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Title: PARTICIPATION OF FARM OPERATORS IN PUBLIC LAND CONSERVATION PROGRAMS IN THE CYPRESS CREEK BASIN OF CROCKETT COUNTY, TENNESSEE

Abstract approved: Redacted for Privacy

Richard M. Highsmith, Jr.

This research deals with the problem of soil erosion in Cypress Creek basin in West Tennessee and farmer participation in public conservation programs. The study area is marginal to the Tennessee Valley, a region identified in the 1930's as having a serious agricultural soil erosion problem. The four voluntary programs are the Soil Conservation Service, Conservation Reserve, Agricultural Conservation Payments Program administered by the Agricultural Stabilization and Conservation Service, and the Cooperative Extension Service.

The purpose of the research was to determine if soil erosion is currently a serious problem in the study area, determine if participation in the selected programs is significantly different in the study area than the surrounding region, determine if participation in the non-targeted conservation programs is concentrated in any

socio-economic or cultural subgroups of farmers, and determine if the programs have been successful in fulfilling their own goals and objectives.

The entire study area was mapped for land use and field size at the 1:20,000 scale using aerial photography flown in 1941 and 1971. The photography was interpreted for the extent of erosion at both time periods. Correspondence with state agricultural officials and county officials in the surrounding region provided information necessary for comparing participation rates.

Fifty-five farmers were selected at random and interviewed concerning their opinion of the programs, their participation in the programs, their perception of erosion in the area, and their relationship to twelve independent participation variables. The results of the farmer interviews were statistically treated for the purpose of hypothesis testing by the Crosstabs and Scattergram subprograms of the Statistical Package for the Social Sciences program at the Oregon State University Computer Center. A judgement of soil erosion was accomplished by the author that includes each field identified as being farmed by the 55 sample farmers.

Interpretation of aerial photography, field observations, and interviews with agricultural officials and farmers reveals that soil erosion is currently a serious problem in the study area. Farmer interviews and correspondence with agricultural officials indicates no

significant difference between study area participation rates in the selected programs and regional participation rates.

Statistical treatment of the interview data reveals that the programs have a representative cross-section of farmer participation, although at a low level. None of the twelve selected variables were significantly related to participation in the four programs. Although each selected program has provided benefits to farmers who voluntarily participated, they have not met their objectives of conservation of soil and water on an area wide scale.

There are two apparent reasons for program failure. First, the programs are voluntary and as such farmers are free to make their own choice based on personal preference or any other criteria. Second, the subsidy offered by the programs seems insufficient to induce many farmers to participate. Until there is a basic change in both farmer attitudes and program subsidy levels, it seems likely that the present situation will continue.

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Participation of Farm Operators in Public Land Conservation Programs in the Cypress Creek Basin of Crockett County, Tennessee

by

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Typed by Margi Wolski for John Avery Emison

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The earth lies polluted

under its inhabitants;

for they have transgressed the laws. . . .

Therefore a curse devours the earth,

and its inhabitants suffer. . .

Isaiah

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CHAPTER I

INTRODUCTION

Introduction to the Problem

The study of land use and land conditions under human occupancy is rooted deep in geographic thought and practice. In recent years, with growing awareness by urban Americans of the need to maintain both the flow of products and services from land and the quality of the environment, these concerns have taken on new dimensions that encompass much of society. Increasingly, the public has been seeking governmental programs to assure that land supply and quality will be maintained.

Economic Background of the Problem

When viewed from an economic perspective, soil erosion can under certain circumstances be a case of the farmer receiving part of his income by depreciating the value of his land (Bishop and Toussaint, 1958, p. 147). This may be an economically rational action in the short run for the private land owner or manager. However, society's time frame is infinite and its best interest is

conservation of soil resources for present and future generations. As Heady has noted, soil conservation is the problem of "allocating scarce resources" between present and future time periods (Heady, 1952, p. 768).

The philosophical basis for governmental interference in private land managerial decisions is to ensure that social welfare will not be abrogated in favor of private interests. Without governmental control the private individual may make decisions that are in his short-term economic best interest, but detrimental to long-term public welfare.

Remedial action to the soil erosion problem in this country has taken two forms. First, programs such as the Conservation Reserve and Agricultural Conservation Payments Program directly subsidize the expense of constructing certain conservation investments. Second, technical expertise is made available at no charge to the land owner or manager through the Soil Conservation Service and the Cooperative Extension Service. These programs are aimed at the primary economic issue of soil conservation, that of making up the financial difference between private short-term gain and society's long-term needs. Or stated differently, soil conservation programs aim to make national goals and needs economically rational decisions for private individuals.

Historical Interest in the Land Resource Base

The magnitude of the impact of imprudent land use on the acceleration of soil erosion, although observed by a few thoughtful farmers and scholars since colonial times, was not generally recognized in the United States until the 1930's. Then, especially through the efforts of a number of soil scientists of the Department of Agriculture, soil erosion was identified as a national problem and a nationwide soil conservation program was initiated.

Two men were outstanding forces in the crusade that had a goal of adjusting the nation's land use to its land capability: Curtis Fletcher Marbut (1863-1935) and Hugh Hammond Bennet (1881-1960). Dr. Marbut contributed the concept of soil as the living surface of the land, the product of natural developmental process, and subject to alteration by human use. He contributed also to the accumulation of the necessary information base for wise land use decisions. As long-time chief of the Soil Survey Division of the Department of Agriculture, Dr. Marbut developed and applied the comparable system of soil classification based entirely upon soil characteristics in the national soil survey.

Dr. Bennett worked for many years as a soil scientist in the American South. He became the Director of the Soil Erosion Service which was created in the Department of the Interior in 1933 as an

emergency agency. The work of the SES led to legislation in 1935 which declared it to be the policy of the Congress "to permanently provide for control and prevention of soil erosion" and which established the Soil Conservation Service as a permanent agency of the Department of Agriculture. Dr. Bennett was the Director of the SCS, holding the position until his retirement in 1951. Under his leadership the SCS operated with missionary zeal.

As a result of the growth in concern for conservation that began in the 1930's, other public agencies and programs, both existing and newly developed, became involved with the problem of soil loss and land management. By the late 1930's soil and water conservation districts were being formed in counties all across the nation. In addition, experiment stations and extension services of land grant universities were generating information regarding management practices and tillage methods. Information from these agencies as well as TVA and other units of the U.S. Department of Agriculture was reported to the public in the form of informational circulars, technical bulletins, and special reports.

Literature Review

Bennett and W. R. Chapline published in 1928, "Soil Erosion A National Menace" (Bennett and Chapline, 1928). This was the first warning about soil erosion that drew the attention of farmers,

governmental officials, and the public in general. The articulation, documentation, and photography of the problems in the publication aroused a national concern for land resources that blossomed into action in the 1930's and early 1940's. Bennett (September, 1931, pp. 147-170; December, 1943, pp. 163-198) brought the problem of soil erosion and consequent loss of agricultural land to the attention of scholars with two articles in the Annals. Bennett and Lowdermilk (1938, p. 608) called for a national agricultural land policy in 1938, a component still lacking in the national soil erosion battle. Other scholars were also concerned with the same problem.

In 1935, Parkins and Whitaker noted that "the occupation of this continent has been accompanied by an unprecedented destruction of the natural landscape," and the period of "reckless spending" of natural resources has "continued unabated through the first decades" of the 20th Century (Parkins and Whitaker, 1939, p. ix). In 1944, Graham concluded that degradation of the physical land base is closely related to the health of those people who are sustained by it. Graham admonished land managers to therefore consider the natural landscape "as an ecological complex prescribing the use which man can make of the land" (Graham, 1944, p. 87).

Publications dealing with agricultural and forestry land use and management problems continued through the 1950's and 1960's, but with less frequency than before. Scholars such as Smith (1958),

Whitaker and Ackerman (1951), Dasmann (1959), Blase and Timmons (July-August, 1961, pp. 157-162), and Highsmith et al. (1969) updated land conservation studies completed two decades previously.

By the late 1950's, geographic interest in land began to shift from physical maintenance of the agricultural land base to socio-economic and cultural aspects of rural land use. Some publications such as those by Griffin and Chatham (September, 1958, pp. 195-208) and Hart (January, 1976, pp. 1-17), deal with urban fringe impacts on agricultural land. Hart (September, 1968, pp. 417-440; April, 1977, pp. 148-166; December, 1978, pp. 505-517) has also contributed scholarly publications dealing with other cultural aspects of agricultural land use.

A number of scholars have devoted research efforts to defining agricultural specialty areas. Among these have been Prunty (October, 1952, pp. 439-461), Corbet (1966), Anderson (November, 1970, pp. 13-27), Siniard (May, 1975, pp. 17-32), and Raitz (May, 1975, pp. 33-46). Other scholars such as Kollmorgen and Jenks (March, 1958, pp. 27-40; September, 1958, p. 231), Blok (1973), Siniard (May, 1973, pp. 1-11), Smith (March, 1975, pp. 58-70), and Van Otten (1977) have studied the spatial structure of the farm operation.

The decade of the 1960's saw a new interest in the environment develop among geographers. This interest was primarily directed towards man's negative impact on ecological systems. Typical of

this category is Detwyler's (1971) book which includes readings on lake eutrophication, oceanic oil pollution, noise pollution, groundwater contamination, and DDT impact on certain bird populations. Manners and Mikesell (1974) take a more philosophical approach to the problem but address similar topics such as climate modification, grassland ecosystem imbalance, and stream regimen and quality.

After initial awareness of soil erosion by the general public more than a generation ago, an attitude of unconcern seems to have prevailed especially among scholarly researchers. This is reflected by the lack of recent research and publication on the quality of the physical land base and the public programs designed to deal with it. The lack is particularly acute in doctoral dissertations in geography and agriculture in spite of the proliferation of Doctor of Philosophy degrees. A search of the dissertation abstracts for the United States and Canada, and use of the Lockheed Information Systems through the Kerr Library Information Retrieval Service failed to uncover any publications assessing the effectiveness of public programs through their impact on the physical land base and the participating farmers. It is with the concern for a lack of dissertation research, and the need for review of land conservation programs that this research was formulated.

The Problem and Objectives

The dissertation deals with the problem of soil erosion and the public programs designed to control it. The study area is the Cypress Creek basin in Crockett County, Tennessee.

