeans 5	Apr. 20- May 10 Apr. 20- May 10	Grain followed by pasture Pasture
3	Oats, soybeans, cover crop Crimson clover	Oats 49- 64 Glover 12-18	Mar. 1-15 July 20- Sept. 1	Winter oats if possible Pasture and turn under

* First bottoms.

Note: This rotation might be increased to four years by soybeans for seed following corn.

(a) Mooers, C. A., Rates and Dates for Planting for Tennessee Farm and Garden Crops, University of Tennessee Agricultural Experiment Station Circular No. 11.

Farmers with a minimum of either upland or bottom land will need to modify these rotations. They are intended to be merely suggestive in the establishment of a cropping system.

Pasture. Pasture in Crockett County ranked next to hay, and second to row crops, in acreage. Lespedeza made up approximately 20 per cent of the pasture land. Fields are frequently pastured a year or more, after being cropped two years in hay. Bermuda grass is the chief constituent of permanent pastures. Many of the farmers try to establish their pastures on old crop land which is being retired from cultivation because of its inability to produce row crops profitably.

TABLE XXXL PASTURE ESTABLISHMENT ON 112 FARMS, CROCKETT COUNTY, TENNESSEE, 1936

Item	Pasture Practice						
	Pas- ture Estab- lish- ment	Lespe- deza Alone	Lespe- deza, Red Top	Red Top	Red Clover	Alfal- fa	Sudan
No. of farms re- porting each practice	112	102	102	5	3	3	2
No. of fields re- ported for each practice	-	68	34	3	3	1	2
Acres in each es- tablishment	1002	644	305	37	11	3	2
Cost per acre:							
Seed (1)	-	\$1.85	\$2.42	\$.60	\$2.35	\$5.00	\$1.32
Man labor (2)	\$0.58	.56	.56	.80	.80	1.60	1.08
Horse labor (3)	0.75	.76	.75	.41	.87	1.80	.43
Total	-	3.17	3.73	1.81	4.02	8.40	2.83
Pasture units (4)	-	3.2	3.3	2.9	3.6	-	16.0

(1) Seed costs figured at the following rates: lespedeza @ 8.8¢ per lb.; red top @ 12¢ per lb.; red clover @ 23.5¢ per lb.; alfalfa @ 25¢ per lb.; and sudan @ 5.5¢ per lb.

(2) Man labor calculated on the basis of 8¢ an hour.

(3) Horse labor calculated on the basis of 6¢ an hour.

(4) Pasture unit = number of months grazed by one animal unit equivalent.

There is often need for better water facilities. During the past few years many farms have been without adequate water, and have had to either

haul water or drive their stock considerable distances.

Additional fencing is needed on many farms in order that different fields in the rotation may be pastured.

In Crockett County, pasture in most cases means land sown either to lespedesa or to lespedesa and red top combined. These crops are sometimes cut for hay, harvested for seed, pastured by livestock, or left idle. There are but few instances of permanent pasture, except Bermuda grass. Greater attention might be given to establishing pasture grasses, and to the use of legumes with high soil conserving and soil building properties.

Though the usual practice in this area is to neglect pastures, proper attention to seeding, fertilization, erosion control, weed control and supervised grazing has been found to pay dividends.

Upland soils may need a somewhat different mixture of pasture plants, compared with bottom land, hence two mixtures are suggested. The poorly drained, or severely eroded, phases of bottom land is most often planted to pasture.

TABLE XXXI. SUGGESTED PERMANENT PASTURE MIXTURE FOR UPLAND SOILS, CROCKETT COUNTY, TENNESSEE

Pasture Mixture	Pounds of Seed per Acre (a)	Favorable Planting Dates (a)	Comments (a)
Red top	6-10	March 1-15	Small pieces of sod broadcast and covered
Lespedeza	8-12	March 1-30	
Bermuda grass	8-10	March 15-May 15	
White clover	1-2	March 1-15	
Red clover (if limed)	4-6	March 1-15	

(a) Mosers, C. A., Rates and Dates of Planting Tennessee Farm and Garden Crops, University of Tennessee, Agr. Experiment Station Circular No. 11.

The suggested pasture mixture for upland soils is: red top 6-10 lbs.; lespedeza 8-12 lbs.; Bermuda sod; white clover 1-2 lbs.; and if limed, red clover 4-6 lbs. (Table XXXII).

The suggested pasture mixture for bottom land soils is: red top 4-8 lbs.; lespedeza 3-5 lbs.; Bermuda sod; white clover 1-2 lbs.; if limed, red clover 5-7 lbs.; alsike clover 2-4 lbs. (Table XXXIII).

TABLE XXXIII. SUGGESTED PERMANENT PASTURE MIXTURES FOR BOTTOM LAND SOILS, CROCKETT COUNTY, TENNESSEE

Pasture Mixture	Pounds of Seed per Acre (a)	Favorable Planting Dates (a)	Comments (a)
Red top	4-8	March 1-15	Small pieces of sod broadcast and covered
Lepedeza	3-5	March 1-30	
Bermuda grass	8-10	March 15-May 15	
White clover	1-2	March 1-15	
Red clover (if limed)	5-7	March 1-15	
Alsike clover	2-4	March 1-15	

(a) Moccers, C. A., Rates and Dates of Planting for Tennessee Farm and Garden Crops, University of Tennessee Agricultural Experiment Station Circular No. 11.

(1) Bermuda grass is the most important pasture grass in that area.

It is adapted to practically all soils, and spontaneously spreads to cover the land. It is fairly palatable and nutritious. Close grazing improved its quality. It is easily injured by frost.

(2) The lespedesas are the most important summer legumes in that area. The common species has already spread naturally to much of the grazing land where ordinary grass plants occur. One advantage of lespedeza is its ability to grow with grasses without thinning out those already present. Lespedeza is found on the poorer soils, and supplies grazing during the summer and fall months. It shows little preference for soil type. Four varieties of annual lespedeza are found there: Common, Tennessee 76, Kobe, and Korean. Tennessee 76 and Common are probably best

for a permanent pasture mixture.

(3) White clover is the most important early spring, fall, and winter pasture legume in that section. It is well adapted to soils in which moisture is sufficient to sustain it. It is valued chiefly as a grazing plant in mixtures with grasses, being rarely used alone.

(4) Redtop, commonly known in this area as Herd's grass, has a wide range of soil adaptations and does well on most of the land in this section.

(5) Red clover, if it can be grown successfully, will add to the value of the pasture in yield and palatability; but the land in this area usually requires liming before it will succeed.

Winter Cover Crops. Twenty per cent of the farms surveyed had some kind of cover crops. Three and eight-tenths per cent of the area now in row crops has been in cover crops within the past 3 years.

Rye, oats, and wheat are the principal cover crops. The per acre cash costs of rye averaged \$0.81, and wheat \$1.25. The cash equivalent of all rye costs is also less than that of oats and wheat (Table XXXIV).

Cover crops are needed in this area to protect the soil from washing, gullyng, and the loss of soluble plant food. Such crops provide late fall, winter and early spring pasture, sometimes reduce the amount of early spring land preparation, and build up the soil through the addition of nitrogen and organic matter.

Crimson clover, though seldom used in this area, might prove to be the valuable winter cover crop. It is adapted to a variety of soils, makes a turf for pasturing throughout the winter, is ready to turn under

early in spring, and decays quickly because of its succulence and high nitrogen content. To succeed here it must be inoculated, or seeded on inoculated land, and must have a well prepared but settled and moist seedbed. It is well to test germination of crimson clover seed, since

TABLE XXXIV COSTS OF ESTABLISHING COVER CROPS ON 30 FARMS
SURVEYED, CROCKETT COUNTY, TENNESSEE, 1936

Item	Rye	Wheat	Oats	Crimson Clover
Number of fields	13	9	6	2
Acres in crops	118	35	44	21
Seed sown per acre	3/4 bu.	.96 bu.	1.3 bu.	16.2 $\frac{1}{4}$
Labor hours per acre				
Man hours	4.2	3.8	6.6	14.6
Horse hours	5.9	7.0	8.7	27.6
Tractor hours	-	.34	.18	-
Cash costs				
Seed	.61	1.00	.80	1.24
Labor (man and horse)	.20	.08	-	.18
Tractor	-	.17	.09	-
Total cash costs	.81	1.25	.89	1.42
Total including cash equivalents	1.30	1.98	1.98	4.06
Hay yields on 3 fields (tons per acre)	-	.84	1.0	-
Pasture units*	2.8	2.4	1.3	5.0

Two other fields, one sown to a mixture of Austrian peas, wheat, and oats (5 acres) and one to Sudan in July (1 1/2 acres) are not included in this tabulation.

* Months pastured times animal units.

germination is sometimes poor. Combinations of crimson clover with any one of the small grains may be seeded two or three weeks later than crimson clover alone. In combinations, the seeding rate may be reduced about one-third for each crop. A combination of plants in a cover crop often improves its value, reducing the risk of failure of one plant to germinate or to set a good stand.

The Agricultural Extension Service of the University of Tennessee
has suggested the following cover crops:⁽⁵⁾

TABLE XXXV. COVER CROPS

Cover Crop	Seeding Rate, Lbs.	Seeding Date	Seeding Requirements	Uses
Crimson clover	12-18	July 20 to Aug. 30	Requires exceptionally good seed bed, firm, moist	Pasture and turn under
Vetch (Hairy)	20-30	August September October	Less exacting. May be seeded between rows of corn, cotton, etc., or disced in after harvesting summer crop	Turn under late in spring
Austrian Winter Peas	60-90	Sept. 1 to Oct. 15	Between the rows or after any summer crop. Requires rich land and lime	Turn under in March or April
Winter Oats	48-64	September	After early summer crops	Pasture, hay, grain
Wheat	60-90	October	After summer crops	Pasture, grain, hay
Barley	84-96	Sept. 1 to Oct. 15	Like wheat but requires richer land	Pasture, grain (hay if beardless)
Rye	56-84	Aug. 20 to Nov. 1	Least exacting and most certain to grow under a great variety of conditions	Pasture - hay
Rye Grass	25-30	Sept. 1 to Oct. 15	Will germinate and grow almost anywhere but very responsive to fertilizer	Pasture - hay

(5) Source: Publication 188, Tennessee Agricultural Extension Service, 1936.

Reforestation. Forest plantings have been made on 22 of the 150 farms surveyed, including an area of 47.25 acres, or 0.4 per cent of the total land area of the farms.

The average cost of the nursery seedlings was \$1.49 per 1,000. The seedlings obtained from local sources did not require an expenditure of cash, but this advantage was more than offset by the greater amount of labor required in obtaining and setting the local stock. It required an average of 57.8 hours labor to set 1,000 seedlings of local stock compared with 10.3 hours per 1,000 nursery grown seedlings (Table XXXVI).

TABLE XXXVI. REFORESTATION PRACTICES IN CROCKETT COUNTY, TENNESSEE, 1936

Items	All Seedlings	Source of Seedlings	
		Nursery	Local Stock
Number of plantings	22	16	6
Acres planted	47.25	35	12.25
Trees set per acre	1,242	1,631	128
Cost of trees per 1,000	1.45	1.49	-
Per acre	1.80	2.43	-
Total cash cost per 1,000 trees	2.93	3.02	-
Per acre	3.64	4.92	-
Hours labor per 1,000 trees	11.6	10.3	57.8
Per acre	14.4	16.8	7.4
Estimated total cost per acre*	2.95	3.77	0.59

* Labor figured @ 8¢ per hour. Trees at actual cost.

When reforestation is done it should be planned in such manner that the long-time economic returns will be sufficient to justify the retirement of the eroded land for that purpose.

On many of the farms surveyed some trees have been planted on steep slopes, on hilltops, on severely gullied and eroded fields, or in out-of-

the-way corners of fields. A profitable return in posts, poles, and small timbers may be expected from land and labor, if the right species are selected and care is given them during the first years after planting.

Approximately 50 per cent of the area which needed reforestation has already been planted to trees. Black locust is the species that has been planted. These have usually been set in the bottoms of gullies. Black locust is a valuable tree as a nurse crop, and there is apparently a good market for locust posts in this area.

Since some of the land should be permanently retired from cultivation, perhaps other species having a greater commercial value might provide larger long-time returns. On gently rolling lands, such as Memphis silt loam, the better grade of hardwoods, such as white, Spanish and black oaks, pignut, and mockernut hickories are suggested. On bottom lands, red gum, white ash, red oak, yellow poplar, and black walnut. Yellow pine and short leaf pine often do better than other species on poor sandstone soils. Tupelo gum and cottonwood are suggested plantings for alluvial flood plains, swamps, sloughs and margins of bayous. Some other species may be grown with success in different sections, depending upon conditions.

TABLE XXXVII. SOILS DATA BY TYPE, SLOPE, EROSION, AND LAND USE,
112 FARMS, CROCKETT COUNTY, TENNESSEE
All Soil Types

Slope & Erosion	Cultivated Land				Pasture	Wood-land	Idle	Total Land
	Row Crops	Small Grains	Meadow	Total				
+ or 1	2156.8	10.8	295.1	2462.7	255.8	199.7	57.4	2975.6
2	235.3	19.9	94.3	349.5	47.9	1.9	-	399.3
3	243.3	2.7	59.0	305.0	36.1	0.5	-	341.6
A 33	9.1	-	12.5	21.6	2.4	-	22.3	46.3
(0-3%) 4	.9	-	-	.9	-	-	-	.9
5&9	-	-	-	-	-	-	-	-
7	4.1	-	10.5	14.6	43.0	-	1.4	59.0
8	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-
Total	2649.5	33.4	471.4	3154.3	385.2	202.1	81.1	3822.7
+ or 1	22.7	-	-	22.7	2.5	-	5.5	30.7
2	6.9	-	-	6.9	12.7	-	-	19.6
3	414.0	12.4	105.6	532.0	44.2	-	-	576.2
B 33	1236.7	12.9	400.2	1649.8	211.1	1.6	16.6	1879.1
(3-6%) 4	157.8	-	69.6	227.4	25.2	-	1.5	254.1
5&9	-	-	-	-	-	-	6.2	6.2
7	929.9	59.4	616.0	1605.3	743.0	3.1	118.8	2470.2
8	8.8	-	68.6	77.4	66.1	6.7	16.3	166.5
9	-	-	-	-	-	-	-	-
Total	2776.8	84.7	1260.0	4121.5	1104.8	11.4	164.9	5402.6
+ or 1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-
BB 33	5.7	-	-	5.7	-	-	4.5	10.2
4	11.4	-	17.9	29.3	2.2	1.1	-	32.6
5&9	-	-	-	-	6.9	14.8	4.4	26.1
(6-9%) 7	139.5	-	38.7	178.2	95.7	3.5	1.5	278.9
8	20.0	-	36.6	56.6	105.6	-	36.6	198.8
9	-	-	-	-	-	-	8.6	8.6
Total	176.6	-	93.2	269.8	210.4	19.4	55.6	555.2
+ or 1	1.7	-	-	1.7	-	-	-	1.7
2	-	-	.8	.8	-	-	-	.8
3	-	-	-	-	-	-	-	-
33	3.2	-	-	3.2	2.9	-	-	6.1
4	23.5	-	5.1	28.6	-	-	-	28.6
C 5&9	-	-	-	-	10.9	-	7.0	17.9
(9-12%) 7	44.0	-	42.1	86.1	19.4	-	4.5	110.0
8	10.4	-	31.5	41.9	48.7	-	5.2	95.8
9	-	-	-	-	-	-	-	-
Total	82.8	-	79.5	162.3	81.9	-	16.7	260.9
+ or 1	-	-	-	-	-	-	-	-
2	-	-	-	-	1.7	-	-	1.7
3	-	-	-	-	-	-	-	-
D 33	2.8	-	-	2.8	-	-	-	2.8
(12% & over) 4	2.4	-	-	2.4	-	-	-	2.4
5&9	-	-	-	-	2.1	1.3	15.3	18.7
7	3.3	-	3.9	7.2	-	-	1.9	9.1
8	-	-	12.1	12.1	29.5	5.7	10.9	58.2
9	-	-	-	-	-	-	1.4	1.4
Total	8.5	-	16.0	24.5	33.3	7.0	29.5	94.3
Grand Total	5694.2	118.1	1920.1	7732.4	1815.6	239.9 1001.7*	347.8	10135.7

(continued)

TABLE XXVI. SOILS DATA BY TYPE, SLOPE, EROSION, AND LAND USE,
112 FARMS, CROCKETT COUNTY, TENNESSEE (cont.)

78.

Acres of Memphis Silt Loam and Memphis Silty Clay Loam

Slope & Erosion	Cultivated Land				Pasture	Wood-land	Idle	Total Land
	Row Crops	Small Grains	Meadow	Total				
+ or 1	2.1	-	-	2.1	2.1	-	-	4.2
2	-	-	-	-	-	-	-	-
3	40.7	-	9.2	49.9	11.3	0.5	-	61.7
A 33	6.6	-	-	6.6	-	-	-	6.6
(0-3%) 4	-	-	-	-	-	-	-	-
5&9	-	-	-	-	-	-	-	-
7	-	-	-	-	8.5	-	-	8.5
8	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-
Total	49.4	-	9.2	58.6	21.9	0.5	-	81.0
+ or 1	14.4	-	-	14.4	-	-	5.5	19.9
2	-	-	-	-	2.5	-	-	2.5
3	195.8	10.3	36.7	243.3	19.2	-	-	262.5
B 33	951.2	12.9	271.5	1235.6	164.6	1.6	15.9	1417.7
(3-6%) 4	115.7	-	60.8	176.5	19.5	-	.8	196.8
5&9	-	-	-	-	-	-	6.2	6.2
7	649.5	14.6	491.4	1155.5	567.7	1.8	58.4	1783.4
8	2.4	-	55.5	57.9	55.1	6.7	9.5	129.2
9	-	-	-	-	-	-	-	-
Total	1929.0	38.3	915.9	2883.2	828.6	10.1	96.3	3818.2
+ or 1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-
BB 33	5.7	-	-	5.7	-	-	4.5	10.2
(6-9%) 4	11.4	-	17.9	29.3	2.2	1.1	-	32.6
5&9	-	-	-	-	6.9	14.8	4.4	26.1
7	139.5	-	38.7	178.2	95.7	3.5	1.5	278.9
8	20.0	-	36.6	56.6	105.8	-	36.6	198.8
9	-	-	-	-	-	-	8.6	8.6
Total	176.6	-	93.2	269.8	210.4	19.4	55.6	555.2
+ or 1	1.7	-	-	1.7	-	-	-	1.7
2	-	-	0.8	0.8	-	-	-	0.8
3	-	-	-	-	-	-	-	-
C 35	3.2	-	-	3.2	2.9	-	-	6.1
(9-12%) 4	23.5	-	5.1	28.6	-	-	-	28.6
5&9	-	-	-	-	10.9	-	7.0	17.9
7	42.2	-	42.1	84.3	18.2	-	4.5	107.0
8	10.4	-	31.5	41.9	48.7	-	5.2	95.8
9	-	-	-	-	-	-	-	-
Total	81.0	-	79.5	160.5	80.7	-	16.7	257.9
+ or 1	-	-	-	-	-	-	-	-
2	-	-	-	-	1.7	-	-	1.7
3	-	-	-	-	-	-	-	-
D 33	2.8	-	-	2.8	-	-	-	2.8
(12% & over) 4	2.4	-	-	2.4	-	-	-	2.4
5&9	-	-	-	-	0.4	1.3	15.3	17.0
7	3.3	-	3.9	7.2	-	-	1.9	9.1
8	-	-	12.1	12.1	29.5	5.7	10.9	58.2
9	-	-	-	-	-	-	1.4	1.4
Total	8.5	-	16.0	24.5	31.6	7.0	29.5	92.6
Grand Total	2244.5	38.3	1113.8	3396.6	1173.2	37.0 778.3*	198.1	4804.9

TABLE XXXVII. SOILS DATA BY TYPE, SLOPE, EROSION, AND LAND USE,
112 FARMS, CROCKETT COUNTY, TENNESSEE (cont.)

Grenada Silt Loam and Henry Silt Loam

Slope & Erosion	Cultivated Land				Pasture	Wood- land	Idle	Total
	Row Crops	Small Grains	Meadow	Total				
+ or 1	63.3	-	26.6	89.9	6.0	-	-	95.9
2	158.8	19.9	62.5	241.2	56.9	1.9	-	280.0
3	191.7	2.7	46.9	241.3	24.8	-	-	266.1
A 33	2.5	-	12.5	15.0	2.4	-	22.3	39.7
(0-3%) 4	0.9	-	-	0.9	-	-	-	0.9
5&9	-	-	-	-	-	-	-	-
7	-	-	4.0	4.0	28.6	-	-	32.6
8	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-
Total	417.2	22.6	152.5	592.3	98.7	1.9	22.3	715.2
+ or 1	8.3	-	-	8.3	2.5	-	-	10.8
2	6.9	-	-	6.9	10.2	-	-	17.1
3	210.9	0.8	65.7	277.4	21.9	-	-	299.3
B 33	285.5	-	123.4	408.9	45.7	-	0.7	455.3
(3-6%) 4	42.1	-	8.8	50.9	5.7	-	0.7	57.3
5&9	-	-	-	-	-	-	-	-
7	274.6	44.8	124.6	444.0	175.3	1.3	60.4	681.0
8	6.4	-	13.1	19.5	11.0	-	6.8	37.3
9	-	-	-	-	-	-	-	-
Total	834.7	45.6	335.6	1215.9	272.3	1.3	68.6	1558.1
Grand Total	1251.9	68.2	488.1	1808.2	371.0	3.2	90.9	2273.3

Oliver, Lintonia, and Calhoun Silt Loams

+ or 1	-	-	1.1	1.1	-	-	-	1.1
2	76.5	-	23.4	99.9	8.9	-	-	108.8
3	7.1	-	2.9	10.0	-	-	-	10.0
A 33	-	-	-	-	-	-	-	-
(0-3%) 4	-	-	-	-	-	-	-	-
5&9	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-
Total	83.6	-	27.4	111.0	8.9	-	-	119.9
+ or 1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
3	7.3	-	-	7.3	3.1	-	-	10.4
B 33	-	-	5.3	5.3	0.8	-	-	6.1
(3-6%) 4	-	-	-	-	-	-	-	-
5&9	-	-	-	-	-	-	-	-
7	5.8	-	-	5.8	-	-	-	5.8
8	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-
Total	13.1	-	5.3	18.4	3.9	-	-	22.3
Grand Total	96.7	-	32.7	129.4	12.8	-	-	142.2

TABLE XXXVII. SOILS DATA BY TYPE, SLOPE, EROSION, AND LAND USE,
112 FARMS, CROCKETT COUNTY, TENNESSEE (cont.)Collins and Waverly Silt Loam

Slope & Erosion	Cultivated Land				Pasture	Wood- land	Idle	Total
	Row Crops	Small Grains	Meadow	Total				
+ or 1	2091.4	10.8	267.4	2369.6	247.7	199.7	57.4	2874.4
2	-	-	8.4	8.4	2.1	-	-	10.5
3	3.8	-	-	3.8	-	-	-	3.8
A 33	-	-	-	-	-	-	-	-
(0-3%) 4	-	-	-	-	-	-	-	-
5&9	-	-	-	-	-	-	-	-
7	4.1	-	6.5	10.6	5.9	-	1.4	17.9
8	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-
Total	2099.3	10.8	282.3	2392.4	255.7	199.7	58.8	2906.6
+ or 1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
3	-	0.8	3.2	4.0	-	-	-	4.0
B 33	-	-	-	-	-	-	-	-
(3-6%) 4	-	-	-	-	-	-	-	-
5&9	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-
Total	-	0.8	3.2	4.0	-	-	-	4.0
D (12% 5&9 & over)	-	-	-	-	1.7	-	-	1.7
Grand Total	2099.3	11.6	285.5	2396.4	257.4	199.7 220.2*	58.8	2912.3

Lexington and Pheba Silt Loam

C 7 (9-12%)	1.8	-	-	1.8	1.2	-	-	3.0
----------------	-----	---	---	-----	-----	---	---	-----

* Includes forest not measured.

1. No apparent accelerated erosion
2. Slight sheet erosion
3. Moderate sheet erosion
33. Heavy sheet erosion

4. Severe sheet erosion
- 5&9. Very severe sheet erosion and
very frequent or destructively
large gullies
7. Occasional gullies
8. Frequent gullies
9. Very frequent or destructively
large gullies

CHAPTER III

FERTILIZERS FOR CROCKETT COUNTY AND WEST TENNESSEE

The soils of West Tennessee, though naturally well supplied with plant food, have under cultivation become poor in humus and nitrogen, caused by the system of farming generally followed and erosion during heavy rains. The improvement of such lands should include liming, fertilization, and the production of legumes, clovers in particular.

The typical soil is a grayish-brown silt loam with a yellowish-colored subsoil. Considerable variation is not uncommon on the same farm, for the grayish-brown loam is often replaced, especially on the lower levels, by a gray-colored, very silty soil, or "white land", resembling in general appearance the "crawfishy" soils of Middle and East Tennessee. Both of these types have been the subject of investigation at the West Tennessee Agricultural Experiment Station at Jackson, and both have been found to be well supplied with phosphoric acid and potash. The grayish-brown loam was found to be very poor in lime, by the adding of which excellent crops of clover and alfalfa were obtained, while without it they were complete failures. This type was naturally fertile, but long cropping in cotton and corn, together with the attendant erosion, which is more serious than for the loess soils, have greatly reduced the productiveness. However, the readiness with which it responds to good treatment is very striking.

The gray "crawfishy" soils have proved to be considerably superior to soils of similar appearance found elsewhere in the State. Their chief drawback comes from the ease with which the surface soil grains cement together during heavy rains, so that the excess of water is not readily absorbed and the drainage is apt to be poor. On the Station Farm at Jackson this type has proved to be only moderately in need of either lime or phosphate, but very responsive to potash. Excellent crops of lespedeza, peanuts, red clover, and alfalfa were obtained with little difficulty. The nitrogen and humus supplies are very low. This kind of soil therefore is not well suited to grain crops, and non-legumes in general, but may be used to much advantage both for pastures and for the production of legumes.

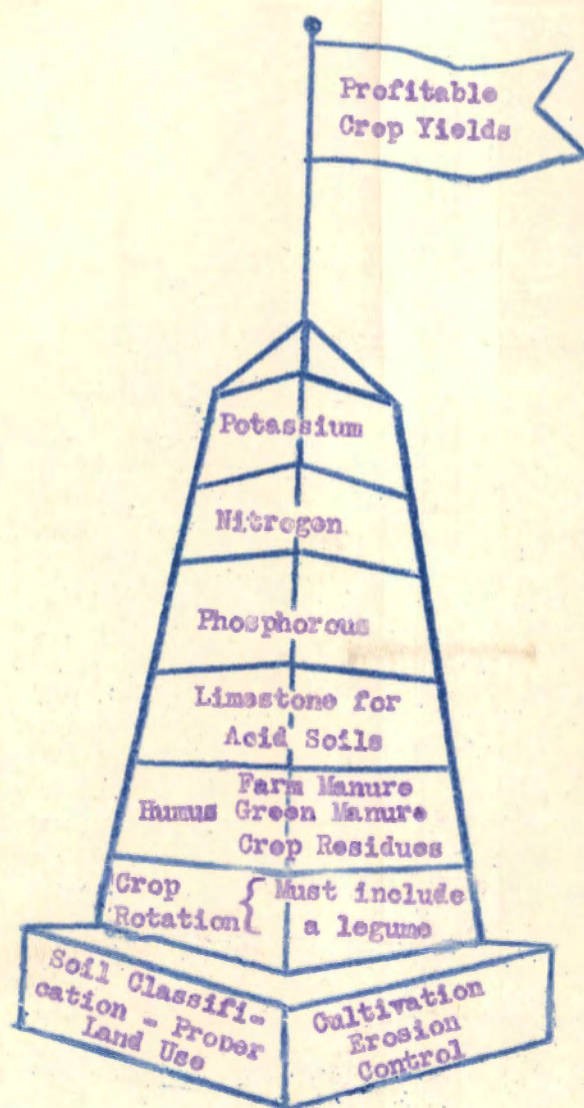


Figure 19. Profitable Crop Yields Are Based On Proper Land Use, Erosion Control, Crop Rotation, Addition of Humus and the Application of Mineral Elements as Needed

Another common type of soil is reddish-colored. It is said to be by nature fully the equal of the grayish-brown loam. Little experimental work has, however, been done on this soil by the Station, but the indications are that its chief plant food needs are lime, nitrogen, and phosphoric acid. This type is light, easily tilled, and contains more sand than the grayish-brown loams. It is suitable to all common farm and garden crops. (1)

Commercial fertilizers have never been used as extensively in West Tennessee as in either Middle or East Tennessee. The use of fertilizers in Crockett County is generally limited to applications of Kainit (potassium) and 4-8-4 (nitrogen, phosphorous, and potassium) at rates varying from 150 to 250 pounds per acre. Most of this is used on cotton, and on a few truck farms in the southeastern part of the survey area. Twenty per cent of the farmers reported the use of commercial fertilizers, on 363 acres, or 2.7 per cent of the total area surveyed.

The recommendations are based on the results of field experiments and are intended for average conditions. New land and well manured land would be expected to require less of all the important plant food elements.

A marked difference has been found in the soil supplies of phosphoric acid in the western and eastern portions of West Tennessee, and in the fertilizers best adapted to the areas, so that it has been necessary to make different recommendations.

(1) University of Tennessee Experiment Station, The Soils of Tennessee, Circular No. 5, April 16, 1932.

TABLE XXXVIII. FERTILIZER RECOMMENDATIONS FOR RED LAND OF WEST TENNESSEE
AND YELLOW LAND OF EASTERN THIRD OF WEST TENNESSEE

Crop	Pounds per Acre of Nutrients		Formula	Amount of For- mula per Acre
Corn and small grains	N	15)	6-10-0	250 lbs.
	P ₂ O ₅	24)		
	K ₂ O	0)		
Small grains to be followed by clover and grass	N	15)	4-10-6	350
	P ₂ O ₅	36)		
	K ₂ O	20)		
Cowpeas, soybeans, and other legumes	P ₂ O ₅	24)	0-10-4	200
	K ₂ O	8)		
Cotton, tomatoes, potatoes, etc.	N	15)	5-10-4	300
	P ₂ O ₅	32)		
	K ₂ O	12)		
Tobacco	N	18)	8-10-5	250
	P ₂ O ₅	24)		
	K ₂ O	15)		
Meadows and pas- tures	N	15)	6-10-6	250
	P ₂ O ₅	24)		
	K ₂ O	15)		

TABLE XXXIX. FERTILIZER RECOMMENDATIONS FOR YELLOW LAND OF WESTERN
TWO THIRDS OF WEST TENNESSEE

Crop	Pounds per Acre of Nutrients		Formula	Amount of For- mula per Acre
Corn and small grains	N	15)	15-0-0	100 lbs.
Small grains to be followed by clover and grass	N	15)	12-10-10	120
	P ₂ O ₅	12)		
	K ₂ O	12)		
Cowpeas, soybeans, and other legumes for hay	P ₂ O ₅	10)	0-10-10	100
	K ₂ O	10)		
Cotton, tomatoes, potatoes, etc.	N	24)	15-10-10	160
	P ₂ O ₅	16)		
	K ₂ O	16)		
Tobacco	N	18)	15-10-15	120
	P ₂ O ₅	12)		
	K ₂ O	16)		
Meadows and pastures- top dressing	N	15)	15-0-0	100
	P ₂ O ₅	0)		
	K ₂ O	0)		

Source: Both tables from University of Tennessee, Agricultural Experiment
Station Circular No. 23, Fertilizers, for Tennessee Soils.

TABLE XL. FERTILIZER RECOMMENDATIONS FOR WHITE LAND OF WEST TENNESSEE

Crop	Lbs. per Acre of Nutrients	Formula	Amount of Formula per Acre
Corn and small grain	N 15) P ₂ O ₅ 32) K ₂ O 10)	5-10-5	300 lbs.
Small grains followed by clover and grass	N 15) P ₂ O ₅ 32) K ₂ O 30)	5-10-10	300
Cowpeas, soybeans and other legumes for hay	P ₂ O ₅ 32) K ₂ O 32)	0-10-10	300
Cotton, tomatoes, po- tatoes, etc.	N 15) P ₂ O ₅ 32) K ₂ O 30)	5-10-10	300
Tobacco	N 15) P ₂ O ₅ 32) K ₂ O 30)	5-10-10	300
Meadows and pastures, top dressing	N 15) P ₂ O ₅ 32) K ₂ O 30)	5-10-10	300

Source: University of Tennessee Agricultural Experiment Station Circular
No. 23, Fertilizers for Tennessee Soils.

