May 9, 1959

To the Graduate Council:

I am submitting herewith a thesis written by Marvis Doyle Cunningham entitled "An Economic Evaluation of Soil Conservation Systems in the Lick Creek Watershed." I recommend that it be accepted for nine quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

W. O. Henderson
Major Professor

We have read this thesis
and recommend its acceptance:

Frank T Bell

H H Spitze

Accepted for the Council:

Dale Wantling
Dean of the Graduate School

AN ECONOMIC EVALUATION OF SOIL CONSERVATION SYSTEMS IN THE LICK CREEK WATERSHED

A THESIS

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

---

by

Marvis Doyle Cunningham

June 1959

2 R
33

ACKNOWLEDGEMENT

The writer sincerely appreciates the help of his teachers and colleagues for assistance and inspiration rendered in producing this manuscript.

Special appreciation is expressed to Mr. H. A. Henderson, Dr. Frank F. Bell, Dr. R. G. F. Spitze and Dr. Joe Martin. Additional credit is due Mr. Henderson for his helpful encouragement and assistance in the organization of the study.

Personnel of the Soil Conservation Service, U.S.D.A., were most helpful and cooperative. The writer is very appreciative of this assistance and thankful to Clarence Richards and W. P. Corbett for their part in preparing the conservation plans, and to W. R. Hurst, Jr. and H. N. Estes for providing advice and materials.

Assisting in the preparation of the manuscript were Mrs. Anita Thress, Mrs. Gertrude Nance, Mrs. Elizabeth Elson and Miss Shirley Phillips.

Appreciation is also expressed to the University of Tennessee Agricultural Departments of Agronomy, Dairying, Agricultural Economics and Rural Sociology, and to the Experiment Station.

449661

TABLE OF CONTENTS

CHAPTER		PAGE
I.	INTRODUCTION	1
	The Small Watershed Protection Act	1
	Several local programs proposed and rejected	2
	Three groups of farmers in watersheds	3
	Objectives of the study	4
	The study area	6
	Farm characteristics	10
	General procedure for the study	11
II.	PRESENT AND ALTERNATIVE CONSERVATION SYSTEMS	14
	Present farm situation	14
	Procedure used for analyzing the conservation systems	20
	Land use planned for full-time farmer	24
	Conservation systems for full-time farmer	26
	Economic implications of conservation systems	27
	Returns for full-time farmer	29
	Land use planned for part-time farmer	32
	Conservation systems for part-time farmer	33
	Returns for part-time farmer	35
III.	CONCLUSIONS	39
BIBLIOGRAPHY		43
APPENDICES		44
	Appendix A	45
	Appendix B	78

LIST OF TABLES

TABLE		PAGE
I.	Costs and Returns for Present Farming Program for a Representative 56-Acre Farm, Greene County, Tennessee	21
II.	Cropping and Livestock Systems for Selected Conservation Systems for a Representative 56-Acre Greene County Farm, Full-Time Farmer	28
III.	Financial Summary of Conservation Systems for a 56-Acre Greene County Farm, Projected Price Level, Full-Time Farmer	31
IV.	Cropping and Livestock, Selected Conservation Systems for a Representative 56-Acre Greene County Farm, Part-Time Farmer	36
V.	Financial Summary of Conservation Systems for a 56-Acre Greene County Farm, Projected Price Level, Part-Time Farmer	38
VI.	Expected Prices to be Paid by Farmers in Tennessee, Projected Price Level	45
VII.	Expected Prices to be Received by Farmers in Tennessee, Projected Price Level	47
VIII.	Estimated Cash Expenses Per Acre of Selected Farm Crops, Projected Price Level	48
IX.	Estimated Cash Expenses Per Animal of Selected Farm Enterprises, Projected Price Level	51
X.	Estimated Needed Grain and Forage	52

TABLE PAGE

XI. Estimated Costs and Returns of Full-Time Farmer With Low Level of Conservation 53

XII. Estimated Needed and Available Grain and Forage for Low Level of Conservation, Full-Time Farmer 56

XIII. Estimated Costs and Returns of Full-Time Farmer with Medium Level of Conservation 57

XIV. Estimated Needed and Available Grain and Forage for Medium Level of Conservation, Full-Time Farmer 60

XV. Estimated Costs and Returns of Full-Time Farmer with High Level of Conservation 61

XVI. Estimated Needed and Available Grain and Forage for High Level of Conservation, Full-Time Farmer 64

XVII. Estimated Costs and Returns of Part-Time Farmer with Low Level of Conservation 65

XVIII. Estimated Needed and Available Grain and Forage for Low Level of Conservation, Part-Time Farmer 67

XIX. Estimated Costs and Returns of Part-Time Farmer with Medium Level of Conservation 68

XX. Estimated Needed and Available Grain and Forage for Medium Level of Conservation, Part-Time Farmer 71

XXI. Estimated Costs and Returns of Part-Time Farmer with High Level of Conservation 72

XXII. Estimated Needed and Available Grain and Forage for High Level of Conservation, Part-Time Farmer 75

XXIII. Estimated Labor Requirements for Selected Conservation Systems 76

LIST OF FIGURES

FIGURE PAGE

1. Soil Association Map of Lick Creek Watershed District, Greene and Washington Counties, Tennessee 9
2. Soil Map of a 56-Acre Farm, Upper Lick Creek Watershed, Tennessee 16
3. Present Farm Layout and Cropping Plan of a 56-Acre Farm, Upper Lick Creek Watershed, Tennessee, 1957 19
4. Field Layout for Conservation Systems 23

CHAPTER I

INTRODUCTION

The Small Watershed Protection Act[1]

The Watershed Protection and Flood Prevention Act Public Law 566 (passed in 1954 and amended in 1956) is an act:

"To authorize the Secretary of Agriculture to cooperate with State and local agencies in the planning and carrying out of works of improvement for soil conservation, and for other purposes."

In relation to the need for a watershed program this act states:

> Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that erosion, floodwater, and sediment damages in the watersheds of the rivers and streams of the United States, causing loss of life and damage to property, constitute a menace to the national welfare; and that it is the sense of Congress that the Federal Government should cooperate with States and their political subdivisions, soil or water conservation districts, flood prevention or control districts and other local public agencies for the purpose of preventing such damages and of furthering the conservation, development, utilization, and disposal of water and thereby of preserving and protecting the Nation's land and water resources.

The need for a small watershed program appears to many to be very great. There is a need for water management practices that are beyond the capabilities of individual farmers. These practices may be needed to complement and make more effective the soil and water conservation practices on farms that serve or protect the watershed community. These practices fit in between the programs for soil and water conservation on farms, and large

---

[1] Watershed Protection and Flood Prevention Act, Public Law 566, 83d Congress; 68 Stat. 666. As amended by the Act of August 7, 1956. Public Law 1018, 84th Congress, 70 Stat. 1088.

water-control structures in major river developments.[2]

Several Local Programs Proposed and Rejected

Recently several local organizations in Tennessee have filed petitions to form a watershed district as authorized by the Watershed Protection and Flood Prevention Act, U. S. Public Law 566 (passed in 1954 and amended in 1956) and the Tennessee Watershed District Act, Public Chapter No. 112 (passed in 1955). However, in some cases local problems have arisen which have prevented the development of a small watershed project. In some of these cases people in the watersheds have prevented a watershed project from being initiated. In other cases the project has been initiated but for various reasons the people have lost interest in pursuing it to completion. Several factors may account for this loss of interest which may include: (1) conflict of socio-economic interests among landowners within individual watersheds; (2) general lack of concern for erosion control, water conservation, and flood prevention; and (3) limitations of the cost-sharing arrangements that have been proposed. Personnel associated with the watersheds have found that much of the opposition comes from the people in the upper part of the watershed.[3]

---

[2]H. H. Steele, "Economics of Small Watershed Development." Production Economics Research Branch, A.R.S., U.S.D.A. (Address to Committee on Water Resources Development, Pullman, Washington; June 27-29, 1955).

[3]Joseph E. Winsett, "Problems of Small Watershed Districts in Tennessee Organized Under Public Law 566." (Unpublished Master's Thesis, University of Tennessee, 1958).

Three Groups of Farmers in Watersheds

In a small watershed there are at least three groups of farmers that are affected in different ways. One group is below the structure where the land will be protected from flooding. The second group is located where at least part of the farms will be flooded by the retention structure and the third group is located in the uppermost part of the watershed, which will not be affected directly by the detention structures. In a study recently made of the small watershed program it was found that the locations of the retention dams formed a fairly distinct dividing line between the farmers that were opposed to and the ones that favored the watershed district. The study further indicated the need for a more appealing program to landowners in the upper reaches of the watersheds. The farmers below the proposed dam sites were found to be in favor of the watershed program because their land would be protected from flooding. The second group, or the ones that would have part of their land flooded, were opposed because much of their productive land would then be under water. The third group, which would not be particularly benefited by the watershed program, did not seem to have any strong opposition to the program until they were influenced by the landowners immediately on the upper side of the proposed dam sites. It seemed these farmers in the upper part of the watershed could not see any direct benefits from the program, but were afraid their neighbors near the dams would not receive just compensation for damages that might occur to them. As a result, these two groups were able to defeat the watershed district in two watersheds.[4]

---

[4] Ibid., p. 88.

The problem is that in order for a small watershed project to be authorized for works of improvement, owners of at least 50 percent of the land in the upper part of the watershed must meet certain conditions. They must agree to carry out soil conservation measures and proper farm plans even though they may (or may not) be directly benefited by the watershed program. The conservation measures and plans are agreed upon by the farmer with suggestions from personnel of the Soil Conservation Service.

Farmers may receive technical assistance from the Extension Service and the Soil Conservation Service, financial assistance from the Agricultural Conservation Program, and credit from the Farmers Home Administration to carry out conservation practices even without a watershed project. Yet with all this available assistance the majority of farmers do not carry out many recommended soil conservation measures. One reason for this may be that the farmer believes that these practices will not be economical for him to apply. This study is an attempt to determine to what extent the conservation practices suggested for the upper watershed farmers benefit or cost the farmers who carry out those practices.

Farmers who live outside an organized watershed district have the same problem as those in the upper watershed, with the exception that they have no moral obligation to carry out the conservation measures as suggested for upper watershed farmers. The results of this study should be of interest to farm operators and farm leaders on similar farms outside an organized watershed district.

Objectives of the Study

Many conservation systems are known to control erosion, yet they

differ as to the cost of application and their effect on profits to farmers. The overall purpose of this study was to determine the costs and returns of various levels of conservation for a typical farm in the upper part of Lick Creek Watershed.

For the purpose of this study conservation may be defined as maintaining soil productivity over time.

The specific objectives of this study are:

1. To determine costs and returns of cropping systems at different levels of conservation.
2. To determine the additional resources necessary to develop conservation systems of farming.
3. To determine the effects of conservation systems upon different combinations of enterprises to see which are most profitable.

Many farmers may not believe that any conservation system will be economical for them to apply. In case it can be determined that these systems will conserve the soil and at the same time increase the income, farmers should accept these practices more readily.

With an acceleration in the adoption of practices, the watershed program will make more and faster progress. This not only will apply to the Lick Creek Watershed, but should encourage participation in other watershed projects.

The information should also be useful to any conservation program in this part of the country. There is always the problem in a conservation program of getting the farmers to apply the needed systems; if the farmers realize that the practices are both profitable and conserving they should

apply the practices more readily.

The Study Area

Most of the data in this section was obtained from a soil survey report of Greene County, Tennessee.[5]

Location

The study area is the Lick Creek Watershed. The watershed is located primarily in the northwest part of Greene County, Tennessee, with a small part in the northwestern part of Washington County, Tennessee. Lick Creek is a tributary of the Nolichucky River. The watershed has an area of approximately 170,000 acres.

Greene County is in the northeastern part of Tennessee. The county seat, Greeneville, is 70 miles northeast of Knoxville, 55 miles southeast of Bristol, and 63 miles northwest of Asheville, North Carolina. Villages in the watershed include Baileyton, Mohawk, Ottway, Mt. Carmel, Cross Anchor, and Mosheim.

Climate

In the valley part of the county the summers are fairly long and warm while the winters are fairly short and cool. The mean temperature for the year is approximately 56 degrees and has an annual range from 20 degrees to 100 degrees. The frost-free period is usually between April 15 and October 25.

---

[5] Soil Survey, Greene County, Tennessee; prepared by Soil Conservation Service, U.S.D.A., in cooperation with Tennessee Agricultural Experiment Station and Tennessee Valley Authority (August, 1958), pp. 1-3.

The mean annual rainfall is approximately 45 inches. This varies in certain years from 29 to 53 inches. The amounts by season average about 11.5 inches during the winter months, 12 inches during the spring months, 13 inches during the summer and 7.5 inches during the fall months. Late spring and early summer rains are the most intense and consequently cause the most flooding and damage.

Physiography and Topography

The watershed starts at the north corner of Washington County and runs to the west corner of Greene County, where Lick Creek empties into the Nolichucky River. The area lies within the Ridge and Valley province, which is known as the Great Valley of East Tennessee. It is composed of parallel ridges and valleys which are in a southwest-northeast direction. The watershed is about 35 miles long and its width varies from six to eight miles except in the middle where it is about 12 miles wide. The topography ranges from level to gently sloping along the streams and colluvial areas to very steep and rugged in the uplands. The elevation ranges from about 1000 feet in the valleys to over 3000 feet in the high uplands.