There are four component hypotheses of the research stated in null form as follows:

1. Soil erosion is not a serious problem in the study area.
2. The extent of participation in publically sponsored land conservation programs in the study area is not significantly different from that of a multi-county region or the state as a whole.
3. There are no social, cultural, or economic subgroups of farmers in which participation in the publically sponsored land conservation programs is concentrated.
4. The public land conservation programs have not successfully fulfilled their own goals and objectives.

An objective complimentary to the above hypotheses is the determination of farmer opinion of each public land conservation program.

Proxy Hypotheses

Hypotheses one, two, and four were measured and directly tested through analysis of the data. However, because hypothesis three deals with indirect factors, "proxy" hypotheses were needed. The function of the proxy is to directly measure the indirect or secondary components of the main hypothesis. Several proxies were formulated and are as follows:

1. Increasing age of the farmer is not related to participation in public land conservation programs.
2. Increasing number of years lived in the area does not lead to participation in public land conservation programs.
3. Increasing number of years farmed in the area does not lead to participation in public land conservation programs.
4. Increasing education of the farmer does not lead to participation in public land conservation programs.
5. Increasing income of the farmer does not lead to participation in public land conservation programs.
6. Decreasing percentage of farmer income derived from non-agricultural sources does not lead to participation in public land conservation programs.
7. Increasing size of farm does not lead to participation in public land conservation programs.

8. Increasing size of total land ownership does not lead to participation in public land conservation programs.
9. Rental of land does not lead to participation in public land conservation programs.
10. There is no relationship between the type of rental agreement and participation in public land conservation programs.
11. There is no relationship between rental agreement restrictions and participation in public land conservation programs.
12. A change in cultivation techniques over the last ten years does not lead to participation in public land conservation programs.

Significance of the Research

The Cypress Creek basin is located in the southern United States where serious land deterioration problems were identified in the 1930's. This deterioration was primarily the result of a one crop cotton culture which showed little concern for soil maintenance.

Former U. S. Secretary of the Interior Stewart Udall observed that the "worst shortcoming" of our national natural resource stewardship is the "appalling erosion of topsoil" (Udall, 1963, p. 72). Butzer uses much stronger language in describing the problem. He states that land abuse in the United States since colonial times has been tantamount to "unconscious rape" which "has had an impact that

rivals or exceeds that of six to ten millennia of cultivation in the Mediterranean world," and exceeds any naturally induced equilibrium change in the southeastern United States since pre-Pleistocene times (Butzer, 1974, p. 71).

The fact that proper agricultural land management has "not been translated into remedial action at the farm level" in the U. S. is adequately documented in the literature (Soils Bulletin No. 30, 1976, p. 33). This research will demonstrate whether or not a similar situation exists in the Cypress area.

The study area has been under direct influence of State and Federal agencies responsible for implementing programs designed for maintenance of soil and water quality. The Agricultural Stabilization and Conservation Service and its predecessors have been in operation since 1933. The Crockett Soil and Water Conservation District was organized in 1942, and a full time University of Tennessee agricultural extension agent was assigned to the area in the early 1950's. The study area is marginal to the Tennessee Valley Authority area which has drawn international attention over the last 45 years as a regional approach to land and water problems. Farmers, land owners, and agricultural officials in the Cypress basin have easy access to the Tennessee Valley. Daily contact has enhanced the knowledge of land use and land condition problems, TVA response to such problems, and the results of public programs.

It has been noted by Gilbert F. White, that few follow up studies have been initiated to ascertain the significance of public programs relating to resources (White, November, 1972, p. 308). This dissertation highlights the need for review of public programs related to agricultural land conservation in the study area.

With the time and money expended by State and Federal agencies, and knowledge developed by TVA and other agencies at public expense, one would expect to find a significant and effective level of participation in land conservation programs in the study area. However, in spite of the efforts to control erosion, the problem persists.

In 1978, U. S. Agriculture Secretary Robert Bergland said that the nation is on a "collision course with disaster" unless effective soil conservation efforts are instituted between now and the end of the century (Risser, December, 1978, p. 1). TVA Board Chairman, S. David Freeman, recently commented that the portion of Tennessee in which the study area is located looks like the "before" in the "before and after" pictures in TVA publications. Freeman said, "It is difficult to believe that the problem of erosion here is about as serious as it was when TVA was created in 1933"(The Crockett Times, January 17, 1979). Indeed, the SCS has recently determined that the non-floodplain areas of West Tennessee have an average erosion rate of 34 metric tons of soil per hectare per year (15 short tons per acre per year). In addition, in the study area more than 1,600 hectares

are losing 34 to 67 metric tons of soil per hectare per year and more than 850 hectares are losing 67 to 201 metric tons of soil per hectare per year (U.S.D.A., SCS, 1975, p. 18 & map no. 5). The Cypress basin would appear, therefore, to present an excellent case for study of the previously outlined objectives.

Research Methodology

Data Requirements

In order to test the first hypothesis, information was needed regarding the physical condition of the Cypress area. Erosion information was obtained through four sources: interpretation of aerial photography for 1941 and 1971, field observations accomplished by the author in 1976 and 1977 including personal aerial reconnaissance, published information, and interviews with farmers, land owners, and agricultural officials in the area.

Information needed to test the second hypothesis consisted of the participation rate for each program in the study area, region, and state. These data were obtained through field interviews with farmers and correspondence with administrative officials in charge of the programs in surrounding counties and at the state level.

Data needed to test the third hypothesis consisted of the participation characteristics of farmers in the Cypress area. These

data were obtained through field interviews of farmers using the standard questionnaire reproduced in Appendix One.

Information needed to test the fourth hypothesis included all types previously listed in this section.

Data Collection

Published Sources. Information was obtained from various published sources. A list of these publications is included in the Selected Bibliography.

Field Observations. Field observations were conducted at various times from September, 1976 to June, 1977. Other observations were made in August and September, 1977 including a sample-by-sample judgement of soil erosion.[1] Appendix Two includes the definitions used for each erosion category.

Aerial Photography. Aerial photography was used to map and catalog the recent evolution of land use and land conditions in the Cypress area. Photography for 1941 and 1971 was interpreted and mapped on a field-by-field basis. These maps are located in the pocket at the end of the dissertation. Aerial photography flown in 1956 and 1960 was used to follow the changes made by farmers in

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[1] There were 148 groups of contiguous fields that were identified as land farmed by individuals who were interviewed.

small drainage ways that bisected fields. An aerial reconnaissance was personally performed by the author. Several oblique aerial photography taken on these flights are used in subsequent chapters.

Correspondence with Agricultural Officials. Correspondence with Extension Leaders, District Conservationists (technical Director of local soil and water conservation districts), and state Agricultural Stabilization and Conservation Service officials provided the information used in comparing study area participation rates with the multi-county region and the state as a whole.

Interviews with Local Officials. Background and perspective information was obtained by interviews with local officials. These interviews provided the author with knowledge about each official's responsibility, special problems, and area of expertise.

Interviews with Farm Operators in the Cypress Area. Data obtained by interviews with study area farmers provided the following information: 1) rate of participation for each program, 2) relationship of the variables to participation in each program, and 3) farmer opinion of the programs.

A total of 55 samples were drawn from the population of farmers in the study area. The Crockett County Extension Leader estimated the number of farms in the Cypress area to be approximately 175.

The sample size equals approximately 30 percent of the total number of farms in the study area.

A random or representative sample of farmers was needed to accurately test hypotheses two, three, and four. No master list of farmers exists so an alternative means of drawing the sample had to be devised. The entire area was mapped on a field-by-field basis using aerial photography. Each field was numbered and information regarding certain features recorded. This map (dated 1971) was used to select fields at random through the selection of random numbers. The author then interviewed the individual farming the selected field. Although information about fields was obtained through the interview, it is the farmer as land manager and decision maker that was the primary point of the sample.

A possible bias exists in using this selection procedure. Fields were used to identify individuals to be interviewed because there was no other way to representatively select farmers. This leads to a bias in that there is an increased probability of selecting a farmer with a larger farm size than a farmer with a smaller farm size. Also, given identical farm size, the farmer with more fields is more likely to be selected than the farmer with fewer, larger fields. In order to eliminate as much error as possible several qualifications were used. First, the sample was stratified according to known farm size for Crockett County. Table I shows the number of

TABLE I. Sample Size by Farm Size Category Based on Crockett County, Tennessee, Estimates, 1977.

Farm Size Category	Percent of Crockett County Total	Sample Size	Percent of Sample
Less than 4 hectares	7.7	3	5.5
4 to 20 hectares	30.1	15	27.3
20 to 72 hectares	33.2	20	36.3
72 to 202 hectares	19.6	11	20.0
More than 202 hectares	9.4	6	10.9
	100.0	55	100.0

Source: Author, and University of Tennessee/Tennessee State University Cooperative Extension Service.

interviews taken from each farm size category. The proportion of each category approximates the 1977 Extension Service estimates for farm size in Crockett County. Stratification according to farm size eliminated much of the potential error in that a limited number of farmers were interviewed in each farm size category. Once the predetermined number of interviews were completed in any farm size category, additional farmers selected by the random number process were rejected unless they fell into a category that had not been completed. This greatly reduced the probability of only large farmers being sampled and ensured a representative sample of farmers by farm size.

Evidence of the accuracy of the sample is provided in Table II which shows the very low raw chi square score of expected farm size

TABLE II. Chi Square Test of Sample Versus Actual Farm Size.

Farm Size Category	Expected	Sampled	Partial Chi Square
Less than 4 hectares	4.25	3	0.368
4 to 20 hectares	16.73	15	0.179
20 to 72 hectares	18.35	20	0.148
72 to 202 hectares	10.80	11	0.004
More than 202 hectares	4.87	6	0.262
Total	55.00	55	0.960

Result: No significant statistical difference between the means of sampled and actual farm size at the 99.5 percent confidence level.

Source: Author

versus the sample. Statistical evidence indicates that the means of actual farm size and sampled farm size are similar at the 99.5 percent confidence level. Also, mean farm size for the sample is 89.4 hectares (220.9 acres) with an actual farm size of 83.4 hectares (206.1 acres).

Other qualifications included the rejection of a random number selected more than once, and rejection of a farmer selected more than once. These qualifications reduced the potential for error in that farmers with large operations and many fields would not be sampled a second time.