TABLE XLI. FERTILIZER RECOMMENDATIONS FOR MEMPHIS SILT LOAM SOIL

Crop	Nutrients Recommended		Fertilizer Recommended	
	Kinds	Pounds per Acre	Kinds	Pounds per Acre
Corn and small grains	N P ₂ O ₅	12-24 9-18	8-6-0	150-300
Small grains to be fol- lowed by clover and grass	N P ₂ O ₅ K ₂ O	12-18 12-18 16-24	6-6-8	200-300
Lespedeza, soybeans, and other legumes for hay	P ₂ O ₅ K ₂ O	12-18 16-24	0-6-8	200-300
Cotton, tobacco, toma- toes, potatoes, etc.	N P ₂ O ₅ K ₂ O	24-32 15-20 15-20	8-5-5	300-400
Meadows and grass pas- tures, top dressing	N	16-32	16-0-0	100-200

Source: University of Tennessee Agricultural Experiment Station Circular
No. 60, April 1938.

Cotton is a crop that responds profitably to fertilizer applications, and on many soils fertilization has become a necessary practice in the production of economic yields.

TABLE XLII. FERTILIZERS FOR COTTON IN WEST TENNESSEE

Recommendations per acre based on the results of cooperative experiments conducted in each of a number of counties.

For the western two-thirds, which has little need of phosphate -- "red" and "yellow" lands:

	80 lbs. Ammonium sulphate
	100 lbs. Superphosphate
	25 lbs. Muriate of potash
Analysis:	
	Nitrogen 8 per cent
	Available
	phosphoric acid 8 per cent
	Potash 6 per cent

For the eastern section, which usually responds markedly to phosphate-- "red" and "yellow" lands:

	80 lbs. Ammonium sulphate
	200 lbs. Superphosphate
	25 lbs. Muriate of potash
Analysis:	
	Nitrogen 5 1/3 per cent
	Available
	phosphoric acid 10 1/2 per cent
	Potash 4 per cent

For "white" land of both western and eastern sections:

	80 lbs. Ammonium sulphate
	200 lbs. Superphosphate
	60 lbs. Muriate of potash
Analysis:	
	Nitrogen 4 3/4 per cent
	Available
	phosphoric acid 9 1/2 per cent
	Potash 8 3/4 per cent

Note: Instead of 80 pounds of ammonium sulphate, 100 pounds of nitrate of soda may be used.

Source: University of Tennessee Agricultural Experiment Station Circular No. 15, Fertilizers for Cotton in West Tennessee, July 20, 1933.

Liming. Crushed limestone was applied on 8 of the 150 farms surveyed in Crockett County, the applications having been made prior to 1930, on only 0.27 per cent of the area surveyed. The only crops for which liming was reported were red clover and alfalfa. A very small acreage of these lime-requiring crops is now grown in this area. From the standpoint of both soil conservation and good farm practices, the production of these crops should be encouraged, but they cannot be successfully grown without lime. At the West Tennessee Experiment Station it was found that in a three-year average, limestone alone increased the yield of wild lespedeza hay 39 per cent.⁽²⁾

Two tons of ground limestone applied to the soil just preceeding the clover crop is recommended.

TABLE XLIII. LIMESTONE TREATMENT, CROCKETT COUNTY, TENNESSEE, 1936

Item	Total	Crop	
		Red Clover	Alfalfa
Number of fields treated	9	5	4
Acres treated	36	16	20
Tons applied, total	80	40	40
per acre	2.22	2.50	2.00
Total cash cost of limestone	\$171.16	\$89.00	\$82.16
Cash cost per ton	2.14	2.22	2.05
per acre	4.75	5.55	4.10

Since Memphis silt loam and Memphis clay loam are upland soils with more erosion, and subject to more leaching, they will possess less of the mineral plant foods and accordingly will be in greater need of fertilizer

(2) Hendricks, H. E., Lime and Prosperity on the Farm, Tennessee Agricultural Extension Service Publication 133, February 1936.

treatments. Waverly and Collins silt loams showing but little erosion and only moderate leaching will be in less need of fertilizers including lime, except in poorly drained areas. Grenada silt loam will be in need of fertilizer treatment to approximately the same extent as Memphis silt loam, though tending towards Collins and Waverly silt loams.

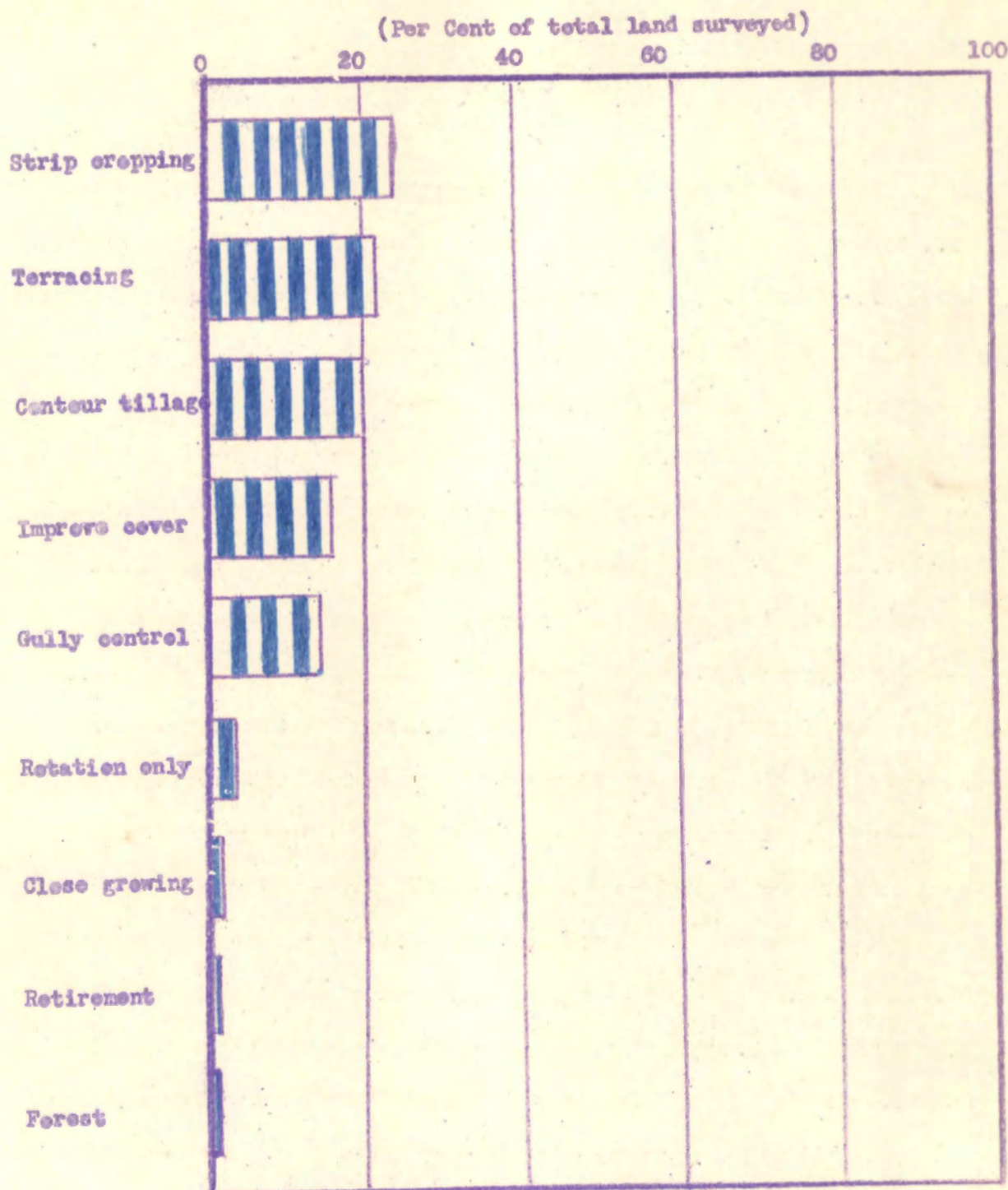
These conclusions are further borne out by the following facts. Of the 8 farms which applied lime, six were mapped by the Soil Conservation Service, and five found to be predominately Memphis silt loam; in other words, of the farms mapped and which applied lime, 83 per cent are Memphis silt loam.

CHAPTER IV

RECOMMENDED SOIL CONSERVATION PRACTICES

One of the most needed soil conservation practices in Crockett County, Tennessee, is strip cropping. In the area surveyed 24 per cent or 2746.3 acres are in need of strip cropping. All measures of soil defense, either separate or combined, have as their primary purpose slowing down the rate of water flow. Strips of close-growing crops filter out the soil particles from silt-laden water running down from above. The flow of water is checked because it meets innumerable obstructions. Slow-moving water drops its load, and the water is given more time to soak into the ground. None of the farms surveyed practiced strip cropping as a means of soil conservation, though this practice is recommended by the Soil Conservation Service as a control measure for 59.8 per cent of the farms and 24 per cent of the farm area. Strip cropping is apparently well adapted to this area.

Twenty-two per cent of the surveyed land needs terracing. Forty-four farms had some form of terrace in 1936, which partially protect with varying degrees of effectiveness 1,042 acres, which is 46 per cent of the area recommended as in need of terraces. Many of the smaller terraces consist primarily of furrows thrown together with a turning plow, and designed with no particular effort towards obtaining the correct or uniform slope. The larger terraces are usually constructed by tractors and "Martin" ditches. The usual cost averaged about forty cents per 100 lineal feet of terrace, or 6 cents a rod (Table XLIV).



Source: Table XLV.

Figure 20. Percentage of the Surveyed Land Needing Soil Conservation Practices, Crockett County, 1936

TABLE XLIV. SUMMARY OF TERRACING ON 44 FARMS, CROCKETT COUNTY, TENNESSEE, 1936

Item	Base Width of Terraces			
	3-4 feet	5-10 feet	11-15 feet	16-24 feet
Acres terraced	*(35) 229	267	*(10) 38	463
Total length (rods)	*(140) 2580	2580	*(180) 868	4370
Labor hours per acre:				
Man hours	6.6	3.4	3.8	3.3
Horse hours	5.5	5.2	3.0	1.6
Tractor hours	-	0.07	0.26	0.22
Cash cost per acre	\$0.22	\$0.21	\$0.29	\$0.53
Per 100 rods	\$1.93	\$2.19	\$1.27	\$5.63
Cash equivalent of labor and tractor cost**				
Per acre	\$0.86	\$0.64	\$0.68	\$0.52
Per 100 rods	\$7.61	\$6.59	\$3.00	\$5.52

* Acres and rods terraced for which no cost data were available.

** Flat rates per hour applied as follows: Man labor, 8¢; horse labor, 6¢; and tractor labor, 75¢.

Contour tillage is needed on 20 per cent of the land surveyed in Crockett County. This method of soil conservation was practiced on 38.7 per cent of the farms and on 7.6 per cent of the farm area surveyed. Thus an additional 38.1 per cent of the farms and 12.4 per cent of the farm area are in need of contour tillage. In contour farming one tills the field across the slope, or around the hill and not in straight or parallel lines suggested by roads and fences, and because of the difficulty in laying of the land in fields which have a major slope in one direction with a group of short and often steep slopes in other directions many farmers do not practice this form of soil conservation.

Improvement in cover is needed on 16.2 per cent of the farming area surveyed. Pasture, cover crops or woodlots cannot be effective in soil

conservation practices unless they possess growth dense enough to slow down or prevent run-off. This phase is discussed again in connection with recommendations.

Gully erosion is more evident than sheet erosion and prompt action has saved many fields. Fourteen and one half per cent of the area surveyed needs gully control measures. Gully control measures have been attempted on 61.3 per cent of the farms, and on 1.8 per cent of the area, which leaves 12.7 per cent of the land still in need of gully control. Methods employed include use of brush, corn-stalks, weeds, straw, etc., which are used to fill the gullies. Revegetation is then depended upon to check the gullying. More emphasis should be placed on grassed waterways, better check dams, reforestation in severe gullies, all used in coordination with one or more of the recommended practices for soil conservation.

The selection and use of approved rotations will control erosion on 4.1 per cent of the land. These rotations are found elsewhere in this report.

Close growing crops are needed on 2.0 per cent, retirement is needed for 1.0 per cent, and forest is needed on 0.4 per cent of the land area surveyed.

Farms classified according to dominant soil type in need of soil conservation practices show considerable variation from the average of the entire area.

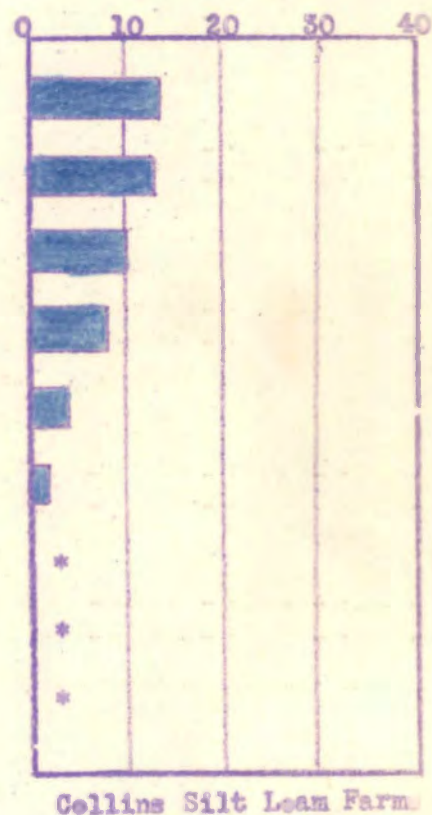
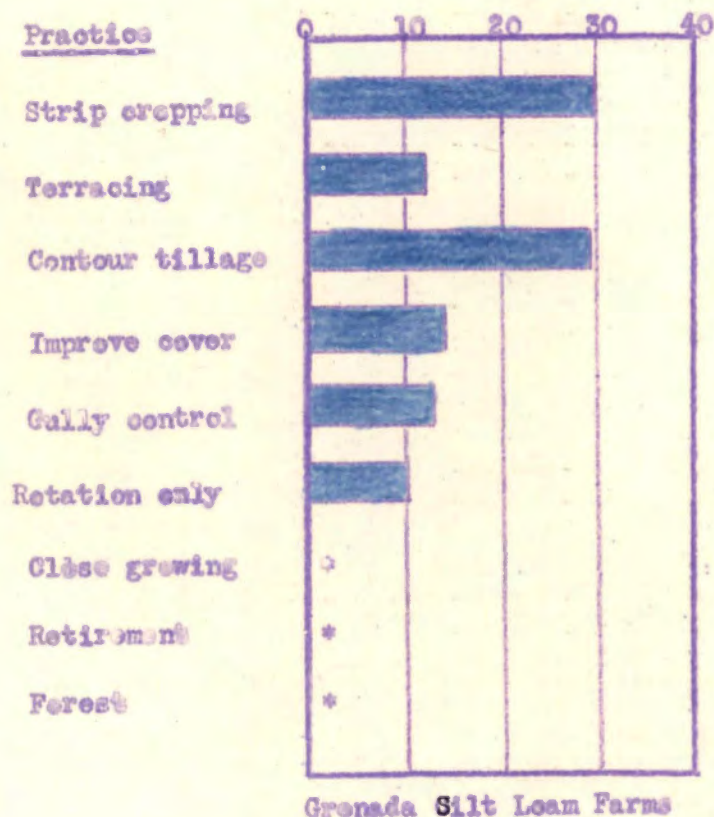
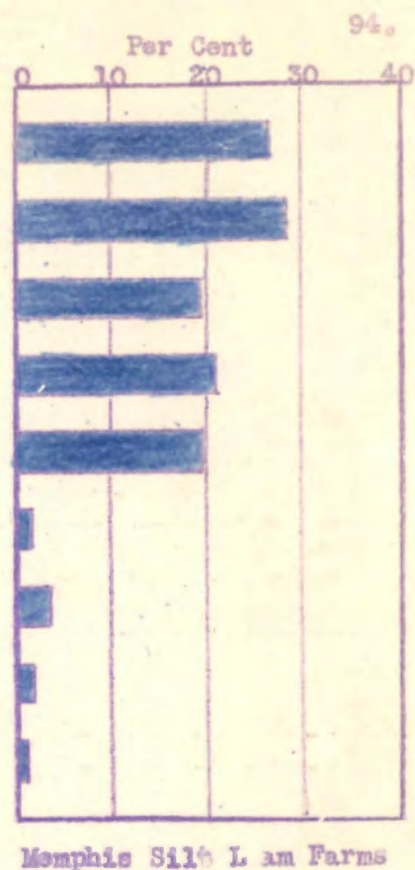
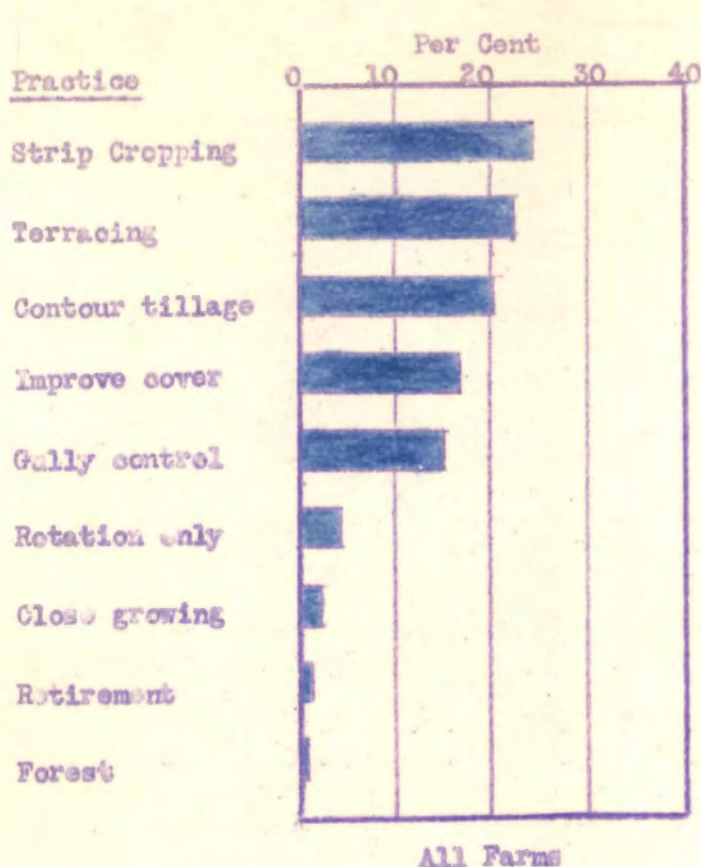
Memphis silt loam farms are in greater need of all the measures for soil conservation. This is expected since Memphis silt loam soil is more severely eroded, and on steeper slopes. These farms need 28.2 per cent of

the area terraced, 19.2 per cent contour farmed, 26.6 per cent strip cropped, 20.5 per cent improved cover, 19.6 per cent gully control, 3.2 per cent close growing, 1.4 per cent rotation only, 1.5 per cent retired and .8 per cent planted to forest.

TABLE XLV. ACRES AND PER CENT OF THE TOTAL LAND AREA SURVEYED NEEDING SOIL CONSERVATION PRACTICES, BY FARMS OF DOMINANT SOIL TYPES, 112 FARMS, CROCKETT COUNTY, TENNESSEE, 1936

Soil Types	Terracing	Contour Tillage	Rotation Only	Strip Cropping	Improve Cover	Gully Control	Retirement	Close Growing	Forest
<u>Memphis silt loam farms:</u>									
Acres	1477.1	1005.4	71.6	1391.0	1070.8	1027.1	79.1	166.7	39.5
Pct.	12.9	8.8	.6	12.2	9.4	9.0	.7	1.5	.3
<u>Grenada silt loam farms:</u>									
Acres	258.1	440.9	152.3	444.6	209.9	200.5	1.3	-	-
Pct.	2.3	3.9	1.3	3.9	1.8	1.8	.0	-	-
<u>Collins silt loam farms:</u>									
Acres	171.5	131.3	28.5	179.3	109.1	51.6	1.5	11.8	-
Pct.	1.5	1.1	.2	1.6	1.0	.5	.0	.1	-
<u>Waverly silt loam farms:</u>									
Acres	11.8	16.9	-	64.2	30.1	62.2	2.5	-	-
Pct.	.1	.1	-	.6	.3	.5	.0	-	-
<u>Undifferentiated farms:</u>									
Acres	600.8	686.0	215.7	667.2	430.9	320.8	35.0	50.9	2.4
Pct.	5.3	6.0	1.9	5.8	3.8	2.8	.3	.4	.0
<u>Total farms:</u>									
Acres	2519.3	2280.5	468.1	2746.3	1850.8	1662.2	119.4	229.4	41.9
Pct.	22.0	20.0	4.1	24.0	16.2	14.5	1.0	2.0	.4

Grenada silt loam farms are not so much in need of soil conservation practices as Memphis silt loam farms (Table XLV). Of the land in Grenada silt loam farms 17.1 per cent need terracing, 29.3 per cent need contour tillage, 10.1 per cent need rotation only, 29.5 per cent need strip cropping,



Source: Table XLV.

*Less than .1 per cent

Figure 21. Percentage Distribution of Farms by Dominant Soil Type Needing Soil Conservation Practices, Crockett County, 1936

13.9 per cent need improved cover, 13.3 per cent need gully control and .1 per cent need retirement.

Collins silt loam farms are least in need of soil conservation practices. On these farms 12.9 per cent of the acres need terracing, 9.8 per cent need contour tillage, 2.1 per cent need rotation only, 13.5 per cent need strip cropping, 8.2 per cent need improved cover, 3.9 per cent need gully control, and .1 per cent need retirement and close growing crops.

TABLE XLVI. PERCENTAGE DISTRIBUTION OF LAND NEEDING SOIL CONSERVATION PRACTICES BY FARMS CLASSED ACCORDING TO DOMINANT SOIL TYPE, 112 FARMS, CROCKETT COUNTY, TENNESSEE, 1936

Conservation Practice	Total Area Needing Practice	Memphis Silt Loam	Grenada Silt Loam	Collins Silt Loam	Waverly Silt Loam	Farms of Mixed Soil Type
Terracing	22.0	28.2	17.1	12.9	3.3	21.1
Contour tillage	20.0	19.2	29.3	9.8	4.8	24.1
Rotation only	4.1	1.4	10.1	2.1	-	7.6
Strip cropping	24.0	26.6	29.5	13.5	18.1	23.5
Improve cover	16.2	20.5	13.9	8.2	8.5	15.2
Gully control	14.5	19.6	13.3	3.9	17.6	11.3
Retirement	1.0	1.5	.1	.1	.7	1.2
Close growing	2.0	3.2	-	.1	-	1.8
Forest	.4	.8	-	-	-	.1

On the farms of mixed soil type or farms on which no single soil type constituted as much as 50 per cent of the land area, the need for soil conservation practices approximated the average for the entire area (Table XLVI).

The need for soil conservation practices in themselves constitute recommendations for soil improvement. And with these recommendations in mind it should be realized that most farms are in such condition that they require a combination of methods for the best results.

CHAPTER V

LAND USE RECOMMENDATIONS TO CONSERVE THE SOIL

Proper land use is one of the most effective ways of conserving soil, involving the planting of lands to the crops to which they are best adapted. The placing of additional land under a more adequate cover of vegetation immediately presents the problem of income. The job of maintaining or increasing the net farm income, over a period of years, is the highest hurdle confronting the farmer. However, too much land has been and is now exposed to erosion. In general, this means an increase in the legume and grass acreage and a decrease in the acreage of row crops, though blanket recommendations do not always apply, since specific variations will modify their application.

The farms were sorted for tabulation into four groups, based upon the percentage of farm land area in bottom land, for purposes of analysis and to form the basis for recommendations. Group I contained farms having over 60 per cent of the total area in bottom land; Group II, 40-59 per cent; Group III, 20-39 per cent; and Group IV, less than 20 per cent.

Land use, livestock numbers and production, size of farm, crop yields, crop and livestock receipts, expenses and farm income data were calculated by these four groups, and compared with a summary of physical characteristics of soil type, slope and erosion, for the respective groups.

Soil Conservation Service representatives recommended major land use

practices that would conserve the soil. Recommendations were made for each physical factor of soil type, slope, and erosion as to whether row crops, cover crops, meadow, pasture, or forest would be the proper cover to prevent erosion.

TABLE XLVII. NUMBER OF FARMS CLASSIFIED ACCORDING TO THE PERCENTAGE OF TOTAL AREA IN BOTTOM LAND, CROCKETT COUNTY, TENNESSEE, 1936

Item	All Farms	Group I Over 6%	Group II 40-59%	Group III 20-39%	Group IV Under 20%
Number of farms	112	20	13	31	48

The upland farms are larger as measured by man work units per farm (Table XLVIII) and in acres per farm.

TABLE XLVIII. SIZE: AVERAGE MAN WORK PER FARM ACCORDING TO PERCENTAGE OF FARM AREA IN BOTTOM LAND, 112 FARMS, CROCKETT COUNTY

Group	Number of Farms	Average Man Work Units	Acres per Farm
All farms	112	404.3	95.7
Group I	20	370.7	81.5
Group II	13	339.1	77.2
Group III	31	459.7	119.2
Group IV	48	400.2	91.6

The total investment per farm averaged more on the farms with the lower percentages of land in bottom land. Farms in Group I and II have lower investment in real estate, livestock, machinery and equipment, and required less cash to run the farm than did the farms in Group III and IV (Table XLIX).

TABLE XLIX. SUMMARY OF SOME FARM MANAGEMENT FACTORS PER FARM
 ACCORDING TO PERCENTAGE OF TOTAL AREA IN BOTTOM LAND,
 112 FARMS, CROCKETT COUNTY, TENNESSEE,
 1936

Summary	All Farms	Group I Over 60%	Group II 40-59%	Group III 20-30%	Group IV Under 20%
Number of farms	112	20	13	31	48
Size of farms	95.7	81.5	77.2	119.2	91.6
Total investment	6705.50	5183.10	5483.20	8428.70	5443.50
Real estate	5151.90	3844.70	4046.20	6533.10	5104.10
Livestock	774.10	674.60	723.70	883.00	758.80
Machinery and equipment	309.40	281.40	251.50	390.50	284.30
Feed and supplies	350.00	280.90	383.80	447.70	306.60
Cash to run farm	120.10	101.50	78.10	174.40	104.30
Farm income	518.80	472.90	458.20	534.50	544.70
Labor income	189.80	216.20	183.10	63.20	262.40
Per cent return on investment	5.6	5.4	5.1	5.2	6.2

Income figures on the different groups of farms showed considerable variation being highest on farms with less than 20 per cent of the total land area in bottom land. Group III farms which showed the lowest average labor income, although not the smallest farm income, would probably average much higher in labor income for years more nearly normal in growing conditions. It is generally known that large farms make larger incomes during good years but lose more during bad years compared with smaller farms. It is interesting to note that the per cent return on investment between the various groups of farms varied but 1.1 per cent.

The farms in Group I and Group II had fewer acres of row crops but a larger percentage of their total land in row crops than did farms in Group III and Group IV. Cotton and corn are the chief crops and the farms in

Group I and Group II planted fewer acres but a larger percentage of their farms to these crops (Table L). There is not much difference in the acreage or per cent of land growing cover crops on the different groups of farms, all farms being very low. Farms with 20-39 per cent bottom land, Group III, and under 20 per cent bottom land, Group IV, have larger acreages of meadow and plowable pasture. Other minor differences in land use are found in Table L.

TABLE L. PRESENT LAND USE PER FARM ON 112 FARMS, CROCKETT COUNTY,
ACCORDING TO PER CENT OF THE TOTAL LAND AREA IN BOTTOM LAND

Land Use	All Farms		Group I (Over 60)		Group II (45-59 %)		Group III (20-39%)		Group IV (Under 20%)	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Total farm land area	95.7	100.0	81.5	100.0	77.2	100.0	119.1	100.0	91.6	100.0
Total including double crops	97.5	101.9	82.8	101.7	78.4	101.5	121.3	101.8	93.5	102.1
Double crops	1.7	1.9	1.4	1.7	1.2	1.5	2.1	1.8	1.9	2.1
Row crops	45.2	47.3	39.9	49.0	38.9	50.5	53.7	45.1	43.6	47.6
Corn (all purposes)	20.9	21.8	18.9	23.1	23.0	29.9	24.1	20.2	19.0	20.8
Cotton (harvested)	16.0	16.7	15.0	18.3	10.9	14.2	17.1	14.4	17.0	18.6
Grain sorghum	.2	.2	-	-	.2	.2	.2	.1	.3	.3
Irish potatoes	.01	.01	-	-	-	-	-	-	.03	-
Sweet potatoes	.1	.1	-	-	-	-	.2	.2	.1	.1
Tobacco	.01	.01	-	-	-	-	-	-	.03	-
Vegetable crops	.8	.9	1.0	1.2	.5	.6	1.0	.9	.7	.8
Strawberries	.5	.6	.4	.5	.3	.4	.6	.5	.6	.7
Orchards, vineyards	.5	.6	.2	.2	.2	.2	.3	.3	.9	1.1
Hay (cowpeas, soybeans, etc. 1/2)	.9	1.1	.9	1.1	.3	.3	1.4	1.3	.7	.9
Other crops (1/2)	1.2	1.3	.8	1.0	1.0	1.2	1.7	1.4	1.1	1.3
Idle, failure or fallow	3.8	4.0	2.7	3.4	2.6	3.4	6.9	5.8	2.7	3.0

(continued)

TABLE L. PRESENT LAND USE PER FARM ON 112 FARMS, CROCKETT COUNTY,
ACCORDING TO PER CENT OF THE TOTAL LAND AREA IN BOTTOM LAND (cont.)

Land Use	All Farms		Group I (Over 60)		Group II (45-59%)		Group III (20-39%)		Group IV (Under 20%)	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Cover crops	2.1	2.2	1.4	1.7	2.5	3.0	2.0	1.7	2.5	2.8
Wheat	.7	.8	.6	.8	1.2	1.6	.7	.6	.7	.8
Oats	.5	.5	-	-	1.0	1.2	.5	.4	.5	.6
Barley	-	-	-	-	-	-	-	-	-	-
Rye	-	-	-	-	-	-	-	-	-	-
Small grains cut for hay	.9	.9	.8	.9	.2	.2	.7	.7	1.2	1.4
Winter legumes	-	-	-	-	-	-	-	-	-	-
Meadow and plow- able pasture	30.8	32.5	21.3	26.1	25.6	33.0	37.3	31.4	31.0	35.0
Alfalfa	.02	.02	-	-	-	-	-	-	.05	.1
Lespedeza, sweet clover	13.3	13.9	10.2	12.5	7.3	9.4	19.0	16.0	12.5	13.7
Red clover, timothy	.2	.2	.1	.1	-	-	.1	.1	.3	.4
Other tame and wild grasses	1.2	1.3	.8	.9	2.5	3.4	1.6	1.4	.8	.9
Soybeans, cow- peas, etc. (1/2)	.9	1.0	.9	1.2	.3	.3	2.2	1.9	.7	.9
Other crops (1/2)	1.2	1.3	.8	1.0	1.0	1.2	.9	.8	1.1	1.3
Rotation plowable pasture	13.9	14.5	8.6	10.6	14.5	18.8	13.3	11.2	16.3	17.7
Permanent pas- ture	3.0	3.2	3.4	4.1	.6	.8	3.9	3.3	2.9	3.3
Woodland pas- ture	6.9	7.3	9.0	11.0	5.2	6.8	10.4	8.6	4.3	4.8
Woodland not pasture	3.6	3.8	3.2	3.9	2.4	3.1	6.2	5.4	2.4	2.6
Other farm land	5.6	5.9	4.8	5.9	3.3	4.3	7.4	6.3	5.4	6.0

Farms with more land in bottom land had fewer work stock, fewer cattle, more hogs, fewer sheep, and goats, and fewer chickens than did the farms with more upland soil (Table LI).

TABLE LI. AVERAGE NUMBER OF LIVESTOCK PER FARM ACCORDING TO
PERCENTAGE OF FARM AREA IN BOTTOM LAND, 112 FARMS, CROCK-
ETT COUNTY, 1936

Livestock	All Farms	Group I	Group II	Group III	Group IV
Work stock	4.3	4.0	3.8	3.9	4.7
Cattle	7.1	5.3	8.8	9.9	5.7
Hogs	3.2	4.0	4.2	3.4	2.5
Sheep & goats	.8	.6	-	.1	1.6
Chickens	52.2	45.9	52.5	49.2	56.7

Conforming to approved conservation practices, it was found that row crops might be increased as much as 60 per cent on the Group I farms, with as much as 20 per cent increase in cotton acreage. Cover crops need to be increased to 9.6 per cent. Corresponding to the increase in row crops it was found possible to decrease the meadow and plowable and permanent pasture in proportion (Table LII).