Geology and Soils

The parallel valleys and ridges were formed during a long period of geologic erosion following folding and faulting of the underlying rocks. The exposed rocks are chiefly limestone and shales. Limestone and shale are interbedded in places, other places have interbedded sandstone and shale, and still others have interbedded sandstone, shale and limestone.

The soils of the watershed vary with the type of parent material. Dewey and Dunmore soils occur in areas underlain by limestone; Groseclose

by shaly limestone. Dandridge and Litz soils are found in the areas of calcareous to acid shales. Staser, Hamblen, Prader and Whitesburg soils are common in the bottomlands and colluvial areas. See Figure 1 for a map of the watershed with the soil association areas. Appendix B gives a description of these soil association areas.

Transportation, Markets and Industries

Greene County is well supplied with highways, especially the part in the Great Valley. There is adequate bus and truck transportation over the highways. The Southern Railway provides transportation from Mohawk, Mosheim, and Greeneville to Washington, D. C. to the northeast through Johnson City and to Knoxville and other points to the southwest. One of the proposed interstate highways is to be built through the area.

The county has adequate markets for agricultural products, especially tobacco and processing milk. The majority of the milk produced in the county is processed at Greeneville, the county seat, by plants of two companies that sell on a nationwide market. In addition to the milk plants, other local industry includes a radio and television factory, a fertilizer plant, a chair factory, and a hosiery mill.

Types of Farming

Greene County is one of the leading agricultural counties in Tennessee. It is the largest county in the production of burley tobacco and one of the three largest in the production of dairy products. The chief source of cash farm income from crops is tobacco; other principal crops include corn, hay and pasture.

The farms classified in order of number are: tobacco, dairy, general,

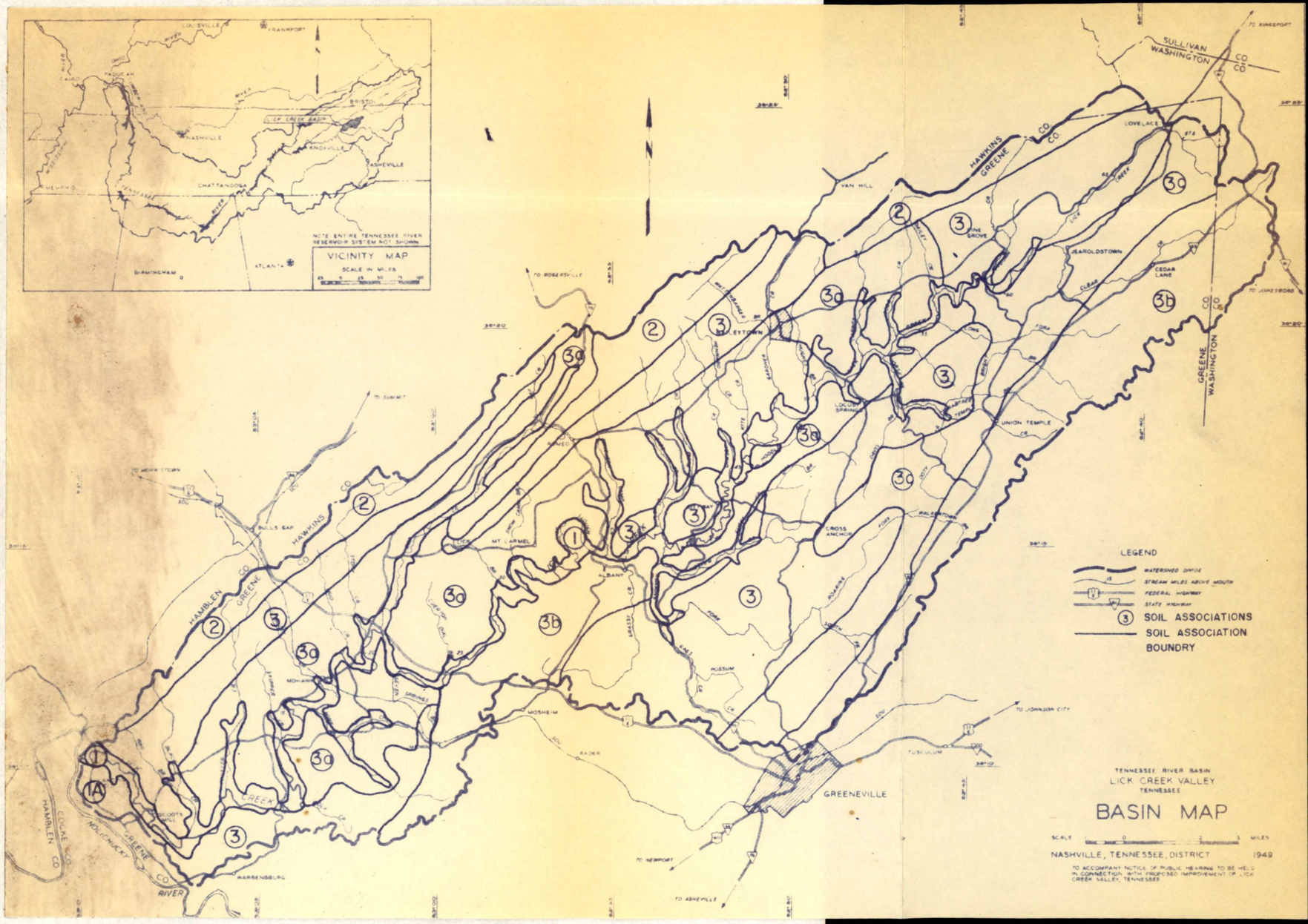


Figure 1. Soil association map of Lick Creek Watershed District, Greene and Washington Counties, Tennessee.

and miscellaneous. The farms that produce milk for sale keep herds from one to seventy head per farm with an average of about 2.3 head per farm. The milk that is sold includes both Grade "A" and ungraded, but is primarily ungraded. Beef cattle and hogs are also important as a source of income and create a market for locally produced grains.

Farm Characteristics[6]

Ownership and Farm Workers

The watershed includes approximately 170,000 acres which are owned by about 3,000 farmers. Approximately 85 percent of the land is operated by the owners, with the remaining land operated primarily by share tenants. Approximately 60 percent of the farm families have at least one member who receives income for either full- or part-time, off-farm employment.

Land Use and Cover

The Soil Conservation Service reports the following uses of the land in the watershed:

> At present there are about 50,973 acres of cropland within the watershed. The area in grassland includes 62,603 acres; and 42,463 acres are in woodland. There are 4,923 acres of idle land and 7,430 acres of miscellaneous land.

Poor cover conditions exist on 40 percent of the cropland and on 50 percent of the pasture lands. The cover conditions on the remaining cropland and pasture land are fair to good. The water infiltration rates for the forest are 25 percent, very poor; 50 percent, poor; 15 percent, fair; 6 per-

---

[6]Watershed Work Plan, Lick Creek Watershed. Greene and Washington Counties, Tennessee. Prepared by Lick Creek Watershed District with assistance by Soil Conservation Service, U.S.D.A. (September, 1958).

cent, good; and 3 percent, very good. The idle land in this watershed generally has poor cover conditions.

General Procedure for the Study

The study was designed to obtain insight into the costs and returns of the application of different soil conservation systems at three levels of conservation. This was for a farm in the upper part of Lick Creek Watershed.

The first step in the procedure was to locate a farm that was representative of the farms found in this area. The data used to determine this representative farm was obtained from a survey on the "Resources and Income of Rural Families in Eastern Tennessee."

The survey was conducted by the Department of Agricultural Economics and Rural Sociology, Tennessee Agricultural Experiment Station, in cooperation with the Agricultural Research Service, U.S.D.A. The data were collected by interviewing rural families in Grainger, Greene, Hamblen, Hawkins, Jefferson, Sullivan and Washington counties in December, 1957, and January, 1958. The interviewed families were in randomly selected blocks or segments. The number of families interviewed compared to the total number of families was in the ratio of 1 : 180. A total of 506 families were interviewed.

It was felt there was not enough interviews taken in Lick Creek Watershed to find a representative farm as there were only twenty-three taken in this location. To increase the size of the sample all farms included in the overall survey that had the same soil associations as those farms within the watershed were used as a background to select a representative farm for

the upper watershed. It was thought the characteristics of the farms outside the watershed would be similar to the farms within the watershed if the soils were in a similar soil association. There was a total of 114 farms that had a similar soil association as those within the watershed.

The information for these farms was then collected and studied as to size, amounts and percentage of cultivated land, pasture land, woodland, and soils, and the types of farming. The next procedure was then to select a farm that would be most representative of all these conditions.

The survey information showed that many people had off-farm employment. They worked on other farms and in the nearby towns of Greeneville, Morristown, and Kingsport. Approximately 60 percent of the farm families have members that have either full- or part-time off-farm employment. Therefore, in order to make the study more meaningful it was decided to plan conservation systems for part-time as well as full-time farmers.

When the representative farm had been located, conservation systems were planned for low, medium and high levels of conservation by personnel of the Soil Conservation Service, U. S. Department of Agriculture.

As the plans were being made, different enterprises and combination of enterprises were used to fit the cropping systems that had been planned. A budget analysis was then made to determine the costs and returns of these different levels of conservation. An analysis of the budgets was made to find if the net family earnings were related to the different levels of conservation.

In making the budget analysis it became necessary to obtain input output information from published and unpublished material of the Tennessee Agricultural Experiment Station. The pasture and crop yields estimate was

obtained from five personnel of the Agronomy Department of the University of Tennessee; likewise the estimated production for dairy cows was obtained from five personnel of the Dairy Department. All estimates were made independently. These independent estimates were then averaged and the rounded average used to arrive at the input output ratios used in the budgets.

CHAPTER II

PRESENT AND ALTERNATIVE CONSERVATION SYSTEMS

The farm which was found to be representative of a large proportion of the farms in the upper part of Lick Creek Watershed is located in the western part of Greene County.

Present Farm Situation

Financial Position

Ownership of the farm selected for study was acquired in 1942 by a direct purchase. In 1958 there was no mortgage on the farm and the farmer was almost free of debt, as typical of farmers in the area.

Topography

The topography of the land is rolling with a slope range of 2 to 30 percent. A small stream runs through the farm and provides a good drainage system for the slopes to each side. This stream presents a problem in that it overflows in times of heavy rainfall. The fields are rather small and not suited to strip cropping, terraces or long contour rows, because of short steep slopes.

Soils

The soils are of shale origin and include Hamblen, Leadvale, Whitesburg, Dandridge and Needmore. Hamblen occurs in the bottom lands adjacent to the streams and is suitable for the growing of corn, hay and permanent pasture. The yields of corn and pasture are high. Leadvale consists of local alluvium and is found on the smoother parts of gentle foot slopes,

below areas of the associated Dandridge soils. Its suitability for crops is limited by being imperfectly drained. Crops that are commonly grown on it include corn, tobacco, small grain, hay and pasture. Alfalfa stands are difficult to establish and maintain on this soil.

Whitesburg is an imperfectly drained soil that consists of young local alluvium derived chiefly from calcareous shale. It occurs in narrow strips along small streams. The crops that are suited to it include corn, soybeans, pasture and hay, other than alfalfa. Needmore has calcareous shale directly under the soil in many places; in other places it is leached to depths of three to four feet. Depth to the shale bedrock ranges from one to three feet. Production of crops is limited by its low water supplying capacity. It is well suited to small grains and to legumes and grasses but is easily eroded and must be kept in sod if extensive erosion is to be prevented.

The Dandridge has a depth to the shale bedrock ranging from 6 inches to 2 1/2 feet, depending upon the amount of erosion. The soil is medium acid where it is deep and slightly alkaline where it is shallow to the bedrock. This soil is not suited very well for cultivation but will provide good grazing part of the year if the pastures are well fertilized. The yields of pasture in summer are limited by the very low water supplying capacity. See Figure 2 for a soil map with mapping units and land classes.

Land areas that have the same soil mapping unit are small and have an irregular shape. This presents a difficult problem in laying out fields of efficient size and uniform soil conditions. As a result the fields are not uniform in size which causes considerable fluctuation in crop yields as fields are rotated.