The sampling method used in this research has certain bias as previously stated. However, with the qualifications used in drawing

the sample the method provided for the valid collection of data. Furthermore, the sample can be treated as if it were representative.

Data Analysis

The data were analyzed both quantitatively and qualitatively. Quantitative analysis included the use of descriptive statistics (mean, median, mode, standard deviation), and the hypothesis testing statistics of chi square, Pearson's product moment correlation coefficient, and asymmetric lambda. These computations were made by the Statistical Package for the Social Sciences computer program (subprogram Crosstabs and Scattergram) at the Oregon State University Computer Center.

Chi square is a test that determines whether or not a significant relationship exists between two variables. This is done by computing the difference between observed and expected frequencies (Mendenhall, 1975, pp. 233-235). Chi square was used to test the "proxies" of hypothesis number three against participation in the Agricultural Conservation Payments program.

The Pearson product moment correlation coefficient (r) is the most powerful test of correlation. This statistic describes the degree of association between paired sets of values at the interval level. If the values are randomly distributed r approaches zero. If the values are perfectly paired, r equals +1.0. If the values are

inversely paired, r equals -1.0 (Hammond and McCullagh, 1974, pp. 193-195).[2] The Pearson correlation coefficient was used to test the "proxies" of hypothesis number three against frequency of contact with the Soil Conservation Service and the Cooperative Extension Service. For the purpose of hypothesis testing, all variables are assumed to be normally distributed.

Asymmetric lambda is a measure of association of variables when one or both of the variables are on the nominal level. It measures the percentage in improvement to predict the value of the dependent variable once the value of the independent variable is known. The maximum value of lambda is 1.0, which occurs when prediction of the dependent variable by knowledge of the independent variable can be made without error. A value of zero means there is no improvement in prediction. The higher the value, the more association there is between the variables.[3]

Lambda was used to test the "proxies" of hypothesis number three against participation in the Conservation Reserve program.

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[2] Mathematically, the Pearson correlation coefficient is defined as "the ratio of covariation to square root of the product of variation in X and the variation in Y, where X and Y symbolize the two variables" (Nie et al., 1975, p. 280).

[3] Mathematically, lambda is defined as the difference between the sum of the maximum values of the cell frequencies in each column less the maximum value of the row totals (Nie et al., 1975, p. 225).

Too few participants were sampled to validate the chi square method. The Pearson correlation coefficient was likewise useless because participation information was available only on the nominal level. Therefore, lambda was chosen from the remaining applicable statistics.

Correlation analysis was used in the section dealing with multiple variable participation characteristics. Simple proportional analysis was used to test the second hypothesis. Hypotheses one, three and four were tested by logical subjective analysis.

Plan of Study

The organization of this dissertation is intended to establish the analytic framework against which the hypotheses may be tested. Chapter Two presents an analysis of the physical resources of the Cypress area and identifies the importance of each component.

The evolution of land utilization and condition change is discussed in Chapter Three. The validity of hypothesis number one is assessed.

Chapter Four includes the presentation of the intent and goals of the public land conservation programs in the study area. Also, the extent of participation is analyzed and hypothesis number two tested.

The fifth and sixth chapters deal with hypothesis number three.

Single variable participation characteristics are discussed in Chapter Five, and multiple variables are discussed in Chapter Six.

Chapter Seven reports and assesses the relevance of farmer opinion of the public conservation programs. Hypothesis number four is discussed and analyzed.

Finally, Chapter Eight consists of a summary of research findings and hypothesis verification. Problems relating to program effectiveness are listed and discussed.

CHAPTER II

THE LAND RESOURCE BASE

Location of the Study Area

The study area, the Cypress Creek drainage basin, is located in Crockett County, Tennessee, at 35°45' North latitude, 80°05' West longitude. It is approximately 105 kilometers northeast of the City of Memphis and 50 kilometers east of the Mississippi River (see Figure 1 for location of the study area in West Tennessee). The study area is elongated north to south and covers approximately 104 square kilometers.

Topography and Drainage

The topography of the study area is characterized by a gently rolling plain. The highest elevation is 143.5 meters and the lowest is 91.1 meters. In the interior and lower parts of the basin, slopes vary in length from 75 to 1,800 meters. Slopes vary from zero to four percent. (See Table III.) In this area slopes do not limit any type of land and field organization. In the peripheral and upper portion of the basin, the slopes vary in length from 30 to 305 meters. Here, slopes limit field arrangement and organization in extensive areas owing to angles of three to fifteen percent.

Agricultural land use is seriously limited in the upper portion

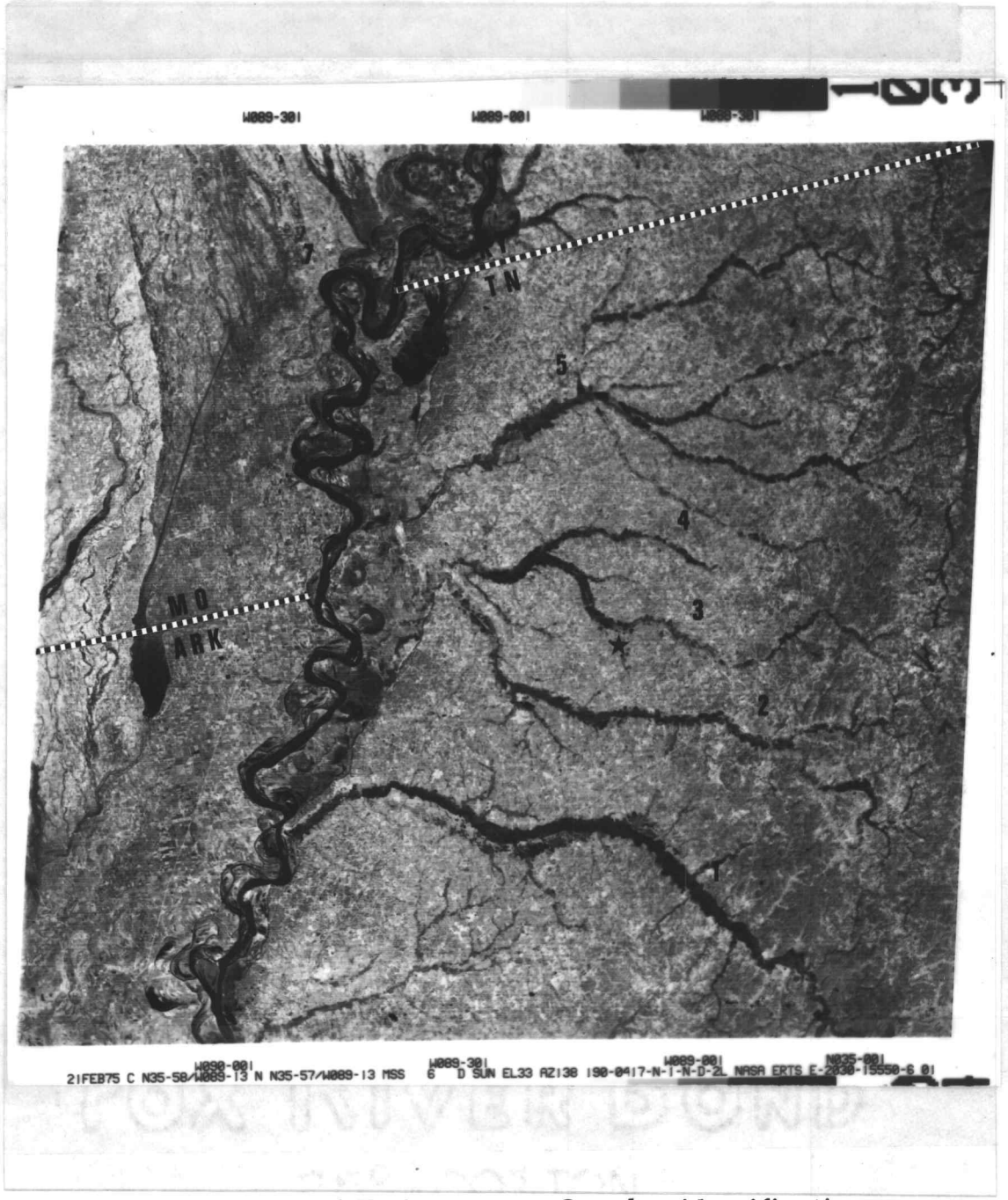

Figure 1. Mississippi Embayment. Overlay identification: No. 1 - Hatchie River. Nos. 2, 3, and 4 - South, Middle, and North Forks of Forked Deer River. No. 5 - Obion River. No. 6 - Reelfoot Lake. No. 7 - Mississippi River. Star indicates location of study area.

TABLE III. Slope Measurements

Percent of Slope	Percent of Area	Hectares
0 to 3	45.8	4898.4
3 to 8	42.2	4506.9
8 to 15	11.7	1252.7
greater than 15	0.3	32.9

Source: Author, measured from U.S.G.S. topographic maps.

of the basin where slopes are greater than eight percent. Land use is limited in the lower reaches of the basin by poor drainage, however, much of it is well suited to intensive agriculture with proper conservation management.

The drainage within the study area is dendritic in pattern. Significant modifications have occurred during the period of settlement and use. Aerial photography of 1941 indicates the original Cypress Creek had a meandering course. In the early 1920's and again in 1975, Cypress and Sand Creeks were channelized. Parts of the original course show up as meanders that are separated from the present channel. This phenomenon has occurred due to the filling in and subsequent cultivation of portions of the original channel. (See Figure 2). It is impossible to accurately determine the gradient of the course of the original creek, but it was probably less than 0.5 meters per kilometer (or 2.6 feet per mile). This undoubtedly left a

Figure 2. The crooked row of trees in the center marks the pre-1920 meandering Cypress Creek.

large part of the floodplain under water in the early spring when precipitation is slightly higher than the other seasons and evapotranspiration is near its minimum.

The original course was modified to a relatively straight ditch in the 1920's and Sand Creek, which is a tributary of Cypress Creek, was also channelized for a short distance at that time.[4] The intended

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[4] Several drainage districts were established in Crockett County in the 1920's for the purpose of providing a tax base to pay for channelization. Taxes were collected to retire bonded indebtedness. Source: interview with Jerrell Reasons, Crockett County Court Clerk, March 15, 1977.

purpose of the channelization was to speed the drainage of the floodplains. The gradient of Cypress Creek was increased to 0.64 meters per kilometer (or 3.38 feet per mile, see Table IV for stream gradients). This did speed the flow of water from the basin. However, it must have taken with it much more sediment than had been the case prior to channelization. The practice of intensive row cropping has, over the years, filled in and obliterated most of the original meander scars.