Row crops and cover crops, without erosion control measures, were recommended on erosion classes slight to moderate sheet erosion on A slopes (0-3 per cent), which predominated in Group I farms.

The decrease in woodland is caused by the introduction of crops and pasture in bottom lands when drained. Some woodland, however, will replace row crops and meadow on steep and badly eroded slopes.

The increase in row crops in Group I farms will possibly require an increase in work stock. Cattle will have to be decreased on these soils because of the decrease in hay and pasture. The small increase in corn will be consumed by the additional work stock and hogs.

Farms in Group II having 40 to 59 per cent of the total farm land area in bottom land can increase row crops, and cotton as much as 30 per cent.

Cover crops should be increased to 23.3 per cent. Plowable, meadow, and rotation pasture can be decreased (Table LII).

Group III farms with 20 to 39 per cent of the total farm land area in bottom land may increase row crops 20 per cent which may be practically all cotton. Cover crops need increasing to 27.3 per cent. Meadows and pastures need only a slight reduction in acreage to make the cotton increase possible (Table LIV).

Farms in Group IV having less than 20 per cent bottom land, require a decrease in row crops and an increase in meadow and pasture to meet with soil conservation recommendations. The corn acreage is reduced, though cotton is maintained. With an increase in hay and pasture, work stock may get along with less corn. An improved labor distribution should require fewer work stock. Cattle may be increased to consume increased hay and pasture. These farms are in need of the largest increase in cover crops which should be increased to 31.4 per cent (Table LV)

All farms should decrease the acreage of idle, failure, or fallow land and the acreage in uses classed as other farm land. In an area such as this there is little reason why any land should be idle, since if the season of planting for one crop is past there are still a number of crops that are well adapted and can and should be planted. This leaves the land in idle, failure, or fallow land largely one of crop failure.

Some few farms need to shift row crops from upland to bottom land and pastures and hay crops to the upland soil. Which in effect will bring about soil conservation without a reduction in row crops.

TABLE LII. PRESENT AND RECOMMENDED FARM LAND USE TO EFFECT SOIL CONSERVATION ON 20 FARMS IN CROCKETT COUNTY, ALL HAVING 60 PER CENT OR MORE OF THE TOTAL FARM LAND AREA IN BOTTOM LAND

GROUP I

Land Use	Present Use (1935)		Recommended Use	
	Acres	Per Cent	Acres	Per Cent
Total (including double cro crops)	1,656.6	101.7	1,786.0	109.6
Double crops	27.0	1.7	156.4	9.6
Total farm land area	1,629.6	100.0	1,629.6	100.0
Row crops	797.6	49.0	1,238.5	76.0
Corn (all purposes)	378.5	23.1	449.7	27.6
Cotton (harvested)	300.4	18.3	620.8	38.1
Grain sorghum	-	-	-	-
Irish potatoes	-	-	-	-
Sweet potatoes	-	-	-	-
Tobacco	-	-	-	-
Vegetable crops	19.6	1.2	39.1	2.4
Strawberries	7.5	.5	8.2	.5
Orchards, vineyards	3.0	.2	3.3	.2
Hay (cowpeas, soybeans, etc., 1/2)	18.5	1.1	81.5	5.0
Other crops (1/2)	15.5	1.0	16.3	1.0
Idle, failure or fallow	54.6	3.4	19.6	1.2
Cover crops	27.0	1.7	156.4*	9.6*
Wheat	12.0	.8	11.4	.7
Oats	-	-	22.8	1.4
Barley	-	-	4.9	.3
Rye	-	-	1.6	.1
Small grains cut for hay	15.0	.9	73.3	4.5
Winter legumes	-	-	42.4	2.6
Meadow and plowable pasture	425.5	26.1	218.4	13.4
Alfalfa	-	-	.2	.01
Lespedeza, sweet clover	203.0	12.5	88.0	5.4
Red clover, timothy	1.0	.1	1.6	.1
Other tame and wild grasses	15.0	.9	14.6	.9
1/2 cowpeas, soybeans, etc.	18.5	1.2	21.2	1.3
Other crops (1/2)	15.5	1.0	8.2	.5
Rotation plowable pasture	172.5	10.6	84.6	5.2
Permanent pasture	67.0	4.1	40.7	2.5
Woodland pasture	180.0	11.0	-	-
Woodland not pasture	63.0	3.9	53.8	3.3
Other farm land	96.5	5.9	78.2	4.8

* All cover crops recommended in new land use program by Soil Conservation Service are double crops.

TABLE LIII. PRESENT AND RECOMMENDED FARM LAND USE TO EFFECT SOIL CONSERVATION ON 15 FARMS IN CROCKETT COUNTY, ALL HAVING FROM 40 TO 59 PER CENT OF THE TOTAL FARM LAND AREA IN BOTTOM LAND

GROUP II

Land Use	Present Use (1935)		Recommended Use	
	Acres	Per Cent	Acres	Per Cent
Total (including double crops)	1,019.3	101.5	1,237.7	123.3
Double crops	15.5	1.5	233.9	23.3
Total farm land area	1,003.8	100.0	1,003.8	100.0
Row crops	506.4	50.5	685.6	68.3
Corn (all purposes)	299.0	29.9	301.1	30.0
Cotton (harvested)	142.0	14.2	304.2	30.3
Grain sorghum	2.0	.2	2.0	.2
Irish potatoes	-	-	-	-
Sweet potatoes	-	-	-	-
Tobacco	-	-	-	-
Vegetable crops	6.6	.6	12.1	1.2
Strawberries	4.0	.4	4.0	.4
Orchards, vineyards	2.2	.2	2.0	.2
Hay (1/2 cowpeas, soybeans, etc.)	3.8	.3	38.1	3.8
Other crops (1/2)	13.0	1.2	10.0	1.0
Idle, failure, or fallow	33.8	3.4	12.1	1.2
Cover crops	30.5	3.0	233.9*	23.3*
Wheat	16.0	1.6	16.1	1.6
Oats	12.5	1.2	32.1	3.2
Barley	-	-	3.0	.3
Rye	-	-	1.0	.1
Small grains cut for hay	2.0	.2	46.2	4.6
Winter legumes	-	-	135.5	13.5
Meadow and plowable pasture	333.2	33.0	262.9	26.2
Alfalfa	-	-	0.1	.01
Lespedeza, sweet clover	94.5	9.4	94.3	9.4
Red clover, timothy	-	-	1.0	.1
Other tame and wild grasses	33.0	3.4	30.1	3.0
1/2 cowpeas, soybeans, etc.	3.7	.3	3.0	.3
Other crops (1/2)	13.0	1.2	8.0	.8
Rotation plowable pasture	189.0	18.8	126.4	12.6
Permanent pasture	8.0	.8	11.0	1.1
Woodland pasture	67.0	6.8	-	-
Woodland not pasture	31.0	3.1	1.0	.1
Other farm land	43.2	4.3	43.3	4.3

* All cover crops recommended in new land use program by Soil Conservation Service are double crops.

TABLE LIV. PRESENT AND RECOMMENDED FARM LAND USE TO EFFECT SOIL
CONSERVATION ON 31 FARMS IN CROCKETT COUNTY, ALL HAVING
FROM 20 TO 39 PER CENT OF THE TOTAL FARM LAND AREA
IN BOTTOM LAND

GROUP III

Land Use	Present Use (1935)		Recommended Use	
	Acres	Per Cent	Acres	Per Cent
Total (including double crops)	3,759.5	101.8	4,701.8	127.3
Double crops	66.0	1.8	1,008.3	27.3
Total farm land area	3,693.5	100.0	3,693.5	100.0
Row crops	1,666.0	45.1	2,027.7	54.9
Corn (all purposes)	748.0	20.2	746.1	20.2
Cotton (harvested)	531.0	14.4	1,085.9	29.4
Grain sorghum	5.2	.1	3.7	.1
Irish potatoes	-	-	-	-
Sweet potatoes	7.0	.2	7.4	.2
Tobacco	-	-	-	-
Vegetable crops	32.0	.9	33.2	.9
Strawberries	19.0	.5	18.5	.5
Orchards, vineyards	10.0	.3	11.1	.3
Hay (1/2 cowpeas, soybeans, etc.)	46.5	1.3	48.0	1.3
Other crops (1/2)	53.3	1.4	29.5	.8
Idle, failure, or fallow	214.0	5.8	44.3	1.2
Cover crops	63.0	1.7	1,008.3*	27.3*
Wheat	23.0	.6	18.5	.5
Oats	16.0	.4	36.9	1.0
Barley	-	-	3.7	.1
Rye	-	-	3.7	.1
Small grains cut for hay	24.0	.7	169.9	4.6
Winter legumes	-	-	775.6	21.0
Meadows, plowable pasture	1,156.0	31.4	1,181.9	32.0
Alfalfa	-	-	.3	.01
Lespedeza, sweet clover	591.0	16.0	591.0	16.0
Red clover, timothy	4.2	.1	7.4	.2
Other tame and wild grasses	50.0	1.4	51.7	1.4
1/2 cowpeas, soybeans, etc.	70.0	1.9	48.0	1.3
Other crops (1/2)	29.8	.8	29.5	.8
Rotation plowable pasture	413.0	11.2	454.0	12.5
Permanent pasture	123.0	3.3	162.5	4.4
Woodland pasture	323.0	8.6	-	-
Woodland not pasture	194.0	5.4	144.0	3.9
Other farm land	232.5	6.3	177.4	4.8

* All cover crops recommended in new land use program by Soil Conservation Service are double crops.

TABLE LV. PRESENT AND RECOMMENDED FARM LAND USE TO EFFECT SOIL
CONSERVATION ON 48 FARMS IN CROCKETT COUNTY, ALL HAVING LESS
THAN 20 PER CENT OF THE TOTAL FARM LAND AREA IN BOTTOM
LAND

GROUP IV

Land Use	Present Use (1935)		Recommended Use	
	Acres	Per Cent	Acres	Per Cent
Total (including double crops)	4,487.3	102.1	5,899.3	134.2
Double crops	91.0	2.1	1,603.5	34.2
Total farm land area	4,396.3	100.0	4,396.3	100.0
Row crops	2,093.8	47.6	1,824.5	41.5
Corn (all purposes)	916.0	20.8	756.2	17.2
Cotton (harvested)	820.2	18.6	817.7	18.6
Grain sorghum	14.8	.3	12.9	.3
Irish potatoes	1.7	-	-	-
Sweet potatoes	6.3	.1	4.3	.1
Tobacco	1.5	-	-	-
Vegetable crops	34.9	.8	35.2	.8
Strawberries	29.0	.7	30.3	.7
Orchards, vineyards	46.4	1.1	48.4	1.1
Hay (1/2 cowpeas, soybeans, etc.)	37.2	.9	35.3	.8
Other crops (1/2)	55.3	1.3	30.3	.7
Idle, failure, or fallow	130.5	3.0	52.9	1.2
Cover crops	124.0	2.8	1,503.5*	34.2*
Wheat	35.0	.8	35.2	.8
Oats	28.0	.6	70.3	1.6
Barley	-	-	-	-
Rye	-	-	-	-
Small grain cut for hay	61.0	1.4	219.8	5.0
Winter legumes	-	-	1,148.2	26.8
Meadow and plowable pasture	1,535.5	35.0	1,690.4	43.0
Alfalfa	2.5	.1	8.8	.2
Lespedeza, sweet clover	601.5	13.7	703.4	16.0
Red clover, timothy	16.0	.4	39.6	.9
Other tame and wild grasses	40.0	.9	131.8	3.0
1/2 cowpeas, soybeans, etc.	37.3	.9	48.4	1.1
Other crops (1/2)	55.2	1.3	48.4	1.1
Rotation of plowable pasture	783.0	17.7	910.0	20.7
Permanent pasture	143.0	3.3	338.5	7.7
Woodland pasture	211.2	4.8	-	-
Woodland not pasture	116.4	2.6	131.9	3.0
Other farm land	263.4	6.0	211.0	4.8

* All cover crops recommended in new land use program by Soil Conservation Service are double crops.

A summary of the land use recommendations to effect soil conservation on the 112 farms in Crockett County, Tennessee, is given in Table LVA. It is possible to increase row crops as much as 12 per cent and also to increase meadow permanent and plowable pasture by cutting down on idle, failure, or fallow land and woodland pasture. Cover crops need increasing to 27.1 per cent.

Differences in land use recommendations in the type of farming area, compared with the sample area, are based on differences in soil, slope, and severity of erosion. An increase of 50 per cent in meadow and plowable pasture is recommended for the type of farming area, owing to the relatively large proportion of the land in steeper slopes. A decrease in row crops is recommended for type of farming area but not the sample area. A decrease in woodland is recommended for both the sample area and type of farming area. Considerable forest acreage is now on poorly drained bottom land, to be cleared, for crops and pasture. Land in woodland pasture should in most cases become either woodland not pastured, or cleared for crops or pasture. Both sample area and type of farming area farms are badly in need of cover crops which should be increased until nearly one fourth of the land is in cover crops. All cover crops recommended in the new land use program are double crops.

An increase in hay and pasture will necessitate an increase in livestock, chiefly cattle.

TABLE LVA. PRESENT AND RECOMMENDED FARM LAND USE TO EFFECT SOIL
CONSERVATION ON 112 FARMS IN CROCKETT COUNTY, TENNESSEE

TOTAL FARMS SURVEYED

Land Use	Present Use (1935)		Recommended Use	
	Acres	Per Cent	Acres	Per Cent
Total (including double crops)	10,921.6	101.9	13,625.2	127.1
Double crops	200.5	1.9	2,902.1	27.1
Total farm land area	10,723.1	100.0	10,723.1	100.0
Row crops	5,063.6	47.3	5,776.3	53.9
Corn (all purposes)	2,341.5	21.8	2,253.1	21.0
Cotton (harvested)	1,793.6	16.7	2,828.6	26.4
Grain sorghum	22.0	.2	18.6	.2
Irish potatoes	1.7	.01	—	—
Sweet potatoes	13.3	.1	11.7	.1
Tobacco	1.5	.01	—	—
Vegetable crops	93.1	.9	118.6	1.1
Strawberries	59.5	.6	61.5	.6
Orchards, vineyards	61.6	.6	64.8	.6
Hay (1/2 cowpeas, soybeans, etc.)	105.9	1.1	202.9	1.9
Other crops (1/2)	137.0	1.3	86.6	.8
Idle, failure, or fallow	432.9	4.0	128.9	1.2
Cover crops	244.5	2.2	2,902.1*	27.1*
Wheat	86.2	.8	81.2	.8
Oats	56.5	.5	162.1	1.5
Barley	—	—	11.6	.1
Rye	—	—	6.3	.1
Small grains cut for hay	102.0	.9	509.2	4.7
Winter legumes	—	—	2,131.7	19.9
Meadow and plowable pasture	3,453.3	32.3	3,553.6	33.1
Alfalfa	2.5	.02	9.4	.1
Lespedeza, sweet clover	1,490.0	13.9	1,476.7	13.8
Red clover, timothy	21.2	.2	49.6	.5
Other tame and wild grasses	139.0	1.3	228.2	2.1
1/2 cowpeas, soybeans, etc.	106.1	1.0	120.6	1.1
Other crops (1/2)	137.0	1.3	94.1	.9
Rotation plowable pasture	1,557.5	14.5	1,575.0	14.6
Permanent pasture	341.0	3.2	552.7	5.2
Woodland pasture	781.2	7.3	—	—
Woodland not pasture	404.4	3.8	330.7	3.1
Other farm land	635.6	5.9	509.9	4.7

* All cover crops recommended in new land use program by Soil Conservation Service are double crops.

TABLE LVI. PRESENT AND RECOMMENDED FARM LAND USE TO EFFECT SOIL CONSERVATION IN SAMPLE AREA, CROCKETT COUNTY, TENNESSEE

Land Use	Present Use 1935*		Recommended Use	
	Acres	Per Cent	Acres	Per Cent
Total farm land area	106,436	100.0	106,436	100.0
Double crops	38	.03	28,182	26.5
Row crops	56,154	52.8	58,270	54.8
Corn (all purposes)	24,785	23.3	24,785	23.3
Cotton (harvested)	21,531	20.3	26,928	25.3
Sorghum for hay	271	0.3	271	0.3
Grain sorghums	27	0.03	27	0.03
Irish potatoes	252	0.2	252	0.2
Sweet potatoes	299	0.3	299	0.3
Tobacco	-	-	-	-
Peanuts	40	0.04	40	0.04
Vegetable crops	472	0.5	472	0.5
Strawberries	1037	1.0	1037	1.0
Orchards and vineyards	352	0.3	352	0.3
Hay (1/2 soybeans, cowpeas, etc.)	1818	1.7	1818	1.7
Other crops (1/2)	732	0.7	732	0.7
Idle, failure or fallow	4538	4.2	1257	1.2
Cover crops	-	-	28182	26.5
Wheat for grain	536	0.5	1277	1.2
Oats for grain	460	0.4	2074	2.0
Barley for grain	-	-	299	0.3
Rye for grain	-	-	106	0.1
Small grain cut for hay	150	0.1	4257	4.0
Winter legumes (as crimson clover)	-	-	20063	18.8
Summer cover (as sudan)	-	-	106	0.1
Meadow and plowable pasture	33149	31.1	34501	32.4
Alfalfa	15	0.01	40	0.04
Lespedeza and sweet clover	12180	11.4	12161	11.4
Red, white, alsike clover, timothy, etc.	662	0.7	1818	1.7
Other tame and wild grasses	789	0.7	1037	1.0
Soybeans, cowpeas, beans (1/2)	1818	1.7	1818	1.7
Other crops (1/2)	731	0.7	731	0.7
Plowable pasture	16954	15.9	16896	15.9
Other pasture (Census)	708	0.7	-	-
Permanent pasture	-	-	4814	4.5
Woodland pasture	5000	4.7	-	-
Woodland not pasture	4174	3.9	3742	3.5
Other farm land	6143	5.8	5109	4.8

* Acreage taken from sixteenth Census of Agriculture, 1935.

Note: All cover crops recommended in new land use program by Soil Conservation Service are double crops.

TABLE LVII. PRESENT AND RECOMMENDED FARM LAND USE TO EFFECT
SOIL CONSERVATION IN TYPE OF FARMING AREA III

Land Use	Present Use (1935)*		Recommended Use	
	Acres	Per Cent	Acres	Per Cent
Total (including double crops)	2,207,200	100.2	2,648,452	120.3
Double crops	5,916	.2	447,168	20.3
Total farm land area	2,201,284	100.0	2,201,284	100.0
Row crops	1,016,289	46.1	766,574	34.8
Corn (all purposes)	387,803	17.6	300,780	13.7
Cotton (harvested)	354,068	16.1	354,068	16.1
Sorghum for hay	4,489	.2	4,489	.2
Grain sorghum	214	.01	214	.01
Irish potatoes	4,608	.2	4,608	.2
Sweet potatoes	9,553	.4	9,553	.4
Tobacco	40	.001	40	.001
Peanuts	903	.04	903	.04
Vegetable crops	8,762	.4	8,762	.4
Strawberries	4,761	.2	4,761	.2
Orchards and vineyards	7,086	.3	7,086	.3
Hay (1/2 cowpeas, soybeans, etc.)	34,073	1.6	34,073	1.6
Other crops (1/2)	11,322	.5	11,322	.5
Idle, failure, or fallow	188,607	8.6	25,915	1.2
Cover crops	9,014	.3	447,168**	20.3**
Wheat	3,793	.1	8,286	.4
Oats	3,885	.2	15,010	.7
Barley	-	-	4,761	.2
Rye	13	-	814	.03
Small grains cut for hay	1,323	.01	82,866	4.0
Winter legumes	-	-	332,338	14.9
Summer cover (sudan)	-	-	3,093	.1
Meadow and plowable pasture	459,720	21.0	730,641	33.2
Alfalfa	1,009	.04	3,093	.1
Lespedeza and sweet clover	89,221	4.1	220,128	10.0
Red clover, timothy, etc.	5,240	.2	37,421	1.7
Other tame and wild grasses	16,786	.8	88,052	4.0
Soybeans, cowpeas, beans, (1/2)	34,073	1.6	34,073	1.6
Other crops (1/2)	11,321	.5	11,322	.5
Rotation plowable pasture	302,070	13.7	336,552	15.3
Other pasture	63,582	2.9	-	-
Permanent pasture	-	-	255,525	11.6
Woodland pasture	143,882	6.5	-	-
Woodland not pasture	309,716	14.1	343,082	15.6
Other farm land	204,997	9.3	105,462	4.8

* Acreage taken from sixteenth Census of Agriculture, 1935.

** All cover crops recommended in new land use program by Soil Conservation Service are double crops.

CHAPTER VI

ECONOMIC EFFECT OF SOIL CONSERVATION RECOMMENDATIONS ON INDIVIDUAL FARMS SELECTED FROM EACH GROUP

If soil conservation practices are to be generally adopted by farmers it must be shown that their effect will be to increase the long time income, without involving undue expense or loss of immediate income.

In order to determine the economic effect of soil conservation recommendations on farms of this area, individual farms were selected from each group on the basis of per cent of total land area in A slope, and then each group was further divided into two sub-groups. The sub-group A contained farms with the highest per cent of A slope land, and sub-group B, the lowest per cent. The farms were re-arrayed within the sub-groups on the basis of size.

The median sized farm, the largest and the smallest were selected from each sub-group. Actual land use as given by these 12 farmers for their 1935 business was compared with land use recommended for soil conservation on each of the 12 farms.

TABLE LVIII. INDIVIDUAL FARMS SELECTED FOR BUDGETARY
ANALYSIS, CROCKETT COUNTY
(Farm Number)

Group	Largest	Smallest	Median	
			A	B
Group I	60	110	17	72
Group II	73	74	61	12
Group III	76	46	33	39
Group IV	40	111	49	7

TABLE LIX. RECOMMENDED ROW CROP ACREAGE ON SELECTED FARMS COMPARED WITH 1935 AND 1936 ACTUAL ACREAGE

Group Median Size Farms	Farm Num- ber	Total Acres in Farm	Acres in Row Crops		
			Actual		Maximum Recom- mended
			1935	1936	
Group I					
Sub-group A	17	94	43.5	67	78
Sub-group B	72	70	46	54	52
Group II					
Sub-group A	61	80	44	48	60
Sub-group B	12	75	40	40	48
Group IV					
Sub-group A	33	100	58	59	56
Sub-group B	39	78	23	36	41
Group V					
Sub-group A	49	67	20	35	27
Sub-group B	7	82	31	37	38
Large and Small Farms					
Group I					
Large: Sub-group A	60	148	15	36	122
Small: Sub-group B	110	26	16	20	21
Group II					
Large: Sub-group A	73	118	58	67	87
Small: Sub-group B	74	25	23	11	14
Group III					
Large: Sub-group A	76	650	179	132	386
Small: Sub-group B	46	325	14	21	20
Group IV					
Large: Sub-group A	40	571	169	194	206
Small: Sub-group B	111	29	20	20	14
Farm 83: Sub-group B	83	36	17	18	12

TABLE LX. YIELD PER ACRE OF COTTON AND CORN ON SELECTED FARMS, CROCKETT COUNTY, TENNESSEE

Group and Farm Number	Size of Farms	Cotton, Pounds	Corn, Bushels
Group I			
No. 60	Largest	166	25
" 110	Smallest	344	30
" 17	Median A	276	20
" 72	Median B	259	13
Group II			
No. 73	Largest	167	40
" 74	Smallest	180	14
" 61	Median A	188	20
" 12	Median B	300	30
Group III			
No. 76	Largest	265	25
" 46	Smallest	233	30
" 33	Median A	200	30
" 39	Median B	331	20
Group IV			
No. 40	Largest	2 60	25
" 111	Smallest	295	8
" 83	Smallest	212	20
" 49	Median A	475	30
" 7	Median B	300	35

TABLE LIII. LAND USE ON LARGEST AND SMALLEST FARMS SELECTED FROM EACH GROUP, CROCKETT COUNTY, TENNESSEE, 1936

Land Use	Group I				Group II				Group III				Group IV			
	Farm 60		Farm 110		Farm 73		Farm 74		Farm 76		Farm 46		Farm 40		Farm 111	
	A.	%	A.	%	A.	%	A.	%	A.	%	A.	%	A.	%	A.	%
All farm land	148	100.0	26	100.0	118	100.0	25	100.0	650	100.0	33	100.0	571	100.0	30	100.0
Crop land	21	14.2	18	69.2	74	62.7	19	76.0	317	48.8	24	72.7	277	48.5	21	70.0
Harvested	21	14.2	18	69.2	74	62.7	19	76.0	317	48.8	23	69.7	257	45.0	21	70.0
Failure	-	-	-	-	-	-	-	-	-	-	1	3.0	20	3.5	-	-
Idle	8	5.4	2	7.7	15	12.7	2	8.0	30	4.6	2	6.1	5	.9	1	3.3
Plowable pasture	30	20.2	5	19.2	16	13.6	-	-	134	20.6	6	18.2	223	39.1	-	-
Woodland	88	59.5	-	-	10	8.5	-	-	158	24.3	-	-	40	7.0	5	16.7
Waste, roads, etc.	2	1.4	1	3.8	4	3.4	5	20.0	11	1.7	2	6.1	27	4.7	4	13.3
Cotton	7	4.7	6	23.1	15	12.7	6	24.0	24	3.7	3	9.1	112	19.6	9	30.0
Corn	8	5.4	8	30.8	28	23.7	11	44.0	150	23.1	10	30.3	42	7.4	10	33.3
Hay	5	3.4	2	7.7	30	25.4	1	4.0	157	21.1	10	30.3	57	10.0	-	-
Lespedeza, clover, etc.	5	3.4	2	7.7	15	12.7	-	-	95	14.6	4	12.1	57	6.5	-	-
Small grains	-	-	-	-	-	-	-	-	-	-	-	-	20	3.5	-	-
Soybeans, cowpeas	-	-	-	-	15	12.7	1	4.0	42	6.5	6	18.2	-	-	-	-
Sweet potatoes	-	-	-	-	-	-	-	-	2	.3	-	-	-	-	-	-
Irish potatoes	-	-	-	-	-	-	-	-	-	-	1	3.0	-	-	-	-
Vegetables for sale and home use	.5	.3	.3	1.2	.5	.4	.5	2.0	1	.2	.3	.8	.5	.1	.3	.7
Orchards	-	-	-	-	-	-	-	-	2	.3	-	-	15	2.6	.5	.3
Strawberries	-	-	2	7.7	-	-	-	-	-	-	-	-	-	-	2	6.7
All other crops	-	-	-	-	-	-	-	-	2	.3	-	-	50	8.8	-	-

TABLE LXIII. LAND USE ON MEDIAN SIZED FARMS SELECTED FROM EACH GROUP, CROCKETT COUNTY, TENNESSEE, 1936

Land Use	Group I				Group II				Group III				Group IV			
	Farm 17		Farm 72		Farm 61		Farm 12		Farm 33		Farm 39		Farm 49		Farm 7	
	A.	%	A.	%	A.	%	A.	%	A.	%	A.	%	A.	%	A.	%
All farm land	94	100.0	70	100.0	80	100.0	75	100.0	100	100.0	78	100.0	67	100.0	82	100.0
Crop land	52	55.3	50	71.4	53	66.3	53	70.7	68	85.0	30	38.5	43	64.2	47	57.5
Harvested	52	55.3	50	71.4	41	51.3	53	70.7	68	85.0	30	38.5	43	64.2	47	57.5
Failure	-	-	-	-	12	15.0	-	-	-	-	-	-	-	-	-	-
Idle	9	9.6	-	-	-	-	1	1.3	9	9.0	8	10.3	3	7.0	3	3.7
Plowable pasture	24	25.5	11	15.7	5	6.3	19	25.3	12	12.0	38	48.7	15	22.4	20	24.4
Woodland	7	7.4	3	4.3	18	22.5	-	-	4	4.0	-	-	2	3.0	8	9.8
Waste, roads, etc.	3	3.2	5	7.1	4	5.0	3	4.0	7	7.0	3	3.8	5	7.5	4	4.6
Cotton	11	11.7	24	34.3	8	10.0	7	9.3	16	16.0	12	15.4	5	7.5	16	19.5
Corn	29	30.9	19	27.1	36	45.0	30	40.0	40	40.0	8	10.3	12	17.9	15	18.3
Hay	9	9.6	7	10.0	9	11.3	14	18.7	10	10.0	7	9.0	23	34.3	16	19.5
Lespedeza, clover, etc.	9	9.6	4	5.7	9	11.3	13	17.3	10	10.0	6	7.7	20	29.8	16	19.5
Small grains	-	-	-	-	-	-	-	-	-	-	-	-	2	2.9	-	-
Soybeans, cowpeas	-	-	3	4.3	-	-	1	1.3	-	-	1	1.3	1	1.5	-	-
Sweet potatoes	-	-	-	-	-	-	-	-	-	-	2	2.6	-	-	-	-
Irish potatoes	-	-	-	-	-	-	-	-	-	-	-	-	.3	.3	-	-
Vegetables for sale and home use	.5	.5	.3	.3	.3	.3	1	1.3	1	1.0	.5	.6	.5	.7	.3	.4
Strawberries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Orchards	1	1.1	-	-	-	-	1	1.3	-	-	-	-	2	2.9	-	-
All other crops	1	1.1	-	-	-	-	-	-	1	1.0	-	-	-	-	-	-

It has already been shown that Group IV farms, with less than 20 per cent of the farm area in bottom land, are most severely eroded and on the farms which will be most affected by soil conservation recommendations.

A summary of physical factors, livestock numbers, crop production and farm income data is included for the farms selected as typifying the problems presented on farms under widely differing conditions as to size, slope, extent of erosion, etc., and as illustrative of the income change resulting from the adoption of these soil conservation recommendations.

A decrease in row crops and an increase in legumes, pasture and forest land is a shift towards a less intensive type of farming, which is equivalent to a decrease in size of business. This reduction in size of farm business on farms already too small creates an acute income problem which is especially difficult to solve since to extensify means a decrease in income and not to extensify may mean a loss of soil, lessened productivity and ultimately a decrease in income.

On the 16 farms taken as representative it was found necessary to reduce the 1935 acreage of row crops on only 3 farms, numbers 72, 110 and 111 (Table LXV). On no farm is it necessary to reduce cotton acreage. In fact, on all but two farms the acreage of cotton might be materially increased, the reduction in corn acreage on these farms being sufficient to meet recommended soil conservation land use practices. It is found that pasture and meadow land may be decreased and row crops increased on the bottom land farms, numbered 17 and 72. Increase in corn, soybeans,

TABLE XIX. LIVESTOCK ON SELECTED FARMS FROM EACH GROUP, CROCKETT COUNTY,
TENNESSEE, 1936

Livestock	Largest and Smallest Farms											
	Group I			Group II			Group III			Group IV		
	Farm 60		Farm 110	Farm 73		Farm 74	Farm 76		Farm 46	Farm 40		Farm 83
	No.	Per 100 A.	No.	No.	Per 100 A.	No.	No.	Per 100 A.	No.	No.	Per 100 A.	No.
Work stock	2	1.4	2	3	3.4	4	9	1.4	4	68	11.9	2
Cattle	3	2.0	2	3	2.5	3	105	16.2	4	59	10.3	6
Hogs	3	2.0	-	2	4.2	8.0	6	.9	-	3	.5	2
Sheep and goats	-	-	-	-	-	-	-	-	-	-	-	-
Chickens	50	33.8	50	25	25.4	100.0	65	10.0	35	75	13.1	35
												97.2

Livestock	Median Size Farms of A and B Class											
	Farm 17			Farm 72			Farm 61			Farm 33		
	Farm 17		Farm 72	Farm 72		Farm 61	Farm 61		Farm 33	Farm 33		Farm 7
	No.	Per 100 A.	No.	No.	Per 100 A.	No.	No.	Per 100 A.	No.	No.	Per 100 A.	No.
Work stock	7	7.4	3	4.3	4	5.0	5	6.7	5	5.0	3	3.7
Cattle	12	12.8	3	4.3	7	8.8	4	5.3	4	4.0	9	2.4
Hogs	15	15.9	1	1.4	6	7.5	2	2.7	2	2.0	1	1.2
Sheep and goats	13	13.8	-	-	-	-	-	-	-	-	-	-
Chickens	85	90.4	25	35.7	40	50.0	50	66.7	50	50.0	150	36.6

and cover crop acreage could in part take the place of reduced meadow and pasture land on these farms.