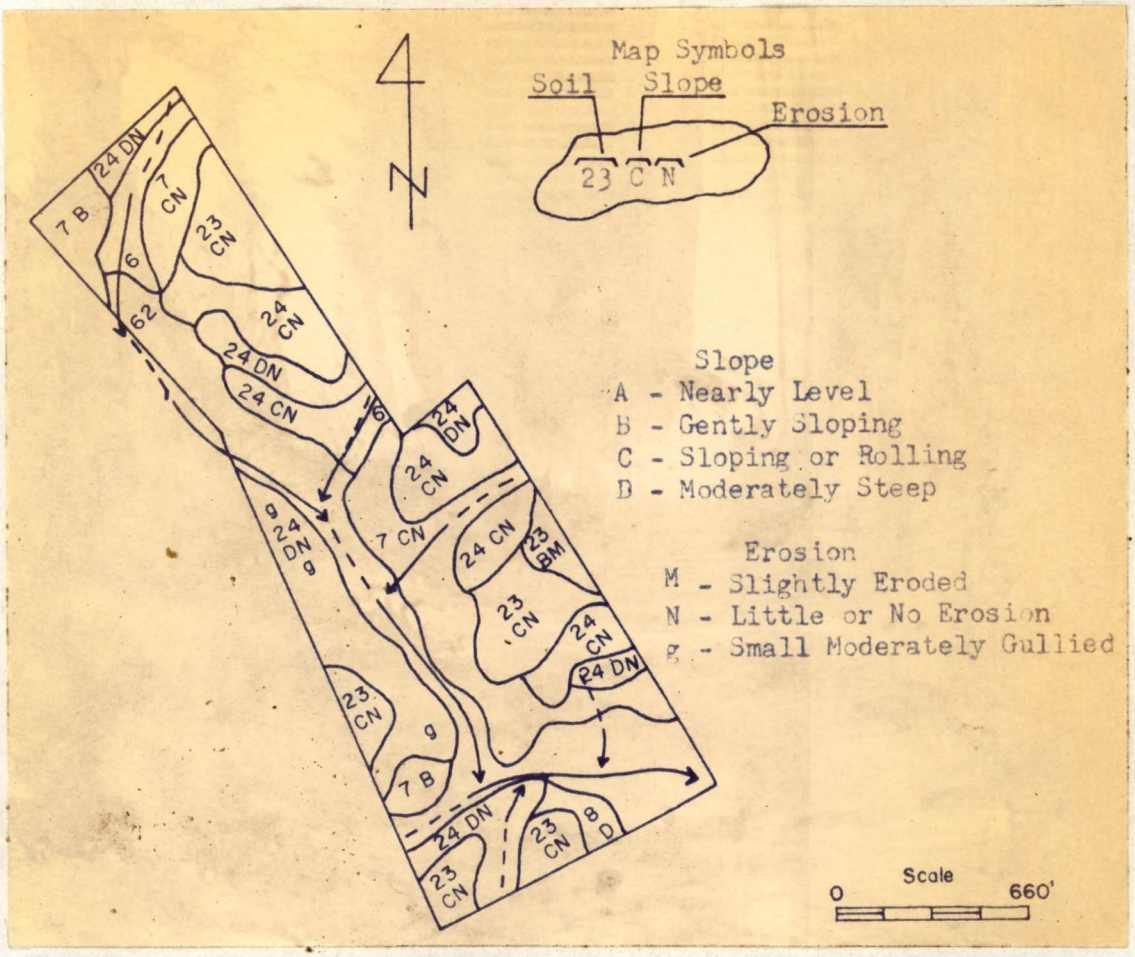


Figure 2. Soil map of a 56-acre farm, upper Lick Creek Watershed, Tennessee.

Soil Symbol	Soils	Soil Name
	Class II	
6		Whitesburg silt loam
62		Hamblen silt loam
23 BM		Needmore silt loam - undulating phase
	Class III	
24 CN		Dandridge shaly silt loam - eroded rolling phase
23 CN		Needmore silt clay loam - eroded rolling phase
7 CN		Leadvale silt loam - eroded rolling phase
	Class IV	
24 DN		Dandridge shaly silt loam - eroded hilly phase
	Class VII	
8 D		Gullied land - shale material

The farm has a total of 56 acres of land, of which approximately 24 acres are on the very gentle slopes and bottom land, 26 acres on the rolling land and 6 acres on steep land. The size of the farm, kinds, amounts and combinations of soils are typical of other farms in the upper part of the watershed. Approximately 50 percent of the farms in the area have between 40 and 139 acres.

Labor Force

The labor force for this farm consisted of the operator, age 47, his wife 47, their daughter 15 and son 17. In 1958 the operator and son were on the farm approximately 100 days each. The son spent the remainder of the time working part time on other farms and at nonfarm jobs. The operator worked 250 days baling hay on other farms and driving a truck for custom hauling.

One-fourth of the farm operators in the area are between 45 and 55 years of age. Nearly half of the households have four or more members, but only one-fifth have as many as four who are fourteen years of age or older.

Present Farm Organization

The farm operator did not express much interest in the farm operation. The present farming operation appeared to be at a very low level from both profit and conservation. The only land cultivated consisted of a garden, 16 acre of tobacco and 1.4 acres of sorghum which was used for livestock feed. The modal group of tobacco allotments in the area is .60 to .69 acres on about one-fifth of all farms in the county. The tobacco and sorghum were rented out. The remaining land was used as follows: forty-one acres for

unimproved pasture, consisting of lespedeza, wild grasses and weeds; seven acres for woodland which were grazed and received no woodland management; five acres were idle; and one acre was used as farmstead. See Figure 3 for a map of the farm with the fields and their present use. The tobacco, when grown, was continued year after year on the same tract of land with no cover crop being used. Livestock had access to the pasture at all times.

Soil tests indicate that the land is low in phosphorus and potash and needs lime. The tobacco received about 800 pounds of 3-9-6 fertilizer per acre per year, with an annual application of manure of about 5 tons per acre. The sorghum was fertilized with about 100 pounds of 3-9-6 per acre. The yield for the tobacco was about 1200 pounds of leaf tobacco per acre, the sorghum about 2 tons per acre and the pasture yields were very low as 41 acres carried only 3 animal units. Based on soil capabilities, the productivity of this farm was very low compared to its potential production.

Facilities

The building facilities, other than the farmhouse, consist of a tobacco-livestock barn, a combination corn crib and machine shed, and poultry house.

The water supply includes a well and a small stream that has at least standing water all year. The livestock on hand January 1, 1958, consisted of three dairy cows and fifty chickens. The equipment included a two row tractor, disk harrow, two row cultivator, hay baler and 1 1/2 ton truck. The inventory of investments showed $10,000 for the land, buildings and fences, $225 for livestock and $2,775 for machinery or a total of $13,000. One-fourth of all households in the area (both farm and nonfarm)

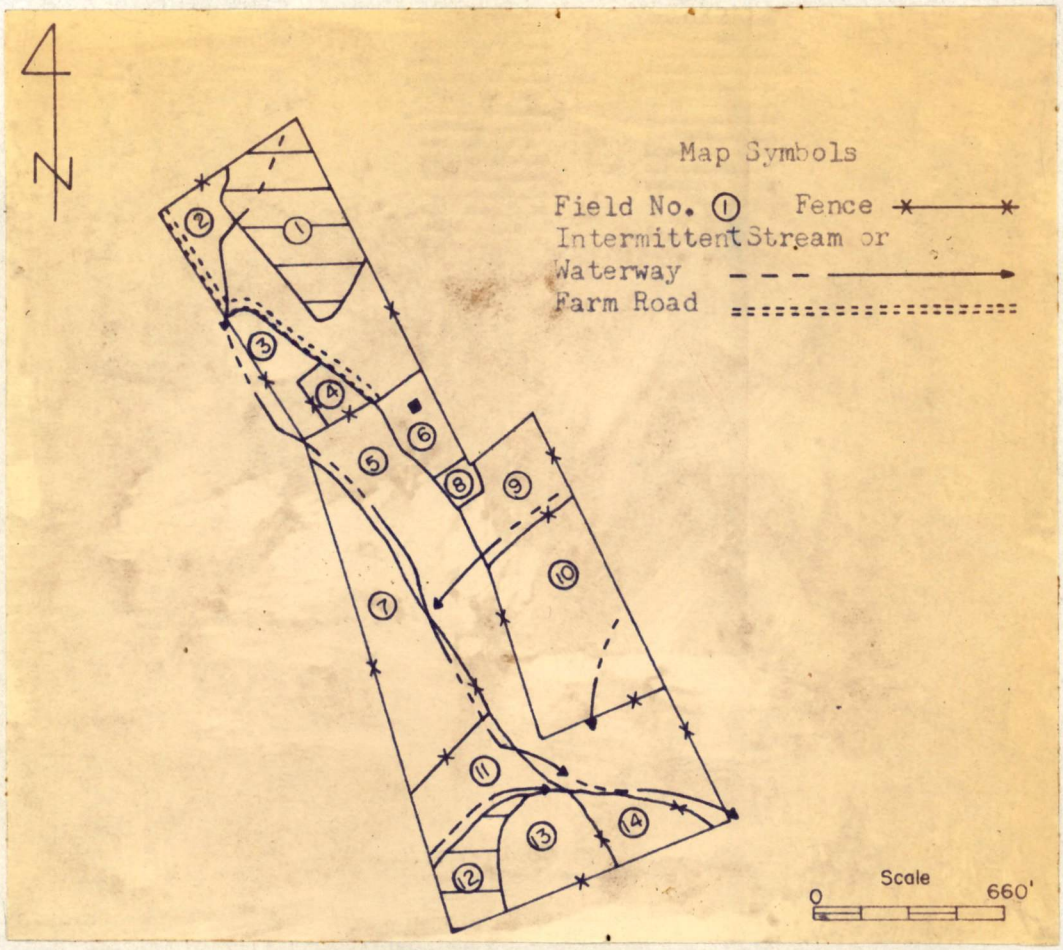


Figure 3. Present farm layout and cropping plan of a 56-acre farm, upper Lick Creek Watershed, Tennessee, 1957.

Field Number	Size in Acres	Land Use
1	5	Woodland
2	5	Idle
3	1.4	Sorghum Cane
4	.6	Tobacco
5	12	Unimproved Pasture
6	1	Farmstead
7	6	Unimproved Pasture
8	1	Unimproved Pasture
9	4	Unimproved Pasture
10	10	Unimproved Pasture
11	2	Unimproved Pasture
12	2	Grazed Woods
13	4	Unimproved Pasture
14	2	Unimproved Pasture
Total	56 Acres	

had a farm investment of $12,000 or more.

Costs and Returns

The total receipts for the farm in 1957 was $1,127, of which $624 consisted of perquisites. The total expenses amounted to $920.25, which left $206.75 as the net earnings for the farm. In addition the receipts for off-farm work amounted to $3,000.00; there was an expense of $616.25 connected with it, leaving a net off-farm income of $2,383.75. The total net receipts for the farm and off-farm work amounted to a total of $2,590.50. A detailed account of the costs and returns is given in Table I.

In most characteristics observed, this farm operator and his resources were typical of those found in the area.

Procedure Used For Analyzing the Conservation Systems

For the plans that follow, the land area and labor force were assumed fixed, the amount of credit was not limited as long as it was profitable. The farm enterprises and combination of enterprises were used that would best conform to the land use, labor and capital in a way that would produce the most net income. The maximum tobacco acreage is fixed by allotment, the number of chickens was fixed at present levels and the hogs would be used only for home use. A farm map with field arrangements is shown in Figure 4.

TABLE I

COSTS AND RETURNS FOR PRESENT FARMING PROGRAM FOR A REPRESENTATIVE 56-ACRE FARM, GREENE COUNTY, TENNESSEE

A. Receipts Item	Amount	Unit	Rate	Value
1. Cash receipts				
Tobacco	234	lb.	$ .60	$140.00
Dairy calves	3	each	75.00	225.00
Fryers	25	each	.60	15.00
Eggs	308	doz.	.40	123.00
Total farm cash receipts				$503.00
2. Perquisites				
Dwelling				$240.00
Milk	50	cwt.	$ 3.40	170.00
Butter	50	lb.	.50	25.00
Hogs	6	cwt.	18.00	108.00
Eggs	200	doz.	.40	80.00
Poultry	15	each	.60	9.00
Garden				100.00
Total perquisites				$624.00
Total farm earnings				1,127.00
Net farm earnings				206.75
3. Off farm custom work				
Hay baling				$ 250.00
Hauling (truck)				2,750.00
Total off farm receipts				$3,000.00
Net off farm income				2,383.00
Total net earnings				2,590.50

TABLE I (continued)

COSTS AND RETURNS FOR PRESENT FARMING PROGRAM FOR A REPRESENTATIVE 56-ACRE FARM, GREENE COUNTY, TENNESSEE

B. Expenses	Total Cost
1. Direct cash crop expenses	$ .00
2. Direct cash costs for livestock	
Feed	100.00
Breeding fees	5.00
Total cash costs for livestock	$105.00
3. Other cash costs	
Marketing tobacco	$ 7.00
Total other cash costs	$ 7.00
Total cash costs	$112.00
4. Farm custom work cash costs[a]	
Gasoline	$200.00
5. Fixed costs	
Equipment depreciation and repairs ($2,775 @ 10%)[a]	$ 277.50
Building depreciation and repairs ($4,000 @ 3%)	120.00
Fence depreciation and repairs ($500 @ 7%)	35.00
Taxes	30.00
Interest on investment	
Land, buildings, fences ($10,000 @ 5%)	500.00
Equipment ($2,775 @ 5%)[a]	138.75
Livestock ($225 @ 5%)	11.25
Total fixed costs	$1,112.50
Total all costs	$1,536.50
Total off farm costs	$616.25
Total farm expenses	$920.25

[a]Used for custom work on other farms

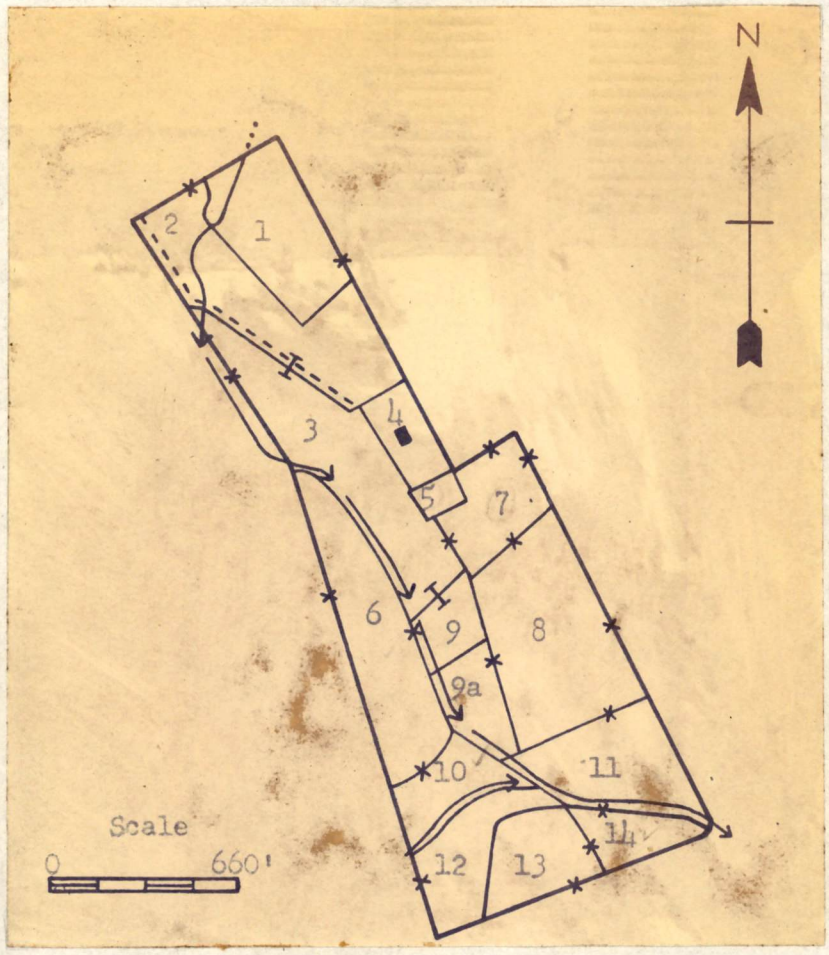


Figure 4. Field layout for conservation systems.