TABLE IV. Stream Gradients

Sand Creek, 2.45 meters per kilometer (tributary of)
Cypress Creek, 0.64 meters per kilometer (tributary of)
Middle Fork - Forked Deer River, 0.39 meters per kilometer (tributary of)
Obion River, 0.30 meters per kilometer (tributary of)
Mississippi River, 0.11 meters per kilometer

Source: Author, measured from U.S.G.S. topographic maps.

Figure 3 shows a portion of the 1975 Cypress channel. The channel dimensions in this reach are approximately five meters in width at the bottom of the channel and three meters deep. The cross sectional area of the channel was increased from approximately five

Figure 3. 1975 Cypress Creek drainage channel located 8.5 kilometers from mouth.

square meters to approximately 15 square meters due to channelization.

Figure 4 shows a reach upstream from that of the previous picture. Channel depth here is currently three to four meters. In the left hand wall of the channel, unconsolidated coastal plain sediments, previously below the soil forming processes, have now been exposed. The cross section of the channel has been increased from approximately five square meters to approximately 20 square meters.

The result of this recent channelization will be a considerable improvement in drainage of portions of the floodplain for several

Figure 4. 1975 Cypress Creek drainage channel located 10.6 kilometers from mouth.

years. However, channelization proceeded to such a depth in 1975 that the basin's base level has been lowered in local areas as much as 1.5 meters. This will, in turn, rejuvenate the direct tributaries of Cypress and Sand Creeks and increase erosion. The author has observed sedimentation of the new channel occurring at almost all points. Brief rain showers send small amounts of runoff down the channel creating miniature meanders and braids.

Drainage characteristics of the basin are displayed in Table V. Most of the basin has ample drainage with the exception of local portions of the floodplains of Cypress and Sand Creeks. The lowest

TABLE V. Drainage Characteristics

Thorough	46.6 percent	4975.4 hectares
Adequate	31.1 percent	3325.9 hectares
Poor	16.6 percent	1778.4 hectares
Excessive	5.7 percent	611.2 hectares

Source: Author, interpreted from 1971 aerial photography

2.5 kilometers of the basin are the most poorly drained because much of it is in the floodplain of the Middle Fork of the Forked Deer River, of which the Cypress basin is a tributary. (See Slope Map, Figure 7.) . The areas of excessive drainage are widely dispersed and are limited to steep slopes which are cropped, severely eroded, or generally lacking vegetative cover.

Surface Geology and Soils

The study area lies entirely within a region of Tertiary and Cretaceous coastal plain depositions known as the Mississippi Embayment (Cushing et al., 1964, p. 3). (Figure 1 is a satellite image of the Mississippi Embayment with streams at flood stage.) Unconsolidated coastal plain sediments range in depth from 550 meters on the eastern edge of the study area to about 610 meters on the western edge (Sterns and Armstrong, 1955, p. 24). With the exception of the floodplains of Cypress and Sand Creeks, the area is

covered with a thin veneer of Quaternary loess (Geologic Map of Tennessee, 1966). This powdery substance has high erosion potential even on low percentage slopes (Figure 5).

Figure 5. Loess, a powdery, windblown substance which is easily cultivated.

The upland soils in the study area are characterized by brown to grayish-brown silt loam or clay silt loam. Loess dolls, small calcareous concretions, are common in most areas (Figure 6). Much of the area is underlain by a strong hardpan varying in depth from 25 to 107 centimeters beneath the surface. The thickness of the hardpan ranges from a few centimeters to several meters with considerable local variation. The density of the clay is also variable.

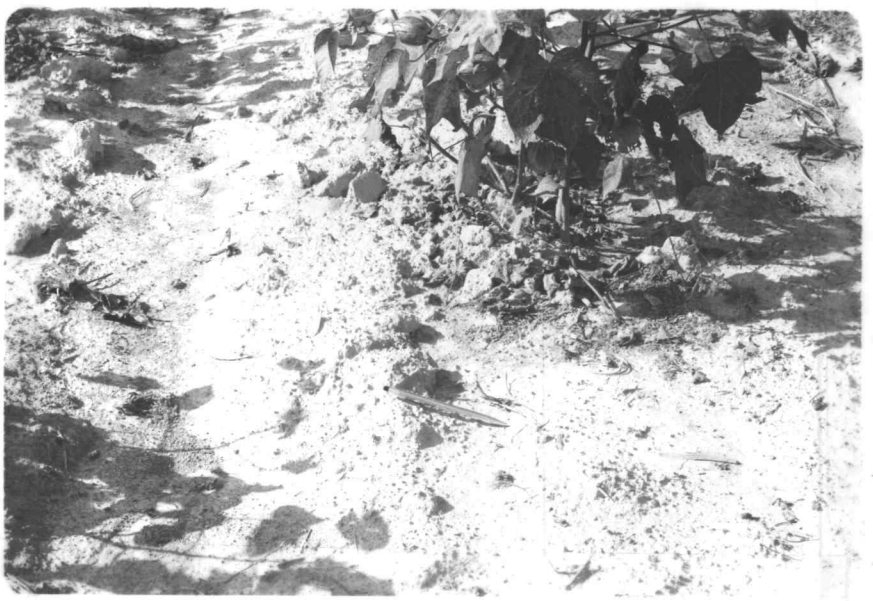

Figure 6. Loess dolls scattered over the surface of this cotton field.

Appendix Three includes a complete description of the study area soils. (See Soils Map, Figure 7.)

From the point of view of land use the hardpan presents two concerns. First, it can limit plant root penetration and thus tends to limit moisture and nutrients reservoirs. Second, it increases the erosion potential because water infiltration is decreased. This is especially critical during periods of intensive rainfall.[5] The prospect of breaking up this hardpan for cultivation is feasible in

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[5] Soil information was obtained from the Crockett County Soil Conservation Service Office and an interview with Mr. Don Clements, Crockett County SCS Agent, December 17, 1976.

Figure 7

SOIL SERIES

FALAYA, WAVERLY, COLLINS

(Floodplain Soils)

GRENADA - LORING

(Hardpan Soils)

LORING - MEMPHIS

(Hardpan or Sandy Subsoil)

CYPRESS CREEK BASIN

SLOPE MAP

0-3 percent

3-6 percent

6-10 percent

N

0 500 1000 1525 meters

0 1000 3000 5000 feet

TENN.

Map Location

MIDDLE FORK

FORKED DEER RIVER

CYPRESS CREEK

FALAYA, WAVERLY, COLLINS

LORING-MEMPHIS

SAND CREEK

ALAMO

GRENADA-LORING

GRENADA-LORING

GADSDEN

GRENADA-LORING

limited areas. Locations with several meters of compact clay near the surface cannot be cultivated by any means. As loess is continually removed by fluvial processes, the hardpan problem is becoming critical to the feasibility of continued cultivation in some areas.

Floodplain soils consist of a deep, friable silt loam. They are generally brown on the surface but become gray and mottled with depth. Of all the study area soils these are the most naturally fertile but are poorly drained and periodically flooded.[6]

Climate

The climate of the study area is humid subtropical. Summers last from mid-May to late September (21 degrees centigrade or more daily average) and are characterized by constantly high relative humidity and occasional thunderstorms. Diurnal range of temperature is commonly less than 11 degrees centigrade in July and August. The area has a great amount of heat energy during the period of intensive plant growth. (See Table VI, Growing Degree Days.) The only physical restriction concerning heat in the summer is that plants must be tolerant of extended periods of 32 to 37 degree centigrade temperatures.

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[6]Soil information was obtained from the Crockett County Soil Conservation Service Office and an interview with Mr. Don Clements, Crockett County SCS Agent, December 17, 1976.

TABLE VI. Growing Degree Days of the Study Area.

Observations made at Memphis, Tennessee, based on 4.44° Centigrade:

Month	Average (degrees Centigrade)
January	0.0°
February	19.4°
March	183.0°
April	342.6°
May	501.1°
June	610.8°
July	680.6°
August	651.1°
September	534.8°
October	385.3°
November	184.8°
December	22.2°
Annual Average Total	4115.7°

Source: The Weather Almanac, Ruffner and Blair (editors), 1974.

Moisture is fairly evenly available during the entire year, although there is a short period of relatively dry weather in the autumn. (See climagraph, Figure 8.) Average annual precipitation is 136.0 centimeters with 74.7 falling from October to March (inclusive) and 61.3 centimeters falling from April to September (Climatological Data, 1941-1976). Little, if any, restriction of crop selection is the result of inadequate precipitation.