Since farms numbered 17, 61, 12, 41, 7, 60, 110, 73, 76, and 40 require no reduction in acreage of row crops to meet soil conservation practices it is evident that on these farms no loss of income will result from following soil conservation recommendations. It is more likely that incomes will be increased as a result of greater use of cover crops and an actual or potential increase in row crops. Probably on none of the selected farms would increased row crop acreage make necessary an increased number of work stock, inasmuch as present crop acreage is not making the most efficient use of work stock. Man labor expense would be increased, however. Inasmuch as the row crop acreage will not be decreased it is found unnecessary to make a budgetary analysis to show that the incomes will not be decreased as a result of soil conservation practices.

The farms numbered 33, 111, and 83 are in need of decreases in row crop acreage for both 1935 and 1936 acreages, farm 74 a decrease from the 1935 acreage, and farms 72, 49, and 46 need a decrease in row crops from the 1936 acreage. Since a decrease in row crops would not necessarily cause a decrease in farm income, these farms have been analyzed by the budget method to determine the economic effect under the recommended system.

Farm number 33 is in need of a row crop acreage reduction of 2 acres, a 2 acre corn reduction is recommended. The 16 acres of cotton is retained. Total meadow is increased 5 acres, cover crops 19 acres, and a decrease of 9 acres of idle land. With these changes the labor income would be about the same or somewhat increased for the increase in hay and pasture offsets

TABLE LIX. FINANCIAL SUMMARY OF SELECTED FARMS FROM EACH GROUP, CROCKETT COUNTY, TENNESSEE, 1936
(Largest and Smallest Farms)

Summary	Group I			Group II			Group III			Group IV															
	Farm 60		No. or A.	Farm 73		No. or A.	Farm 74		No. or A.	Farm 76		No. or A.	Farm 46		No. or A.	Farm 40		No. or A.	Farm 111		No. or A.	Farm 83		No. or A.	%
	%	No. or A.		%	No. or A.		%	No. or A.		%	No. or A.		%	No. or A.		%	No. or A.		%	No. or A.		%	No. or A.		
Size of farm, acres	148		26	118		25	100.0		100.0	650		33	571		30	100.0		36	100.0		36	100.0		36	100.0
Total investment	5013	100.0	2823	6575	100.0	3095	76.0	100.0	74.3	14427	100.0	3421	28202	100.0	3776	53.2	100.0	3433	79.5	100.0	2500	72.8	386	11.2	
Real estate	4067	81.1	2000	5000	76.0	2300	12.5	100.0	16.3	3500	40.7	1800	15000	33.3	3000	4.6	100.0	2500	79.5	100.0	386	11.2			
Livestock	372	7.4	440	819	12.5	504	5.2	100.0	4.7	5866	6.8	171	1304	5.0	185	4.6	100.0	171	4.9	100.0	226	5.0			
Moby. & equipment	332	6.6	100	340	5.2	147	4.8	100.0	4.7	976	11.4	260	1771	7.6	68	6.3	100.0	226	1.8	100.0	226	6.6			
Feed and supplies	192	3.8	183	316	4.8	144	1.5	100.0	4.7	3585	24.8	50	200	1.5	80	7.7	100.0	226	2.1	100.0	226	6.6			
Cash to run farm	50	1.0	100	100	1.5	-	-	-	-	500	3.4	50	200	1.5	80	7.7	100.0	226	2.1	100.0	226	6.6			
Crop receipts	273	100.0	394	929	100.0	191	100.0	100.0	15.7	1469	100.0	90	6599	100.0	369	100.0	233	100.0	100.0	233	100.0	100.0	100.0		
Corn	-	-	-	396	42.6	30	30.8	15.7	71.7	150	10.2	64	4072	61.8	337	5.0	100.0	181	77.7	100.0	181	77.7	100.0	100.0	
Cotton	175	64.1	239	286	30.8	137	5.9	71.7	-	907	61.7	-	333	5.0	-	100.0	100.0	181	77.7	100.0	181	77.7	100.0	100.0	
Hay	-	-	-	55	5.9	-	-	-	-	-	-	-	-	-	-	100.0	100.0	181	77.7	100.0	181	77.7	100.0	100.0	
Truck	14	5.1	88	-	-	-	-	-	-	120	8.2	-	-	-	30	8.1	100.0	100.0	181	77.7	100.0	181	77.7	100.0	100.0
Other	-	-	-	-	-	-	-	-	-	-	-	-	1250	18.9	2	6.1	100.0	100.0	181	77.7	100.0	181	77.7	100.0	100.0
AAA payments	84	30.8	67	192	20.7	24	12.6	12.6	-	292	19.9	26	944	14.3	-	100.0	100.0	42	18.0	100.0	42	18.0	100.0	100.0	
Livestock (total)	372	100.0	440	819	100.0	504	100.0	100.0	15.7	5866	100.0	1140	9927	100.0	443	100.0	386	100.0	100.0	386	100.0	100.0	100.0	100.0	
Horses and mules	200	53.8	300	600	73.3	400	79.3	79.3	15.7	2150	36.6	950	7025	70.7	350	79.0	150	38.9	100.0	150	38.9	100.0	100.0	100.0	
Cattle	105	28.2	100	150	18.3	85	16.9	16.9	15.7	3495	59.6	155	2780	28.0	65	14.7	180	46.6	100.0	180	46.6	100.0	100.0	100.0	
Hogs	27	7.3	-	48	5.9	7	1.4	1.4	1.4	175	3.0	-	35	4.4	-	7.2	28	7.2	100.0	28	7.2	100.0	100.0	100.0	
Sheep and goats	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	100.0	100.0	100.0	
Chickens	40	10.7	40	21	2.5	12	2.4	2.4	2.4	46	3.8	35	87	9.9	28	6.3	28	7.3	100.0	28	7.3	100.0	100.0	100.0	
Increase	94	-	50	295	-	146	-	-	-	1994	-	177	1604	-	44	-	295	-	100.0	295	-	100.0	100.0	100.0	
Decrease	27	-	6	100	-	-	-	-	-	-	-	-	-	-	100	-	-	-	100.0	-	-	100.0	100.0	100.0	

(continued)

TABLE LXX. FINANCIAL SUMMARY OF SELECTED FARMS FROM EACH GROUP, CROCKETT COUNTY,
TENNESSEE, 1956 (continued)
(Largest and Smallest Farms)

Summary	Group I			Group II			Group III			Group IV		
	Farm 60		Farm 110	Farm 73		Farm 74	Farm 76		Farm 46	Farm 40		Farm 83
	No. or A.	%	No. or A.	No. or A.	%	No. or A.	No. or A.	%	No. or A.	No. or A.	%	No. or A.
Farm expense, total	372		218	698		246	2320		167	5358		428
Current	163		185	336		150	1867		89	5218		317
Unpaid family labor	100		15	180		9	150		40	-		32
Livestock (net decrease)	27		6	100		-	-		-	-		-
Depreciation	82		12	46		57	238		58	140		41
Decrease feed and supplies	-		-	36		30	65		-	-		38
Farm income	115		249	528		145	1142		253	2945		134
Interest on investment	251		141	329		155	3796		171			172
Labor income	-136		108	199		-10	-2654		82	1607		-38
Per cent return on investment	-1.7		3.0	5.3		.03	2.5		3.3	9.1		-0.5

(continued)

TABLE LXX. FINANCIAL SUMMARY OF SELECTED FARMS FROM EACH GROUP, CROCKETT COUNTY, TENNESSEE, 1936 (cont.)
(Median Sized Farms)

Summary	Group I				Group II				Group III				Group IV			
	Farm 17		Farm 72		Farm 61		Farm 12		Farm 33		Farm 39		Farm 49		Farm 7	
	No. or A.	%	No. or A.	%	No. or A.	%	No. or A.	%	No. or A.	%	No. or A.	%	No. or A.	%	No. or A.	%
Size of farm, acres	94		70		80		75		100		78		67		82	
Total investment	7067	100.0	5632	100.0	7087	100.0	7979	100.0	5406	100.0	4389	100.0	3976	100.0	6277	100.0
Real estate	4800	67.9	4000	71.0	6000	84.5	5625	70.5	4000	74.0	3100	70.6	2724	68.5	5000	79.7
Livestock	1062	15.0	737	13.1	616	8.7	1121	14.1	640	11.8	663	15.1	602	15.1	367	5.8
Mch. & equipment	485	6.9	378	6.7	113	1.6	368	4.6	170	3.1	260	5.9	250	6.3	290	4.6
Feed and supplies	570	8.1	317	5.6	368	5.2	666	8.3	496	9.2	216	5.0	250	6.3	220	3.5
Cash to run farm	150	2.1	200	3.6	-	-	200	2.5	100	1.9	150	3.4	150	3.8	400	6.4
Crop receipts	466	100.0	952	100.0	314	100.0	465	100.0	902	100.0	555	100.0	411	100.0	935	100.0
Corn	-	-	15	1.6	-	-	60	12.9	245	27.2	-	-	-	-	140	15.0
Cotton	302	64.8	846	88.9	228	72.6	315	67.7	462	51.2	530	78.5	338	82.2	714	76.4
Hay	31	6.7	-	-	-	-	-	-	17	1.9	-	-	-	-	32	3.4
Truck	-	-	-	-	-	-	40	8.6	33	3.7	25	3.7	-	-	-	-
Other	5	1.0	-	-	-	-	-	-	-	-	-	-	20	4.9	-	-
AAA payments	128	27.5	91	9.5	86	27.4	50	10.8	145	16.0	120	17.8	53	12.9	49	5.2
Livestock (total)	1062	100.0	737		616	100.0	1121	100.0	640	100.0	663	100.0	602	100.0	367	100.0
Horses and mules	760	71.6	550		400	64.9	668	59.6	450	70.3	350	52.8	180	29.9	240	65.4
Cattle	156	14.7	150		142	23.1	315	28.1	120	18.8	255	38.4	245	40.7	80	21.8
Hogs	64	6.0	18		58	9.4	50	4.5	30	4.7	25	3.8	27	4.5	25	6.8
Sheep and goats	42	3.9	-		-	-	-	-	-	-	-	-	-	-	-	-
Chickens	40	3.8	19		16	2.6	88	7.8	40	6.2	33	5.0	150	24.9	22	6.0
Increase	761	-	140		129	-	712	-	102	-	290	-	600	-	57	-
Decrease	-	-	-		-	-	-	-	-	-	-	-	-	-	10	-

(continued)

TABLE LXX. FINANCIAL SUMMARY OF SELECTED FARMS FROM EACH GROUP, CROCKETT COUNTY, TENNESSEE, 1936 (cont.)
(Median Sized Farms)

Summary	Group I			Group II			Group III			Group IV		
	Farm 17		Farm 72	Farm 61		Farm 12	Farm 33		Farm 39	Farm 49		Farm 7
	No. or A.	%	No. or A.	No. or A.	%	No. or A.	No. or A.	%	No. or A.	No. or A.	%	No. or A.
Farm expenses (total)	838		520	410		652	586		672	490		453
Current	294		618	210		404	558		432	169		293
Unpaid family labor	229		54	108		60	-		162	260		100
Livestock (net decrease)	-		-	-		-	-		-	-		10
Depreciation	101		86	61		98	28		78	61		30
Decrease feed and supplies	214		62	31		90	-		-	-		-
Farm income	389		272	51		525	583		329	545		619
Interest on investment	353		282	355		399	270		219	199		314
Labor income	36		-10	-304		126	313		110	346		305
Per cent return on investment	2.9		3.9	-2.3		3.7	8.0		4.6	8.8		6.6

the 2 acre decrease in corn production.

Farms number 83 and 111 are both in need of row crop acreage reduction to meet soil conservation practices. These farms are much alike in factors including size, physical factors and others, farm 83 being taken as typifying the difficult problem in soil conservation met with on small upland farms. The adoption of a conservation program would result in a net loss of \$10 according to a budgetary analysis. Cover crops and increased hay and pasture compensate only in part for the loss of feed crops brought about by the reduction in corn acreage. Cover crops would increase feed production but would also increase seed cost.

It must be remembered that the recommended land use is made contingent upon the adoption by the farmers of needed conservation practices, such as good rotations, contour tillage, strip cropping, and terracing as discussed in other chapters.

It is seen that the adoption of soil conservation practices will supplement, and in many cases increase, the present income while making permanent a sound agriculture based on proper land use. For those few small upland farms on which the adoption of recommended soil conservation practices and land use would decrease the immediate income, it can be said that proper land use is in no way less needed, for an extractive agriculture cannot long endure, but that their problem in addition to soil conservation is one of enlarging their farm business through securing additional land or supplementary off-the-farm enterprises.

CHAPTER VII
SOME FARM ORGANIZATION IN RELATION TO
FARM TENURE

A certain amount of tenancy is inevitable in all settled countries. In the pioneer stage of American agriculture, land was to be had for the asking or the taking, and the condition of almost complete owner-operatorship was the result. Quite early, however, those without land who preferred to stay within the area of established settlement rather than enter the unsettled frontier regions had to rent land from those who owned it more abundantly than they could work. In embarking upon the enterprise of farming, land is the factor of production required to a dominant extent. Many young farmers, and older ones as well, cannot afford the purchase of the land they operate. The capital-goods they require for a sensible beginning scale of operation, very often they do possess, or can acquire on available credit, and the labor they provide themselves. Through the savings from efficient operation of rented farms, the purchase of the land they would operate may be consummated.

Tenancy is a stepping stone towards independent owner-operatorship in which the farmer serves a sort of apprenticeship, gaining desirable experience and capital as he climbs the "agricultural ladder". In some instances to rent a farm is more desirable than to buy it, for it enables the prospective farmer to safely determine whether farming is an occupation in which he

may happily spend his life, and also to test whether or not a particular farm is the one which he should buy. Tenancy also provides a greater mobility of population, which among a high grade tenant class really functions as a mitigant of provincialism and localism.

On the other hand, tenancy may lead to impoverishment of the soil, low incomes and resulting low standards of living; may be associated with poor farming methods, and the development of absentee ownership resulting from concentration of landownership. Certain social disadvantages also result from tenancy. A permanent tenant class tends to develop with its accompanying social stratification which impedes the movement towards farm ownership. Too great a mobility of the farm population increases the ills assigned to tenancy, increases institutional instability and leads to a lack of community consciousness and community spirit.⁽¹⁾

In order to study the organizational and farm management aspects of owner-operated farms compared with part-owner (owner additional) operated and tenant operated farms, the farm records were segregated on the basis of tenure. Complete financial summary data and certain land use and production factors were computed for the farms falling in the various groups.

It is not the purpose to discuss tenancy, or relationships between landlord and tenant, but to discover differences in farm organization management and related factors when land is operated by an owner, part-owner or tenant.

Owner-operated farms are slightly larger than either part-owner or tenant operated farms, as measured by the total number of man work units,

(1) Geo. Wilson, The Social Economics of Agriculture, Macmillan Company, 1932, page 162.

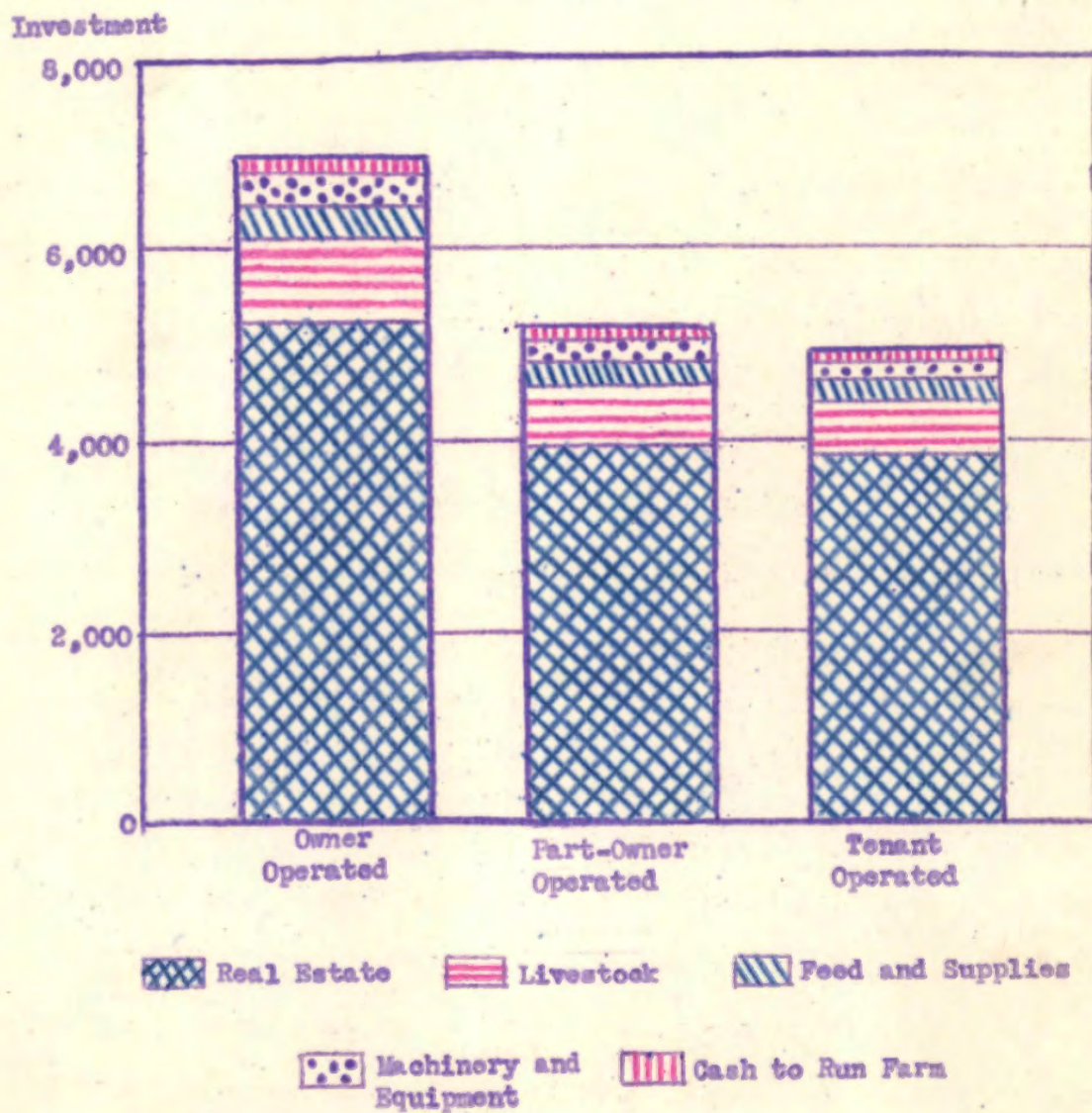
the average being 401, 386, and 351 respectively in each group.

Owners operate 49 per cent of the farms, part-owners operate 21 per cent, and tenants operate 30 per cent of 150 farms surveyed.

Farms operated by the owners have a larger total investment than do farms operated by part-owners or tenants, having an evaluation of \$6,961 for owner farms, \$5136 for part-owner, and \$4926 for tenant operated farms (Figure 22). Real estate was valued at \$5225 on owner operated farms, while on part-owner and tenant farms the values were \$3972 and \$3856 respectively. More livestock was found on the owner operated farms than on either part-owner or tenant farms. The owner-operated farms were better equipped than either of the other types of farms as indicated by a greater investment in machinery and equipment, being approximately one third larger. More feed and supplies were characteristic of owner-operated farms. It also required more cash to run the owner-operated farms than was required for either of the other groups.

It appears that the less adequate facilities for livestock on tenant farms have been a barrier in developing the livestock enterprises. It is probably natural that as the landlord did not share in the returns from the livestock he was not essentially interested in developing these enterprises or in providing full facilities for the livestock. In some cases the tenant is probably able to secure only the work stock necessary for farm operations. Since mobility is characteristic of tenancy, livestock would encumber changes. Under a good system of livestock management both landlord and tenant should be able to profit.

Farm receipts are largest on farms operated by the owner, with larger



Source: Table LXXI.

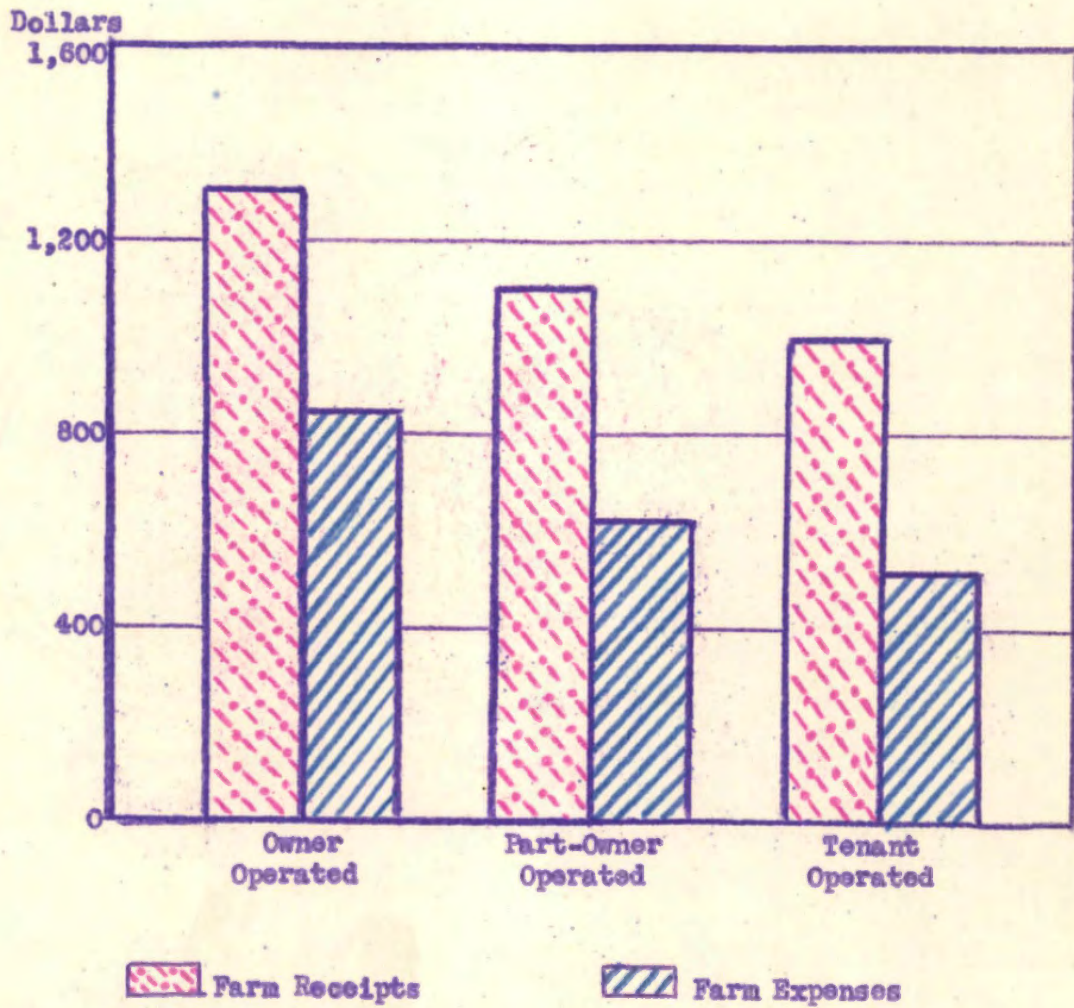
Figure 22. Investment Comparison of Farms Operated by Owners, Part-Owners, and Tenants, 150 Farms, Crockett County, Tennessee, 1936.

returns from crops, livestock, A.A.A. payments and other sources. Greater dependence, however, are placed on crops by the tenant and part-owner operated farms.

Total farm expenses are greatest on farms operated by the owner. Current expenses are larger, being \$661 on owner farms, \$418 on part-owner, and \$284 on tenant farms. Though not particularly significant, owner-operated had a fertilizer expense of \$11 while the part-owner and tenant farms spent but \$6. Depreciation is naturally higher on owner-operated farms due to the larger investment and greater amount of machinery and equipment. Accompanying the larger number of livestock on farms operated by the owner there was a greater decrease in feed and supplies. Unpaid family labor and livestock net decrease, however, were smaller on farms operated by the owner.

Part-owner operated farms produced the largest farm income and labor income, followed by tenant farms, with owner operated farms producing a lower farm income and lower labor income. The labor income averaged \$240 on tenant operated farms, \$234 on part-owner operated farms, and \$107 on owner operated farms. Tenant operated farms produced a labor income over two times as large as owner operated farms. This is an interesting comparison in view of the fact that farm ownership is generally accepted as preferable. The idea has become common that tenants would be better off if they owned the farms they operated. It is important, therefore, to determine why the labor income on the part-owner and tenant operated farms was larger.

The tenant farms, while receiving smaller total farm receipts, were



Source: Table LXXI.

Figure 23. Comparison of Total Farm Receipts and Expenses on Owner Operated, Part-Owner Operated, and Tenant Operated Farms, Crockett County, Tennessee, 1936.

operating on less expense, and when gross expense is compared with gross receipts the advantage lay with the tenant, since the average gross expense on tenant operated farms was approximately 50 per cent of the gross receipts, whereas on owner operated farms the gross expense constituted 66 per cent of the gross receipts.

Since the owner operated farms are larger and carry a larger investment they bear a larger interest charge which decreases the labor income. Some of this additional investment was in unproductive improvements, as the dwelling house. The owner also had a greater expense for new buildings and other improvements. Then too since 1935 was a year below normal in production the larger farms tended to be a handicap in a period of adverse conditions. The tenant operated farms are farmed more intensely than owner farms, as indicated by a larger percentage of the farm land in crops, and also as measured by a smaller A.A.A. payment for soil conserving crops. Tenant farms carry less livestock, apply less fertilizer, and become to this extent more extractive of soil fertility. And as already shown, tenant operated farms make and possess fewer farm improvements, which while contributing to the immediate income, may not be the most economical over a period of years.

Part-owners and owner operated farms supplied the family with more products for family use as indicated by total value. The farm dwelling possessed a greater evaluation on owner and part-owner operated farms indicating more satisfactory living conditions and thus in this respect a somewhat better standard of living. The dwelling being evaluated at \$1097 for owners, \$1044 part-owner, and \$654 on tenant operated farms. The number in

the tenant family is largest, being 5.0 in tenant families, 4.5 in part-owner, and 4.3 in owner families.

The statement that many (but not all) tenants would be better off if they owned the farms they operate, when considered from both the social and economic viewpoint, and over a period of years, is probably true. Under a system of farm ownership the operator, in addition to his labor income

TABLE LXXI. COMPARISON OF FINANCIAL SUMMARY OF 150 FARMS OPERATED BY OWNERS, PART-OWNERS, AND TENANT FARMS, CROCKETT COUNTY, TENNESSEE, 1936

Item	Owner	Part-Owner	Tenant
Number of farms	73	32	45
Investment, total	\$6961	\$5136	\$4928
Operating capital	1736	1164	1070
Real estate	5225	3972	3856
Livestock	877	575	532
Machinery and equipment	336	233	225
Feed and supplies	384	256	239
Cash to run farm	139	100	74
Farm receipts, total	\$1306	\$1115	\$1006
Crops	770	722	703
Livestock (net increase)	307	161	138
Increase feed and supplies	24	60	16
AAA payments	145	122	113
Other sources	60	50	36
Farm expenses (total)	\$ 851	\$ 625	\$ 520
Current	661	418	284
Unpaid family labor	79	116	149
Livestock (net decrease)	13	18	21
Depreciation	63	53	40
Decrease, feed and supplies	35	20	26
Farm income	\$455	\$ 490	\$ 486
Interest in investment	348	256	246
Labor income	107	234	240

usually receives a better house in which to live, more products used in living are furnished by the farm, a larger interest return due to the farm investment

makes the farm income but little different from other types of tenure and with it provides a greater security of tenure. But for any given year such a policy must be accepted with reservations; first, that the tenant is able to finance the purchase of an economical size of farm, and second, that the current rate of return on capital invested in farm land is not appreciably lower than the farm mortgage interest rate.

TABLE LXXII. COMPARISON OF FARMS OPERATED BY OWNERS, PART-OWNERS, AND TENANTS, CROCKETT COUNTY, TENNESSEE, 1936

Item	Owner Farms	Part- Owners	Tenant Farms
Number of farms	75	32	45
Acres in farm	99	77	80
Average man work units	401	386	351
Acres in crops	60	40	52
Value of land	\$ 3368	\$2397	\$2844
Value of land per acre	34	31	35
Value of dwelling	1097	1044	654
Value of other improvements	619	531	358
Value of fertilizer used	11	6	6
Amount of cropper labor	258	136	205
Amount of other hired labor	83	62	413
Cash rent paid to landlord	-	49	79
Income other than farm	88	50	36
Value of products used by family	296	312	213
Amount of mortgage debt	546	2965	1378
Number in family	4.3	4.5	5.0

CHAPTER VIII

RELATION OF VARIOUS FACTORS TO FARM INCOME

Wide differences in farm earnings are found between farms in the same community and operated under the same natural and economic conditions. This is a matter of common observation. Many of the causal factors are already known and have been shown as such by numerous studies conducted in almost every state. Under these circumstances it is unnecessary to prove again that such relationships held true in Crockett County, but in order to present a unified study these relationships will be briefly given. All factors of doubtful significance and those of particular importance, however, will be analyzed with supporting evidence as gathered by this survey. No attempt has been made to show the variation in earnings of an individual farm from year to year, though such differences exist.

Size of Farm

A large volume of business is necessary for the most profitable farming. Size of farm may be measured in many ways such as acres operated or productive man work units. Since acres vary in productiveness man work units have been found to be a more satisfactory measure in Tennessee. Within reasonable limits, and on the average, the larger the farm business, however measured, the more successful the farm. With other factors remaining unchanged, farmers in Crockett County possessing more than the average of 88 acres or 380 man work units per farm make larger incomes. And, unless

farmers with a small business can compensate in some other way, they receive proportionately less in earnings. It should be mentioned that since large farms bear a heavier risk they may also lose more during unfavorable years.

Size is especially important in Crockett County and Tennessee, since farms are usually small, making this factor more often a limiting one. Its significance is further realized when one recalls the larger number of croppers on these farms which in this study have not been considered as a farm unit as in the Census.

On land of equal value a farm of small size if properly organized would have a larger investment per acre, a larger income per acre, more of its income from intensive livestock and crop enterprises, and higher expenses per acre than a larger farm. The small farm must be organized and operated more intensively if sufficient volume is obtained necessary to produce an income comparable to that secured on a larger farm. There will be a greater need for fertilizer due to heavier cropping. Soil erosion will be more difficult to control because of the more intensive crops necessarily grown on small farms. Small farms are more limited in what they can do, and the problem of securing a reasonable farm income necessary to obtaining a desirable standard of living is more difficult to solve.

The size of the farm may be increased either by increasing the income per acre through a better selection and proportioning of more intensive enterprises or by increasing the size of farm in acres. Some farm operators will find it possible to increase their volume of business by developing agricultural side lines on the farm.