Field Number	Size in Acres	Field Number	Size in Acres
1	5	9	1.5
2	5	9a	1.5
3	9	10	2
4	2	11	3
5	1	12	2
6	6	13	2
7	4	14	2
8	10	Total	56

Land Use Planned For Full Time Farmer

Low Level of Conservation

Cultivated land. Field 9a of 1.5 acres will be used each year for tobacco and garden for a period of 10 years, after which time it will be established in sod.

Fields 10, 11 and 14 of 6 acres will be used each year for corn production.

Fields 2, 3, and 8 of 24 acres will be farmed in a 3 year rotation consisting of corn, wheat and 2 years of lespedeza for hay.

Pasture. Fields 5, 6, 7 and 9 of 12.5 acres will be established and maintained in permanent pasture consisting of fescue and white clover. After a period of 10 years field 9 will be used for tobacco.

Field 13 of 3 acres will remain in unimproved pasture.

Woodland. Fields 1 and 12 of 7 acres will remain in woodland.

Medium Level of Conservation

Cultivated land. Fields 9 and 9a of 3 acres will be farmed in a 4 year rotation of tobacco and sod-crop. One field will be established in fescue and Kenland red clover. The other field will be used for tobacco and garden, followed by a cover crop each fall of vetch and oats. Then after a four year period, the uses of the fields will be reversed.

Fields 10, 11 and 14 of 7 acres will be used each year for corn followed each fall by a cover crop of vetch and oats.

Pasture and hay land. Three acres of field 2 will be established and maintained in Timothy and Kenland red clover. This will be used for hay.

The upper half of field 2, plus fields 5 and 7, making a total of 8 acres, will be established and maintained in alfalfa and orchard grass.

Fields 3, 6, 12 and 13 of 19 acres will be established and maintained in fescue and white clover. As the white clover stand begins to leave, fields 6, 12 and 13 will be overseeded with Kobe lespedeza.

Field 8 of 10 acres will be established and maintained in orchardgrass and Ladino clover.

One acre of the woodland of field 1 and all of field 12 will be clear cut; field 12 will be used for pasture and the part of field 1 for meadow.

Woodland. Field 1 of 4 acres will remain in woodland and will receive protection.

Mechanical measures. A drainage ditch of 200 feet will be constructed and maintained between fields 9 and 6, 9 and 10, and 11 and 14.

High Level of Conservation

Cultivated land. This is the same as the medium level of conservation.

Pasture and hayland. Field 1 of 5 acres will be cleared of trees and established in permanent pasture. The conservationist planned this because it was thought the woods formed a barrier to the line of view from the house and also the pasture would be as conserving as the woodland.

Fields 1-2-3-5-6-7-8-10-11-13-14 of 49 acres will be established and maintained in permanent pasture consisting of fescue and Ladino clover.

Woodland. Field 12 of 2 acres will be clear cut and reset to pine seedlings.

Mechanical measures. An open drainage ditch of 500 feet will be constructed and maintained between fields 3 and 6, 9 and 6, 9 and 10, and 11 and 14.

A farm pond will be constructed and maintained in field 7.

Field 4 of two acres is used by all systems for the homestead.

Conservation Systems for Full-Time Farmer

Low Level of Conservation

The full time farmer with the low level of conservation will have a relatively intensified system of farming, as might be expected. In this system the land use will consist of 14 acres of corn for grain, 8 acres of wheat for grain, 12.5 acres of permanent and 3 acres of unimproved pasture, 16 acres of lespedeza for hay, 7 acres of woodland, .9 acre for garden, and .6 for tobacco.

The livestock will include 5 dairy cows, 1 heifer over a year old, 1 heifer under a year old, 50 chickens and 2 hogs for home use.

Medium Level of Conservation

The row crops for the full time farmer with the medium level of conservation will consist of 7 acres of corn for grain, .9 acres for garden, and .6 acres of burley tobacco. All this cultivated land will be followed each fall by a winter cover crop of vetch and oats. As for hay and pasture there will be 4.5 acres of permanent meadow; 1.5 acres will be rotated each four years with the garden and tobacco land. In addition to the meadow for hay there will be 8 acres of alfalfa and orchardgrass. There will be 29 acres of permanent pasture. The woodland will consist of 4 acres which

will receive improved protection and management; another 3 acres will be cleared for pasture and meadow. The mechanical measures to be installed will consist only of 200 feet of channel improvement along the stream.

The livestock system will include 10 dairy cows, two heifers under a year old; other parts of the livestock system will be the same as for the low level system.

High Level of Conservation

At the high level of conservation the system is primarily grassland. There will be only 1.5 acres of permanent meadow, but there will be 49 acres of permanent pasture which will be used for hay. Land clearing will be done on 6 acres; this land will be established in permanent pasture. There will be only 2 acres of woodland. The timber on this land will be cleared out and then it will be set to pine seedlings.

The mechanical measures will include a farm pond and 500 feet of channel improvement.

The livestock will be the same as for the medium level of conservation.

The fertilizer and lime applications for the medium and high level of conservation will be according to soil tests.

See Table II for a complete detailed account of the crops and livestock for the full-time farmer.

Economic Implications of Conservation Systems

After plans for the three levels of conservation were made, a budget analysis was made of each plan to determine the costs, returns and net

TABLE II

CROPPING AND LIVESTOCK SYSTEMS FOR SELECTED CONSERVATION SYSTEMS FOR A REPRESENTATIVE 56-ACRE GREENE COUNTY FARM, FULL-TIME FARMER

Item	Conservation Levels Low	Medium	High
A. Crop Selection	Acres	Acres	Acres
Burley	.6	.6	.6
Corn (for grain)	14	7	
Wheat (for grain)	8		
Alfalfa hay		8	
Lespedeza hay	16		
Meadow		4.5	1.5
Winter cover crop		8.5	1.5
Permanent pasture	12.5	29	49
Unimproved pasture	3		
Garden	.9	.9	.9
Woodland	7	4	2
B. Land Use	Percent	Percent	Percent
Percent of farm in rotation crops	56	15	3
Percent of farm in sod	28	74	90
Percent of farm in woodland	13	8	4
Farmstead	3	3	3
C. Livestock Selection	No.	No.	No.
Dairy cows	5	10	10
Heifers (over 1 year)	1	2	2
Heifers (under 1 year)	1	2	2
Hens	50	50	50
Chicks (raised)	50	50	50
Hogs (home use)	2	2	2

earnings that would be associated with each plan if it were applied. This analysis then showed the relation between net earnings and the level of conservation. In order to make the analysis of these systems more meaningful a case study was also made to obtain costs and returns that resulted from the farming system which is currently being used on the representative farm. The results of this case study are given in Table I.

In evaluating the economic results of these systems the budget was necessary to evaluate the profitableness of the alternatives. Also it was a way of comparing the uses of land, labor, power, equipment and other resources of the farmer with different crop and livestock systems.

The objective of most farm operators is to receive the maximum return in income after paying costs. In order to bring this about or as much so as possible the productive resources must be properly balanced. Budgeting analysis is a tool used by farm operators or planners to decide on the proper balance.

The estimated costs and returns with alternative conservation systems are largely controlled by assumed prices which are governed to some extent by the availability of markets and the grade of the produce sold, especially milk. Other things to be assumed are the erosion costs or soil improvement values. Present price data can be secured rather easily from available empirical data and knowledge of informed people.

Returns for Full-Time Farmer

Low Level of Conservation

The income from the system with the low level of conservation will be derived from the sale of tobacco, corn, wheat, milk from a five-cow dairy

and the perquisites. The total gross family earnings is estimated to be $3,687.50 with a net of $1,283.22. The labor requirements are 1,965 hours which gives an hourly earning of $.65. There will be an added investment of $925 which makes a total of $13,925. The annual return to investment above the 5 percent interest rate amounts to 9.2 percent.

Medium Level of Conservation

At the medium level of conservation the system is estimated to provide a gross return to the family of $5,408.65 and a net of $2,406.73. The income will come from a 10 cow dairy herd, woodland, products and perquisites. The total labor needed is 2,267 hours which gives an hourly return of $1.06. The added investment will be $2,575 which makes a total of $15,575. The annual return to investment will be 15.2 percent above the normal interest rate.

High Level of Conservation

The gross earnings for the system at the high level of conservation are estimated to be $4,911.90 with net family earnings of $1,248.08. The income will be obtained from the same source as the medium level of conservation, with the exception that there will be no corn for sale. The labor requirements are 2,010 hours which will have a return of $.62 per hour. The added investment will be $3,450 or a total of $16,450. The annual return will be 7.6 percent above the normal interest rate.

As a summary, investment and costs are directly related to the conservation level, but income (gross, net, and per hour) are estimated to be highest for the medium conservation system. See Table III for a detailed account of all costs and returns.

TABLE III

FINANCIAL SUMMARY OF CONSERVATION SYSTEMS FOR A 56-ACRE GREENE COUNTY FARM, PROJECTED PRICE LEVEL, FULL-TIME FARMER

Item	Conservation Levels Low	Medium	High
Cash income	$2,730.50	$4,426.25	$3,879.90
Perquisites and other income	957.00	982.00	1,032.00
Total income	$3,687.50	$5,408.65	$4,911.90
Cash expenses			
Crops	$ 751.98	$ 915.25	$ 733.47
Livestock	162.15	280.15	1,083.90
Other	308.90	491.02	477.20
Total cash expense	$1,223.03	$1,686.42	$2,294.57
Other expenses			
Non cash expenses	$ 427.25	$ 512.75	$ 512.75
Fixed expenses	754.00	802.75	856.50
Total other expenses	$1,181.25	$1,315.50	$1,369.25
Total expenses	$2,404.28	$3,001.92	$3,663.82
Family earnings	1,283.22	2,406.73	1,248.08
Added investment above present system	925.00	2,575.00	3,450.00
Total investment	13,925.00	15,575.00	16,450.00
Annual return to dollar of investment[a]	.092	.152	.076
Hours of labor needed	1,965.00	2,267.00	2,010.00
Returns per hour of labor	.65	1.06	.62

[a]Above the normal rate of interest - 5 percent

Land Use Planned for Part-Time Farmer

Low Level of Conservation

Cultivated land. Field 9a of 1.5 acres will be used each year for tobacco and garden for a period of 10 years, after which time it will be established in lespedeza and then field 9 will be used for tobacco.

Pasture and hayland. Fields 2, 3, 5, 6, 7, 8, 9, 10, 11, 13, and 14 of 45.5 acres will be established in lespedeza for pasture and hay.

Woodland. Fields 1 and 12 of 7 acres will remain in woodland.

Medium Level of Conservation

Cultivated land. Fields 9 and 9a of 3 acres will be farmed in a 4 year rotation of tobacco and sod crop. One field will be established in fescue and Kenland red clover. The other field will be used for tobacco and garden, followed by a cover crop each fall of vetch and oats.

Pasture and hayland. Three acres of field 2 will be established and maintained in orchardgrass and Ladino clover.

Fields 3, 6, 10, 11, 13 and 14 of 24 acres will be established and maintained in fescue and white clover. As the clover begins to leave in fields 6 and 13, Kobe lespedeza will be overseeded.

Woodland. Fields 1 and 12 of 6 acres will remain in woodland.

Mechanical measures. A drainage ditch of 200 feet will be constructed and maintained between fields 9 and 6, 9 and 10, and 11 and 14.

One acre of field 1 will be clear cut and established in meadow.

High Level of Conservation

Cultivated land. The only cultivated land will be .6 acres of

tobacco in field 9; this will be followed by a cover crop each fall.

Pasture and hayland. Fields 2, 3, 5, 7, 8, 9, 9a, 10, 11 and 14 of 37.4 acres will be established and maintained in permanent pasture consisting of fescue and Ladino clover. These fields will be used for pasture and hay.