On the other hand, intensity of precipitation creates an erosion problem of serious consequence to cropland without careful conservation management. At a Memphis, Tennessee weather station a record

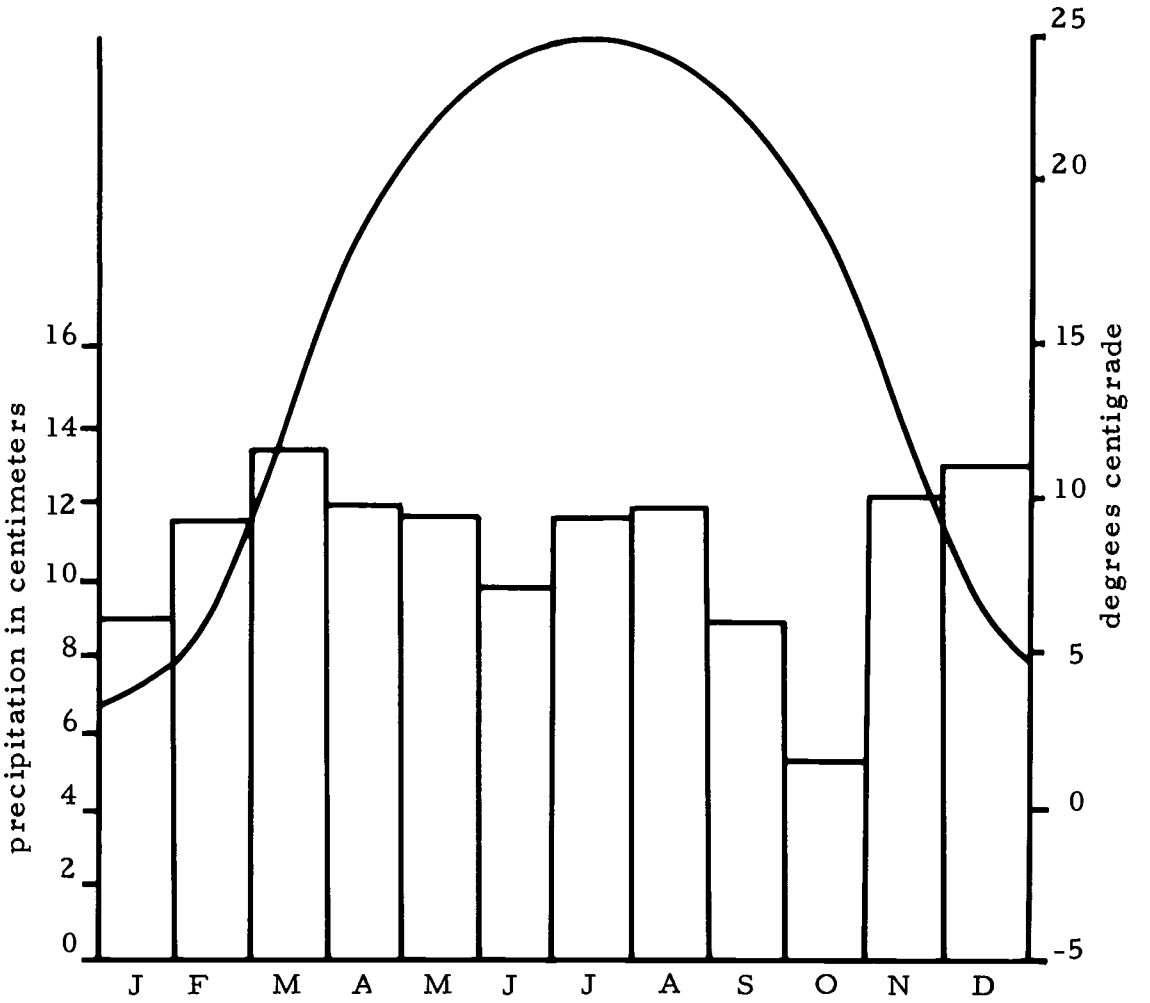

Figure 8. Climagraph. Observations made at Dyersburg, Tennessee, 32 kilometers northwest of the Cypress basin.

Source: Climatological Data, 1961-1975.

rainfall for a 24-hour period of 26.6 centimeters was recorded in November, 1938 (Ruffner and Blair, 1974, p. 517). The average monthly greatest day of precipitation is 3.71 centimeters. Over one-third of all precipitation that falls on the study area occurs on the 12 monthly greatest days of precipitation. This is significantly in excess of the infiltration rate on bare soil and is a destructive force unless accommodated by proper land use and management practices. The Cooperative Extension Service of the University of Tennessee ranks Crockett County in the top 12 of the 95 counties in the State in terms of the rainfall erosion index factor.[7] The precipitation intensity problem is not seasonal in the humid subtropic, rather it is a year-round phenomenon. From 1941 to 1976, there were 76 monthly greatest days of precipitation in the 5.1 to 7.6 centimeter range. Twenty-one other monthly greatest days of precipitation ranged from 7.6 to 15.6 centimeters. (See Table VII, Average Monthly Greatest Day of Precipitation.)

Winters in the study area are usually mild with frequent cyclonic storm passages. The average date of the first killing frost in the autumn is November 4 and the last in the spring is March 26. The frost-free period averages 224 days. There is little restriction on

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[7] The rainfall erosion index is directly proportional to the product value of the total kinetic energy of a given storm times its maximum 30 minute intensity (Jent et al., 1967, p. 10, 34).

TABLE VII. Average Monthly Greatest Day of Precipitation. Observations made at Jackson, Tennessee.

	Average of Monthly Greatest Day of Precipitation, 1941-1976 (expressed in centimers)	Percentage of Monthly Total of Precipitation
January	3.86	24
February	3.53	29
March	3.94	22
April	4.57	39
May	4.26	42
June	3.55	33
July	3.25	28
August	3.12	37
September	3.32	39
October	3.40	52
November	4.11	38
December	3.65	34

Source: Climatological Data, 1941-1976.

agriculture due to the severity of the winter, depth of frozen ground, and freeze-thaw frequency. There are approximately 60 freeze-thaw cycles annually, and the ground is seldom frozen to a depth of five centimeters. Snow does not occur every year and accumulations of more than three to five centimeters are rare. Intensity of precipitation poses more of a hazard in winter than in summer because many farmers leave their croplands bare during the cold months.

Summary of the Land Resource Base

The conditions of modest surface relief, fertile soils, reasonably good drainage, and climate that is generally permissive provides

a land resource base well adapted to biotic production. It is particularly suited to a range of agricultural plants, especially long warm season crops, but by adjusting time of plantings, short warm season and short mild or cool season crops can also be grown. Many pasture plants also do well. With proper use and management of land and water, the Cypress basin has a sustainable potential for productive agriculture.

At the same time, however, the land resources are vulnerable to serious depletion with abuse or imprudent management. The principal problems relate to the loess soils with compact clay subsoil and the evenly distributed, frequently intense precipitation.

The soils are subject to erosion even on the slightest slopes. Thus, land managers must have concern for bare ground, relation of rows to slopes, orientation of fields to slopes, and other practices that will minimize surface runoff and erosion. Unfortunately, such practices have not been followed in the past and soil erosion is consequently a problem.

CHAPTER III

HUMAN ORGANIZATION AND USE OF LAND

Settlement of the Study Area

White settlements in the Cypress Creek basin began in the 1820's near the extreme southeast corner. The earliest settlers, from Middle Tennessee and North Carolina, were attracted to the area by the forest mantle of poplar, hickory, oak, ash and cypress. This forest was the habitat of deer, bear, wolves, lynx, beaver, raccoon, opposum, numerous smaller game, wild turkey, and migratory fowl. The first settlers subsisted on this resource complex (Elder and Elder, 1973, p. 840).

The forest remained virtually undisturbed until the 1830's. During the next decade, commercial agriculture, based mainly on cotton, began and was well established by the time Tennessee joined the Southern Confederacy in 1861. By 1880 about 40 percent of the study area was cleared (Elder and Elder, 1973, pp. 832-833). In the subsequent 60 years the forest of the basin was essentially eliminated in favor of agricultural land uses. By 1941, only six percent of the basin remained in forest. The bulk of the remainder was devoted to the production of cotton.

Evolution of Land Use

By 1940, the cotton production system had evolved into a pattern of small fields, small farms, draft power, and intensive use of hand labor. Most of the cultivation in the study area was accomplished by the use of mules. This practice continued through the 1940's and did not begin to change significantly until the mid-1950's. The Census of Agriculture for 1954 was the last to report information concerning draft animals. That year 11.7 percent of farms in Tennessee reported draft animals as the only source of cultivation power.

The study area agriculture in 1940 was labor intensive through the entire growing cycle: field preparation, planting, cultivation, and harvesting. Animal and human labor was applied to production in lieu of capital inputs.

The use of hand labor and draft power limited the amount of land one man and his family could farm. It also encouraged the maintenance of a large rural labor supply, which was almost exclusively Negro. For a time after technological advance at the national level, the continued availability of this local labor along with the small size of farms tended to slow acceptance of mechanization. Even after the disappearance of the mule, cotton required considerable manual labor through its growth, maturity, and harvest stages. The dependence upon manual labor was necessary for several

reasons. First, after its emergence and growth to a height of 10 to 13 centimeters, cotton had to be weeded and thinned by hand. This situation continued until the mid-1960's when pre-emergence herbicides were developed, and new planting techniques were used to avoid hand thinning. Second, hand harvesting of cotton was necessary until 1962 when the first mechanical cotton picker was commercially used in the study area. Until then, five workers were needed to pick one bale of cotton per day. Presently, a one-row mechanical picker can harvest a maximum of eight bales per day with the use of one or two workers. In 1977, hand picking cost $4 to $5 per 45.5 kilograms compared to $2 to $3 per 45.5 kilograms picked mechanically (Pipkin, personal interview, 1976). There was some resistance to mechanical pickers on the part of a few farmers, but tradition gave way to a more economical method. Mechanization of the cotton harvest freed the farmer from major dependence on hand labor.

These agricultural changes had significant effects upon the racial makeup of the population of the study area. When jobs were mechanized there were few employment prospects in rural areas for the Negro workers. Consequently, many of them moved to metropolitan areas to seek employment.

Mechanization also had an effect on the number and size of farm units. The study area is trending towards larger and fewer farms. (See Table VIII.) From 1940 to 1977 the number of farms has

TABLE VIII. Farm and Farm Size Changes in Crockett County.

	Number of Farms	Percent Change Over Previous Year	Farm Size (Hectares)	Percent Change
1977	882	- 1.5	83.4	+13.2
1974	896	-26.3	73.7	+32.6
1969	1,216	-19.8	55.6	+24.6
1964	1,517	-25.0	44.6	+40.5
1959	2,024	-22.4	31.7	+24.0
1954	2,607	-12.9	25.6	-34.7
1950	2,996	+11.5	39.2	+64.0
1945	2,686	- 2.3	23.9	+ 2.8
1940	2,748	---	23.2	---

Source: Census of Agriculture 1940-1974. The estimates for 1977 were provided by Cooperative Extension Service, Crockett County Office. There was a change in the definition of "farm" in 1950 that accounts for the data anomaly.

declined by about two-thirds. Accompanying the decline in the number of farm units has been an increase in farm size of approximately 278 percent. Modern technology allows the operator to farm more land. Farm sizes have thus increased and so have the size of fields for reasons of capability and feasibility.