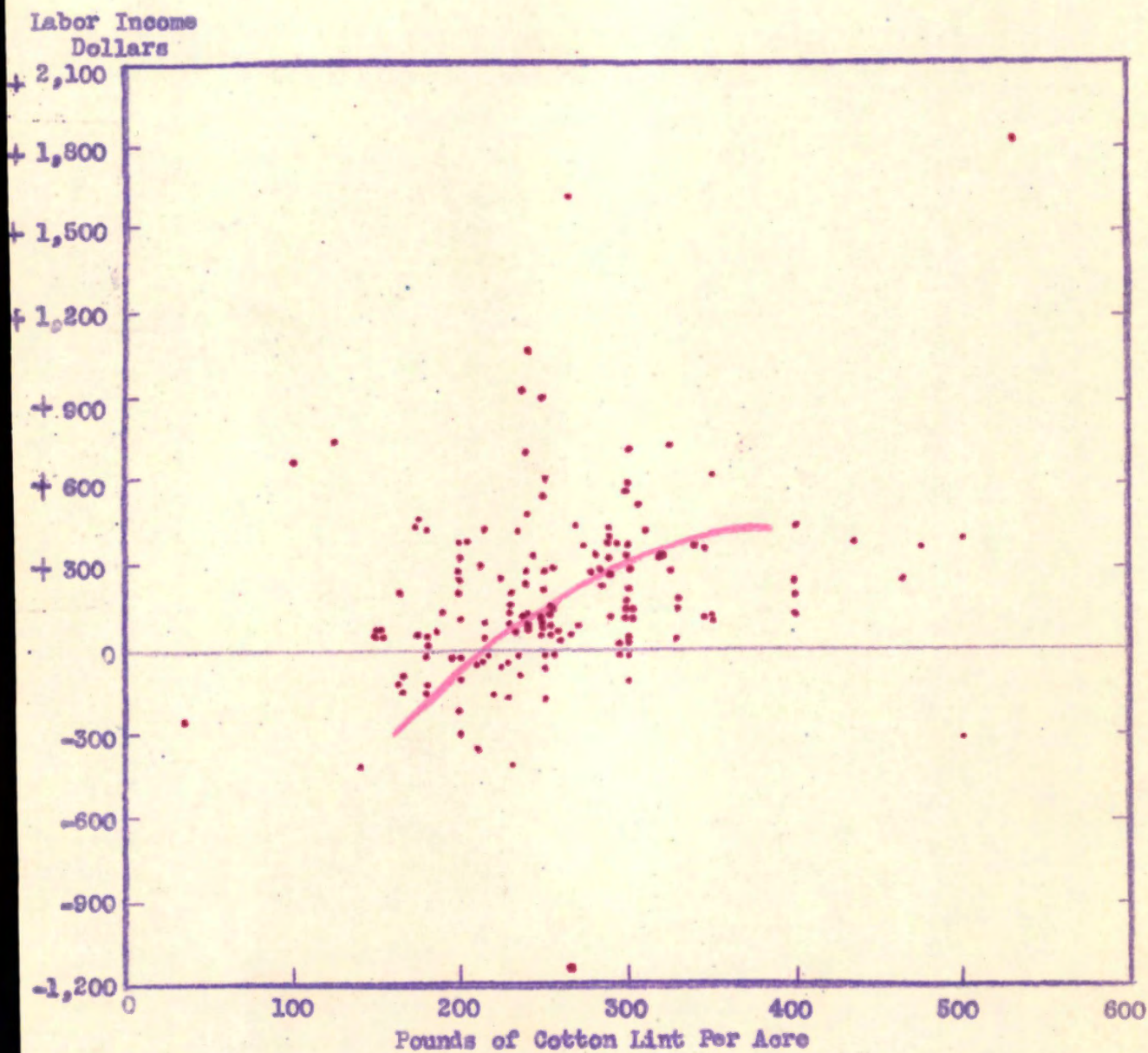


Figure 24. Relation of Cotton Yields to Labor Income, 147 Farms, Crockett County, Tennessee, 1936.

Yields

As a general rule, it may be said that as yields increase the cost per unit of crops and livestock tends to decrease. On two farms in Crockett County a difference of \$800 in labor income was principally explained by differences in yield. On other farms differences in income could be traced largely to the efficiency with which the operator handled his livestock so as to secure greater yields. Eventually, however, if an attempt is made to increase yields indefinitely a point is reached where the increase in yield would no longer pay for the added cost. Farmers generally have not reached that point in production. As a measure of productivity, yield per acre of cotton was selected as the most simple and significant figure directly available. As the yield increased the labor income increased (Figure 24). Furthermore, as the yield increased the probability of the labor income exceeding zero or a loss increased very rapidly; approximately 5 times as many farmers lost money whose cotton yields were below average when compared with farmers with yields above average. High yields are relatively more important on small farms, since the productive acreage is limited.

A Large Percentage of Land in the Higher Profit Crops

Farmers with a relatively higher percentage of land in the higher profit crops normally make more money. Farms with large acreages of forest and pasture land were usually in the lower income groups. To show the effect of per cent of farm land in row crops on labor income, 31 farms of principally

Memphis and Grenada silt loam, with less than 20 per cent bottom land, were paired with the same number of acres but differing in per cent of land in row crops. The average labor income for the two groups shows that farms with the higher percentage in row crops made large incomes (Table LXXIII). A difference of 17 per cent of the land in row crops was associated with a difference of \$110 in labor income.

TABLE LXXIII. RELATION OF PER CENT OF FARM IN ROW CROPS TO LABOR INCOME, 31 FARMS OF UPLAND SOIL, CROCKETT COUNTY, 1936

Group	Average Number Acres Operated	Average Number Man Work Units	Per Cent in Row Crops	Average Labor Income
Farms with higher per cent	77	391	57	\$234
Farms with lower per cent	74	300	40	124

The farmers were able to increase the size of the farm, as is shown by the larger number of man work units on farms with more row crops.

It should be pointed out, however, that on many farms, particularly those of upland soil, this per cent of land in row crops is too large for effective soil conservation. If such practices are permanently followed it will probably be necessary that such land be terraced, strip cropped or other mechanical means used to prevent erosion along with heavier applications of fertilizers. This will reduce somewhat the difference between the two groups. Farms not subject to erosion will not be concerned with this aspect, and can produce greater percentages of row crops without subsequent

loss of fertility.

Crop and Livestock Production Balance

On many farms in Crockett County labor is the most abundant factor of production. A well organized system of crop and livestock production helps to use man labor advantageously. Livestock tends to reduce the requirements for labor in proportion to size during certain seasons by distributing labor throughout the year, enabling one man to accomplish more with less hired help. On many farms a livestock enterprise may be added to the farm business without displacing any of the crop enterprises, thus adding to the volume of business without requiring more acreage.

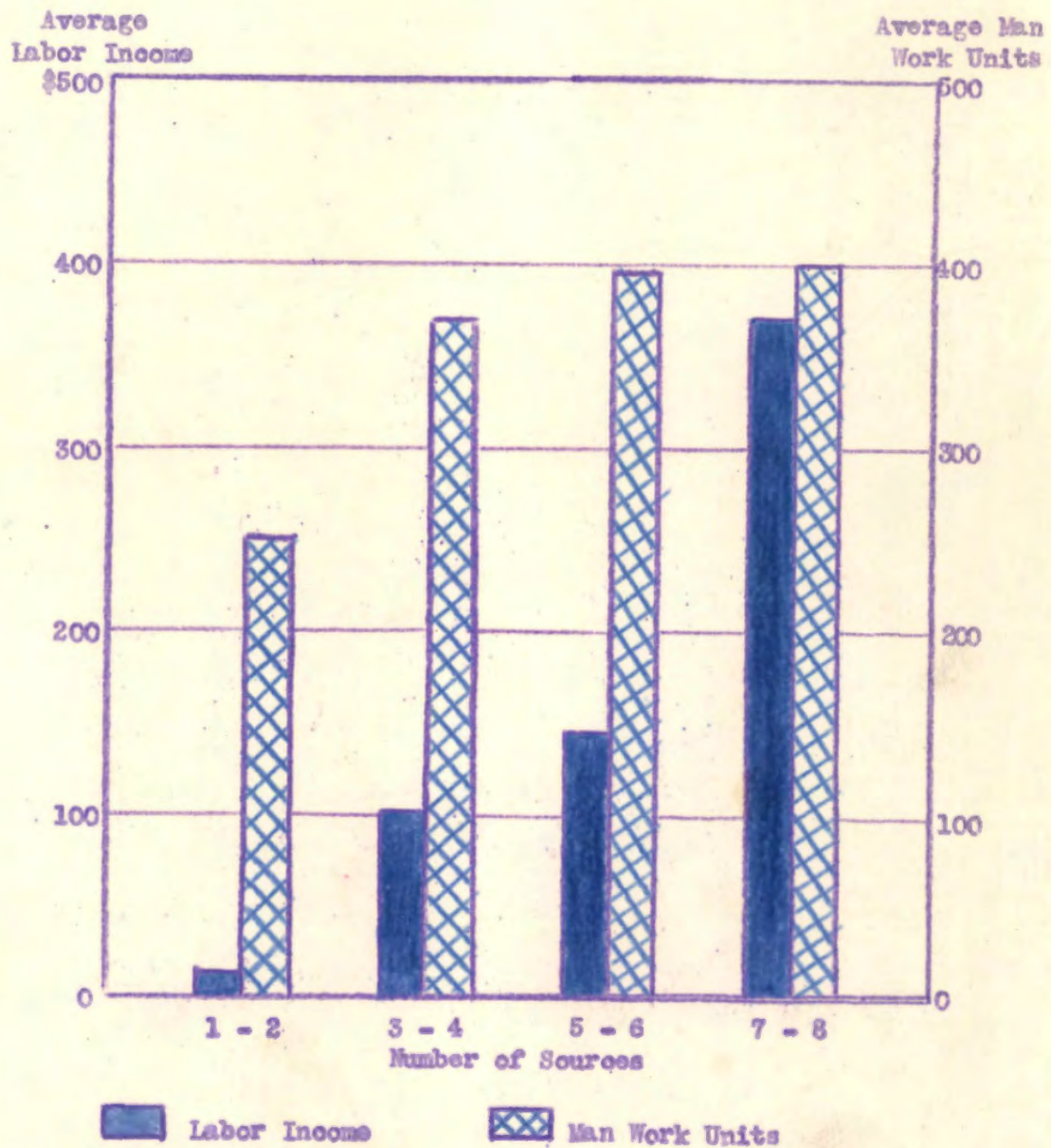
Relation Between Number of Sources of Income and Labor Income

The advantages of diversification over a one crop economy have been advocated for years over all of the United States, yet cotton prevails as the principal, and in some cases the only important source of income on the farms of Crockett County. The principle of diversification is sound both from the standpoint of production, efficiency, and income. Diversification spreads the demand for labor throughout the year, avoiding peak or rush seasons during which help must be hired, followed by slack periods when even the operator may be idle part of the time. Land and equipment is used to better advantage, risk is decreased, soil fertility is maintained, erosion decreased or prevented, and fewer demands are made on borrowed capital since the income is spread over a longer period of

time under a system of diversification.

Continuous income is also a beneficial result of diversification. One hundred and fifty farms were classified according to the number of sources of income that exceeded the taxes. This measure is readily understood by the farmer. Taxes averaged about 40 cents per acre on these farms. Inasmuch as an increase in the number of sources of income associated with an increase in labor income may be due to an increase in size, the average man work units per farm were computed to show what proportion of the increase could be attributed to this factor. It should be mentioned, however, that an increase in size is one of the advantages of diversity, and as such emphasizes the increase.

There were no farms with only one source of income, though several had only one source (cotton) other than the A.A.A. payments. The number of sources of income for most farms would be decreased by one if this item were omitted. Only one farm had as many as 9 sources of income; and this farm had the largest labor income, \$1814. Farms with 1 or 2 sources of income had an average labor income of \$14; those with 3 or 4 sources, \$103; those with 5 or 6 sources, \$146; and those with 7 or 8 sources, \$370 (Table LXXIV). There was a small increase in man work units as the number of sources increased, but the labor income increased much more rapidly as the number of sources increased (Figure 25). For example, farms with 5 or 6 sources of income had an average of 396 man work units and a labor income of \$146; while farms with 7 or 8 sources of income had 399 man work units and a labor income of \$370. Thus an increase of 2 sources is accompanied by an increase of 3 man work units and \$226 in labor income.



Source: Table LXXIV.

Figure 25. Relation Between Number of Sources of Income and Labor Income and to Man Work Units, 150 Farms, Crockett County, Tennessee, 1938.

The range in labor income also demonstrates the effect of diversity; for, as the number of sources of income increase labor income losses (or negative labor income) become smaller and the amount of the labor income becomes larger (Table LXXIV).

TABLE LXXIV. RELATION BETWEEN NUMBER OF SOURCES OF INCOME
AND LABOR INCOME, 150 FARMS, CROCKETT COUNTY,
TENNESSEE, 1936

Number of Farms	Number of Sources	Average Man Work Units	Range in Labor Income	Average Labor Income
7	1 - 2	252	-\$435 to \$194	\$14
56	3 - 4	370	-1154 to 724	103
60	5 - 6	396	- 304 to 1607	146
26	7 - 8	399	27 to 1066	370
150	4.9	380	-1154 to 1814	174

* One farm had 9 sources of income, a labor income of \$1814, and 460 man work units.

This analysis is supported by a study made of 429 West Tennessee farms farms in which it was found that with 3 sources of income or less had an average labor income of \$199 in 1936; those with 4 sources \$473; 5 sources \$559; and those with 6 or more sources \$595. (1) Here again it was found that the increase in labor income was much accelerated over the increase in man work units.

It should be recognized, however, that it would not pay to increase the number of sources indefinitely. It is quite possible to attempt to conduct so many enterprises that efficiency will be lost rather than gained,

(1) Wills, J. E., An Appreciation of Farm Management, paper presented at Third Annual Mid-South Farm Forum, Memphis, Tennessee, December 1937.

due to small uneconomical units or to competition between enterprises for the factors of production.

From an analysis of these and other farm records it appears that the farms of Crockett County and Type-of-Farming Area III should have 5 or more important sources of income. Small farms should have at least 2 of these sources from intensive enterprises, and on larger farms at least, should be an intensive enterprise.

Influence of Livestock on Farm Earnings

As has been shown elsewhere in this study, greater diversity of the average farm in Crockett County will prove to be profitable. Since diversification through increased numbers of livestock is one of the most practicable ways of securing additional diversity, the farms were analyzed on the basis of income from livestock to determine if farms with greater numbers of livestock are securing larger farm and labor incomes.

It is generally known that farms with varying proportions of bottom land present different land use and management problems. In consideration of this difference, the farms were classified into four groups according to the per cent of the total farm land in bottom land as follows: Group I, 60 per cent or more bottom land; Group II 40 to 59 per cent bottom land; Group III 20 to 39 per cent bottom land; and Group IV, 20 per cent or less bottom land. To eliminate the effect of size the farms of each group were arrayed on the basis of acres operated. Each half within each group was then arrayed on the basis of income from livestock. To form the

division known as farms with more or with less livestock the first and third fourth of the livestock array were combined and the second and fourth were combined. Thus the group of farms with the most livestock was formed by taking an equal number of farms with the largest income from livestock from the upper and lower half of the farms arrayed according to acres operated, all of course with similar percentages of bottom land.

It is realized that farms with more livestock will have a larger number of productive man work units. Much of this advantage in size, however, with its resultant larger income must be attributed to livestock since farms with the same or similar soil type and approximately the same acreage have equal physical opportunities. The extent to which a man takes advantage of these opportunities is a measure of his managerial ability.

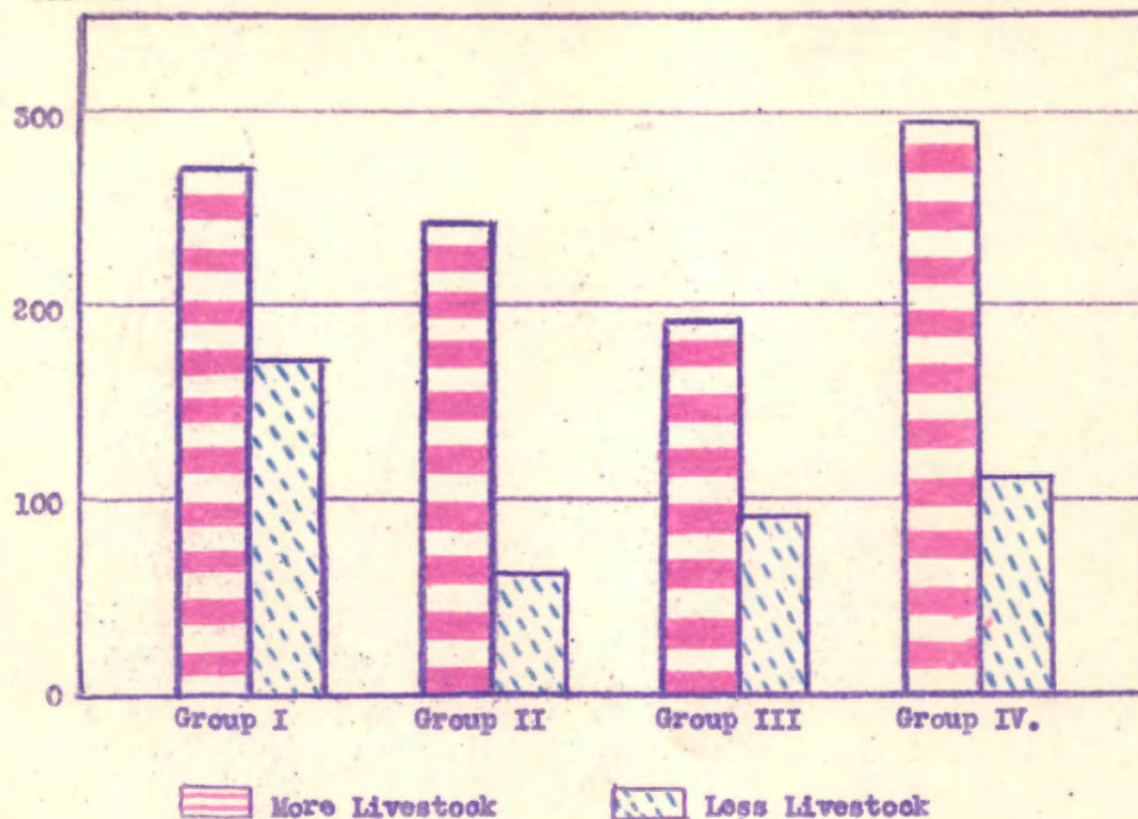
On all groups of farms regardless of the amount in bottom land the farms with more livestock secured larger farm incomes, larger labor incomes, larger labor income per acre, and larger labor income per man work unit (Table LXXV). This is especially significant when it is realized that the difference in number of acres operated is not sufficient to account for more than a small part of the variation in income. This influence of acreage is eliminated by the measure labor income per acre which shows substantial differences in all groups in favor of the farms with the most livestock (Figure 26).

Within the group of farms with 60 per cent or more of the total farm land in bottom land, the farms with the most livestock had a labor income

More Livestock Less Livestock
Source: Table LXXV.

Figure 27. Influence of Livestock on Labor Income Per Acre on 140 Farms Grouped According to Per Cent in Bottom land, Crockett County, Tennessee, 1933.

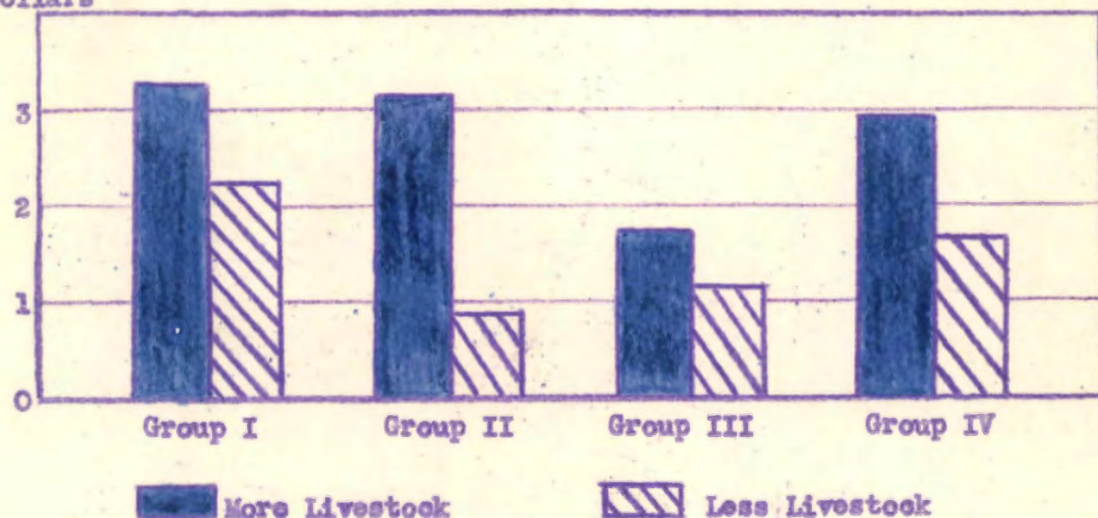
Dollars



Source: Table LXXV.

Figure 26. Influence of Livestock on Labor Income on 149 Farms Grouped According to Per Cent in Bottom Land, Crockett County, Tennessee, 1936.

Dollars



Source: Table LXXV.

Figure 27. Influence of Livestock on Labor Income Per Acre on 149 Farms Grouped According to Per Cent in Bottom Land, Crockett County, Tennessee, 1936.

of \$269.33 and a labor income per acre of \$3.26, while the farms with less livestock had a labor income of \$169.00 and a labor income per acre of \$2.26. This is a difference of approximately \$100 in labor income and a difference of \$1 in labor income per acre. Farms with more livestock had slightly more acres of corn and pasture, but no significant difference existed in acres of cotton. Farms with less livestock sold more than twice as much corn as did the farms with more livestock.

The group of farms with 40 to 59 per cent of the farm area in bottom land had an unusually large difference in favor of the farms with the most livestock. Some of this difference, however, is due to heavy weighting by one farm with a large labor income, in the livestock group. Then too, there was an unusually large number of corn crop failures in the group with less livestock, which decreased the number of bushels of corn sold and subsequently the labor income. Thus, while these factors reduce the difference there remains much variation in favor of farms with more livestock.

Approximately \$100 in labor income and \$.58 labor income per acre difference existed between farms with the most or least livestock on farms with 20 to 39 per cent of the farm area in bottom land.

A difference of \$84 in labor income and \$1.30 in labor income per acre was found between the farms with the most and farms with less livestock on farms with 20 per cent or less of the farm area in bottom land.

Farms with the most livestock had slightly more acres in corn and pasture, and operated a few more acres, though no consistent difference was noted in acres of cotton. Man work units per farm were larger on

livestock farms. The number of productive man work units spent on livestock was approximately twice as great on the farms with more livestock. No group can be classed as strictly livestock farms inasmuch as the group with the largest number of livestock spent an average of only 93.7 man work units per farm on livestock.

Farms with most livestock had larger numbers of milk cows per farm, more livestock classed as other cattle, more hogs, and more hens, but approximately the same number of work stock.

Livestock per farm averages near 3 milk cows, 3 other cattle, 3 hogs, 50 hens, and 3.5 work stock. Many of the farms have no hogs, a few do not have a milk cow, and many lack dairy cow replacements. The farms are not raising sufficient young work stock to replace those growing old.

There are several reasons why the farms with more livestock earn larger labor incomes. Though farms with the same acreage are comparable in size for this measure, one farm may increase the numbers of livestock and thus increase its size as measured by productive man work units. This is of course true where the increase is in an intensive enterprise as milk production, poultry or hogs as was true on the farms studied. These farms with more livestock have a more uniform distribution of labor, inasmuch as the productive man work units are spread more evenly throughout the year. This is significant inasmuch as the largest item in current expenses is labor. Marketing feed crops through livestock is often more profitable, and in general the farms with the most livestock had the least corn to sell. Then too, on many farms there is considerable aftermath and pasture which can be utilized to best advantage by livestock.

TABLE LXIV. INFLUENCE OF LIVESTOCK ON FARM EARNINGS, 149 FARMES, CROCKETT COUNTY, TENNESSEE, 1936

Item	Group I 60+		Group II 40-59		Group III 20-30		Group IV 20-	
	High	Low	High	Low	High	Low	High	Low
Number of farms	12	12	9	8	22	22	32	32
Average per cent bottom land	73	76	48	49	28	51	7	9
Acres in cotton	14.7	14.4	12.6	11.1	17.6	25.8	18.0	13.5
Acres in corn	19.9	17.5	22.2	20.3	21.1	17.6	20.0	14.9
Acres in pasture	12.0	10.3	18.0	8.7	16.4	15.8	22.3	11.4
Acres operated	81.7	74.9	76.5	70.2	109.2	80.3	99.3	66.5
Man work units (total)	397.9	326.6	358.1	317.8	487.9	360.9	429.4	312.4
Man work units (stock)	88.4	45.5	87.7	46.1	95.7	41.9	78.0	37.9
Corn sold, bushels	47.9	112.1	202.0	53.2	70.5	166.6	126.0	60.1
Income from livestock	\$344.41	\$62.58	\$403.33	\$77.50	\$385.98	\$73.50	\$332.34	\$61.43
Farm income	533.83	413.66	537.55	301.11	590.13	343.04	629.00	330.81
Labor income	269.33	169.00	241.11	62.25	191.22	93.68	294.15	110.06
Labor income per acre	3.26	2.26	3.16	.89	1.75	1.17	2.96	1.66
Labor income per man work unit	.69	.52	.68	.20	.42	.26	.68	.35
Number of milk cows	3.2	2.5	3.9	2.3	4.3	2.1	3.0	1.8
Number all other cattle	2.6	.4	7.7	1.1	5.3	.4	3.7	.2
Number hogs	3.2	2.5	3.9	5.2	4.8	2.5	2.4	1.7
Number hens	56.2	35.2	69.4	34.0	57.3	35.4	66.5	38.7
Number work stock	3.5	3.5	3.6	3.5	4.1	3.5	5.3	3.0

These findings lead to the conclusion that many farmers in Crockett County can increase their net income by the addition of more livestock principally milk cows, hogs and poultry regardless of the soil type or percent in bottom land. It seems probable, however, that farms with a minimum of bottom land should increase their livestock enterprises proportionately more.

It is usually wise to have more than one major class of livestock, and if possible to select those classes which are supplementary rather than competitive. Hogs and beef cattle supplement each other, while beef cattle and sheep may be competitive. On small farms it is often desirable to use dairy cattle or poultry, since these enterprises are intensive, use relatively large amounts of labor, and contribute more to an increase in the volume of business than do other classes of livestock.

Power Costs

Costs are reduced when the supply of horse and mechanical power fits the farm needs and is economically handled. The cost of horse labor per hour varies widely on different farms, and it is not unusual to find it practically three times as high on some farms as on others. The average of all farms showed 62 horse work units per horse, with some farms falling as low as 30 and some over 160 per horse. A large part of the cost of horse labor is for feed grown on the farm. Feeds, however, represent a real cost in terms of the value they would have had on the market or if fed to productive livestock. The differences that exist between farms in the efficiency of horse labor may be due either to wide variations in the cost of

keeping the horses or to the fact that some farmers get a larger number of hours of work from their horses in a year's time. The system of farming and number of horses kept will largely determine the number of hours of work per horse.

Tractors are not in common use in Crockett County.

Operating Capital

Machinery and other equipment expenses must be kept under control if low production costs are to be obtained. The proportion of the total investment in operating capital should be relatively high since the per cent return on operating capital is often more than five times as great as the return from fixed capital.

Farm Layout

Well arranged farmstead and fields give greater economy of labor, fencing, and land. Much variation in costs result from present differences in farm layout in Crockett County. Some farms have a better opportunity to plan a convenient field system than others. Most farms, however, should have fields as large as the size of farm, the type of farming, the length of rotation, and physical factors will permit. The distance from farmstead to fields should be made as short as possible in order to save useless travel. Crop fields should be free from obstructions. Farm lanes and driveways should be carefully planned for efficiency of labor, fencing, and land. No more land should be included in the farmstead than is needed for buildings, small lots, and trees and shrubs for landscaping and protection.

Relationship of Farm Records to Labor Income

It is generally assumed that farmers who keep farm records secure larger farm earnings. Farm records provide a history of farm performance, and supply basic information needed in the production and organizational plans of the farm. Since most farmers keep some kind of a record, even if only on check-book stubs, it was necessary to determine what constituted a farm record. For this study, the A.A.A. record book or its equivalent was taken as the amount of records necessarily kept to be classed as a farm record keeper. On 150 farms in Crockett County 19 or 12.6 per cent kept records. A somewhat greater number kept partial records as for poultry. Some farmers start out the year with records but soon discontinue, while many keep no records at all.

Farmers who kept records had an average labor income of \$303 while those who kept no farm records averaged only \$161 labor income (Table LXXVI).

TABLE LXXVI. RELATIONSHIP OF FARM RECORDS TO LABOR INCOME, 150
FARMS, CROCKETT COUNTY, TENNESSEE, 1936

Classification	Number of Farms	Average Number Man Work Units	Average Labor Income
Farmers who kept farm records	19	443	\$303
Farmers who did not keep farm records	131	374	161
All farms	150	380	\$174

It is realized, of course, that usually it is the better farmers who keep records, and as found here, have slightly larger farms, but certainly

some of the difference in income is due to the farmers having kept records and through their analysis made possible an improvement in organizational and enterprise efficiency.

Relation of Education to Farm Earnings

There has been a gradual and continued rise in the educational level of farmers. The amount of formal education, however, varies from that of farmers who have never gone to school a day in their life to that of farmers who are college graduates. In order to study the relation of the operator's education to the success with which the business was conducted, the farmers were divided into two groups, those who had not gone beyond the elementary school and those who had attended high school or college. Only 9 farmers had attended school beyond high school.

The farmers in the high school and college group earned larger labor incomes, or \$244 compared to \$153 for farmers who had attended only the elementary school (Table LXXVII). Farmers in the higher education group operated somewhat larger farms having an average of 414 productive man work

TABLE LXXVII. RELATIONSHIP OF OPERATOR EDUCATION TO LABOR INCOME, 150 FARMS, CROCKETT COUNTY, TENNESSEE, 1936

Educational Group	Number of Farms	Per Cent Owners	Average Number Man Work Units	Average Labor Income
Elementary	113	46	373	\$153
High school or college	37	57	414	\$244

units per farm compared with 375 for the other group. Farmers with more education possess greater probability of becoming owners as shown by 57 per cent of the high school and college group who own their farms compared with 46 per cent of the elementary group who own the farm they operate.

The relationship of farm earnings to the education of the operator is influenced by a few other factors which are difficult to measure. Farmers who have obtained more education will usually possess greater innate ability and would have made a larger labor income because of this regardless of their education. This is illustrated by farmers of little elementary education earning incomes equal to that of the farmers in the group of more education. Many farm operators too possess a good education though they received but little formal training since their education has been a continuous process. It is reasonable to assume that farm operators of more formal education have received more help, both financial and training, from their parents or other sources along with the opportunity for more education.

The farmers in the higher-education groups were more successful in combining the important factors affecting income, were able to operate larger farms, and owned a larger percentage of the farms they operated.

Other Factors

In addition to those influences which are recognizable in a qualitative way, but not exactly measurable, there are others which affect income. Differences in managerial ability seem to cause a wider variation in farm returns than any other individual factor. ⁽²⁾ This statement is

(2) Hopkins, John A., The Uses of Efficiency Factors in Analysis of Farm Records, Iowa Agricultural Experiment Station, Research Bulletin No. 160, 1933.

made a priori, for there is no unquestionable method by which the ability of the manager may be measured excepting the farm returns themselves. How often does an unsatisfactory value in an efficiency factor represent an opportunity which has been overlooked and how often does it simply indicate that the farmer in question is unable to do better because of limitations within himself? The various factors of size, crop yields, labor efficiency, rapid turn-over, low expenses relative to receipts, and others which affect income are in themselves measures of managerial ability.

As has already been shown, some farms are increasing the farm income at the expense of the soil and ^{to} this extent are borrowing soil productivity which will have to be paid back with interest if production is to be maintained.

Methods of marketing and distance to market normally make considerable variation in farm earnings though this seems not to be an important cause for variation in Crockett County.

Changing prices will affect differently farms of different organization.

No doubt some difference could be traced to the methods of selecting and breeding livestock and in the choice of plant varieties.

Peculiar soil, unusual topographical features or farm enterprises, hailstorms, periodic insect pests or disease affect farms differently.

Certain social factors will affect farm earnings, though such effects may largely be reflected in the factors already discussed. Differences in farming practices growing out of variations in social inheritance may account for some difference. Likewise, farm organizations will be affected differently by recent legislation and may cause variation. There is almost an innumerable list of such factors which may affect some few farms.

CHAPTER IX

PROFITABLE FARM COMBINATIONS

In every community there will be some farmers who are able to make satisfactory returns even when economic conditions are relatively unsatisfactory, and in years when economic conditions are favorable their net returns are usually large. Careful observation and study will reveal that these farmers are not lucky as often designated but that their success is due to the way in which their farms are organized and operated. Their crop and livestock enterprises are well balanced and such side lines as are available to the community are developed to the point of maximum profits.

For the purpose of determining the organization of these farms which have proven to be more profitable than others a detailed analysis was made of the organization and management of a number of the most successful farms, selected on the basis of several factors known to affect income. The comparative method of analysing the farm business is used by many authorities, for it is based upon the experiences of a large number of farmers in the same area and who are following the same type of farming. The changes in the organization of the farm when based on the experience of the most successful farmers have been in effect subjected to all the forces, both economic and physical, that are at work in any particular area. This being the case, the farmer who makes changes in his farming system, suggested by the experience of other farmers, is very likely to meet with success.