Woodland. Field 1 of 5 acres will remain in woodland.

Field 12 of 2 acres will be clear cut.

Fields 6, 12 and 13 of 11 acres will be set to pine seedlings.

Fields 6 and 13 of 9 acres will be placed in the conservation reserve of the soil bank.

Mechanical measures. An open drainage ditch of 500 feet will be constructed and maintained between fields 3 and 6, 9 and 6,11 and 10, and 11 and 14.

A farm pond will be constructed and maintained in field 7.

Field 4 of two acres will be used by all systems for the homestead except for the high level which will only have 1.4 acres.

Conservation Systems for Part-Time Farmer

The reason plans were made for the part-time farmer is because the part-time farmer is typical of a large percentage of the farmers in the study area.

Low Level of Conservation

In the system with a low level of conservation practically all the land was used for lespedeza or a total of 45.5 acres. This lespedeza will be used for pasture and hay for sale. There will be an annual fertilizer

application of 200 pounds of 0-20-20 fertilizer; the land will also receive two tons of lime per acre each five years. The only row crops grown will be .6 acres of tobacco and .9 acres for garden. The present 7 acres of woodland will remain, and will receive no management or protection. There will be no mechanical conservation measures.

The only livestock on the farm will be 50 chickens and 2 hogs. The hogs will be for home use.

Medium Level of Conservation

At the medium level of conservation the farming system will be primarily grassland. There will be a total of 42 acres of permanent pasture; 18 acres of orchardgrass and Ladino clover and 24 acres of fescue and white clover. The woodland will consist of 6 acres of hardwoods which will receive improved management and protection. The remaining land use will consist of 4.5 acres of meadow, .6 acres of tobacco, and .9 acres for garden. The livestock will include 10 dairy cows, 2 heifers and 2 calves, 50 chickens and 2 hogs.

High Level of Conservation

At the high level of conservation the farm operation will include 37.4 acres of permanent pasture, all of which will be fescue and white clover. The extra pasture will be cut for hay. The woodland will include 5 acres of old hardwoods, which will receive improved management and protection; 2 acres of pines, for which the land will be clear cut, and an additional 9 acres of pines which will be placed in the conservation reserve of the soil bank. There will be .6 acres of tobacco.

The livestock is very similar to that of the medium level system in

that there will be 10 milk cows, 2 heifers and 2 calves; there will be no chickens nor hogs.

The fertilizer and lime applications for the medium and high levels of conservation will be made according to soil tests.

See Table IV for a detailed account of the crops and livestock for the part-time farmer.

Returns for Part-Time Farmer

Low Level of Conservation

The gross earnings estimated for the low level of conservation are $2,960 with a net of $1,026.16. The labor amounts to 922 hours which gives an hourly return of $1.11. The investment will be $175 less than the original investment which makes a total of $12,825. The return to investment will be 8 percent above the normal interest rate. The income will be derived from the sale of lespedeza, hay, tobacco and perquisites.

Medium Level of Conservation

The gross earnings at the medium level of conservation are estimated to amount to $4,777.60 with a net of $1,396.24. The labor needed will be 2,056 hours with a return of .68 per hour. The added investment will be $2,525, which makes a total investment of $15,525. The annual return on investment will be 8.9 percent above normal interest. The source of income will be derived from the 10 cow dairy herd, tobacco and perquisites.

High Level of Conservation

The gross earnings at the high level of conservation are expected to

TABLE IV

CROPPING AND LIVESTOCK, SELECTED CONSERVATION SYSTEMS FOR A REPRESENTATIVE 56-ACRE GREENE COUNTY FARM, PART-TIME FARMER

Item	Conservation Levels Low	Medium	High
A. Crop Selection	Acres	Acres	Acres
Burley tobacco	.6	.6	.6
Corn (for grain)			
Wheat (for grain)			
Alfalfa hay			
Lespedeza hay	45.5		
Meadow		4.5	
Winter cover crop		1.5	
Permanent pasture		42	37.4
Unimproved pasture			
Garden	.9	.9	
Woodland	7	6	16
B. Land Use	Percent	Percent	Percent
Percent of farm in rotation crops	3	3	1
Percent of farm in sod	81	83	67
Percent of farm in woodland	13	11	29
Percent of farm in farmstead	3	3	3
C. Livestock Selection.	No.	No.	No.
Dairy cows		10	10
Heifers (over 1 year)		2	2
Heifers (under 1 year)		2	2
Hens	50	50	
Hogs	2	2	
Chicks (raised)	50	50	

amount to $4,046.55, with a net of $872. The total labor needed will be 1,771 hours with a return of $.49 per hour. The added investment will be $3,300 and the total will be $16,300. The annual return on investment will be 5.4 percent. The source of income will be from a ten-cow dairy herd, tobacco, hay, conservation reserve, and perquisites. There will be no chickens or hogs.

For the part-time farmer the income (gross and net) was highest for the medium conservation system. The return per hour of labor was highest for the low level system. The investment was highest for the high level but the costs were highest for the medium level. The complete costs and returns are given in Table V.

TABLE V

FINANCIAL SUMMARY OF CONSERVATION SYSTEMS FOR A 56-ACRE GREENE COUNTY FARM, PROJECTED PRICE LEVEL, PART-TIME FARMER

Item	Conservation Levels Low	Medium	High
Cash income	$2,223.00	$3,745.60	$3,337.45
Perquisites and other income	737.00	1,032.00	709.10
Total income	$2,960.00	$4,777.60	$4,046.55
Cash expenses			
Crops	$514.25	$ 681.70	$ 544.20
Livestock	160.40	883.90	923.50
Other	157.44	502.76	358.60
Total cash expense	$832.09	$2,068.36	$1,826.30
Other expenses			
Non cash expenses	$ 364.25	$ 512.75	$ 509.25
Fixed expenses	737.50	800.25	839.00
Total other expenses	$1,101.75	$1,313.00	$1,348.25
Total expenses	$1,933.84	$3,381.36	$3,174.55
Family earnings	1,026.16	1,396.24	872.00
Added investment above present system	-175.00	2,525.00	3,300.00
Total investment	12,825.00	15,525.00	16,300.00
Annual return to dollar of investment	.080	.089	.054
Required hours of labor	922.00	2,056.00	1,771.00
Returns per hour of labor	1.11	.68	.49

CHAPTER III

CONCLUSIONS

There seem to be significant opportunities for improving the farm system and income for the farm selected for study. Improvements could be made by using better farm practices and adjusting the present combination of enterprises for more effective utilization of labor, machinery and other resources. Even though this was a part-time farmer a number of things could have been done to improve the farm income. The pastures could have been improved by seeding, fertilization, and liming. Erosion damage was quite apparent and could have been reduced by establishing a permanent sod. There should be little question but that the income from livestock could have been increased by using improved feeding practices and improved care of the livestock.

The analysis of the three levels of conservation indicates that various opportunities do exist for profitable adjustments of conservation systems and that a farmer may carry out an adequate conservation system of farming that will be profitable. It further indicates that up to a certain level of conservation the conservation system may be made higher and also more profitable.

According to the analysis the returns to the farmer were affected by the levels of conservation. The net returns for the full-time farmer were $1,283 for the low level of conservation, $2,407 for the medium level and $827 for the high level. Therefore according to this study, up to a certain level of conservation the higher the level of conservation the farmer applies, the higher the net income for the farmer; thus it will be

both profitable and conserving for a farmer to carry out a soil conservation system.

The study also indicates that additional resources are necessary to develop conservation systems of farming. In all systems for both the full-time and part-time farmer, other than the low level for part-time farmer, additional capital was needed. To change from the present system of farming to the low level of conservation for full-time farmer would require an added investment of almost $1,000; about $2,500 to change to medium level and nearly $3,500 to change to high level. There was likewise a rise in labor requirements from the present operation of farming to the low level of conservation system and more for the medium level; however, there was a decline for the high level.

It was found that the conservation systems influence upon the combination of enterprises was most profitable. The most profitable enterprises for the full-time farmer had only minor changes related to the conservation systems. The low level of conservation that was most profitable consisted primarily of five milk cows, tobacco, corn and wheat; the medium level, 10 milk cows, tobacco and hay, and the high level 10 milk cows, tobacco and hay. The enterprises for the part-time farmer also differed considerably in that the low level system consisted of lespedeza hay for sale and tobacco; the medium level 10 milk cows, tobacco and hay and the high level 10 milk cows, tobacco and hay.

The use of credit may be very important in the adoption of conservation systems, because higher levels of conservation require additional investments. Many farmers, especially the ones with low incomes may not have available capital to invest in the conservation systems. The farmer may

feel the need to use his capital for consumption or at least to invest it in something that will give a quick return on capital. Many farmers are aware of the possibilities for profit with conservation systems but still refuse to adopt them. Many may reject them because they are aware of the additional capital requirements. As previously stated this analysis indicates that a conservation system may be profitable in the long run but it does require added costs and larger investments. Therefore it would probably be helpful to the watershed program to have loans made on the basis of prospects for profit rather than on the basis of the value of property owned by the farmer.

One of the criticisms of the watershed program is that the only benefit the farmers in the upper part of the watershed receive is in the form of additional technical assistance and in some cases increased A.C.P. payments. Much of this is available under other programs. Yet these farmers are a vital part of the watershed program and have the right to vote in its organization. These people in many watersheds have voted against organization because they did not feel they were receiving enough benefits. Therefore it seems justifiable for the downstream farmers to subsidize conservation systems in the upper watershed that would increase water control and reduce soil erosion and increase incomes on the downstream farms.

The study further shows that the returns to labor will be very low except those at the medium level of conservation. Even with increased investments all returns to labor will be very low. In case there is available off-farm employment, it would probably be more profitable for the farmer to work off the farm, invest his money elsewhere, and seek an

alternative system that would require less labor and investment.

The analysis shows that many alternatives are profitable. All alternatives should provide the farmer an opportunity to improve the soil and develop a more profitable farming business. It would be difficult for the farmer with his present operation, for example, to change to the medium level of conservation and larger dairy enterprise all at once. The medium level of conservation would provide an excellent opportunity to go into the grade A milk business, in case there was an available market. This would probably mean an added net income of about $1,000 per year.

BIBLIOGRAPHY

BIBLIOGRAPHY

Estimated Costs and Returns From Major Farm Enterprises, Tennessee 1952; Monograph No. 268, Tennessee Agricultural Experiment Station (February, 1954).

Steele, H. H., "Economics of Small Watershed Development." Production Economics Research Branch, A.A.S., U.S.D.A., (Address to Committee on Water Resources Development, Pullman Washington, June 27-29, 1955).

Soil Survey Greene County, Tennessee. Prepared by Soil Conservation Service, U.S.D.A., in cooperation with Tennessee Agricultural Experiment Station and Tennessee Valley Authority (Issued August, 1958).

Tennessee Farm and Home Development Handbook, S P 86; Agricultural Extension Service, University of Tennessee, 1955.

Watershed Protection and Flood Prevention Act, Public Law 566; 83d Congress; 68 Stat. 666 as amended by the act of August 7, 1956. Public Law 1018, 84th Congress, 70 Stat. 1082.

Watershed Work Plan. Lick Creek Watershed, Greene and Washington Counties, Tennessee. Prepared by Lick Creek Watershed District with assistance by Soil Conservation Service, U.S.D.A. (September, 1958).

Winsett, Joseph E., "Problems of Small Watershed Districts in Tennessee Organized Under Public Law 566," (Unpublished Master's Thesis, University of Tennessee, 1958).