Photo-Interpretation and Field Observation Evidence of Land Use and Land Condition and Change

Mapping man's cultural alteration of the natural landscape was an interest of many prominent American geographers of the early 20th Century. Carl O. Sauer (1919, p. 47-54) and Derwent S. Whittlesey (1927, p. 72-78) published articles early in the century

that reviewed various field mapping methods. The Hennepin Conference of 1925 as reported by Jones and Finch (1925, p. 148-157) in the Annals produced a major contribution to the observation, description, and interpretation of spatial phenomena.[8]

The era of aerial photography revolutionized the Hennepin scheme for mapping and facilitated comprehensive coverage of large areas. The first governmental agency to apply the art of air photo-interpretation to mapping an agricultural area was the Tennessee Valley Authority. G. Donald Hudson reported in the Annals in 1936 the method used by TVA's Geographic Section to map a portion of the Tennessee Valley and interpret various cultural, physical, and economic characteristics (Hudson, June, 1936, pp. 99-112).

The method used in this research is similar to that developed by Hudson but does not include as many characteristics. The study area was mapped on a field-by-field basis for the years 1941 to 1971. This was accomplished by transferring field boundaries from the aerial photography directly onto a mylar overlay map of the same scale. (See 1941 and 1971 Land Use and Field Size Maps in pocket.) Land use, conservation practices, extent of erosion, and field size data were recorded on separate cards corresponding to each field.

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[8] Whittlesey promptly tested the method suggested at the Hennepin Conference and found it to be useful (Whittlesey, December, 1925, pp. 187-192.

Results of this procedure revealed a 17.6 percent increase in the mean size of fields between 1941 and 1971. (see Table IX, Study Area Field Size 1941-1971.) The mean value of field size rose from 5.9 hectares (14.58 acres) in 1941 to 6.9 hectares (17.14 acres) in 1971. The number of fields fell from 1,817 in 1941 to 1,286 in 1971. Evaluation of the maps (in pocket) reveals that the increase in field size is most noticeable near the center of the study area where drainage is fair to good and slopes pose little or no limitation.

Agricultural land use of the study area intensified from 1941 to 1971. At the beginning of the time period nearly two-thirds of the area was used for row crops. (See Table X.) By 1971, over three-fourths of the area was in row crops.

During the same period conservation management practices received increased acceptance. Interpretation of aerial photography for 1941 revealed that 51 percent of all crop lands had no form of visible conservation management practices. This figure dropped to 33.4 percent in 1971, but rose to 45.3 percent in 1977 based on the field observation sample. Certain specific practices have gained increased acceptance from 1941 to 1977. Terracing was used on only

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All information in the remainder of this section is based on the rural portion of the study area. Urban use of some lands on the fringes of the basin is not included.

TABLE IX. Study Area Field Size, 1941-1971.

Hectares	Observations of Field Size: Number of Fields, 1941	Number of Fields, 1971
less than 1.2	179	57
1.2 to 2.4	443	231
2.4 to 3.6	337	212
3.6 to 4.9	247	174
4.9 to 6.1	156	170
6.1 to 7.3	85	86
7.3 to 8.5	93	86
8.5 to 9.7	61	79
9.7 to 10.9	58	70
10.9 to 12.1	22	39
12.1 to 13.4	27	30
13.4 to 14.6	28	28
14.6 to 15.8	20	16
15.8 to 17.0	10	11
17.0 to 18.2	7	9
18.2 to 19.4	8	16
19.4 to 20.6	4	6
20.6 to 21.9	3	9
21.9 to 23.1	5	9
23.1 to 24.3	2	7
24.3 to 25.3	3	4
24.5 to 26.7	2	5
26.7 to 27.9	0	1
27.9 to 29.1	1	2
29.1 to 30.4	1	0
30.4 to 31.6	1	1
31.6 to 32.8	0	2
32.8 to 34.0	2	0
34.0 to 35.2	2	1
35.2 to 36.4	0	0
36.4 to 37.6	0	0
37.6 to 38.9	1	0
33.9 to 40.1	0	0
40.1 to 41.3	1	0
41.3 to 42.5	1	2
more than 42.5	0	2
	1,817	1,286
1941 mean size = 5.9		1971 mean size = 6.9

Source: Author, measured from aerial photography, 1941 and 1971.

TABLE X. Study Area Land Use, 1941-1971.

Land Use Category	Percentage of Study Area 1941	1971
Row Crops	65.9%	78.5%
Pasture/Hay/Cover crops	27.4%	16.6%
Forest	6.0%	4.6%
Other (excluding urban)	0.7%	0.3%

Source: Author, interpretation of aerial photographs, 1941 and 1971.

three percent of fields in 1941, and four percent in 1971. This practice increased four-fold in the 1970's and was observed on 16.2 percent of sample fields in 1977. The use of winter season cover crops was negligible in 1941 according to the local Extension leader (Pipkin, personal interview, 1977), but increased to 7.4 percent by 1977.

The erosion problem, however, increased during the entire study period. In 1941, approximately 64 percent of all land had been eroded to an extent that was visible on aerial photographs. By 1971, 74 percent of all land was eroded to the same extent. The 1977 observation sample revealed that 87 percent of the sample farms had been eroded to a detrimental extent. (See Table XI, Observed Erosion on Sample Fields.)

Typical scenes of study area erosion problems are shown in Figures 9 through 12. Figure 9 shows a pasture of which a portion has

TABLE XI. Observed Erosion on Sample Fields.

Erosion Class	Number of Fields	Percentage of Total
No Erosion	10	6.8
Mild Sheet Erosion	6	4.1
Widely Spaced Small Gullies	1	0.7
Combination of Mild Sheet and Widely Spaced Small Gullies	81	54.8
Closely Spaced Small Gullies	1	0.7
Closely or Widely Spaced Large Gullies	1	0.7
Loss of "A" Horizon	44	29.7
Closely or Widely Spaced Large Gullies and Loss of "A" Horizon	4	2.7
Totals	148	100.0

Source: Author, field observations made September, 1977.

been deeply eroded. Such extensive erosion probably started when the land was cropped. Although a good sod is now established, the gullies are sufficiently developed to require reshaping and reseeding for effective control.

Figure 10 shows rather deep, closely spaced gullies and a total loss of the "A" horizon on a soybean field. Much of the problem is caused by the rows being oriented parallel to the slope. Although this scene suggests impending loss of the field for cropping purposes, the

Figure 9. An eroded pasture.

Figure 10. Deeply eroded soybean field.

large machinery used in the study area can easily cultivate over and fill in the gullies. In many instances, this situation is repeated several years in succession. This practice tends to conceal the extent of the problem.

The scene in Figure 11 is similar to the previous one. Large farm machinery could fill in the gullies each season for many years in succession. Thus, farmers are not as sensitive to soil loss as one might expect. In fact, one farmer told this researcher that, "The SCS just doesn't understand that the ground is the same 10 feet deep as it is at the surface."

Figure 11. Oblique aerial view of erosion.

Figure 12 shows deep gullying on a Sand Creek tributary. Here gullying has proceeded to a depth of three or more meters. Creation of tributary gullies is evident as erosion proceeds headward. The felt-like texture of the gullied area is winter litter of kudzu vine (Pueraria lobata).

Figure 12. A Sand Creek tributary, 1977.

The creation of these gullies occurred primarily since 1941. At that time there was a farm road crossing the drainage ways perpendicularly from the lower left-hand side of the picture to the upper right. Small bridges existed across each drainage way. By 1971 the bridges were no longer there, having probably been lost to intensive

erosion. By 1977 the farm road was totally abandoned.

Field Interview Evidence of Farmer and Land Use Characteristics in 1977

Information presented in this section is based on data collected in the farmer interviews and treated through the S.P.S.S. computer program.

The average age of the study area farmer in 1977 was 46.7 years. The standard deviation of age was 12.2 years with a range of 16 to 77.

The average number of years "lived in the area" was more than 38 with a standard deviation of almost 16 years. The range of years lived in the area was five to 77 years. The number of years farmed in the study area or its vicinity ranged from one to 55 years. The average time farmed in the area was 22.2 years with a standard deviation of 13.6. (See Table XII for complete statistical comparison of the above characteristics.)

The average education of the study area farmer was a completed high school diploma. Of the 55 sample farmers, 29 had a high school diploma, 14 had less than a high school education, and 12 had one or more years of college. The amount of formal education ranged from seven years to a completed Masters degree.

The 1977 average study area farm family's net income was

TABLE XII. Statistical Summary of Farmer Characteristics.

	(Numbers represent years)				
	Range	Mean	Median	Mode	St. Dev.
Age	61.0	46.7	43.3	40.0	12.2
Years lived in area	72.0	37.6	38.0	40.0	15.9
Years farmed in area	54.0	22.2	20.0	20.0	13.6

Source: Author, based on farmer interviews.

approximately $15,000. The standard deviation was $9,200 with a range from no income to approximately $40,000. Approximately 75 percent of the sample indicated that their income had been fairly stable the previous three years. Of the remaining 25 percent, approximately two-thirds stated that their income was lower than usual last year while one-third stated that their income was higher than usual last year.

The average study area farm family derived 48 percent of its income from non-farming sources. In many cases it was the wife's job or the husband's part time job that brought in the extra income. Only 13 of the 55 sample farmers were entirely dependent upon agriculture for income. The large standard deviation of 36.2 percent and total range of zero to 99 percent dependence on non-farm income

reflects the great variance of this factor.

The land tenure pattern consists of land owned by farmers, land rented by farmers, and land rented to other farmers. The average amount of land owned totaled 55.3 hectares (136.7 acres). The standard deviation was 89.4 hectares (221.1 acres) with a range of zero to 418.1 hectares (1033 acres). Farmers rented an average of 58.4 hectares (144.3 acres) for incorporation into their own farming unit. The standard deviation for rented land was 118.7 hectares (293.2 acres) with a range of zero to 716.3 hectares (1770 acres). The amount of land owned by study area farmers and rented to others averaged 24.3 hectares (60.1 acres). The standard deviation for land rented to others amounts to 60.0 hectares (173.0 acres) with a range of zero to 410.0 hectares (1013.0 acres). (See Table XIII).

TABLE XIII. Statistical Summary of Land Management Characteristics.

	(Numbers represent hectares)				
	Range	Mean	Median	Mode	St. Dev.
Land owned by farmer	418.1	55.3	25.2	0.0	89.4
Land rented by farmer	716.3	58.4	13.8	0.0	118.7
Land rented to other farmers	410.0	24.3	1.7	0.0	70.0

Source: Author, based on farmer interviews.