Farm management studies have shown that there are definite principles that must be observed in the organization and operation of a farm if it is to be financially successful.⁽¹⁾ The most important of these principles as they apply to Crockett County farms were used in the selection of these farms, and are as follows:

1. Good yields tend to reduce the unit cost of producing farm crops. Cotton yields of 258 pounds per acre and corn yields of 24 bushels per acre were used.
2. A larger percentage of land in crops ordinarily yielding larger income will affect profits. Farms with 40 per cent of the farm land area in row crops were selected.
3. Livestock production as a means of marketing crops makes for larger farm income. Farms with average livestock receipts were selected.
4. Efficient handling of livestock reduces cost of production. Livestock receipts per man work unit spent on livestock was used as a measure, the average being \$3.47.
5. A large volume of business is necessary for profitable farming. Size was measured by man work units, the average of 380 being used.
6. A well organized system of crop and livestock production helps use available man labor advantageously. Farms selected were those having \$3.09 or more gross receipts per man work unit.
7. Costs are reduced when the supply of horse and mechanical power fits the farm needs and is economically handled. Farms were selected for this factor on the basis of a minimum of 62 horse work units per horse.
8. Diversity of production helps to insure profits. Those farms having 5 sources of income larger than the taxes were selected.
9. Farm expenses greatly affect income and should be reasonable in relation to receipts. Farms were selected that would have \$1.67 gross receipts per \$1.00 gross expense.

(1) Illinois Bulletin 329, Organizing the Corn-Belt Farm for Profitable Production.

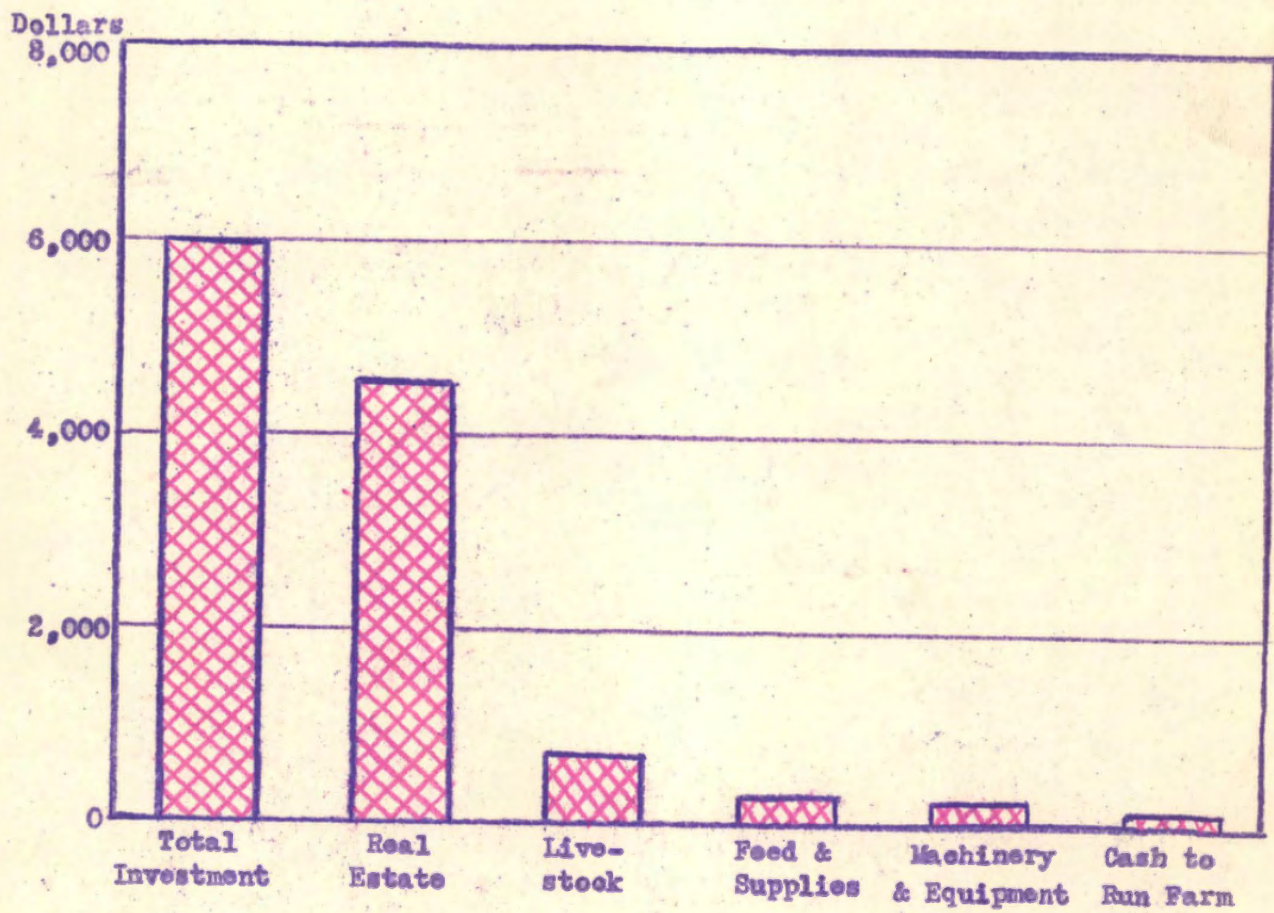
10. Investment-turnover is an expression of the number of years it would take for the total receipts to equal the total investment. Since too slow a turnover indicates excessive investment in fixed capital, 5 years was selected as being a fair rate of turnover.

Factors such as a good farm layout and a well-developed farmstead; production planned in accordance with market demands, and other relationships make for more profitable operation, but it is thought that ten factors would be sufficient in the selection of the more successful farms. It should be pointed out that the standards selected approach average and are not excessive or unusual. Many farmers may exceed the standard in one or two factors. But success is not due to high accomplishments in one or two factors. It is found only when good achievement is associated with several, and the greater the number of factors in which the farm exceeds the average the more certain will be the farm success.

In order to show the divergence in organization and income factors of the more successful farms, comparisons are made with the average of all farms.

One of the best ways of improving the farm business is to study the practices of successful farmers and adapt them to one's own conditions.

The average surveyed farm in Crockett County has a total investment of \$5961, divided \$4547 in real estate, \$709 in livestock, \$281 in machinery and equipment, \$313 in feed and supplies, and \$111 in cash to run the farm (Figure 28). An average of \$1414 per farm was used as operating capital. Approximately 76 per cent of the total capital invested is represented in fixed capital or real estate. This average is based on a farm unit as



Source: Table LXXIX.

Figure 28. Average Farm Investment in Crockett County, Tennessee, 150 Farms, 1936.

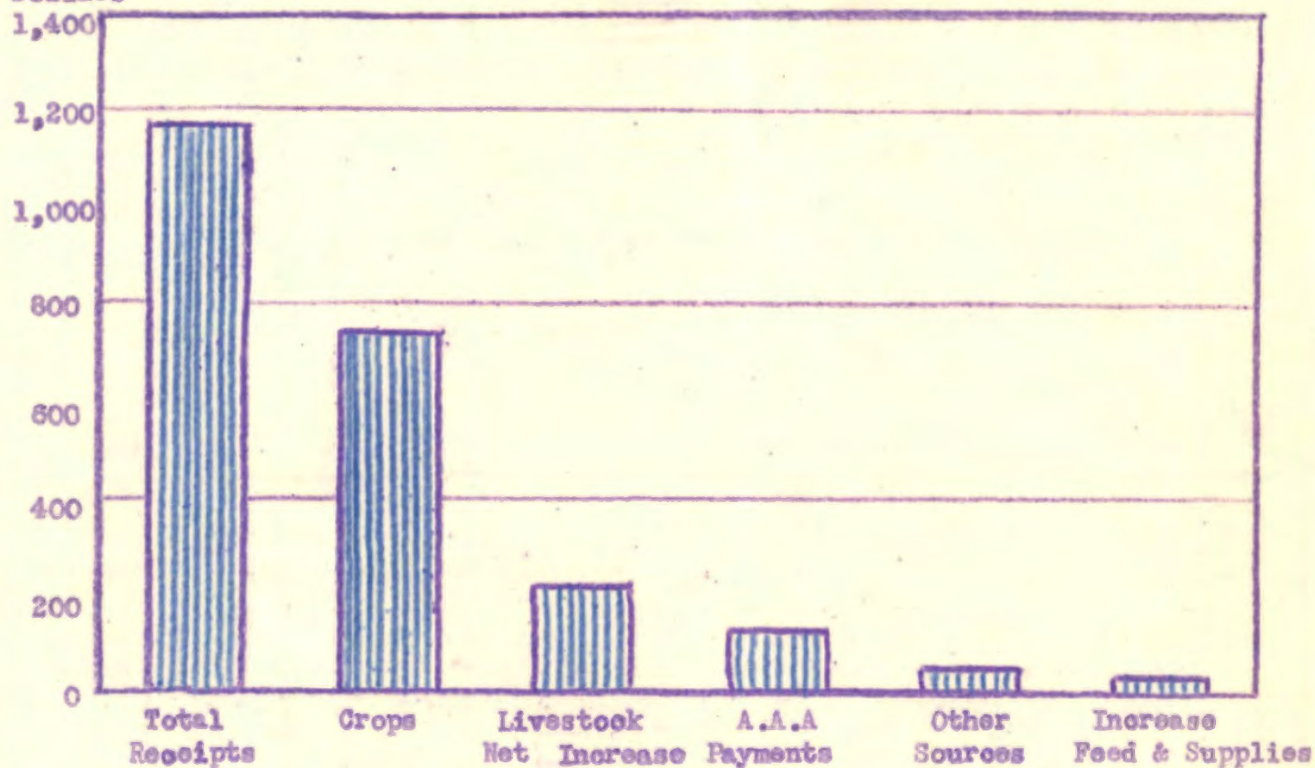
managed by the owner or operator and not on the census classification of a farm which includes croppers.

Farm receipts totalled \$1175 per farm. Crops receipts accounted for \$739, livestock net increases accounted for \$226, A.A.A. payments for \$131, increase in feed and supplies \$29, and all other sources \$50 (Figure 29). Cotton receipts constituted the largest source of income and accounted for the greater part of the entire income. Corn was the second most important crop. An income of \$38 was received from dairy product, \$14 from eggs and \$9 from pork.

Farm expenses averaged \$703 per farm. Current expenses was largest and was \$496, unpaid family labor amounted to \$108, depreciation \$53, decrease feed and supplies \$30, and livestock net decrease \$16. The largest current expense was for cropper labor which amounted to \$162 per farm. Hired labor cost \$42, piece labor \$19, and board for hired labor \$7 per farm, making a total labor cost of approximately \$230 per farm. Taxes amounted to \$43 per farm, and insurance \$19. Machinery and repair expenses averaged \$13 per farm.

The average farm income was \$472. Interest on the investment amounted to \$298 leaving a labor income of \$174 per farm, the \$174 being the amount the farmer received for his labor and management of the farm for the entire year. The operator's labor was valued at \$156 per farm. The average returns on the farmer's investment amounted to 5.3 per cent. Items supplied by the farm used in family living were valued at \$294 per farm.

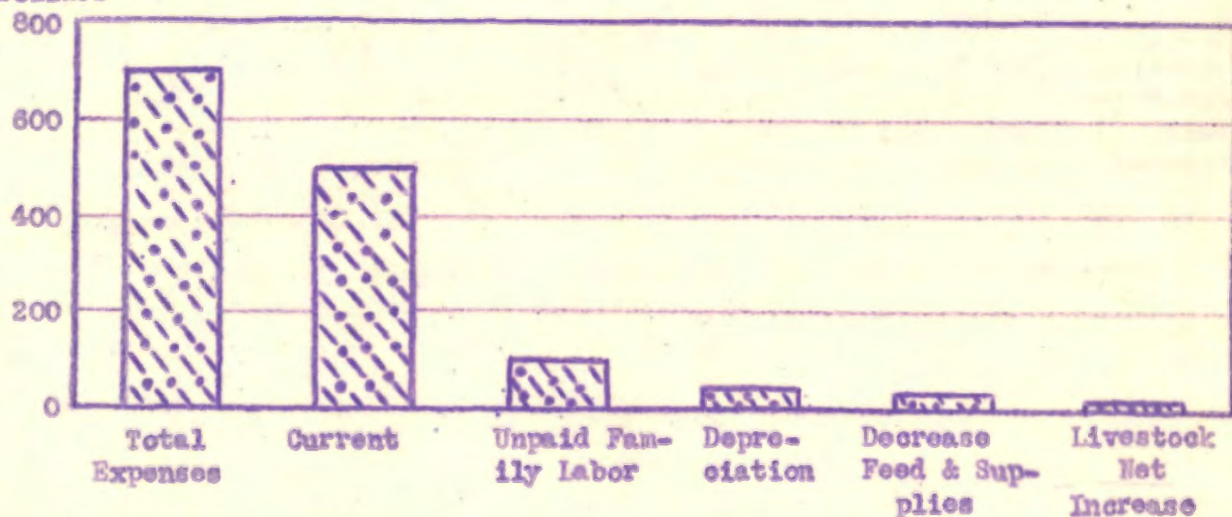
Dollars



Source: Table LXXIX.

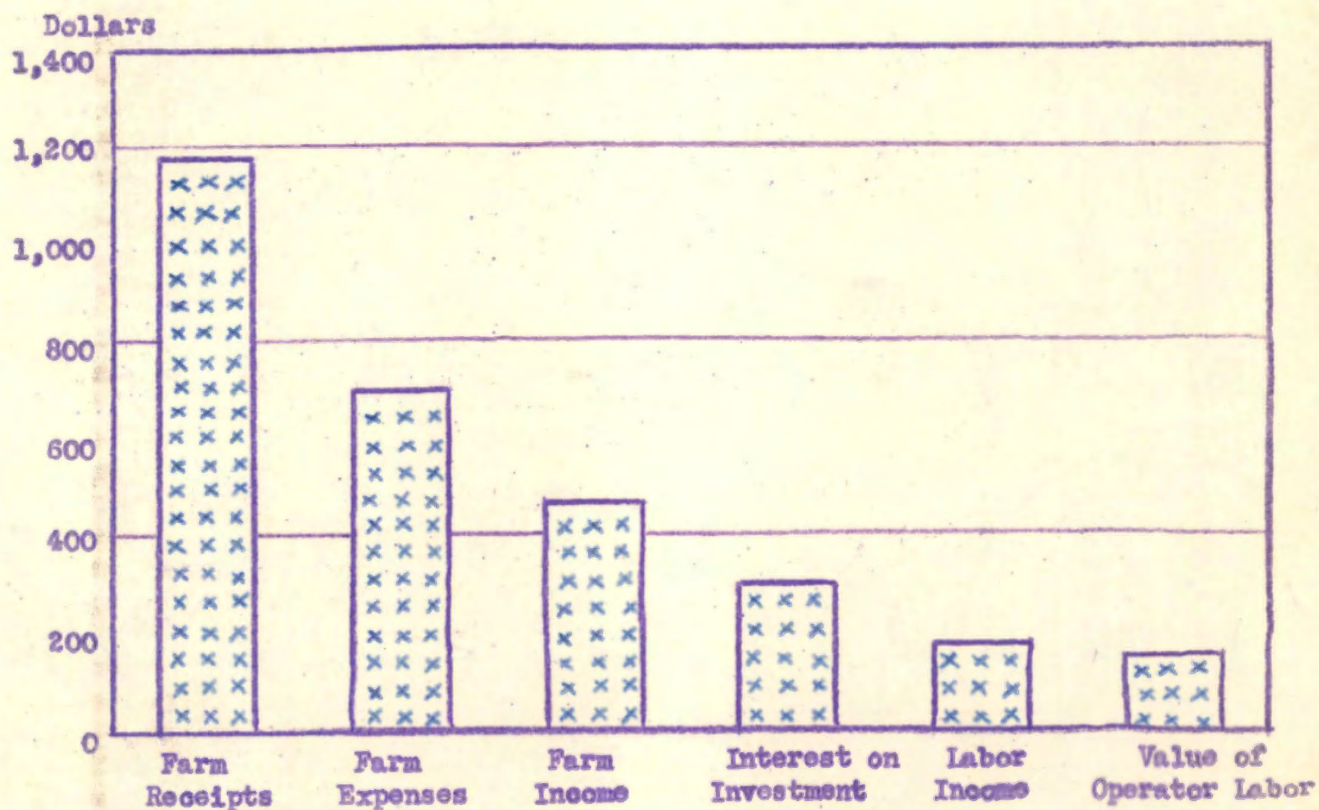
Figure 29. Average Farm Receipts in Crockett County, Tennessee,
150 Farms, 1936.

Dollars



Source: Table LXXIX.

Figure 30. Average Farm Expense in Crockett County, Tennessee,
150 Farms, 1936.



Source: Table LXXIX.

Figure 31. Financial Summary of the Average Farm in Crockett County, Tennessee, 150 Farms, 1936.

The farmer is a laborer, a capitalist and a manager, but at the end of the year is never sure how much of the net profit is the result of his labor, his capital or his managerial ability. It is therefore difficult to compare the economic well-being of farmers with other groups in society. In the accounts of corporations a charge is made for management service; this is a cash cost, while in the farm accounts the net income must be divided between capital and management.

It is difficult to compare farm incomes with incomes of wage earners, since the farmer and his family receive food, fuel and other items of living from the farm for which the farm has received no credit in the earnings.

The value of all products furnished by the farm used in family living was \$294 per farm, which added to the average labor income of \$174 gives average labor earnings of \$468. The largest item supplied by the farm was house rent valued at \$81 per farm. Farms furnished an average of \$73 worth of pork, \$52 worth of garden and orchard products, \$19 worth of milk, \$18 of butter, \$16 of eggs, \$14 of poultry, \$9 of wood and fuel, \$5 of corn, \$4 of sorghum, \$2 of beef, and \$1 of wheat (Figure 32).

Upland farms or farms with no bottom land are smaller than the average of all farms in the survey. They contain 11 fewer acres, fewer livestock of all classes, and fewer productive man work units. The total investment and separate items in the total are smaller by approximately 23 per cent. Farm receipts are smaller by about \$167. Likewise, farm expenses are smaller but not proportionate to the size. Farm income averages \$110 less

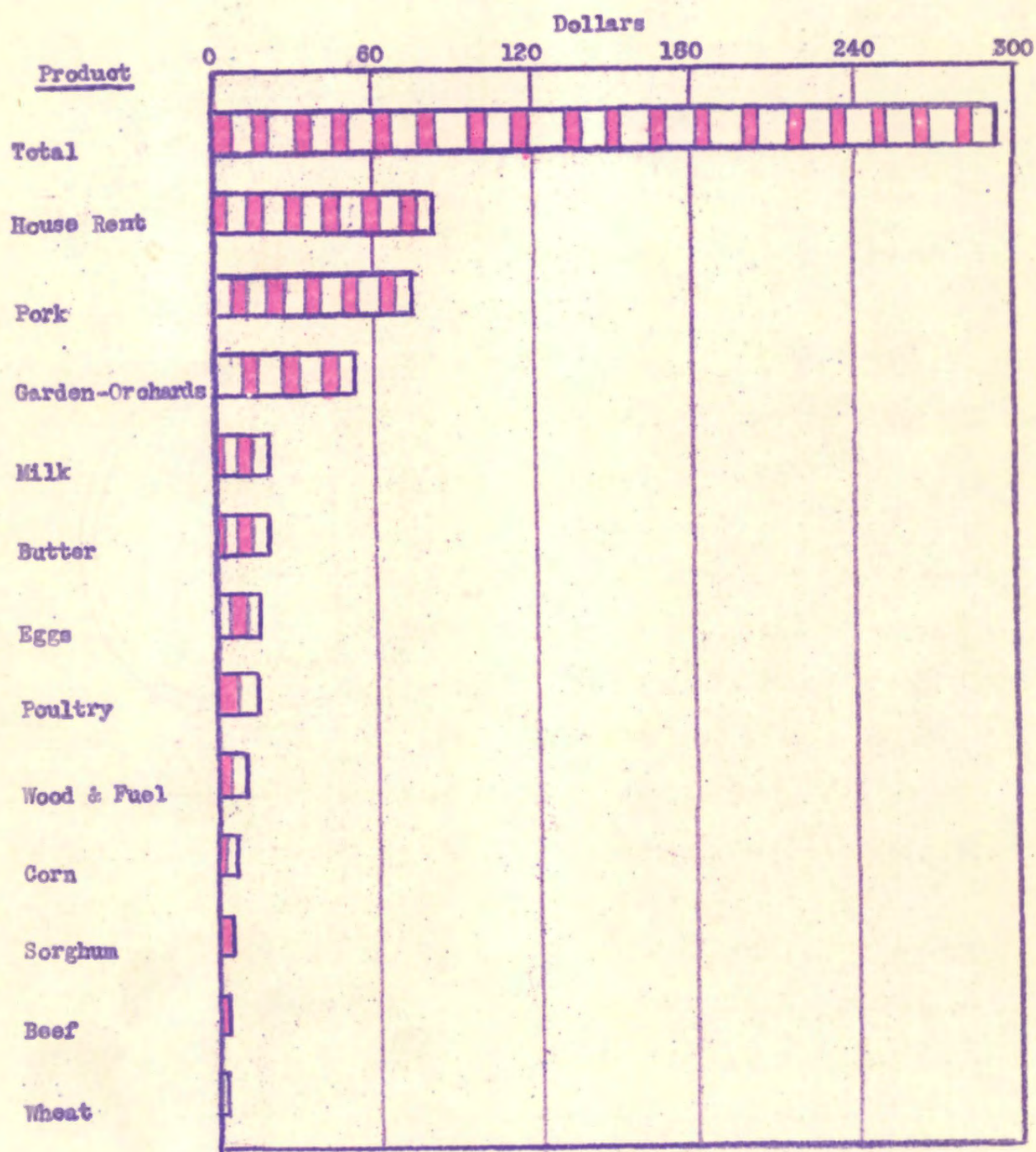


Figure 32. Value of Products Used by Family Average 150 Farms,
Crockett County, Tennessee, 1936.

and labor \$42 less on upland farms. Upland farms receive a lower per cent return on the investment by approximately .7 per cent. The value of the operator's labor is lower but the value of products used by the family is greater (Table LXXIX).

Upland farms are more subject to erosion, and at present are more severely eroded. Since this is true, and as previously recommended, these farms will need to retire a larger percentage of land from cultivation and use more soil conservation practices on the land remaining in cultivation. This, of course, makes the present problem more acute as these farms are already small and produce lower farm earnings. On the other hand, if such land is to remain in farms without declining fertility the soil must be conserved.

These farms will be partially able to solve their problems by increasing diversity largely through greater production of milk and poultry products. This will fit in well with the increased feed resulting from increasing the soil conserving crops. They also will be able to cultivate intensively much of the land normally too steep for cultivation by careful and persistent use of terracing, strip cropping, cover crops, proper rotation, fertilizers and other improved practices.

The most logical and desirable way for this problem to be solved is to increase the number of acres per farm to approximately 100, and until this is done the average farmer on these upland farms must be content with lower farm earnings, since the same opportunities open to him are also open to other farmers. It will be difficult, if not impossible, for all farmers to increase their acreage, but to the resourceful an individual farmer with

initiative much can be done.

Farms selected on the basis of equaling or exceeding the average of ten factors associated with larger farm earnings will be successful not only for the year selected but also stand a much better chance of being successful for any given year. Such farms have a superior organizational balance between the different farm enterprises. A few other farms on the basis of labor income alone might have been selected, but it is thought that such farms are less likely to be equally successful over a period of years due to one or more of such factors as excessive erosion, inefficiency in the use of labor, poor yields, inadequate size, lack of diversity or too great an expense charge.

A comparison of the selected farms on the basis of the ten factors known to affect income shows that they equal or exceed the average in each factor (Table LXXVIII). They are larger as measured by productive man work units being 523 and 380 respectively. They are more diversified, having 6.4 sources of income larger than the taxes compared to 4.9 sources for all farms. Crop yields are higher, 325 pounds of cotton lint and 36 bushels of corn, compared to 258 pounds and 24 bushels for all farms. The per cent of land in row crops is lower, being 45 per cent compared to 53 per cent. The per cent livestock receipts are of the total receipts is the same, being 19 per cent. The efficiency of the 10 farms is greater as measured by crop yields, gross receipts per man work unit, horse work units per horse, and gross receipts per \$1.00 gross expense. The ratio of investment to income is more desirable as measured by faster investment turnover.

TABLE LXXVIII. COMPARISON OF FARMS ON BASIS OF TEN FACTORS,
CROCKETT COUNTY, TENNESSEE

Factors Used	Average 150 Farms	10 Selected Farms
Crop yields		
Cotton lint, pounds	258	325
Corn, bushels	24	36
Per cent of land in row crops	53	45
Per cent livestock receipts are of total receipts	19	19
Livestock receipts per man work unit spent on livestock	\$3.47	\$4.67
Total man work units	380	523
Gross receipts per man work unit	\$3.09	\$4.14
Horse work units per horse	62	71
Number of sources of income	4.9	6.4
Gross receipts per \$1.00 gross expense	\$1.67	\$2.06
Investment turnover	5.1	3.7

The ten selected farms had a larger average total investment by approximately \$2000 or about 13 per cent. They had more real estate, livestock, machinery equipment, feed, supplies and cash to run the farm. The total farm receipts were larger by \$990, receiving more income from crops, livestock, feed and supplies, and A.A.A. payments but slightly less income from miscellaneous sources classed as other sources (Table LXXIX). Since other factors are larger one would expect farm expenses to be larger, and they were larger by \$348. Current expenses were much larger, while unpaid family labor and decrease in feed and supplies were smaller than average. This indicates that on these farms family labor plays a less important position. The farm income was \$1114 compared to \$472 for all farms and \$362 for farms of entirely upland soil. The labor income was \$712 compared with \$174 for all farms. Thus farms with approximately one third more acres

TABLE LXXIX. COMPARISON OF MORE PROFITABLE FARMS, CROCKETT COUNTY

Item	Average 10 Selected Farms	Average of 24 Upland Farms	Average of 150 Farms
Investment, total	\$8,042	\$4,596	\$5,961
Real estate	6,049	3,557	4,547
Livestock	930	529	709
Machinery and equipment	363	191	281
Feed and supplies	511	227	313
Cash to run farm	189	92	111
Farm receipts, total	\$2,165	\$1,008	\$1,175
Crops	1,419	681	739
Livestock (net increase)	411	135	226
Increase feed and supplies	98	41	29
A.A.A. payments	214	117	131
Other sources	32	34	50
Farm expenses, total	\$1,051	\$ 646	\$ 703
Current	824	428	496
Unpaid family labor	100	118	108
Livestock net decrease	41	21	16
Depreciation	78	44	53
Decrease feed and supplies	8	35	30
Farm income	\$1,114	\$ 362	\$ 472
Interest on investment	\$ 402	\$ 229	\$ 298
Labor income	\$ 712	\$ 133	\$ 174
Per cent return on investment	11.3	4.6	5.3
Value operator's labor	\$205	\$148	\$156
Value items for family use	\$365	\$304	\$294
Gross receipts per acre	\$ 18	\$ 13	\$ 13
Labor income per acre	\$ 6	\$ 2	\$ 2

earned more than four times the labor income. The average per cent return on the investment was 11.3 per cent as compared to 5.3 per cent. This is a difference of over 100 per cent in favor of the selected farms since they earned more than twice the interest rate. Thus with an increase of one third in acreage, an improvement in organization associated with more efficiency in production we get four times as great a labor income and twice as great

a per cent return on investment.

It is difficult to say how much of this increase in labor income is due to size, how much to organization, how much to efficiency or how much to other factors. Even that portion which is due to size must be considered in terms of what constitutes an economical unit, for farms too small for efficiency of operation are unduly handicapped.

The reasons why these differences occurred have been largely explained by the variation in the ten factors, but a few additional factors will be presented for further explanation. The ten farms averaged more acres in cotton and corn and had more livestock per farm (Table LXXX). The greater number of milk cows, other cattle, hogs, and poultry increased the size of

TABLE LXXX. COMPARISON OF FARMS ON BASIS OF LAND USE AND NUMBERS OF LIVESTOCK, CROCKETT COUNTY

Item	Average 10 Selected Farms	Average 24 Upland Farms	Average of 150 Farms
Acres operated	117	67	88
Acres in cotton	21	14	15
Acres in corn	26	17	19
Acres in pasture	16	10	16
Number of livestock			
Milk cows	3.3	2.0	2.6
Other cattle	3.9	1.9	2.8
Hogs	3.1	2.5	2.6
Poultry	68	45	48
Work stock	5.1	3.2	3.9
Corn sold	223	60	108

the farm and at the same time developed a more even and uniform distribution of labor, which is brought out by the greater value placed on the operator's labor. Differences due to acreage are partially eliminated by using labor

income per acre which is 3 times higher on the 10 farms than on the average of all farms, being \$6 and \$2 per acre respectively. This indicates that the 400 per cent difference in labor income in favor of the selected farms is due $1/4$ to larger acreage and $3/4$ to better organization and management as brought out by the ten factors. This shows again, as is known in all business, that large dividends are paid for superior managerial ability.

The facts relating to the individual farms revealed that some farms having practically the same area in crops, the same labor supply equipment, etc., varied considerably in their net returns. This variation may be caused by varying prices, differences in management, and to other causes as well as the way in which farms are organized. However, a large part of this difference in income can be traced to the combination of crop and livestock enterprises. To illustrate how some of the more successful farms were organized actual farms will be described.

Farm A is a cotton farm. There are 105 acres of land, 70 acres owned and 35 acres share rented. There are 2 dwelling houses valued at \$2000 and other buildings valued at \$650. The farm machinery and equipment are valued at \$433, livestock at \$1056 and feed and supplies at \$1176, making a total investment of \$9865. The farm is operated by two men, father and son in partnership.

This farm has 90 acres of Memphis silt loam, 13 acres of Collins silt loam and 2 acres of Grenada silt loam.

In 1935 there were 11 acres of cotton, 44.5 acres of corn, 28 acres of lespedeza hay, 10 acres rotation pasture, 5 acres of woods pastured,

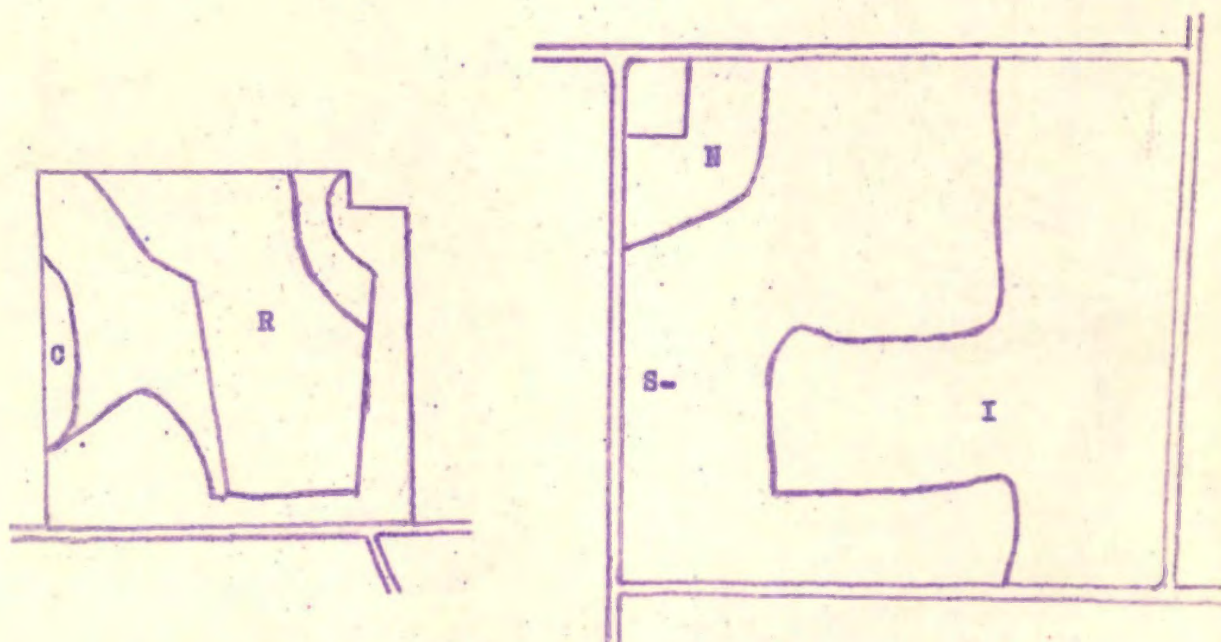
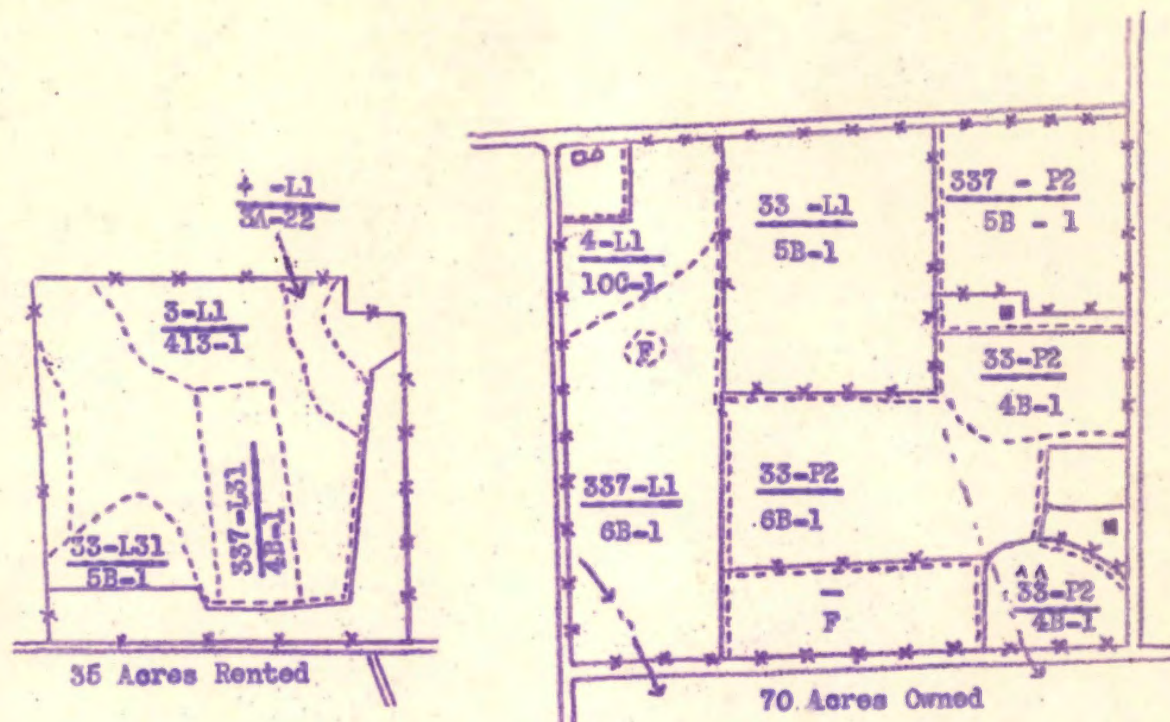


Figure 33. Map of Farm A, Crockett County, 1936.