APPENDICES

APPENDIX A

TABLE VI

EXPECTED PRICES TO BE PAID BY FARMERS IN TENNESSEE
PROJECTED PRICE LEVEL[a]

Item	Unit	Price
Feeds		
Grass and clover hay	ton	$ 15.00
Lespedeza	ton	20.00
Alfalfa hay	ton	30.00
Cotton seed meal	cwt.	4.00
Calf starter	cwt.	6.00
Chick starter	cwt.	5.00
Growing mash	cwt.	5.00
Laying mash	cwt.	5.00
Tankage	cwt.	6.00
Corn	bu.	1.25
Seeds		
Alfalfa	lb.	$ .45
Ladino clover	lb.	.75
Orchardgrass	lb.	.30
Fescue	lb.	.15
Timothy	lb.	.50
Kenland clover	lb.	.45
Lespedeza Korean	lb.	.12
Vetch	lb.	.15
Corn	bu.	10.00
Oats	bu.	1.50
Wheat	bu.	3.50
Tobacco	pack	.75
Fertilizer		
Agricultural limestone (spread)	ton	$ 4.00
3-9-6	ton	40.80
6-12-12	ton	53.00
3-12-12	ton	48.00
0-20-20	ton	61.00
33-0-0	ton	75.00
0-0-60	ton	60.00
Livestock		
Dairy cows	each	$150.00
Dairy heifers	each	100.00
Dairy calves	each	50.00
Pigs	each	12.00

TABLE VI (continued)

EXPECTED PRICES TO BE PAID BY FARMERS IN TENNESSEE,
PROJECTED PRICE LEVEL

Item	Quantity	Unit	Rate	Value
Miscellaneous				
Fermate		lb.	$.70	
Tribasic copper		lb.	.35	
Tobacco cloth		yd.	.13	
Arsenate of lead		lb.	.35	
Inoculation		box	.40	
Tobacco marketing		dollar	.04	
Livestock marketing		dollar	.03	
Milk hauling		cwt.	.30	
Operating tractor				
Tobacco	8.0	hr.	$.60	$4.80
Meadow	11.0	hr.	.60	6.60
Fescue & Ladino (or orchardgrass)	6.3	hr.	.60	3.78
(Orchardgrass & Ladino hay)	11.0	hr.	.60	6.60
Alfalfa (hay)	12.4	hr.	.60	8.44
Cover crop	1.8	hr.	.60	1.08
Corn	6.6	hr.	.60	3.96
Lespedeza (hay)	3.6	hr.	.60	2.16
Lespedeza (pasture)	1.0	hr.	.60	.60
Wheat	5.2	hr.	.60	3.10
Machinery and Equipment				
Depreciation	8 percent			
Interest	5 percent			
Other				
Tobacco (hauling)				$5.00
Milk (hauling)	1	cwt.	.30	.30
Warehouse commission	1	dollar	.04	.04
Livestock marketing	1	dollar	.03	.03
Twine	1	bale	.02	.02

[a]Source: Unpublished data - Tennessee Agricultural Experiment Station, 1959

TABLE VII

EXPECTED PRICES TO BE RECEIVED BY FARMERS IN TENNESSEE, PROJECTED PRICE LEVEL[a]

Item	Unit	Price
Corn	bu.	$ 1.25
Wheat	bu.	2.00
Tobacco	lb.	.60
Alfalfa hay (baled)	ton	30.00
Lespedeza hay (baled)	ton	20.00
Grass hay (baled)	ton	15.00
Milk (processing)	cwt.	3.40
Calves (75#)	each	15.00
Cull cows	each	100.00
Cull hens	each	.75
Fryers	each	.60
Butter	lb.	.50
Eggs	doz.	.40
Hogs	cwt.	18.00

[a]Source: Unpublished data - Tennessee Agricultural Experiment Station, 1959

TABLE VIII

ESTIMATED CASH EXPENSES PER ACRE OF SELECTED FARM CROPS, PROJECTED PRICE LEVEL

Enterprise	Item	Quantity	Unit	Rate	Expense
Burley Tobacco					
Plant bed	Seed	1	pack	$ .75	$ .75
	Fermate	5	lb.	.70	3.50
	Tribasic copper	2	lb.	.35	.70
	Cloth	25	yd.	.13	3.25
	Fertilizer (6-12-12)	1	cwt.	2.65	2.65
	Time				1.60
	Fertilizer	12	cwt.	2.65	31.80
	Arsenate of lead	15	lb.	.35	5.25
	Total per acre				$49.50
Meadow					
Establish	Timothy seed or	6	lbs.	.50	3.00
	Fescue seed	20	lbs.	.15	3.00
	Kenland clover	8	lbs.	.45	3.60
	Inoculation				.40
	Fertilizer (16-12-12)	5	cwt.	2.65	13.25
	Total per acre				20.25
	Cost per acre over 10 year period				2.03
	Cost per acre over 4 year period				5.05
Maintain	Lime	1	ac.	1.60	1.60
	Fertilizer (0-20-20)	3	cwt.	3.05	9.15
	Total per acre				10.75
	Total cost for establishing and maintaining 10 yrs.				12.78
	Total cost for establishing and maintaining 4 yrs.				15.80

TABLE VIII (continued)

ESTIMATED CASH EXPENSES PER ACRE OF SELECTED FARM CROPS, PROJECTED PRICE LEVEL

Enterprise	Item	Quantity	Unit	Rate	Expense
Pasture					
Establish	Ladino clover seed	2	lb.	$ .75	$ 1.50
	Orchardgrass seed	15	lb.	.30	4.50
	or				
	Fescue seed	20	lb.	.15	3.00
	Fertilizer (6-12-12)	6	cwt.	2.65	15.90
	Inoculation				.40
	Total per acre				22.30
	Cost per acre over 10 year period for orchardgrass				2.23
	Cost per acre over 10 year period for fescue				2.08
Maintain	Lime				1.60
	Fertilizer (0-20-20)	3	cwt.	3.05	9.15
	Total per acre				10.75
	Total cost for establishing and maintaining for orchardgrass				12.98
	Total cost for establishing and maintaining for fescue				12.83
Lespedeza					
	Seed	40	lb.	.12	4.80
	Fertilizer (0-20-20)	4	cwt.	3.05	12.20
	Lime			3.20	3.20
	Total per acre				20.10
	Cost per acre over 2 year period				10.10
Alfalfa					
Establish	Seed	20	lb.	.45	9.00
	Orchardgrass seed	5	lb.	.30	1.50
	Fertilizer (0-20-20)	4	cwt.	3.05	12.20
	(3-12-12)	3	cwt.	2.40	7.20
	Inoculation and borax				1.30
	Total per acre				31.20
	Cost per acre over 5 year period				6.25

TABLE VIII (continued)

ESTIMATED CASH EXPENSES PER ACRE OF SELECTED FARM CROPS, PROJECTED PRICE LEVEL

Enterprise	Item	Quantity	Unit	Rate	Expense
Maintain	Lime				$ 2.40
	Fertilizer (0-20-20)	1.5	cwt.		
	(0-0-60)	1.5	cwt.		9.08
	Total per acre				11.48
	Total cost for establishing and maintaining				17.73
Corn					
	Seed	.18	bu.	10.00	1.80
	Fertilizer (6-12-12)	4	cwt.	2.65	10.60
	Low level 33-0-0	1	cwt.	3.75	3.75
	High level 33-0-0	2	cwt.	7.50	
	Lime				1.60
	Total per acre -- low level				17.75
	Total per acre -- high level				21.50
Cover crop					
	Vetch	20	lb.	.15	3.00
	Fertilizer (3-12-12)	2	cwt.	2.40	
	Oats	2	bu.	1.50	3.00
	Total per acre				15.60
Wheat					
	Seed	1.5	bu.	3.50	5.25
	Fertilizer (6-12-12)	4	cwt.	2.65	10.60
	Total per acre				15.85

TABLE IX

ESTIMATED CASH EXPENSES PER ANIMAL OF SELECTED FARM ENTERPRISES, PROJECTED PRICE LEVEL[a]

Animal	Item	Quantity	Unit	Rate	Expense
Dairy cow	Dairy feed (oil meal)	3	cwt.	$ 4.00	$ 12.00
	Breeding fee	1	each	6.00	6.00
	Vet. and medicine	1	each	2.80	2.80
Heifer	Vet. and medicine	1	each	2.00	2.00
Calf	Calf starter	2	cwt.	6.00	12.00
Chickens					
100 laying hens	Starter mash	4.6	cwt.	5.00	20.00
100 pullets	Growing mash	11.3	cwt.	5.00	55.15
	Laying mash	25.0	cwt.	5.00	125.00
	Medicine				2.50
Hogs	Pigs	1	each	12.00	12.00
	Tankage	.70	cwt.	6.00	4.20
	Medicine				.80

[a]Source: Estimated Costs and Returns From Major Farm Enterprise, Tennessee, 1952, Monograph No. 268, Tennessee Agricultural Experiment Station, (February, 1954).

TABLE X

ESTIMATED NEEDED GRAIN AND FORAGE[a]

Animal	No.	Corn	Hay	Pasture
		bu.	tons	cow acre day
Dairy Cows	1	20	2.5	260
Heifer	1	10	1.5	150
Calf	1	5	.5	50
Hens	50	50		
Fryers	50	13		
Hogs	1	15		
Beef Herd	10		15	2,680

[a]Source: Tennessee Farm and Home Development Handbook, S P 86; Agricultural Extension Service, University of Tennessee, 1955.

TABLE XI

ESTIMATED COSTS AND RETURNS OF FULL-TIME FARMER
WITH LOW LEVEL OF CONSERVATION

A. Expected receipts Item	Quantity	Unit	Rate	Value
1. Cash Receipts				
Tobacco	1,080	lb.	$ .60	$ 648.00
Milk sales	275	cwt.		935.00
Calves (75#)	3	each		45.00
Cull cows	1	each		100.00
Chickens (fryers)	25	each		15.00
Eggs	500	doz.		200.00
Corn	342	bu.		427.50
Wheat	120	bu.		240.00
Hay (lespedeza)	6	ton		120.00
Total cash receipts				2,730.50
2. Perquisites and other receipts				
Dwelling				240.00
Milk	50	cwt.	$ 3.40	170.00
Butter	50	lb.	.50	25.00
Eggs	200	doz.	.40	80.00
Poultry	15	each	.60	9.00
Hogs	6	cwt.	18.00	108.00
Garden				300.00
A.C.P. Payment				25.00
Total perquisites and other receipts				957.00
Total receipts plus perquisites				3,687.50
Total farm expenses				2,404.28
Family earnings				1.283.22

TABLE XI (continued)

ESTIMATED COSTS AND RETURNS OF FULL-TIME FARMER
WITH LOW LEVEL OF CONSERVATION

B. Expected expenses Item	Quantity	Unit	Rate	Value
1. Direct cash crop expenses				
Tobacco	.6	acres	$49.50	$ 29.70
Corn	14	acres	17.75	248.50
Wheat	8	acres	15.85	126.80
Lespedeza	16	acres	10.10	161.60
Permanent pasture	12.5	acres	12.83	160.38
Unimproved pasture	3	acres		
Garden	.9	acres		25.00
Woodland	7	acres		
Total direct cash costs for crops				751.98
2. Direct costs for livestock				
Dairy cow	5	each	20.80	104.00
Dairy heifer (over 1 yr.)	1	each	2.00	2.00
Calf (under 1 yr.)	1	each	12.00	12.00
Chickens	50	each	2.03	10.15
Hogs	2	each	17.00	34.00
Total direct cash costs for livestock				162.15
3. Other cash costs				
Milk (hauling)	275	cwt.	.30	82.50
Tobacco (hauling)				5.00
Marketing				25.95
Operating tractor	268.75	hour	.60	161.25
Feed grinding	75	cwt.	.20	15.00
Twine	960	bale	.02	19.20
Total other cash costs				308.90

TABLE XI (continued)

ESTIMATED COSTS AND RETURNS OF FULL-TIME FARMER
WITH LOW LEVEL OF CONSERVATION

B. Expected expenses Item	Quantity	Unit	Rate	Value
4. Non-cash costs				
Machinery and equipment (depreciation 8% and interest 5%)	$2,775.00	year	$ .13	$ 360.75
Interest on livestock investment ($950 @ 5%)				47.50
Death loss (2%)				19.00
Total non-cash costs				427.25
5. Added investment				
Fence				200.00
Livestock				725.00
Total added investment				925.00
Total investment				13,925.00
6. Fixed costs				
Building depreciation ($4,000 @ 3%)				120.00
Fence depreciation ($700 @ 7%)				49.00
Taxes				35.00
Electricity				40.00
Interest on investment				
Land, buildings, fences ($10,200 @ 5%)				510.00
Total fixed costs				754.00
Total all farm expenses				2,404.28

TABLE XII

ESTIMATED NEEDED AND AVAILABLE GRAIN AND FORAGE FOR LOW LEVEL OF CONSERVATION, FULL-TIME FARMER[a]

Item	Acres	Rate	Unit	Total Yield
Corn (bottom undrained)	10	55	bu.	550
Corn (upland)	4	25	bu.	100
Lespedeza hay	16	1.5	ton	24
Pasture				
(Fescue-Ladino)	12.5	80	c.a.d.	1,000
(Unimproved-Lespedeza)	3	60	c.a.d.	180

Cow acre days available by months

Kind	Acres	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Total
Fescue-Ladino	12.5			80	160	200	160	80	40	80	120	80		1,000
Unimproved	3			20	40		20	40	40	10		10		180
Total available				100	200	200	180	120	80	90	120	90		1,180

Cow acre days needed by months

Animals	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Total
Dairy cows (5)													
Dairy heifers (1)			100	180	180	180	180	180	180	180	100		
Dairy calf (1)													
Total needed			100	180	180	180	180	180	180	180	100		1,460
Total available			100	200	240	180	120	80	90	120	90		1,180
Difference			0	20	60	0	-60	-100	-90	-60	-10		-280

	Corn	Wheat	Hay	Pasture (C.A.D.)
Available	650	120	24	1,180
Needed	208		18	1,460
Difference	342	120	6	-280
For sale	342	120	6	

280 C.A.D. divided by 53.2 = 5.25 tons of hay[a]

[a]Source: Agronomy Department, College of Agriculture, University of Tennessee, 1959.