In each land tenure category, zero was the most often observed value. In other words, there is a tendency for some farmers not to own any agricultural land. However, it is also evident that those who do own land have a tendency to neither rent land from others nor rent land to others. Of the sample farmers, 82 percent own agricultural land, 67 percent rent agricultural land, and 31 percent rent a portion of their agricultural land to other farmers. (See Table XIII for a complete statistical comparison of land management characteristics.)

A large percentage of farmers continue to work the land under a share crop rental agreement. Nearly half (45.5 percent) of sample farmers had a share crop agreement with the landowner. Only 7.3 percent have a cash rental agreement with 14.5 percent having a combination of cash and share crop agreements.[9] Nearly one-third of the farm operators did not rent land and therefore had no relevance to rental agreements. A very small percent of the sample (7.3 percent) reported restrictions in the rental agreement. These restrictions most often had to do with crop selection.

There are seven categories of crops or other agricultural products grown in the study area for which farmers reported. The following products are listed in the order of their importance with

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[9] The combination of cash and share crop agreements occurred most often when farmers would rent from several different landowners.

the percent of farmers growing each product in parentheses: Soybeans (76.4%), cotton (61.8%), pasture or hay (38.2%), livestock (29.1%), wheat (16.4%), corn (9.1%), and truck crops (7.3%).

Nearly half (45.5 percent) of the sample farmers are growing the same crops now that they grew 10 years ago. More than 75 percent of those that are growing different crops are growing more soybeans and cotton now than they did in the past. The same cultivation techniques that were used 10 years ago are being used by 43.6 percent of the sample. Approximately one-quarter (27.3 percent) have changed techniques due to growing different crops, with 29.1 percent unable to accurately answer the question.

The soil erosion problem in the study area as perceived by farmers is serious. In answer to the question, "Do you think soil erosion is a problem on the other farms in the area?" 78.2 percent answered, "Yes." The extent of the erosion problem is underscored by a 61.8 percent response in the "somewhat serious" to "very serious" category. Only 18.2 percent of the sample stated that there is no erosion problem. (See Table XIV.)

TABLE XIV. Farmer Estimate of Soil Erosion in Study Area.

Category	Farmer Estimate (percent)
Not at all serious	3.6
Not very serious	29.1
Somewhat serious	41.8
Very serious	20.0
NA	5.5

Source: Author, based on farmer interviews.

Summary

HYPOTHESIS NUMBER ONE: Soil erosion is not a serious problem in the study area.

Based on the evidence of erosion obtained from aerial photography, field observations and interviews, and published information one must conclude that soil erosion is a serious problem. Therefore, the null hypothesis is rejected.

The alternative hypothesis is that soil erosion is a serious problem in the study area in spite of the attention drawn to the problem and public programs designed to reduce it. The history of human settlement and use of land is one of ever increasing agricultural intensification. The characteristics of the land tenure system, farm operation, and the farmer himself seem to sustain the problem rather than abate it.

CHAPTER IV

PUBLIC PROGRAMS AND EXTENT OF PARTICIPATION

Purpose

This Chapter summarizes the purpose of each public conservation programs and the extent of farmer participation. Information about the public programs came from the agencies responsible for their administration. Data concerning participation was obtained by field interviews and treated through the S. P. S. S. computer program.

Public Programs

The agencies examined in this research include the U. S. Soil Conservation Service and the Cooperative Extension Service of the University of Tennessee and Tennessee State University. The programs examined include the Conservation Reserve and Agricultural Conservation Payments programs administered by the U. S. Agricultural Stabilization and Conservation Service.

Soil Conservation Service

The Soil Conservation Service (SCS) became a permanent agency of the U. S. Department of Agriculture in 1935. Its goal is to maintain, and improve the land resources of the nation through

the provision of technical expertise and information to landowners and land users with respect to conservation of soils, plants, woodlands, watershed protection and flood prevention; the conservation, development, utilization and disposal of water; fish and wildlife management; recreation; community development; and related soil and water resource uses.

A soil and water conservation district was formed in the area in 1942 but did not receive substantive support from either the local farmers or the local government until the early 1970's. By 1976, the Crockett Soil & Water Conservation District employed one secretary and one technical assistant. Local funding for a published soil survey has yet to receive approval.

Agricultural Stabilization and Conservation Service

Conservation Reserve Program. The Soil Bank Program was composed of two parts, each distinct and separate, but very closely coordinated in operation. The Acreage Reserve was one part and was a short-term program.[10] It only lasted from 1956 to 1958, and

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[10]The Acreage Reserve Program was a direct attack on agricultural surpluses by encouraging farmers through payments to reduce their production below their acreage allotments. It provided for payments on the normal yield for the acreage of basic crops taken out of production, thus maintaining an improved net farm income and guaranteed return per acre on land included in the Acreage Reserve. A similar program was briefly instituted in the early 1970's during another period of commodity surplus. The "Set Aside" Program operated virtually the same as Acreage Reserve.

will therefore not be subject to evaluation by this research. The other part of the Soil Bank Program was the Conservation Reserve.

The Conservation Reserve part of the Soil Bank Act was designed to retire cropland from production and to help conserve soil, water, timber, and wildlife. Through the program, farmers were given financial assistance to help establish conservation practices on land which would otherwise be producing crops not needed at the time of surpluses of the 1950's. In addition to practice payments, farmers also earned annual payments to help offset the income they might have received by using these acres for crops.

County ASC Committees were advised in September 1956 of the practices and specifications which could be used in Tennessee. These practices included: sowing permanent vegetative cover, pasture improvement (reseeding annuals), liming acid soils, tree planting, construction of ponds, sowing winter or summer vegetative cover, and sowing wildlife vegetative cover. They were also advised to establish Soil Bank Bases and sign contracts beginning with the year of 1956. By early fall 1956, it was getting late to carry out certain practices; however, 199 contracts were entered into during the short sign-up campaign. These contracts covered 4400.5 acres at an annual payment rate of $10 per acre and 798.3 acres at a annual rate of $4 per acre. The total annual payments on these contracts amounted to $46,399.90 each year the contracts remained in force. The practice

payments for these contracts amounted to approximately $95,000.

Contracts were actively signed under Conservation Reserve from 1956 to 1960. These contracts were valid for periods of either five or ten years. However, the farmer could receive an early release under certain circumstances. The length of contracts had the effect of maintaining payments under the program from 1956 to 1969.

Agricultural Conservation Payments Program. The Agricultural Conservation Payments Program (ACP) is a voluntary cost-share program. The program was begun in 1969 at the time when all long-term Soil Bank contracts ended. The program offers cost-sharing, generally on a fifty-fifty basis between the farmer and the Federal government. The maximum government share was increased in 1978 from $2500 to $3500. The partnership is involved in conserving and enhancing soil, water, forest, and wildlife resources for the purpose of ensuring that present and future generations will have an ample supply of food, fiber and other necessities of life. A participating farmer must carry out an approved and needed conservation technique or improvement. The program emphasizes long-term farm-related conservation and environmental problems in rural areas. Practices with substantial public benefits at the least possible public cost are given highest priority. Higher cost-share levels of up to 80 percent government support are authorized for low income farmers.

Major considerations in authorizing cost-sharing are the resulting public benefits such as pollution abatement, enduring soil and water conservation, recreation, wildlife and open space.

In 1975, ACP also provided for long term agreements of up to 10 years to help farmers carry out conservation plans in an orderly manner. Under this arrangement, cost-sharing is obligated for specific practices to be installed over a period of time in accordance with a conservation plan of operations developed with SCS technical assistance.

Cooperative Extension Service

The Cooperative Extension Service of the University of Tennessee and Tennessee State University began service to Crockett County in the mid-1950's with one part time agent. By the late 1950's, a full time agent was available. Today, the Extension Service provides four full time agents and auxiliary staff to deal with the broad range of farm and rural problems.

While the primary goal of the Extension Service is to enhance rural life in general, it provides to the farmer an important source of land conservation skills with regard to crop selection, planting, cultivating, and harvesting techniques, soil sample analysis, and results of information generated by the numerous agricultural experiment stations as well as the campus Extension Service staff of

the University of Tennessee and Tennessee State University.

Extent of Participation

HYPOTHESIS NUMBER TWO: The extent of participation in publically sponsored land conservation programs in the study area is not significantly different from that of a multi-county region or the state as a whole.

Soil Conservation Service

Farmers in the study area seek advice from the SCS at a relatively low level. Only 40 percent of sample farmers consult with SCS. (See Table XV.) The field interviews reveal that 47 of 55 sampled farmers have never requested assistance from the SCS in developing a farm management plan.

TABLE XV. Consultation of Sample Farmers with SCS.

Frequency of Contact	Number of Farmers	Percent of Sample
Almost Never	33	60.0
Annually	15	27.3
Every Few Months	7	12.7
Totals	55	100.0

Source: Author, based on farmer interviews.

This information is in slight contrast to SCS participation in the surrounding counties. The SCS participation rate in a contiguous three county region is approximately 56 percent.[11] This means that the rate of SCS participation in the surrounding area (Dyer, Haywood, and Madison Counties in Tennessee) is about 1.4 times that of the study area. While this difference is measurable, it seems to be less than significant. Based on this information hypothesis number two is accepted.

Conservation Reserve

A smaller number of sample farmers participated in the Conservation Reserve program than in any of the other programs or agencies. (See Table XVI.) This is to be expected since Conservation Reserve had the lowest actual participation rate of all programs regionally and nationwide.

The total number of farms participating in Conservation Reserve in a six county region that includes the study area is presented in Table XVII. Table XVIII presents the approximate percentage of farm participation for each county in a six county region and the state total. The percentages are based on the year of the

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[11] Information regarding farmer consultation with SCS was obtained by correspondence with District Conservationists in Dyer, Haywood, and Madison Counties in 1978.

TABLE XVI. Sample Farmer Participation in Conservation Reserve.

	Number of Farmers	Percent of Sample
Participants	12*	21.8
Non-Participants	40	72.7
NA or DK	3	5.5
Totals	55	100.00

* This figure includes each study area sample farmer who farms land that was in the Conservation Reserve Program regardless of its location within or without the study area.

Source: Author, based on farmer interviews.

greatest number of participants in each county (1961) versus the number of farms for the nearest census of agriculture year (1959). These data show that Crockett County farmers participated in the program at a higher rate than most of the surrounding area. However, due to a low participation rate in all counties, hypothesis two is accepted.