4.5 acres of waste land, 1.75 acres of farmstead and 1/4 acre of garden.

The farm was not heavily stocked. There were only 7.9 animal units. There were 4 mules, 1 horse, 5 milk cows, 3 sows and 230 hens. During the year 57 pigs were farrowed, 36 of which were raised for market. There were also 700 chickens hatched of which 550 were raised to marketable age.

A composite symbol of the farm showing land use, erosion, slope and soil type is shown in Figure 33. The field arrangement and farmstead location are also shown. It is seen here that the farm owned is all Memphis silt loam soil, a farm in need of improvement in cover and strip cropping to conserve the soil. The land in medium pasture is much in need of improvement in cover, both because the yields are poor and the land is washing. The land in row crops of heavy sheet erosion should be cultivated by strip cropping. The land near the school house should be kept in close growing crops only, as erosion is already severe. On the farm land rented soil conservation can be brought about by proper rotations alone (Figure 33).

In 1900, 12 acres of land with an 8 per cent slope were terraced, making a total length of 200 rods and a base width of 6 feet. The terraces have prevented washing but are too far apart for best results. In 1936 4 acres of land with a 6 per cent slope were terraced, which has resulted in checking the erosion. Contour tillage is practiced on 16 acres. No gully control, strip-cropping or reforestation as a means of soil conservation are practiced. Pastures are established on 28 acres; lespedeza and red-top are sown together. The pastures are not treated resulting in their productiveness being rated as fair. No cover crops are sown, though much of the land is in need of winter protection.

TABLE LXXXI. PRODUCTION AND DISPOSITION OF CROPS ON FARM A

Items	Cotton, Lint	Cotton, Seed	Corn	Lespedeza Hay	Garden
Acres	11		44.5	28	.3
Yield per acre	522		40	1.5	
Production	5730	9168	1780	40	
Sales:					
Amount	5730		477	8	
Price	\$.11		\$.84	\$7.50	
Value	\$ 630	\$106	\$ 400	\$ 60	
Home use:					
Amount	5				
Value	\$ 4				\$50

TABLE LXXXII. LIVESTOCK RECORD ON FARM A

Items	Horses	Mules	Milk Cows	Calves (7)	Brood Sows	Feed- er Hogs	Pigs S-27 F-27	Hens	Chick- ens (700)	Total
Beginning inventory										
Number	1	4	5		3			230		
Price, cents								.85		
Value, dollars	100	500	200		60			196		1056
Ending inventory										
Number		5	5	3	2		18	230		
Price, cents								.85		
Value, dollars		625	200	40	40		227	196		1328
Sales										
Number	1			4	1	12	13	190	260	
Price or amount				800#	665#	2520#	2470#	85¢	20¢	
Value, dollars	100			36	54	227	222	162	52	853
Purchases										
Number		1				12				
Price or amount						780#				
Value, dollars		100				770				170
Died							18	50	150	
Family use										
Number							5		100	
Value									20	20

TABLE LXXXIII. LIVESTOCK PRODUCTS ON FARM A

Items	Butter	Butterfat, cream	Market milk	Eggs	Meat (Pork)	Total
Sales: Amount		600		645 doz.	125	
Price		25¢		15¢	18¢	
Value		\$150		\$97	\$22	\$269
Family use: Amount	100#		50	75@	1375@	
@ 20¢	@ 20¢		gal.	20¢	10¢	
Value	\$20		\$5	\$15	\$137	\$177

TABLE LXXXIV. FEED AND SUPPLIES ON FARM A

Items	Beginning Inventory		Ending Inventory	
	Amount	Value	Amount	Value
Hay	34 T	\$ 255	34 T	\$ 255
Lespedeza seed	12 bu.	30	10 bu.	28
Corn	1000 bu.	840	1198 bu.	1006
Cottonseed	2824 bu.	51	2824 bu.	51
Total		\$1176		\$1340

TABLE LXXXV. SUMMARY ON FARM A

Investment, total	\$9,865
Real estate	7,200
Livestock	1,056
Machinery and equipment	433
Feed and supplies	1,176
Cash to run farm	0
Farm receipts, total	\$2,827
Crops	1,196
Livestock, net increase	1,224
Other sources (man labor)	72
Increase feed and supplies	164
A.A.A. payments	171
Farm expenses, total	\$ 520
Current	424
Unpaid family labor	-
Livestock, net decrease	-
Depreciation	96
Decrease feed and supplies	-
Farm income	\$2,307
Interest on investment	493
Labor income	1,814
Value operator's labor (2 men)	504
Per cent return on investment	18.2
Value items for family use	\$ 466

The farm income on farm A was \$2307, and the labor income was \$1814, which is higher than on any other farm surveyed. The return on investment

Labor Income	Investment		Total Acres	Man Work Units Per 1000 Inv.		Total	Gross Receipts		L.S. Rec. per MWU on L.S.	Cotton Yield	Sources of Rec.
	Total	% Operat- ing Cap.		Total	Per 1000 Inv.		% of In- vest.	Per M.W.U.			
1700	11,000	44	140	630	98	140	39	8.00	550	500	10
1400	10,000	40	130	580	91	125	35	7.00	475	450	9
1100	9,000	36	120	530	84	110	31	6.00	400	400	8
800	8,000	32	110	480	77	95	27	5.00	325	350	7
500	7,000	28	100	430	70	80	23	4.00	250	300	6
\$174	\$5,961	24	88	380	63	65	19	\$3.09	\$167	258	4.9
-150	5,000	20	80	330	56	50	15	2.00	100	200	4
-450	4,000	16	70	280	49	35	11	1.00	25	150	3
-750	3,000	12	60	230	42	20	7	-	-	100	2
-1050	2,000	8	50	180	35	5	3	-	-	50	1
-1350	1,000	4	40	130	28	-	-	-	-	-	-

*Mean of 150 farms.

Figure 34. Business Analysis of Farm A, Crockett County, Tennessee, 1936

was 18.2 per cent. This income is surprisingly large when we recall that the average labor income was only \$174 per farm.

It is difficult to say exactly what is responsible for such a large difference since income is the result of a large number of factors. The factors probably responsible for this difference are organization, crop yields, size, and management. The cotton yields averaged 522 pounds per acre, corn averaged 40 bushels per acre, and hay averaged 1.5 tons per acre which are all much above the average. More acres were operated and a greater number of productive man work units were obtained. More than twice as great a percentage of gross receipts came from livestock. Horses were used more efficiently as shown by more horse work units per horse. The farm had nine sources of income larger than the taxes indicating much greater diversity. Expenses were lower as indicated by larger gross receipts per \$1.00 gross expense. The investment turnover was much faster, being approximately 3.5 years. Thus this farm has a very profitable balance of crop and livestock enterprises, larger size both in acres and man work units, much better crop yields, larger returns from livestock, smaller expenses and a more efficiently operated farm.

Farm B earned a labor income of \$903 (Figure 35). While this is far above the average for all farms it does not approach what this farm could earn. Size as shown by 108 acres of land is 20 acres larger than average and 3 acres larger than Farm A yet size as measured by productive man work units is near average, being 390. This indicates that on the same acreage the average farmer is able to obtain a larger volume of business. Poor land might account for such a difference but not in this case since there is 49 acres of Collins silt loam, 50 acres of Grenada silt loam, and 9 acres of

Figure 35. Map of Farm B, Crockett County, 1936.

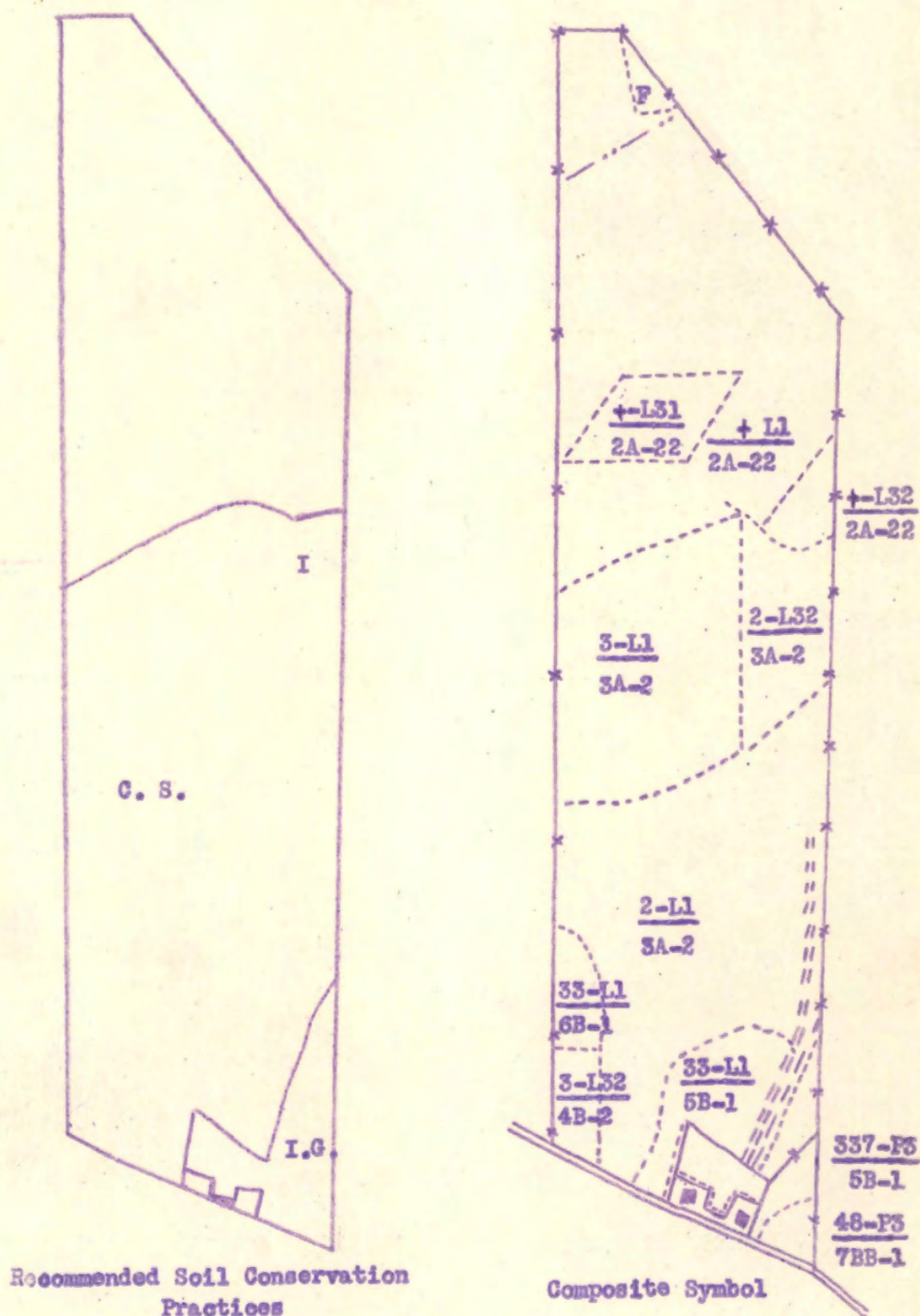


Figure 35. Map of Farm B, Crockett County, 1936.

Memphis silt loam. Most of the land shows little or only moderate sheet erosion, all of which could be controlled by contour tillage, strip cropping or through an improvement of cover (Figure 35). Some of land in row crops near the house is fairly steep and more subject to erosion so that this land will need to be kept in meadow and pasture more of the time and the land farther from the house depended upon to produce corn and cotton.

This farmer has 1 milk cow, 2 brood sows, 8 other hogs, and 45 hens, which is less than he could very profitably keep. Then too his efficiency is only average as shown by average livestock receipts per man work unit spent on livestock (Figure 36). Six pigs from 2 sows and 45 chickens from 45 hens is not satisfactory. Five head of work stock were kept to do 313 horse work units, which is average.

Cotton yields were about average, though 30 acres of corn yielded 35 bushels per acre.

The strong points of this farm are that the investment is relatively low, per cent operating capital high, larger number of acres, more man work units per \$1000 invested, rapid turnover, and large receipts per \$100 gross expense. The weak points are: too few man work units, too few livestock and poor cotton yields. And then, only average efficiency is not a desirable goal for any farmer.

Farm C is small both in acres and man work units and was selected to illustrate that while small farms are handicapped they can be successful by proper farm organization and efficiency in farm practices.

Thirty-two of the 50 acres in the farm were planted to crops in 1936,

Investment	Total
1700	11,000
1400	10,000
2100	9,000
500	8,000
500	7,000
1174	6,996
-150	6,846
-150	6,696
-750	5,946
-1050	4,896
-1250	3,646
-1250	2,396
-1250	1,146

Labor Income	Investment		Total Acres	Man Work Units		Gross Receipts			L.S. Rec. per MWU on L.S.	Cotton Yield	Sources of Rec.		
	Total	% Operating Cap.		Total	Per \$1000 Invest.	On L. S.	Total	% of Invest. M.W.U.				Per \$100 Gross Ex.	
1700	11,000	44	140	630	98	140	3200	39	8.00	550	8.50	500	10
1400	10,000	40	130	580	91	125	2800	35	7.00	475	7.50	450	9
1100	9,000	36	120	530	84	110	2400	31	6.00	400	6.50	400	8
800	8,000	32	110	480	77	95	2000	27	5.00	325	5.50	350	7
500	7,000	28	100	430	70	80	1600	23	4.00	250	4.50	300	6
\$174	\$5,961	24	88	380	63	65	\$1175	19	\$3.09	\$167	\$5.47	258	4.9
-150	5,000	20	80	330	56	50	800	15	2.00	100	2.50	200	4
-450	4,000	16	70	280	49	35	400	11	1.00	25	1.50	150	3
-750	3,000	12	60	230	42	20	-	7	-	-	.50	100	2
-1050	2,000	8	50	180	35	5	-	3	-	-	-	50	1
-1350	1,000	4	40	130	28	-	-	-	-	-	-	-	-

Average for Survey.

Figure 36. Business Analysis of Farm B, Crockett County, Tennessee, 1936

14 to rotation pasture, and the remaining 4 acres in farmstead, roads and idle land. On this farm, there were 3 milk cows, 1 brood sow, 75 hens and 2 mules. During the year 3 calves, 9 pigs and 200 chicks were raised.

The farmer kept his expenses low and was able to supplement his income from the farm by baling hay which paid him \$146. He also stored sweet potatoes for which he received \$60. The A.A.A. payment amounted to \$90. His total labor income was \$619. The return on investment was 13.4 per cent.

The chief factors responsible for this man's success are that he was able to operate efficiently and to supplement the farm income by other sources. He had a rapid turnover, larger than average receipts per man work unit, per \$100 gross expense, larger than average livestock receipts per man work unit spent on livestock, and better than average cotton yields (Figure 37). This farmer, however, can increase his income by further improvement in the efficiency with which he operates his farm as he does not approach that attained on Farm A. Success as attained on Farm A is limited since Farm C is much smaller in size, though by efficiency and good organization returns greater than average and far better than some farms even much larger, can be attained.

TABLE LXXXVI. SUMMARY OF FARM C

Investment, total	\$4,860
Real estate	3,500
Livestock	650
Machinery and equipment	344
Feed and supplies	266
Cash to run farm	100
Farm receipts, total	\$1,325
Crops	526
Livestock (net increase)	397
Other sources	206
Increase feed and supplies	106
A.A.A. payment	90

(continued)

Labor Income	Investment		Total Acres	Man Work Units		Gross Receipts				L.S. Rec. per MWU on L.S. Cotton Ex.	Cotton Yield	Sources of Receipts	
	Total	% Oper. Capital		Total	Per 1000 Invest. Stock	On Live-Stock	Total	% of Inv. M.W.U.	Per \$1000 Gross Ex.				
1700	11,000	44	140	630	98	140	3200	39	8.00	550	8.50	500	10
1400	10,000	40	130	580	91	125	2800	35	7.00	475	7.50	450	9
1100	9,000	36	120	530	84	110	2400	31	6.00	400	6.50	400	8
800	8,000	32	110	480	77	95	2000	27	5.00	325	5.50	350	7
500	7,000	28	100	430	70	80	1600	23	4.00	250	4.50	300	6
174	\$5,961	24	88	380	63	65	\$1175	19	\$3.09	\$167	\$3.47	258	4.9
-150	5,000	20	90	330	56	50	800	15	2.00	100	2.50	200	4
-450	4,000	16	70	280	49	35	400	11	1.00	25	1.50	150	3
-750	3,000	12	60	230	42	20	0	7	0	-	.50	100	2
-1050	2,000	8	50	180	35	5	-	3	-	-	-	50	1
-1350	1,000	4	40	130	28	-	-	-	-	-	-	-	-

* Average of survey.

Figure 37. Business Analysis of Farm C, Crockett County, 1936.

TABLE LXXXVI. SUMMARY OF FARM C
(continued)

Farm expenses, total	\$463
Current	395
Unpaid family labor	15
Livestock (net decrease)	-
Depreciation	53
Decrease feed and supplies	-
Farm income	862
Interest on investment 5%	243
Labor income	619
Per cent return on investment	13.4
Value items for family use	\$223

Farm D is a 50 acre farm operated by a tenant on a two thirds share basis. The interesting thing on this farm is the way in which it is organized and managed so as to produce a large volume of business on few acres. Few farms in Crockett County feed livestock, but the operator of this farm was able to profitably feed out an average of 22 steers.

This farm had 12 acres of cotton with a yield of 240 pounds, 10 acres of corn with a yield of 45 bushels per acre, 8 acres of clover hay yielding 1 ton per acre, 1 acre of tomatoes yielding 250 bushels and 16 acres of rotation pasture.

The farm had 2 mules, 1 milk cow, 1 brood sow, 50 hens, and purchased 24 feeder steers.

The 20 steers were purchased at Memphis for \$373.95, \$74.70 were paid for 4 local steers. Transportation from Memphis on 20 steers by truck cost \$12.50 which makes a total cost of \$461.15 for 24 steers delivered at the farm. It was necessary to purchase 2 tons of cottonseed meal costing \$47.00, 21,641 pounds of hulls costing \$58.68, \$3.36 worth of salt, and 4 tons of hay costing \$25.00, which makes a total purchased feed cost of

\$134.04. The steers were pastured approximately one half on the operator's land and one half on adjacent land owned by the landlord. More than half of the growth was attributed to the pasture of red-top and lespede_a. The steers were sold for \$775.25, making a net profit of \$180, which was divided equally between the operator and the landlord. This particular enterprise was operated on a 50-50 basis by the landlord and tenant.

This farm was located 77 per cent on bottom land principally Collins silt loam and was not subject to much erosion. No terracing, contour furrowing, strip cropping, gully control or reforestation was practiced.

The operator of this farm was able to organize and manage his farm so as to care for 352 productive man work units, or 7.0 productive man work units per acre as compared with 4.3 productive man work units for all farms.

This farm was operated more efficiently than the average as shown by a labor income per man work unit of \$2.00 compared with 46 cents for all farms. There were 85 horse work units per horse compared with the average of 62. Expenses were lower as shown by a gross income of \$3.03 per dollar of gross expense compared with an average of \$1.67. Corn yields of 45 bushels per acre is nearly twice as high as the average, though a cotton yield of 240 pounds are slightly below average. Cotton yields should be improved and proper fertilization should largely accomplish this. By improving the clover hay yields the feed expense would be reduced.

TABLE LXXXVII. SUMMARY OF FARM D

Investment, total	\$3,494
Real estate	2,500
Livestock	612
Machinery and equipment	200
Feed and supplies	157
Cash to run farm	25
Farm receipts, total	\$1,305
Crops	750
Livestock, net increases	447
Other sources	-
Increase feed and supplies	18
A.A.A. payments	90
Farm expenses, total	\$ 430
Current	338
Unpaid family labor	60
Livestock, net decreases	-
Depreciation	32
Decrease feed and supplies	-
Farm income	\$ 875
Interest on investment	175
Labor income	700
Per cent return on investment	20.6
Value of items for family use	\$ 299

Farm income varies between some farms similarly organized and with relatively the same productive efficiency because the operator is able to manage his practices so as to leave time for off-the-farm work. Farms E and F are representative of this difference. Both farms had 85 acres of land and approximately the same number of man work units. Yields were similar on both farms. Farm F has a larger total investment, being \$7701 compared to \$4123. Farm F also has more livestock, both milk cows and work stock. The soil types are similar but Farm E is somewhat more severely sheet and gully eroded. Both farms are in need of improved soil conservation practices, such as terracing, and strip cropping (Figure 38).

Farm E had a labor income of \$433 compared to the \$28 labor income of Farm F. Such a difference means a great deal in living conditions. Farm E was able to operate his farm on approximately \$173 less expenses and was also able to do work off the farm which paid him about \$255 more than was received by the operator of Farm F. These two farms in addition to operating very similar farms lived only a few miles apart in the same neighborhood and were both near 55 years of age, yet one man exercised managerial ability which enabled him to earn many times the labor income of a neighboring farmer, and more than twice as much as the average farmer.

CHAPTER X

SUMMARY OF RECOMMENDATIONS AND CONCLUSIONS

The aim of farm management is to provide the largest continuous farm income and the purpose of this study is to analyze farm organization and farm practices in West Tennessee, Crockett County, in relation to land use and their affect on the soil with a view towards the determination of the different kinds and amounts of the several crops and classes of livestock to combine in relation to soil so as to make this income possible. To do this it has been necessary to ascertain needed soil conservation practices, proper land use, desirable fertility measures, approved crop rotation, profitable degree of diversity and other improvements in farm practices and efficient operation adapted as far as possible to individual farms.

This study is based on a farm management and soil survey conducted jointly by the University of Tennessee Agricultural Experiment Station and the United States Department of Agriculture in Crockett County, Tennessee, as representative of Type of Farming Area III.

Crockett County is located in central West Tennessee in the drainage basin of the Mississippi River. Topographical features are gently rolling. The climate is mild, humid, and well suited to agriculture.

The entire population is rural, with no large city within the county. Memphis is approximately 70 miles southwest. Markets for nearly all farm

products must be found outside the county. Railroads are conveniently located but the roads are poor.

The prevailing type of agriculture is the growing of cotton as a cash crop in conjunction with the production of corn and lespedeza used chiefly as feed for the work stock. Few livestock are kept.

The principal soils are Memphis and Grenada upland series and Collins and Waverly bottom land series, with Memphis silt loam being found on 38.7 per cent of the area surveyed. The weighted average slope of all soils is 3.7 per cent.

Nearly half of ^{the} top soil, for the average of all slopes, of the farms surveyed has been washed away by sheet erosion, 6 per cent on the A slopes, 68 per cent on the B slopes, and over 85 per cent on the BB, C, and D slopes. A greater proportion of the surface soil has been removed by erosion in the Type-of-Farming Area than on the Sample Farms. This erosion, has resulted in serious loss of fertility.

Land use problems are interrelated with many farm management and soil conservation practices and the way in which they are solved will affect both the present economic well-being of the individual farmer and the permanency of some land for profitable agricultural production.

The degree of soil erosion is influenced by a combination of several factors, the credibility of the particular soil type, slope of the land, and land use practices. Tenancy, mortgage indebtedness, size of farm, and other factors influence erosion through their effect on land use.

Memphis silt loam erodes most easily, followed by Grenada silt loam, Oliver silt loam, and Collins and Waverly silt loams in the order named. The extent and proportion of erosion is also greatest on Memphis silt loam

and least on Collins and Waverly silt loams.

As the slope increases erosion increases if other factors are held constant, and since the steeper slopes are more subject to erosion, and are more severely eroded, it is suggested that they be taken out of cultivation so far as practicable, or cultivated only in association with terracing, strip cropping or other appropriate soil conservation practices.

Memphis silt loam of "A" slope erodes much more rapidly when planted to row crops than when kept in pasture. The rate of sheet erosion decreases as land use is changed towards less intensive crops such as pasture. Gully erosion is also related to land use, though this may be obscured by the shifting of land use towards pasture and forest as the gullying becomes more severe.

Severe sheet erosion is limited to the upland soils. Gullying is directly correlated with sheet erosion, and becomes more severe following sheet erosion. Attention to gullying is needed on 25.2 per cent of the total area surveyed.

Since practically all of the BB, C, and D slopes occur on Memphis silt loam it is principally this soil type that should be taken out of cultivation and planted to pasture and woods. Areas having A slopes, and less than 25 per cent of the topsoil lost and no gullies, need no special control measures. Areas of A, B, and BB slopes, with moderate to severe sheet erosion associated with occasional gullies, need terracing or strip cropping with cultivation on the contour. The C slopes might be used best for close growing crops. The areas of D slope, and those having severe to very severe sheet erosion associated with frequent gullies, might well be

taken out of cultivation and retired to pasture or forests.

General recommendations are difficult to apply to individual farms and must be adapted to particular needs of each farm and in many cases to particular fields. The determination of desirable adjustments in land use and in management practices on existing farms, in the final analysis, to be of value must be made on the basis of individual farms in the light of economic and social factors as well as physical characteristics. Such adjustments cannot be intelligently made until the probable effect of such changes on the rest of the farm has been determined.

In an area of several different soil types present in varying combinations on different farms, farmers do not have, nor can they be expected to acquire, a uniform concept as to how a particular soil type may be best utilized. Farmers, of necessity, will utilize their best soil for intensive or row crops, while on another farm such soil may constitute the poorest land and be utilized as pasture. This concept recognizes that while soil type is a logical unit by which to study the natural land types of a well developed farming area, the farm is the economic unit on which the use of a particular soil type is determined. For these reasons, specific land use suggestions are made according to soil type and slope class in association with degrees of erosion, together with suggested erosion control measures, realizing that on some farms further modification will be necessary to meet existing conditions. For instance Memphis silt loam soil, of A slope with less than 25 per cent of the "A" horizon removed, might be planted to row crops with no mechanical erosion control measured needed, while land of the same soil type and slope class, but with severe

sheet erosion, would be planted to row crops only in association with terracing or contour tillage. Memphis silt loam soil of C slope is potentially pasture and woodland. For Grenada silt loam of B slope uneroded, the land use might be row crops and meadow with terracing or contour tillage. Collins silt loam is a row crop soil not in need of any erosion control measures, and may be used to produce as much as economically possible of the row crops. Similarly, land use suggestions are made for each of the major soil types, according to slope class and extent of erosion, accompanied by erosion control measures.

A four-year rotation of cotton followed by a cover crop of crimson clover, corn and soybeans, oats and lespedesa, and lespedesa, is suggested for Memphis and Grenada silt loams. A three-year rotation consisting of oats and soybeans followed by a cover crop of crimson clover, cotton (a cover crop is not necessary but is desirable), and corn and soybeans.

Permanent pastures in Crockett County might be improved by planting a combination of red top, lespedesa, Bermuda grass, white clover, red clover, and alsike on bottom lands. Winter cover crops are not extensively grown, but could be used by more farmers to advantage.

The soils of West Tennessee, though naturally well supplied with plant food, have under cultivation become poor in humus and nitrogen caused by the system of farming generally followed and by erosion during heavy rains. Commercial fertilizers have never been used as extensively as in either Middle or East Tennessee. The use of fertilizer in Crockett County is generally limited to applications of Kainit (potassium) and 4-8-4

(nitrogen, phosphate, and potassium) at rates varying from 150 to 250 pounds per acre, generally used on cotton and a few truck farms. Twenty per cent of the farmers reported the use of commercial fertilizer on 363 acres, or 2.7 per cent of the area surveyed.

A marked difference has been found in the soil supplies of essential plant food elements and in the response of various crops to applications of fertilizer. This necessitates a field study of individual soil needs and the making of recommendations as specific as possible. For this reason suggestions are made by type of soil and crop planted. Generally, Memphis silt loam will be in need of large amounts of fertilizer, especially on land planted to cotton, and truck crops.

Crushed limestone was applied on 8 of the 150 farms, or on .27 per cent of the area surveyed. The only crops for which liming was reported were red clover and alfalfa, and from the standpoint of both soil conservation and good farm practices the production of these crops should be encouraged, but they cannot be successfully grown without lime.

Strip cropping is needed more than any other soil conservation practice in Crockett County. None of the farms surveyed practiced strip cropping, though this practice is recommended by the Soil Conservation Service as a control measure for 59.8 per cent of the farms and 24 per cent of the farm area. Twenty-two per cent of the land needs terracing. Forty-four farms had some form of terrace in 1936, which partially protect with varying degrees of effectiveness 1,042 acres, which is 46 per cent of the area recommended as in need of terraces. The usual cost of terraces averages about 40 cents per 100 lineal feet or 6 cents a rod. Contour tillage is

needed on 20 per cent of the land surveyed. This method of soil conservation was practiced on 38.7 per cent of the farms and on 7.6 per cent of the area. Improvement in cover is needed on 16.2 per cent of the farming area. Pasture, cover crops or woodland cannot be effective in soil conservation unless they possess growth dense enough to slow down or prevent run-off. Gully erosion is more evident than sheet erosion and prompt action has saved many fields. Fourteen and one-half per cent of the area surveyed needs gully control measures. Gully control measures have been attempted on 61.3 per cent of the farms and 1.8 per cent of the area. Methods employed included use of brush, corn stalks, weeds, straw, etc., which are used to fill the gullies. More emphasis should be placed on grassed waterways, better check dams, reforestation in severe gullies, all used in coordination with one or more of the specifically suggested practices for erosion control. The selection and use of approved rotations will control erosion on 4.1 per cent of the land. Close growing crops are needed on 2.0 per cent, retirement is needed for 1.0 per cent and forest is needed on .4 per cent of the land area surveyed. The farm land area in forest was not included in the area mapped by soil type.

Farms classified according to the dominant soil type show that Memphis silt loam farms are in greater need of all the measures for soil conservation. Grenada silt loam farms are intermediate, while Collins silt loam farms are least in need of soil conservation practices. Farms of mixed soil type, or those possessing no dominant type, approximate the average of the survey.

Proper land use is one of the most effective ways of conserving soil,

involving the planting of lands to crops to which they are best adapted. This means, in general, an increase in the legume and grass acreage and a decrease in the acreage of row crops. The farms were sorted into four groups based upon the percentage of farm land area in bottom land. Group I contained farms having over 60 per cent of the total area in bottom land; Group II, 40-59 per cent; Group III, 20-39 per cent; and Group IV, less than 20 per cent. Land use, livestock numbers and production, size of farm, crop yields, crop and livestock receipts, expenses and farm income were calculated by the four groups and compared with a summary of physical characteristics of soil type, slope and erosion.