TABLE XIII

ESTIMATED COSTS AND RETURNS OF FULL-TIME FARMER
WITH MEDIUM LEVEL OF CONSERVATION

A. Expected receipts Item	Quantity	Unit	Rate	Value
1. Cash receipts				
Tobacco	1200	lb.	$ .60	$ 720.00
Milk sales	650	cwt.	3.40	2,210.00
Calves (75#)	7	each	15.00	105.00
Cull cows	2	each	100.00	200.00
Chickens (fryers)	25	each	.60	15.00
Eggs	500	doz.	.40	200.00
Woodland products	4	acre	5.10	20.40
Hay	22	ton	30.00	660.00
Corn	237	bu.	1.25	296.25
Total cash receipts				4,426.25
2. Perquisites and other receipts ($932 - $50 A.C.P. payment)				982.00
Total receipts plus perquisites				5,408.65
Total farm expenses				3,001.92
Family earnings				2,406.73

TABLE XIII (continued)

ESTIMATED COSTS AND RETURNS OF FULL-TIME FARMER
WITH MEDIUM LEVEL OF CONSERVATION

B. Expected expenses Item	Quantity	Unit	Rate	Value
1. Direct cash crop expenses				
Tobacco	.6	acre	$49.50	$ 29.70
Corn	7.0	acre	21.50	150.50
Timothy and Kenland clover	3.0	acre	12.78	38.34
Fescue and Kenland clover	1.5	acre	15.80	23.70
Alfalfa and orchardgrass	8.0	acre	17.73	141.84
Fescue and Ladino clover	19.0	acre	12.83	243.77
Orchardgrass and Ladino clover	10.0	acre	12.98	129.80
Cover crop	8.5	acre	15.60	132.60
Garden	.9	acre		25.00
Woodland	4.0	acre		
Total direct cash costs for crops				915.25
2. Direct cash costs for livestock				
Dairy cow	10		20.80	208.00
Dairy heifer (over 1 year)	2		2.00	4.00
Calf (under 1 year)	2		12.00	24.00
Chickens	50		2.03	10.15
Hogs	2		17.00	34.00
Total direct cash costs for livestock				280.15
3. Other cash costs				
Tobacco (hauling)				5.00
Milk (hauling)	550	cwt.	.30	165.00
Operating tractor	397.7	hour	.60	238.62
Feed grinding	153	cwt.	.20	30.60
Twine	2,590	bale	.02	51.80
Total other cash costs				491.02

TABLE XIII (continued)

ESTIMATED COSTS AND RETURNS OF FULL-TIME FARMER
WITH MEDIUM LEVEL OF CONSERVATION

B. Expected expenses Item	Quantity	Unit	Rate	Value
4. Non-cash costs				
Machinery and equipment (depreciation and interest)	2775	year	$.13	$ 360.75
Milking machine (depreciation and interest 10%)				22.50
Interest on cattle investment (5%)				92.50
Death loss (2%)				37.00
Total non-cash costs				512.75
5. Added investment				
Livestock				1,625.00
Milking machine				225.00
Milking shed				250.00
Fence				200.00
Channel improvement				200.00
Land clearing (3 acres)				75.00
Total added investment				2,575.00
Total investment				15,575.00
6. Fixed costs				
Building depreciation ($4,250 @ 3%)				127.50
Fence depreciation ($700 @ 5%)				49.00
Taxes				40.00
Electricity				60.00
Interest on investment				
Land, buildings, fence ($10,525 @ 5%)				526.25
Total fixed costs				802.75
Total all farm expenses				$3,001.92

TABLE XIV

ESTIMATED NEEDED AND AVAILABLE GRAIN AND FORAGE FOR MEDIUM LEVEL OF CONSERVATION, FULL-TIME FARMER

Item	Acres	Rate	Unit	Total Yield
Corn	7	80	bu.	560
Timothy-Kenland red clover	3	2	ton	6
Fescue-Kenland red clover	1-5	2	ton	3
Alfalfa-orchardgrass	8	3.5	ton	28
Orchardgrass-Ladino	10	110	c.a.d.	1,100
Fescue-Ladino	19	110	c.a.d.	2,090
Cover crop	7	80	c.a.d.	560

Cow acre days available by months

Kind	Acres	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Total
Orchardgrass-Ladino	10			80	170	250	170	90	45	80	135	80		1,100
Fescue-Ladino	19			160	335	450	335	165	85	160	240	160		2,090
Cover crop	7			140	140	140						140		560
Available				380	645	840	505	255	130	240	375	380		3,750

Cow acre days needed by months

Animals	Units	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Total
Cows (10) Heifers (2) Calves (2)	12			200	360	360	360	360	360	360	360	200		2,920
Total needed				200	360	360	360	360	360	360	360	200		2,920
Total available				380	645	840	505	255	130	240	375	380		3,750
Difference				180	285	580	145	-105	-230	-120	15	-180		830

830 C.A.D. divided by 53.2 = 15 ton of hay in excess

	Corn	Hay	Pasture
Available	560	52	2,920
Needed	323	30	2,920
Difference	237	22	

TABLE XV

ESTIMATED COSTS AND RETURNS OF FULL-TIME FARMER
WITH HIGH LEVEL OF CONSERVATION

A. Expected receipts Item	Quantity	Unit	Rate	Total cost
1. Cash receipts				
Tobacco	1200	lbs.	$ .60	$ 720.00
Milk sales	550	cwt.	3.40	1,870.00
Calves (75#)	7	each	15.00	105.00
Cull cows	2	each	100.00	200.00
Chickens	25	each	.60	15.00
Eggs	500	doz.	.40	200.00
Woodland products (pine-net)	2	acres	2.45	4.90
Hay (grass and clover)	51	ton	15.00	765.00
Total cash receipts				3,879.90
2. Perquisites and other receipts ($932 plus $100 A.C.P. payment)				1,032.00
Total receipts plus perquisites				4,911.90
Total farm expenses				3,663.82
Family earnings				1,248.08

TABLE XV (continued)

ESTIMATED COSTS AND RETURNS OF FULL-TIME FARMER
WITH HIGH LEVEL OF CONSERVATION

B. Expected expenses Kind of crop	Quantity	Unit	Rate	Total cost
1. Direct cash crop expenses				
Tobacco	.6	acres	$49.50	$ 29.70
Pasture (fescue and Ladino clover)	49.0	acres	12.83	625.67
Fescue and Kenland	1.5	acres	15.80	23.70
Garden	.9	acres		25.00
Woodland (new trees)	2.0	acres	3.00	6.00
Cover crop	1.5	acres	15.60	23.40
Total direct cash for crops				733.47
2. Direct cash costs for livestock				
Dairy cow	10	each	20.80	208.00
Dairy heifer (over 1 yr.)	2	each	2.00	4.00
Calf (under 1 yr.)	2	each	12.00	24.00
Chickens	50	each	2.03	10.15
Hogs	2	each	17.00	34.00
Grain	323	bu.	1.25	403.75
Hay	20	ton	20.00	400.00
Total direct cash costs for livestock				1,083.90
3. Other cash costs				
Hauling (tobacco)				5.00
Hauling (milk)	550	cwt.	.30	165.00
Marketing costs				17.00
Operating tractor	355	hour	.60	213.00
Feed grinding	153	cwt.	.20	30.00
Twine	2,360	bale	.02	47.20
Total other cash costs				477.20

TABLE XV (continued)

ESTIMATED COSTS AND RETURNS OF FULL-TIME FARMER
WITH HIGH LEVEL OF CONSERVATION

B. Expected expenses Item	Quantity	Unit	Rate	Total cost
4. Non-cash costs				
Machinery and equipment (depreciation & interest)	$2,775	year	$.13	$ 360.75
Milking machine (depreciation and interest) 10%				22.50
Interest on cattle investment $1,850 @ 5%)				92.50
Death loss (2%)				37.00
Total non-cash costs				512.75
5. Added investment				
Fence				200.00
Milking shed				250.00
Milking machine				225.00
Livestock				1,625.00
Land clearing (6 acres)				150.00
Drainage ditch				500.00
Farm pond				500.00
Total added investment				3,450.00
Total investment				16,450.00
6. Fixed costs				
Building depreciation ($4,250 @ 3%)				127.50
Fence depreciation ($700 @ 7%)				49.00
Taxes				40.00
Electricity				60.00
Interest on investment				
Land, buildings, fence ($11,600 @ 5%)				580.00
Total fixed costs				856.50
Total all farm expenses				3,663.82

TABLE XVI

ESTIMATED NEEDED AND AVAILABLE GRAIN AND FORAGE FOR HIGH LEVEL OF CONSERVATION, FULL-TIME FARMER

Item	Acres	Rate	Unit	Total Yield
Fescue-Ladino	49	120	c.a.d.	5,880
Fescue-Kenland	1.5	2	ton	3

Cow acre days available by months

Kind	Acres	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Total
Fescue-Kenland	49			450	900	1380	900	450	225	450	675	450		5,880
Needed (12 A.U.)				200	360	360	360	360	360	360	360	200		2,920
Difference				250	540	1020	340	90	135	90	315	250		2,960

2,960 c.a.d. divided by 53.2 = 56 tons of hay

	Corn	Hay	Pasture
Available		59	2,960
Needed[a]	323	18	2,960
Difference	-323	51	

[a]Twenty tons of lespedeza hay will be bought for dairy cattle.

TABLE XVII

ESTIMATED COSTS AND RETURNS OF PART-TIME FARMER WITH LOW LEVEL OF CONSERVATION

A. Expected receipts Item	Quantity	Unit	Rate	Value
1. Cash receipts				
Tobacco	1,080	lb.	$ .60	$ 648.00
Chickens (fryers)	25	each	.60	15.00
Eggs	500	doz.	.40	200.00
Hay (lespedeza)	68		.20	1,360.00
Total cash receipts				2,223.00
2. Perquisites				
Dwelling				240.00
Eggs	200	doz.	.40	80.00
Poultry	15	each	.60	9.00
Hogs	6	cwt.	18.00	108.00
Garden				300.00
Total perquisites				737.00
Total receipts plus perquisites				2,960.00
Total farm expenses				1,933.84
Family earnings				1,026.16
B. Expected expenses				
1. Direct cash crop costs				
Tobacco	.6	acre	49.50	29.70
Lespedeza	45.5	acre	10.10	459.55
Garden	.9	acre		25.00
Woodland	7	acre		
Total direct cash costs for crops				514.25
2. Direct cash livestock costs				
Chickens	50	each	2.03	10.15
Hogs	2	each	17.00	34.00
Grain	93	bu.	1.25	116.25
Total direct cash costs for livestock				160.40

TABLE XVII (continued)

ESTIMATED COSTS AND RETURNS OF PART-TIME FARMER
WITH LOW LEVEL OF CONSERVATION

B. Expected expenses Item	Quantity	Unit	Rate	Value
3. Other cash costs				
Tobacco (hauling)				$ 5.00
Operating tractor	163.80	hour	$.60	98.04
Twine	27.20	bale	.02	54.40
Total other cash costs				157.44
4. Non-cash costs				
Machinery and equipment (depreciation and interest)	2,775.00	year	.13	360.75
Interest on livestock investment ($50 @ 5%)				2.50
Death loss (2%)				1.00
Total non-cash costs				364.25
5. Added investment				
Total added investment				-175.00
Total investment				12,825.00
6. Fixed costs				
Building depreciation ($425 @ 3%)				127.50
Fence depreciation				35.00
Taxes				35.00
Electricity				40.00
Investment ($10,000 @ 5%)				500.00
Total fixed costs				737.50
Total farm expenses				1,933.84

TABLE XVIII

ESTIMATED NEEDED AND AVAILABLE GRAIN AND FORAGE FOR LOW LEVEL OF CONSERVATION, PART-TIME FARMER

Item	Acres	Unit	Rate	Total Yield
Lespedeza	45.5	ton	1.5	6.8

	Corn	Hay
Available		68
Needed	93	
Difference	93	68

TABLE XIX

ESTIMATED COSTS AND RETURNS OF PART-TIME FARMER
WITH MEDIUM LEVEL OF CONSERVATION

A. Expected receipts Item	Quantity	Unit	Rate	Value
1. Cash receipts				
Tobacco	1200	lbs.	$ .60	$ 720.00
Milk sales	600	cwt.	3.40	2,040.00
Calves (75%)	7	each	15.00	105.00
Cull cows	2	each	100.00	200.00
Chickens (fryers)	25	each	.60	15.00
Eggs	500	doz.	.40	200.00
Woodland products	6	acre	5.10	30.60
Hay	29	ton	15.00	435.00
Total cash receipts				3,745.60
2. Perquisites and other receipts ($932 & $100 A.C.P. payment)				1,032.00
Total receipts plus perquisites				4,777.60
Total farm expenses				3,381.36
Family earnings				1,396.24

TABLE XIX (continued)

ESTIMATED COSTS AND RETURNS OF PART-TIME FARMER
WITH MEDIUM LEVEL OF CONSERVATION

B. Expected expenses Item	Quantity	Unit	Rate	Value
1. Direct cash costs for crops				
Burley tobacco	.6	acre		$ 29.70
Timothy & Kenland clover	3	acre	$12.78	38.34
Fescue & Kenland clover	1.5	acre	15.80	23.70
Orchardgrass & Ladino clover	18	acre	12.98	233.64
Fescue and Ladino clover	24	acre	12.83	307.92
Cover crop	1.5	acre	15.60	23.40
Garden	.9	acre		25.00
Woodland	6	acre		
Total direct cash costs for crops				681.70
2. Direct cash costs for livestock				
Dairy cow	10		20.80	208.00
Dairy heifer (over 1 yr.)	2		2.00	4.00
Calf (under 1 yr.)	2		12.00	24.00
Chickens	50		2.03	10.15
Hogs	2		17.00	34.00
Hay	10		20.00	200.00
Grain	323	bu.	1.25	403.75
Total direct cash costs for livestock				883.90
3. Other cash costs				
Hauling milk	550	cwt.	.30	165.00
Tobacco hauling				5.00
Marketing costs				41.80
Operating tractor	368.60	hour	.60	221.16
Feed grinding	153	cwt.	.20	30.60
Twine	1,960	bale	.02	39.20
Total other cash costs				502.76

TABLE XIX (continued)

ESTIMATED COSTS AND RETURNS OF PART-TIME FARMER
WITH MEDIUM LEVEL OF CONSERVATION

B. Expected expenses Item	Quantity	Unit	Rate	Value
4. Non-cash costs				
Machinery and equipment (depreciation and interest)	2,775	year	$ .13	$ 360.75
Milking machine (depreciation and interest) 10%				22.50
Interest on cattle investment				92.50
Death loss (2%)				37.00
Total non-cash costs				512.75
5. Added investment				
Channel improvement	200	feet	1.00	200.00
Fence				200.00
Milking shed				250.00
Milking machine				225.00
Livestock				1,625.00
Land clearing (1 acre)				25.00
Total added investment				2,525.00
6. Fixed costs				
Building depreciation ($4,250 @ 3%)				127.50
Fences depreciation ($700 @ 7%)				49.00
Taxes				40.00
Electricity				60.00
Interest on investment, for land buildings, fences ($10,475 @ 5%)				523.75
Total fixed costs				800.25
Total all farm expenses				3,381.36

TABLE XX

ESTIMATED NEEDED AND AVAILABLE GRAIN AND FORAGE FOR MEDIUM LEVEL OF CONSERVATION, PART-TIME FARMER

Item	Acres	Rate	Unit	Total yield
Timothy-Kenland	3.0	2	ton	6
Fescue-Kenland	1.5	2	ton	3
Orchardgrass-Ladino	18.0	120	c.a.d.	2,160
Fescue-Ladino	24.0	120	c.a.d.	2,880

Animal Units-12	Corn	Hay	Pasture
Available	323	49	5,040
Needed[a]	323	20	2,920
Difference		29	2,120

2120 c.a.d. = 40 tons of hay in excess

[a]Ten tons of lespedeza hay will be bought for dairy cattle.

TABLE XXI

ESTIMATED COSTS AND RETURNS OF PART-TIME FARMER
WITH HIGH LEVEL OF CONSERVATION

A. Expected receipts Item	Quantity	Unit	Rate	Value
1. Cash receipts				
Tobacco	1200	lbs.	$ .60	$ 720.00
Milk sales	550	cwt.	3.40	1,870.00
Calves (75#)	7	each	15.00	105.00
Cull cows	2	each	100.00	200.00
Woodland products (pine - 10 yrs. net)	11	acre	2.45	26.95
Hardwood	5	acre	5.10	25.50
Hay	26	ton	15.00	390.00
Total cash receipts				3,337.45
2. Perquisites and other receipts				
Dwelling				240.00
Milk	50	cwt.	3.40	170.00
Butter	50	16	.50	25.00
A.C.P. payment				50.00
Conservation reserve payment	9	acre	15	135.00
Conservation reserve rent	9	acre	9.90	89.10
Total perquisites and other receipts				709.10
Total receipts plus perquisites				4,046.55
Total farm expenses				3,174.55
Family earnings				872.00

TABLE XXI (continued)

ESTIMATED COSTS AND RETURNS OF PART-TIME FARMER
WITH HIGH LEVEL OF CONSERVATION

B. Expected expenses Item	Quantity	Unit	Rate	Value
1. Direct cash crop expenses				
Tobacco	.6	acre	$49.50	$ 29.70
Pasture (fescue & Ladino clover)	37.4	acre	12.83	472.14
Woodland	5	acre		
New trees	11	acre	3.00	33.00
Cover crop	.6		15.60	9.36
Total direct cash crop expenses				544.20
2. Cash costs for livestock				
Dairy cow	10	each	20.80	208.00
Dairy heifer (over 1 yr.)	2	each	2.00	4.00
Calf (under 1 yr.)	2	each	12.00	24.00
Grain	230	bu.	1.25	287.50
Hay	20	ton	20.00	400.00
Total cash costs for livestock				923.50
3. Other cash costs				
Hauling (tobacco)				5.00
Hauling (milk)	550	cwt.	.30	165.00
Marketing costs				17.00
Operating tractor	188	hour	.60	112.80
Feed grinding	153	cwt.	.20	30.00
Twine	1,440	bale	.02	28.80
Total other cash costs				358.60
4. Non-cash costs				
Machinery and equipment (depreciation and interest)	2,775	year	.13	360.75
Milking machine (depreciation and interest) 10%				22.50
Interest on cattle investment (5%)				90.00
Death loss (2%)				36.00
Total non-cash costs				509.25

TABLE XXI (continued)

ESTIMATED COSTS AND RETURNS OF PART-TIME FARMER
WITH HIGH LEVEL OF CONSERVATION

B. Expected expenses Item	Quantity	Unit	Rate	Value
5. Added investment				
Fence				$ 200.00
Milking shed				250.00
Milking machine				225.00
Livestock				1,575.00
Land clearing	2	acre	$25.00	50.00
Drainage				500.00
Pond				500.00
Total added investment				3,300.00
Total investment				16,300.00
6. Fixed costs				
Building depreciation ($4,250 @ 3%)				127.50
Fence depreciation ($700 @ 7%)				49.00
Taxes				40.00
Electricity				60.00
Interest on investment				
Land, buildings, fences ($1,150 @ 5%)				562.50
Total fixed costs				839.00
Total all farm expenses				3,174.55

TABLE XXII

ESTIMATED NEEDED AND AVAILABLE GRAIN AND FORAGE FOR HIGH LEVEL OF CONSERVATION, PART-TIME FARMER

Item	Acres	Rate	Unit	Total Yield
Fescue-Ladino	38	130	c.a.d.	4,940

Animal units - 12	Corn (bu.)	Hay (ton)	Pasture (C.A.D.)
Available		36	4,940
Needed	230	10	2,960
Difference	-230	26	1,980

Twenty tons of lespedeza hay will be bought for dairy cattle.

1,980 C.A.D. = 36 tons of hay

TABLE XXIII

ESTIMATED LABOR REQUIREMENTS FOR SELECTED CONSERVATION SYSTEMS

Levels of Conservation	Total	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Full-Time Farmer													
Low	1,965	99	133	103	121	173	205	140	275	251	184	141	140
Medium	2,267	156	185	137	142	242	223	195	260	194	170	174	189
High	2,010	160	182	135	132	168	283	186	142	153	127	163	179
Available Hours	4,540	360	360	360	360	360	420	420	420	360	360	360	400
Part-Time Farmer													
Low	922	18	61	25	42	77	62	66	248	153	43	66	61
Medium	2,056	155	179	135	130	184	240	155	247	148	127	162	194
High	1,771	195	161	125	105	123	211	121	145	104	100	147	234
Available Hours	2,620	200	200	200	200	200	260	260	260	200	200	200	240

APPENDIX B

DESCRIPTION OF SOIL ASSOCIATION AREAS IN LICK CREEK WATERSHED DISTRICT, GREENE AND WASHINGTON COUNTIES, TENNESSEE[1]

AREA 1

This area includes an estimated 2 percent of the total county area or about 7,986 acres. It occurs in the northern portion of the county and consists mainly of first bottoms and low terraces along Lick Creek. It is nearly level to gently sloping with little or no erosion. The soils are deep, productive, easy to work, and well suited to most of the common crops. The major problem in the area appears to be the poorly drained soils which commonly occur along the rims of the flood plains. Flooding may also be a problem along the creeks. At present the area is being used for the production of the common crops such as corn, small grain, and many hay and pasture plants. Practically all of the area is cleared and very little is presently idle.

Dominant soil series: Staser, Hamblen, Prader, and Sequatchie

AREA 1A

This area is located in the extreme northwest portion of the county along the Nolichucky River. It consists primarily of first bottom and low terrace soils. It is nearly level to gently sloping with little or no erosion. The soils are deep, productive, easy to work, and are well suited to the crops commonly grown in the county. This area differs from area 1 primarily in that its soils have been derived from more mixed parent material and in some cases, contain more sand.

Dominant soil series: Congaree, Chewacle, Wehadkee, State, Altavista, and Hamblen

AREA 2

This area represents an estimated 8 percent of the total county area or about 31,946 acres. It consists of the mountain range in the southern part of the county and the Bays Mountain Range in the northern part of the county. The area is a mountainous belt which is very steep, rocky, and with shallow soils. Practically all is still in forest and there appears to be no potential for agriculture on this area except for forestry.

Dominant soil series: Lehew (Teas), Armuchee, Dandridge, stony land, (Muskingum, soil material)

---

[1]Letter received by M. D. Cunningham from W. R. Hurst Jr., Party Leader, Watershed Work Plan Party, Soil Conservation Service (May 29, 1958).

AREA 3

This area includes an estimated 18 percent of the total county area or about 71,880 acres. This is mainly a steep upland belt. Slopes are relatively long and steep and the hill tops are narrow and winding. The soils are well drained shallow soils derived from calcareous shales. The average depth to bedrock is about twelve inches. Because of the steep slopes and shallow soils and drouthiness, most of the suitable cropland is confined to the areas along drainageways and on benches or footslopes. These areas are generally deep and productive but they normally comprise a very small percentage of the land on any one farm. Occasional small areas or spots of poorly drained soils occur along the drains and from seepage at the base of slopes. Erosion over the area appears to be about moderate, however, erosion is difficult to ascertain on these shallow soils. The crop and pasture yields on these uplands appear to be low, probably due to drouthiness. Overgrazing is common throughout the area and pastures generally consist of lespedeza and volunteer plants. A relatively small proportion of the pastures are improved. The area appears to have an adequate water supply for livestock. Most farms have perennial streams, although not all.

Dominant soil series: Dandridge, Leadvale, and Whitesburg

AREA 3a

This area represents an estimated 18 percent of the total county area or about 71,880 acres and occurs in the northern portion of the county. It is a rolling to hilly area but has extreme slope ranges from gently sloping to very steep. The soils are dominantly well drained upland soils developed from calcareous shale, some of it is now leached to a depth of five to ten feet. The area is dominantly well drained but small areas of soils lacking in drainage are common. Some of the level areas have weak pans. Erosion over the area is moderate to severe. Generally, the soils of this area are very low in natural fertility, although the shallow soils are well supplied with lime. They respond well to fertilization and good management, and most crops can be grown where the slopes and soil depth are favorable. Practically all the common crops are now being grown in the area. Overgrazing is common and there is a large acreage of unimproved pasture. The area is fairly well supplied with surface water, but it is not as plentiful as in Area No. 3.

Dominant soil series: Sequoia, Needmore, Dandridge, Leadvale and Whitesburg.

AREA 3b

This area includes an estimated 32 percent of the total county area or 127,785 acres. Most of this area occurs as one continuous belt running roughly through the center of the county. The area is dominantly rolling

and hilly and the topography is characterized by short moderately steep slopes with relatively broad smooth tops. Some areas have a hummocky topography due to the numerous sinks or depressions. Generally this area consists of well drained upland soils which are derived from dolomitic limestone. These soils have light brown silty surface soils and reddish-colored clayey subsoils. The soils along the drainageways and hollows, and on footslopes and benches are generally deep, productive, and well drained, although small areas or spots of poorly drained soils occasionally occur. Sloping areas or hill slopes generally have moderate to severe sheet erosion. The erosion pattern is closely related to the relief. The smoother areas or areas with low relief generally have slight to moderate erosion. Gully erosion is not common, however, occasional gullied spots or short gullies do occur. The clayey nature of the subsoils makes those soils highly susceptible to accelerated sheet erosion when not afforded adequate ground cover.

These soils are well suited to all the crops commonly grown in the area. They appear to be particularly well suited to grasses and legumes. Most farms have a high proportion of pasture and hay land that is potentially highly productive of these crops. Suitable cropland may be relatively low on many farms due to unfavorable factors as strong slopes and erosion.

Many of the streams are subterranean and there is a shortage of surface water over most of the area.

The present use of the land appears to be as follows: 60 percent pasture, includes large acreage of unimproved pasture; 20 percent crops; 10 percent woodland; and 5 to 10 percent idle.

The more obvious problems of the area are: sheet erosion on the stronger sloping areas, shortage of surface water, drainage or crop adjustment on the poorly drained spots, and the large acreage of unimproved pasture and overgrazing in general.

Dominant soil series: Dunmore, Dewey, Greendale, Emory, Pace and Lindside

AREA 3c

This area occupies an estimated 9 percent of the total county area or about 35,940 acres. It occurs as one narrow elongated belt which begins in the center of the county and extends to its northeast corner. This area is dominantly a hilly upland area but has extreme slope ranges from gently sloping to very steep. It is similar to Area No. 3b and differs from it chiefly by being steeper, more eroded, and shallow to bedrock. The soils are mainly well drained uplands and their alluvial-colluvial associated, all of which are derived from dolomitic limestones. The area includes deep, moderately deep, and shallow soils. Limestone outcrops are common through-

out the area and relatively large areas occur which have a high percentage of outcrops. The use of these areas is limited to pasture or forestry. On areas of deep and moderately deep soils, all crops are adapted when other soil factors such as slope, are favorable. Erosion over the area is moderate to severe. Many of the steeper areas have severe sheet erosion. Because of sinks and crevices in the bedrock, many of the streams are subterranean and there is a shortage of surface water throughout most of the area. Poorly drained soils are confined to small areas or spots along streams and seepage areas at the base of slopes.

The major problems of the area appear to be active sheet erosion on sloping areas, shortage of suitable cropland due to such unfavorable factors as strong slopes and stony areas, overgrazing and shortage of surface water for livestock.

The present use of the land is estimated as follows: 55 percent pasture; largely unimproved; 10-15 percent crops; 15 percent forest; and 15 percent idle.

Dominant soil series: Dunmore, stony land, Greendale, and Pace.