Conforming to approved conservation practices, it was found that row crops might be increased as much as 60 per cent on the Group I farms and maintain fertility with as much as 20 per cent increase in cotton acreage. Cover crops need to be increased to 9.6 per cent, while pasture and meadow may be proportionately decreased. The increase in row crops in Group I farms will possibly require an increase in work stock and a decrease in cattle. Farms in Group II having 40 to 59 per cent of the farm area in bottom land can increase row crops and cotton as much as 30 per cent. Cover crops should be increased to 23.5 per cent. Plowable, meadow, and rotation pasture can be decreased. Group III farms with 20 to 39 per cent bottom land may increase row crops 20 per cent which may be almost all cotton, cover crops need increasing to 27.3 per cent, meadow and pasture need only a slight reduction in acreage to make the cotton increase possible. Farms in Group IV having less than 20 per cent bottom land require a decrease in row crops and an increase in meadow and pas-

ture to meet with soil conservation recommendations, the cotton acreage may be maintained though the corn acreage is decreased, these farms are in need of the greatest increase in cover crops which should be increased to 31.4 per cent. All farms should decrease the acreage of idle, failure, or fallow land and the acreage in uses classed as other farm land. These adjustments are made on the basis of soil conservation alone.

A decrease in row crops and woodland and a 50 per cent increase in meadow and plowable pasture is recommended for Type-of-Farming Area III by the University of Tennessee and United States Department of Agriculture.

Representative farms were selected from each of the above groups for a budgetary analysis to determine the economic effect of soil conservation recommendations on individual farms. A summary of physical factors, livestock numbers, crop production, and farm income data are included for the selected farms. On no farm is it necessary to reduce cotton acreage, on all but two farms the acreage might be increased, the reduction in corn acreage being sufficient to meet recommended conservation practices. Pasture and meadow land may be decreased and row crops increased in the bottom land farms. Some farms needing row crop reduction may be able to do so and maintain the present farm income. A few small upland farms because of their small size will not be able to maintain their present income either by following or not following the recommended practices. It was found that the adoption of soil conservation practices will supplement and in many cases increase the present income while making permanent a sound agriculture based on proper land use.

Tenancy is inevitable in all settled countries and should be a stepping stone towards independent farm owner-operatorship in which a man serves a sort of apprenticeship gaining desirable experience and capital as he climbs the "agricultural ladder". In order to study the organizational and management aspects of owner-operated farms compared with part-owner operated and tenant operated farms, the farms were segregated on the basis of tenure. Of the 150 farms, 49 per cent were owner-operated, 21 per cent part-owner operated, and 30 per cent tenant operated. Owner operated farms are slightly larger than either part-owner or tenant operated farms. The investment is largest on owner-operated farms and smallest on tenant farms. The same relative position was found in regards to value of real estate, value of livestock, and the value of machinery and equipment. Farm receipts are largest on owner operated farms as are also farm expenses. The part-owner operated farms produced the largest farm income and labor income, followed by tenant farms, with owner operated farms producing a lower farm income and lower labor income. Since the owner operated farms are larger and carry a larger investment they bear a larger interest charge which decreases the labor income. The tenant farms are farmed more intensively as indicated by a larger percentage of land in crops. Tenant farms have fewer livestock, and apply less fertilizer. Tenant farms possess and make fewer farm improvements, such as fertilization, fencing, buildings, etc., which while contributing to the immediate income, may not be the most economical over a period of years. Part-owners and owner operated farms supplied the family with more products for family use. The farm dwelling possessed greater valuation on owner

and part owner operated farms. Tenant families were largest. The statement that tenants would ultimately be better off if they owned the farms they operated is true, since under a system of farm ownership the operator in addition to his labor income receives a better home in which to live, more products used in living furnished by the farm, a larger interest return, all of which provides a greater security of tenure, economic status and less social discrimination. But for any given year and for certain individuals such a policy must be accepted with certain reservations as to size of farm, and the current rate of return on capital invested in land.

Wide variation in farm earnings occur between farms in the same community and operated under the same natural and economic conditions, caused by a complexity of several factors. Size affects income, since in general (with other factors unchanged) the larger the farm business, however measured, the more successful the farm. Small farms will have a larger investment per acre, larger income per acre, more of their income from intensive crop and livestock enterprises and much higher expenses per acre. As crop and livestock yields increase farm earnings increase. As the cotton yields increased in Crockett County the farm earnings increased. Farms with a larger percentage of farm land in the higher profit crops earned larger incomes, a difference of 17 per cent of the land in row crops was associated with a difference of \$110 in labor income on Memphis and Grenada silt loam farms of comparable size. As the number of sources of income larger than the taxes increase both the number of man work units and labor income increased but the labor income increased at a much faster

rate so that the farms with 5-6 sources of income and 396 man work units earned a labor income of \$146 while farms with 7-8 sources and 399 man work units averaged \$370 labor income. Since diversity is profitable, to diversify by livestock seems logical and it was found that on all groups of farms regardless of the proportion of bottom land the farms with more livestock secured larger farm incomes, larger labor incomes, larger labor income per acre, and larger labor income per man work unit. Farms with more efficiency in the use of power, chiefly horses, were able to reduce their costs of production and thereby earn larger labor incomes. Farms with a larger per cent of the investment in operating capital earned larger incomes. Farmers who kept records had an average labor income of \$303 while those who kept no records averaged only \$161 labor income. Farm operators who had attended only an elementary school averaged \$153 in labor income while operators who had attended high school or college averaged \$244 in labor income. Other factors such as farm layout, prices, managerial ability, methods of marketing, topographical features, etc., all influence farm earnings.

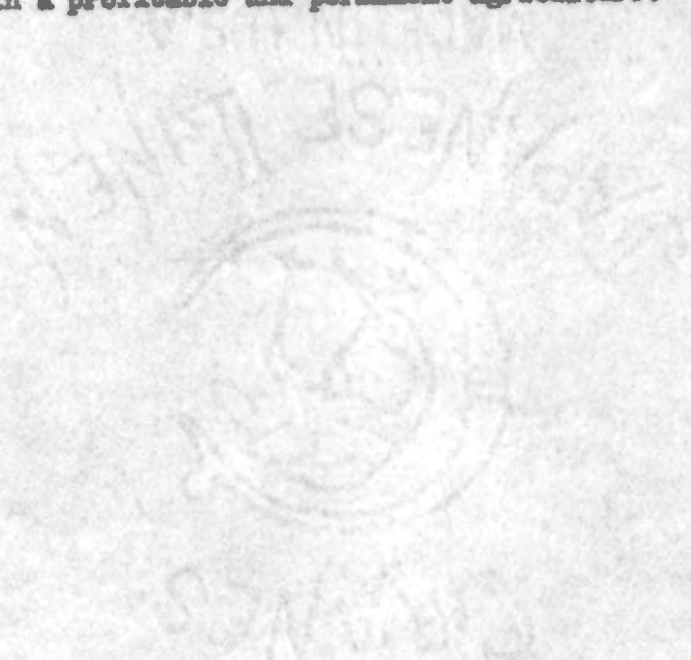
Even on farms of comparable characteristics variations in income occur between farms due to differences in the way in which they are organized and managed. The average farm in the survey had an investment of \$5961, farm receipts of \$1175, farm expenses of \$703, a farm income of \$472 and a labor income of \$174, plus \$294 worth of items supplied by the farm used in family living. The operator's labor was valued at \$156 and the return on investment averaged 5.3 per cent.

Upland farms with no bottom land are smaller than the average, they contain fewer acres, fewer productive man work units, and fewer livestock. Farm receipts, farm expenses and farm income are smaller with the labor income averaging \$183. These farms are more subject to erosion and at present are more severely eroded. Greater diversity, improvement in operating efficiency, and the use of soil conservation practices on these farms will partially solve their problem, but size remains a limiting factor.

Farms equally or exceeding the average in ten factors known to affect income were found to average \$712 in labor income. With an increase of one third in acreage, an improvement in organization associated with higher efficiency in production the labor income was multiplied by four and the per cent return on investment doubled. Individual farms of medium size, well organized and operated efficiently earned as much as \$1814 labor income. Some small farms were able to compensate for lack of size by greater efficiency, more intensity of livestock and crop enterprises or through the development of available sidelines. Illustrative farms are discussed with factors of production, problems, and suggested improvements.

Thus the farms both in Crockett County and Type-of-Farming Area III can improve their present and potential farm income through an incorporation of greater diversity both crop and livestock, particularly livestock; increased size; increased efficiency in crop yields, livestock yields, man work units per man, horse work units per horse, receipts per \$100 expense, through keeping farm records for analysis; by taking advantage

of farm educational programs; improving the farm layout; managing the production programs so as to secure the benefit of higher seasonal prices through better marketing; through basing their farm organization on proper land use in association with soil conservation practices so as to maintain a profitable and permanent agriculture.



BIBLIOGRAPHY

- Allred, C. E., Sant, Paul T., Smith, Craig M., Index Numbers of Prices Received by Tennessee Farmers, 1910-1936, With Comparisons, University of Tennessee, Agricultural Experiment Station, Monograph Number 41, Knoxville, Tennessee, 1937.
- Allred, C. E., Sant, Paul T., Smith, Craig M., Seasonal Prices of Farm Products in Tennessee, University of Tennessee, Agricultural Experiment Station, Monograph No. 51, Knoxville, Tennessee, 1937.
- Bennett, Hugh H., Allen, Resden T., Davis, L. Vincent, Watkins, C. R., Soil Survey of Shelby County, Tennessee, U. S. Department of Agriculture, Bureau of Soils, Washington, D. C., 1919.
- Case, H. C. M., Mosher, M. L., Farm Practices That Pay, University of Illinois, Agricultural Experiment Station, Circular 389, Urbana Illinois, 1932.
- Case, H. C. M., Wilcox, R. H., Organizing The Corn-Belt Farm For Profitable Production, University of Illinois, Agricultural Experiment Station, Bulletin 329, Urbana, Illinois, 1934.
- Duggan, B. O., Armentrout, W. W., Jones, W. B., Educational, Economic, and Community Survey, Crockett County, University of Tennessee, Agricultural Extension Service, Knoxville, Tennessee, 1924.
- Forster, G. W., Saville, R. J., Profitable Farm Combinations, North Carolina Agricultural Experiment Station, Bulletin 252, Raleigh, North Carolina, 1927.
- Gee, Wilson, The Social Economics of Agriculture, MacMillan Company, 1932.
- Hendricks, H. E., A Land Use and Soil Management Program for Tennessee, University of Tennessee, Agricultural Extension Service, Publication 197, Knoxville, Tennessee, 1936.
- Hendricks, H. E., Lime and Prosperity on the Farm, University of Tennessee, Agricultural Extension Service, Publication 133, Knoxville, Tennessee, 1936.
- Henry, Jerome J., The Nichols Terrace: An Improved Channel-Type Terrace for the Southeast, U. S. Department of Agriculture, Farmers Bulletin 1790, Washington, D. C., 1937.
- Holmes, Horace C., Increasing Farm Returns, University of Tennessee, Agricultural Extension Service, Publication 210, Knoxville, Tennessee, 1937.

- Hopkins, John A., The Uses of Efficiency Factors in Analysis of Farm Records, Iowa Agricultural Experiment Station, Research Bulletin 180, Ames, Iowa, 1933.
- Hopkins, John A., Taylor, Paul A., Cost of Production in Agriculture, Iowa Agricultural Experiment Station, Research Bulletin 184, Ames, Iowa, 1933.
- Hopkins, John A., Goodsell, Wylie B., Practices on Iowa Farms, Iowa Agricultural Experiment Station, Bulletin 360, Ames, Iowa, 1937.
- Hopkins, John A., Farm Organization and Management in Webster County, Iowa Agricultural Experiment Station, Bulletin 360, Ames, Iowa, 1936.
- Hutson, J. B., Farm Budgeting, U. S. Department of Agriculture, Farmers Bulletin 1584, Washington, D. C., 1933.
- Jensen, W. C., Russell, B. A., Pee Dee Farm Management Studies, 1925-30, Clemson College, Agricultural Experiment Station, Bulletin 269, Clemson, South Carolina, 1931.
- Kell, Walter V., Cover Crops for Soil Conservation, U. S. Department of Agriculture, Farmers Bulletin 1758, Washington, D. C., 1936.
- Kellog, Charles E., Ablerter, J. Kenneth, A Method of Rural Land Classification, U. S. Department of Agriculture, Technical Bulletin 469, Washington, D. C., 1935.
- Kellog, Charles E., Development and Significance of the Great Soil Groups of the United States, U. S. Department of Agriculture, Miscellaneous Publication 229, Washington, D. C., 1936.
- Lyman, W. S., Bennett, Frank, and Melendon, W. E., Soil Survey of Madison County, Tennessee, U. S. Department of Agriculture, Bureau of Soils, Washington, D. C., November, 1907.
- MeLeod, J. H., Holmes, H. C., A Planned Farm Program, University of Tennessee, Agricultural Extension Service, Publication 187, Knoxville, Tennessee, 1937.
- Miller, M. F., Cropping Systems in Relation to Erosion Control, University of Missouri, Agricultural Experiment Station, Bulletin 566, Columbia, Missouri, 1936.
- Miller, M. F., Soil Conservation in Improved Agriculture, University of Missouri, Agricultural Experiment Station, Bulletin 562, Columbia, Missouri, 1936.
- Moore, G. A., A Select List of Varieties of Farm Crops, University of Tennessee, Agricultural Experiment Station, Circular No. 10, Knoxville, Tennessee, 1937.

Moore, C. A., Clovers and Grasses for Hay and Pasture, University of Tennessee, Agricultural Experiment Station, Bulletin 165, Knoxville, Tennessee, 1938.

Moore, C. A., Fertilizers for Tennessee Soils, University of Tennessee, Agricultural Experiment Station, Circular No. 60, Knoxville, Tennessee, 1938.

Moore, C. A., Rates and Dates of Planting for Tennessee Farm and Garden Crops, University of Tennessee, Agricultural Experiment Station, Circular No. 11, Knoxville, Tennessee, 1931.

Moore, C. A., The Rational Improvement of Cumberland Plateau Soils, University of Tennessee, Agricultural Experiment Station, Publication 101, Knoxville, Tennessee, 1913.

Moore, C. A., The Rational Improvement of Highland Rim Soils, University of Tennessee, Agricultural Experiment Station, Publication 102, Knoxville, Tennessee, 1914.

Moore, C. A., Coryel, H. H., The Soils of Rutherford County, University of Tennessee, Agricultural Experiment Station, Bulletin 130, Knoxville, Tennessee, 1924.

Moore, C. A., Robert, S. A., Fertility and Crop Experiments at the West Tennessee Station, University of Tennessee, Agricultural Experiment Station, Bulletin No. 109, Knoxville, Tennessee, 1914.

Pond, G. A., Ranney, W. P., Factors Causing Variation in Earnings Among Dairy Farmers in Southeastern Minnesota, University of Minnesota, Agricultural Experiment Station, Bulletin 314, St. Paul, Minnesota, 1934.

Roe, H. B., Neal, J. H., Soil Erosion Control in Farm Operation, University of Minnesota, Agricultural Extension Service, Special Bulletin 170, St. Paul, Minnesota, 1935.

Rule, Glen K., Conserving Corn Belt Soils, U. S. Department of Agriculture, Washington, D. C., Farmers Bulletin No. 1795, 1937.

Sharps, C. F., Stewart, What Is Soil Erosion? U. S. Department of Agriculture, Washington, D. C., Miscellaneous Publication No. 286, Feb. 1938.

United States Department of Commerce, Census of Agriculture, Washington, D. C.

University of Tennessee, Winter Cover Crops for Pasture and Soil Conservation, Agricultural Extension Service, Publication 168, Knoxville, Tennessee, 1936.

Warren, Stanley Whitson, An Economic Study of Agriculture in Northern Livingston County, New York, Cornell University, Agricultural Experiment Station, Bulletin 539, Ithaca, New York, 1932.

Wildermath, Robert, Soil Survey of Henry County, U. S. Department of Agriculture, Bureau of Soils, Washington, D. C., 1922.

Wills, John Elliot, Land Use Problems in Selected Areas of Central Illinois, Doctor's Thesis, University of Illinois, Urbana, Illinois, 1937.

APPENDIX



Form No. _____

State and County Code No. _____

Farm Serial No. _____

SOIL
FARM ORGANIZATION AND/CONSERVATION SURVEY

State _____ County _____ C.D. _____ Type Farming Area _____

Operator _____ P.O. _____ Age _____ Color _____

Landlord _____ P.O. _____ Age _____ Color _____

Location of farm _____ Kind of road _____

Acres owned _____ Acres rented _____ Acres rented out _____ Acres operated _____

Tenure of operator _____ Years on this farm _____

Value of Cropper's Share of Farm Products and Expenses

	Acres	Production	Cropper's Share			
			Fraction	Amount	Price	Value
Corn.....						
Corn fodder....						
Cotton.....						
Cottonseed.....						

Total Value of Cropper's Share of Farm Products _____

	Total Expense	Cropper's Share			
	Amount	Amount	Price	Value	
Fertilizer.....					
Seed and plants					
Ginning.....					

Total value of cropper's share of expenses _____

Cost of cropper's labor* _____ (_____ Mo.) _____

*Value of cropper's share of farm products less value of cropper's share of expenses

Crop	Land Use		Recom- mend- ed	Yield		Pro- duc- tion, 1935	Sales			Con- sump- tion, 1935	Home Use
	1935	Adjus- ted		Nor- mal	1935		Operator		Landlord		
							Amt.	Price			
SOIL DEPLETING:											
1. Corn, grain, wages.....											
2. Corn for silage.....											
3. Corn, other.....											
4. Cotton, wages.....											
5. Cotton, cropper.....											
6. Wheat.....											
7. Oats.....											
8. Irish potatoes.....											
9. Sweet potatoes.....											
10. Orchards.....											
11. TOTAL DEPLETING.....											
CONSERVING CROPS:											
12. Hays: clover.....											
13. ".....											
14. ".....											
15. Green manure.....											
16. Rotation pasture.....											
17. TOTAL CONSERVING.....											
NEUTRAL:											
18. Woods not pastured.....											
19. Woods pastured.....											
20. Open permanent pasture.....											
21. Rotation pasture.....											
22. Waste land.....											
23. Idle crop land.....											
24. Farmstead.....											
25. TOTAL NEUTRAL.....											
26. TOTAL LAND IN FARM.....											
Crops sold for sale (land, amount, and value)											

Kind	Beginning of year March 1		End of year			Sales		Purchases	Losses No. and value	Family Use	
	No.	Weight Value	No.	Weight Value	No.	Wt. Value	No.			Value	
Horses.....											
Mules.....											
Colts.....											
Cows for milk.....											
Cows for beef.....											
Calves born 1935-36...											
Yearling heifers.....											
Yearling steers.....											
2-year old heifers.....											
2-year steers.....											
All other cattle.....											
Sheep.....											
Lambs born 1935-36....											
Sows and gilts.....											
Pigs born spring 1935..											
Pigs born fall 1935...											
Other hogs.....											
Hens.....											
Chickens raised 1935-36											
Other poultry.....											
TOTAL.....											
Lambs grain fattened..											
Cattle grain fattened.											
Notes on recommended changes in livestock enterprises											

OPERATOR'S LIVESTOCK RECORD

[illegible]

[illegible]

No.	Item	Units and Quantity	Farm Operator	Landlord	No.	Item	Units and Quantity	Farm Operator	Landlord
1.	Seed. (p. 5).....				37.	Shredding Hired.....			
2.					38.	Shelling Hired.....			
3.	Plants.....				39.	Silo Filling Hired..			
4.	Trees.....				40.				
5.	Fertilizer (p. 5)....				41.				
6.					42.	Ginning.....			
7.					43.	Containers.....			
8.	Spray Material.....				44.				
9.					45.				
10.					46.	Repairs-Machinery...			
11.					47.	" -Truck.....			
12.					48.	" -Tractor.....			
13.	Labor - annual.....				49.	Veterinary expense..			
14.	" - month.....				50.				
15.	" - day.....				51.	Breeding fees.....			
16.					52.	Horse shoeing.....			
17.					53.	Marketing expense...			
18.					54.	Storage.....			
19.	Labor - piecework....				55.	Freight.....			
20.	Board, hired labor...				56.	Commission.....			
21.					57.	Advertising.....			
22.	Gas & oil-truck farm.				58.	Binder twine.....			
23.	" " -tractor....				59.	Baling wire.....			
24.	Auto, farm use.....				60.	Feeds. (p. 5).....			
25.					61.				
26.					62.				
27.					63.				
28.	Electricity-Farm Use.				64.	Other Expenses.....			
29.					65.	Taxes.....			
30.	Threshing-hired.....				66.	Insurance.....			
31.					67.	Telephone.....			
32.					68.	Cash Rent.....			
33.	Baling-hired.....				69.	Fence repairs.....			
34.					70.	Building repairs....			
35.					71.				
36.	Baling hired.....					TOTAL.....			

Page 7.

Machinery and Equipment

T = Tenant
L = Landlord

No.	Items	Value at Beginning of Year	Number	No.	Items	Value at Beginning of Year	No.
	Wagons, beds, racks.....				Lime, fert. distri-		
	Buggies, carriages.....				butors.....		
	Stalk cutters.....				Thrashers, hullers, etc		
	Breaking plows, walking.				Corn huskers, silage		
	Breaking plow, sulky or				cutters.....		
	gang.....						
	Middle busters.....				Grain cleaners.....		
	Harrows, spike or spring				Feed grinders.....		
	tooth.....				Sirup & sugar equip..		
	Harrows, disk.....				Sprayers.....		
	Rollers, plankers.....				Potato equipment.....		
	Corn, cotton planter....				Orchard equipment....		
	Grain drills, seeders...				Engines.....		
	Plant setters.....				Tractors.....		
	Plow stocks and sweeps..				Auto trucks.....		
	Cultivators, weeders....				Work harness, plow-		
	Corn binders.....				gears.....		
	Grain binders.....				Driving harness.....		
	Mowers.....				Dipping vat.....		
	Tedders.....				Dairy equipment.....		
	Hay rakes.....						
	Hay loaders, stackers...						
	Hay baler.....				Poultry equipment....		
	Manure spreader.....				Small tools.....		
					TOTAL: Operator		
					TOTAL: Landlord		

Other Sources of Income

	Receipts				Family Use	
	Amount	Price	Operator	Landlord	Amount	Value
an labor.....						
an and horse labor..						
achine work.....						
AA benefit payments						
ent buildings.....						
umber.....						
ool wood.....						
arden.....						
Total.....						

F = Tenant
L = Landlord

Real Estate and Improvements

Items	Value Beginning of year	Value Improve- ments Made During Year	Value Property Sold or Sal- vaged During Year	Value End of Year	Depreciation Charges Pct. Amt. During year	Repair Expenses Normal
Dwellings.....						
Tenant houses.....						
Other buildings.....						
Gin and equipment.....						
Fences.....						
Drains, terraces, irrigation						
Land clearings, etc.....						
Total, Operator.....						
Total, Landlord.....						

	Beginning of year	Bought During Year	Sold During Year	End of Year	Cash to run farm
Value operator's real es- tate.....					Operator
Value landlord's real es- tate.....					Landlord

NOTES

Breed of cows	Number pure bred	No. in family on farm	Under 16 years
Breed of bulls used	Years used this breed	No. boys who are farmers	Other occupations
Breed of sheep	Number pure bred	No. girls who are farmers	Other occupations
Breed of hogs	Number pure bred	Total number persons living on farm	
Working capital	Mo. Int. \$	Highest school attended by operator	
Operator's mortgage	Interest rate, %	Years in this school	
Price paid for farm	Year	Years farm laborer	Other occupations
What will farm rent for?		Years tenant	On this farm
Farm operated by tenants	yrs. By croppers	Years owner	On this farm
Value unpaid family labor	Months	Kind of accounts kept	
Value operator's labor	Months		
Value landlord's labor	Months		
		Grade	
		Investigator	

Form No. _____

State and County Code Number _____
Farm Serial Number _____

SURVEY OF SOIL CONSERVATION PRACTICES - 1936

County _____ Name _____ Address _____

TERRACING:

Acres terraced _____ Year built _____ Field No.* _____ Average slope of land _____ %
 Power used _____ Equipment _____
 Soil type _____ Previously terraced? _____
 Inst. used running lines _____ Spacing _____ Fall _____
 Total length _____ rods. Base width _____ feet.
 Type internal outlets _____ Results _____
 _____ Road outlets? _____
 Approximate total cash cost \$ _____ . Hired labor _____
 hrs. Rate _____ Family or exchange labor _____ hrs.
 Equipment, cash cost \$ _____ Planting on contour? _____
 Time spent annual upkeep _____ hrs. Acreage similar land needing terraces _____
 Effectiveness on erosion _____

Effects on farm operations _____

TERRACING:

Acres terraced _____ Year built _____ Field No.* _____ Average slope of land _____ %
 Power used _____ Equipment _____
 Soil type _____ Previously terraced? _____
 Inst. used running lines _____ Spacing _____ Fall _____
 Total length _____ rods. Base width _____ feet.
 Type internal outlets _____ Results _____
 _____ Road outlets? _____
 Approximate total cash cost \$ _____ . Hired labor _____
 hrs. Rate _____ Family or exchange labor _____ hrs.
 Equipment, cash cost \$ _____ Planting on contour? _____
 Time spent annual upkeep _____ hrs. Acreage similar land needing terraces _____
 Effectiveness on erosion _____

Effects on farm operations _____

CONTOUR FURROWING ON PASTURES:

Acres furrowed _____ Year _____ Field No. _____ Percent of slope _____
 Furrows: Distance between _____ feet; depth _____ inches; width _____ inches
 Sodded? _____; Continuous? _____; If blocked, distance between blocks _____ ft.
 Construction: Equipment used _____
 Power used _____

Labor:

Cash Expenses:

Regular farm _____ hours
 Hired _____ hours
 Relief _____ hours
 Rate of labor per hr. _____

Labor _____
 Equipment _____
 Materials _____

Tractor work _____ hours; Tractor use _____
 Annual man labor for maintenance _____ hours. Other costs \$ _____
 Effectiveness in checking run-off _____
 Percent increase in carrying capacity _____
 Recommendations from your experience _____

CONTOUR TILLAGE:

Acres _____ Soil Type _____ Average slope _____
 Year practice started _____ Operations on which contour tillage is
 practiced _____

Crops for which contour tillage is practiced _____

Special equipment required _____
 Effect upon yield of crops _____ %. Effect upon erosion _____
 Effect upon cost of crop production _____ %
 Rotation: _____

GULLY CONTROL:

Field number _____ Soil type _____ Slope _____ %
 Degree of gullying _____ Extent _____
 Method used in control _____

Effectiveness of control measures _____

Remarks: _____

TRIP-CROPPING:

Soil type _____ Field No. _____ Average slope _____ % Area cov-
 ered _____ acres. Width of strips _____ ft. Rotation _____
 Effects on farm operation _____

Effectiveness on erosion control _____

REFORESTATION:

Acres set _____ Year set _____ Field No. _____ Trees per acre _____
 Soil type _____ Fertility _____ Topography _____

Extent of erosion _____

Species _____

Source of seedlings _____ Cost per 1,000 _____ Age _____

Method of setting _____

Setting crew _____

Hours labor to set 1,000 trees _____ Labor cash costs per 1,000 \$ _____

Other cash costs per 1,000 _____

Present diameter (DBH) _____ inches. Height _____ feet. Expected use _____

_____ Maturity date _____

Area needing reforestation: crop land _____ pasture _____

Areas reforested naturally last ten years _____ Predominant _____

Species _____ Condition of land before natural reforesta-
 on _____

Effectiveness on erosion _____

PASTURE ESTABLISHMENT AND TREATMENT:

1. Establishment: Year _____ Field No. _____ Months of seeding: Grass _____
 Clover _____ Character of ground: Lowland, highland, fertile, average fertility, poor, level, steep, rolling, rock outcrop, old crop land. Soil type _____
 Acres _____; Nurse crop used _____; Yield _____
 Seeding mixture _____
 Rate per acre: _____ Price of seed _____ Inoculation (Total cost) \$ _____
 Fertilizer: Formula _____ Acres _____ Rate _____ Price tons \$ _____
 Lime: Kind _____ Acres _____ Rate _____ Price tons \$ _____
 Preparing land and planting: Man _____ hours; Horse _____ hours;
 Tractor _____ hours. Cash costs: total _____; man labor _____ Tractor _____
 Hay cut _____ Years _____ Average Yield _____ Time cut _____
 Grazing (1st full season of grazing):
 _____ months by _____ head of _____ No. by age groups _____
 _____ months by _____ head of _____ No. by age groups _____
 Years required to reach full capacity _____ Expected productive life of pasture _____
 yrs. Present conditions: Stand _____ Kinds pasture _____
 plants _____ Which predominate? _____
 Kind and extent of weeds _____
 2. Treatment (old stands): Year of original seeding _____ Field No. _____
 Character of ground: Lowland, highland, fertile, average fertility, poor, level, rolling, steep, rock outcrop, old crop land. Soil type _____
 Fertilizer: Formula _____ Acres _____ Rate _____ Price \$ _____
 Distributed in _____ applications at _____ Months interval. _____
 Lime: Kind _____ Acres _____ Rate _____ Price \$ _____
 Manure: Acres _____ Rate _____ Frequency _____
 Reseeding: Mixture _____ Rate per acre _____ Price of seed _____
 How often do you reseed this pasture? _____
 Weed control: _____
 Mechanical treatment: _____
 Grazing: (1935)
 _____ months by _____ head of _____ No. by age groups _____
 _____ months by _____ head of _____ No. by age groups _____
 Present condition: stand _____ Kind of pasture plants _____
 Which predominates _____ Kind and extent of weeds _____
 Acres needing improvement _____
 Remarks _____

Legumes: (clovers, peas, beans)

Do you plan to increase acreage of any of the legumes? (Indicate kind and per cent increase.) _____

Why? _____

Do you plan to decrease legume acreage: (Indicate kind and per cent of increase.) _____

Why? _____

If no legumes are grown, why not? _____

COVER CROPS:

Season of growth _____ Crop _____ Acreage _____ Field No. _____
 Seed per acre _____ lbs. Price per pound _____ Kind of fertilizer _____
 Amount per acre _____ Price per ton _____
 Man labor per acre preparing and seeding _____ hrs. Horse labor _____ hrs.
 Tractor use _____ hrs. Equipment use _____ hrs. Labor cash cost \$ _____
 Tractor cash cost \$ _____ Other cash cost \$ _____ Total cash cost \$ _____
 Grazing: _____ acres Harvested _____ acres. _____ yield
 _____ mos. _____ head of _____ Left on ground: _____ acres
 _____ mos. _____ head of _____ Plowed under green: _____ acres
 _____ mos. _____ head of _____ Date turned under _____
 Effect upon erosion _____
 Effect upon yield of following crop _____
 Remarks: _____

LIME:

Crops applied: Kind _____ Acres _____ Tons per A _____
 Kind _____ Acres _____ Tons per A _____
 Kind _____ Acres _____ Tons per A _____
 Kinds of lime applied _____
 Frequency of application on same land: _____
 Cost per ton at farm \$ _____ for _____, and \$ _____ for _____
 _____ Distance from quarry _____ Location of quarry _____
 _____ Method of transportation from quarry to farm _____

Effect on: (1) Yields _____

(2) Stands _____

(3) Other effects _____

If no lime is applied, do you think it would pay? Why or why not? _____

Conservation Practices: (Summary)

Items	Acres in Use	Acres Needed	Explanation
1 Terracing			
2 Strip cropping			
3 Contour planting			
4 Pasture contour furrowing			
5 Green manure			
6 Chemical fertilization			
7 Lime			
8 Winter cover			
9 Summer cover			
0 Weed control			
1 Fallow			
2 Pasture improvement			
3 Pasture establishment			
4			
5			
6			
7			
8			

[illegible]

Reasons for not following the usual rotation:

Amount of seed per acre: corn
legum

Wheat

Oats

Grass

* Treatment is listed in code as follows:

T - Terracing

SC - Strip cropping

R - Reforestation

CT - Contour tillage

G - Gully control

Field Number to correspond to those of Soil Survey by S. C. C. enumerator.
Include seeding practice (quantity and time)

Include seeding practice (quantity and time)

GL - Ground lime

BL - Búrt lime

N - Nitrogen

K - Potash

P - Phosphorus

of Soil Survey by S. C. C. enumerator.

Fertilizers in hundreds of pounds

Burnt lime

Ground limestone in tons