Agricultural Conservation Payments Program

A little more than half of the sample farmers have participated in the ACP one or more times. Results of the sample are shown in Table XIX. The total number of participants in a six county region that includes the study area is presented in Table XX. For comparative purposes, it should be noted that in 1969, Crockett, Dyer, Haywood, and Lauderdale Counties had approximately the same

TABLE XVII. Conservation Reserve Program Participants.

Counties	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Crockett	9	10	132	156	156	150	147	73	53	47	44	44	8
Dyer	4	8	72	96	92	89	87	43	35	31	24	24	10
Gibson	7	13	166	238	236	230	224	128	81	79	67	66	21
Haywood	15	33	161	184	184	178	160	102	91	85	76	75	12
Lauderdale	1	2	56	66	63	59	59	21	14	14	14	13	3
Madison	2	3	14	22	21	19	18	9	4	4	4	4	2
Tennessee	1402	2498	6127	7978	7876	7280	6701	4324	3146	3095	2700	2237	826

Source: Walter E. Head, Acting State Executive Director, Tennessee State Agricultural Stabilization and Conservation Service Office, Nashville, Tennessee.

TABLE XVIII. Percentage of Farm Participants in the Conservation Reserve Program.

Counties	Percentage of Total Farms
Crockett	10
Dyer	6
Gibson	8
Haywood	10
Lauderdale	5
Madison	2
Tennessee	6

Source: Walter E. Head, Acting State Executive Director, Tennessee State Agricultural Stabilization and Conservation Service Office, Nashville, Tennessee.

TABLE XIX. Sample Farmer Participation in ACP.

	Number of Farmers	Percent of Sample
Participants	28	50.9
Non-Participants	27	49.1
Totals	55	100.0

Source: Author

TABLE XX. Number of Participants in ACP.

Counties	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Crockett	848	981	1021	924	124	97	185	23	39	68
Dyer	444	539	494	404	198	236	116	22	101	87
Gibson	2209	1976	2065	1702	477	410	110	49	69	108
Haywood	650	656	679	618	296	175	38	62	89	118
Lauderdale	432	475	494	440	193	170	111	34	83	92
Madison	653	537	521	425	208	199	48	54	114	115
Tennessee	49021	49712	46777	42549	25393	29670	2893	3795	9810	14428

Note: The figures presented may represent participation by farmers on several different properties and include some multiple payments to a single individual for several locations.

Source: Walter E. Head, Acting State Executive Director, ASCS, Nashville, Tennessee

number of farms (1,200 to 1,350). Madison and Gibson Counties had considerably more farms, 1,696 and 2,750, respectively. There was a total of 121,406 farms in the State of Tennessee in 1969.

Related to the above figures, ACP participation in the study area has been approximately twice that in Dyer, Lauderdale, and Madison Counties on a per farmer basis. Study area participation has been about equal to that in Haywood County, and about 20 percent greater than statewide participation. However, study area participation is about 25 percent lower than in Gibson County. Therefore, participation in ACP in the study area is significantly greater than either the state or a multi-county region. On this basis, hypothesis number two is rejected.

Cooperative Extension Service

Most farmers in the study area do not consult with the Extension Service on a regular basis regarding conservation management techniques. Evidence of this is presented in Table XXI.

Even though use of the Extension Service by study area farmers seems low, it compares with a surrounding four county region on a nearly equal basis. Participation in the Extension Service in Gibson, Haywood, Lauderdale, and Madison Counties in Tennessee averages

TABLE XXI. Consultation of Sample Farmers with the Cooperative Extension Service

Frequency of Contact	Number of Farmers	Percent of Sample
Almost Never	32	58.2
Annually	11	20.0
Every Few Months	11	20.0
NA or DK	1	1.8
Totals	55	100.0

Source: Author, based on farmer interviews

approximately 44 percent of farmers.[12] Utilization of the Extension Service by farmers in the study area is approximately 91 percent of that in the larger region. There being no significant difference between the study area and the region, hypothesis number two must be accepted.

There were several interesting unsolicited comments made by farmers during the interviews. A large number of farmers regarded the information available from the Extension Service as beneficial to inexperienced farmers or those with unusual problems. The author was impressed with the notion implied by many farmers that it is a sign of weakness or dependence to consult with the Extension Service.

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[12] Information about farmer consultation with the Extension Service regarding conservation management practices was obtained through correspondence with Extension Leaders in Gibson, Haywood, Lauderdale, and Madison Counties in 1978.

This impression was particularly noticed among the older and less educated farmers although a strict pattern was not evidenced. It is interesting to note that 40 percent of the sample farmers have never attended an Extension Service "field day."

There is an additional problem faced by the Extension Service, that of the significance of its impact on conservation in the study area. Based on interviews with farmers and Extension Service personnel, it is the judgement of the author that the latter are competent, and have honorable intentions. However, there is some question about the efficiency of getting information to the farming public. Part of the problem lies in the apathy of farmers who are not legally bound to implement conservation techniques. Until this situation changes those farmers who do not see the wisdom of implementing conservation management will continue to be swayed by short term economic motives, tradition, or other factors.

Summary

The extent of use of the Extension Service and SCS is somewhat less in the study area than the surrounding region. Conservation Reserve participation is somewhat higher in the study area than the region. None of these three are significantly different than the region. Only ACP participation is considerably greater in the study area than in the larger region.

This information reveals several interesting patterns. First, the two agencies not offering monetary assistance (SCS and Extension Service) have lower participation rates in the study area than the region, while the two programs offering monetary assistance (Conservation Reserve and ACP) have higher participation rates than the region. Second, the program with the most participation in the study area is ACP which offers limited monetary subsidy, but requires the least adjustment and is the most flexible for the farmer in regard to long term commitments. Third, the Conservation Reserve program which offered the most monetary assistance but required the most commitment by farmers to long term goals had the least participation rate of all. Fourth, the two service agencies (SCS and Extension Service) which offer free "take it or leave it" advice and no monetary subsidy had virtually equal participation levels that were between those of ACP and Conservation Reserve.

CHAPTER V

SINGLE VARIABLE PARTICIPATION CHARACTERISTICS

Introduction

This chapter summarizes the participation characteristics for each public land conservation program and addresses hypothesis number three. Its basic objective is to determine what if any category of farmers participate in the public programs at significant levels. In doing so, all twelve proxy hypotheses are tested.

The programs under examination are non-targeted. This means that they are not designed to draw participation from any subgroup of farmers. Rather, they are designed to have a broad range of participants. Concentrated participation would mean that limited groups of farmers are benefiting from the programs.

Data were obtained by field interviews and treated through the S.P.S.S. computer program (subprograms Crosstabs and Scattergram). For the purpose of hypothesis testing, the chi square and Pearson correlation coefficient statistics are used at the confidence level of 95 percent. This means that there is no greater than one chance in 20 that the hypothesis is erroneous when it is accepted as accurate. The statistic lambda is also used for hypothesis testing. The significance level chosen for lambda is a minimum score of 0.75.

HYPOTHESIS NUMBER THREE. There are no social, cultural, or economic subgroups of farmers in which participation in the publically sponsored land conservation programs is concentrated.

Theoretical Framework for Proxies

Each proxy hypothesis was chosen to supply a specific piece of information in order to ascertain the validity of the third hypothesis. Assumptions were made regarding each proxy for the purpose of providing a framework for analysis.

The assumptions made regarding the age of the farmer and how long he has lived and farmed in the area are as follows: First, as all three time related proxies increase, the probability of participation increases due to a longer time period in which to participate. For example, from a time perspective, the farmer who has lived and worked in the area for 25 years has had a 25 times greater opportunity to participate than the farmer who has lived and worked in the area for only one year. Second, as a farmer grows older and learns by experience, it is assumed that he will understand the need for and advantages of participation in public land conservation programs and consequently be motivated to do so.

Farmer education was chosen as a proxy in order to determine what if any relationship exists between increasing education and participation. One would logically assume that the more educated

farmer would understand society's long term conservation needs better than his less educated peer. One would also assume that he would take a pragmatic approach to the erosion problem and therefore be more likely to participate in programs to control it.

It is logical to assume that increasing farmer income leads to participation in public land conservation programs because a higher income level allows the farmer to plan beyond short term economic needs. As a result, the farmer can afford to participate in the public programs and postpone economic returns from the present to the future.

The percent of non-farm income was chosen as proxy in order to determine what if any relationship exists between part time as well as full time farmers and participation in the public land conservation programs. The assumption made regarding non-farm income is similar to that of total income. As the percent of non-farm income increases the dependency upon agriculture for a living decreases. This increasing economic freedom from agriculture allows the farmer to participate in the public programs and postpone financial returns from the present to the future.

Farm size was chosen as a proxy because it is reflected in the scale of management unit. As such it is logical to assume that farmers managing farms of great difference in size will respond differently to the public land conservation programs. Specifically, it

is assumed that larger farm size leads to participation and smaller farm size does not lead to participation. The assumption is based on the observation that smaller farming units are generally oriented towards more short term economics than larger units. Therefore, the manager of the larger farm unit is free to participate in the programs and postpone current economic gain to the future.

Amount of land owned was chosen as a proxy for a similar reason. It is assumed that great differences in the amount of land owned leads farmers to different responses to public land conservation programs. In this case it is assumed that increasing land ownership leads to participation in order for the land to receive proper management. This is the farmer's way of protecting the long term productivity of his land investment.

Amount of land rented was chosen as a proxy in order to determine whether or not it is significantly related to participation. It is assumed that farmers do not take the same care of rented land that they do for land they own. This phenomenon is a common trait of human nature, and as the amount of land rented increases one would expect participation to decrease.

Type of rental agreement and rental agreement restrictions were chosen as proxies for similar reasons. Both are intended to determine whether or not increasing restrictions on the land manager by the landlord lead to non-participation in public land conservation

programs. For the purpose of this research it is assumed that increasing management restrictions leads to non-participation. Specifically, a share crop versus a cash rental agreement is assumed to lead to non-participation, and rental agreement restrictions versus no restrictions are also assumed to lead to non-participation.

The proxy changing cultivation techniques was chosen to serve as a surrogate for the degree of farmer flexibility and willingness to adopt new methods. The assumption is that flexibility and adaptability leads to participation.

Proxy Hypotheses

The following proxy hypotheses are used to determine the validity of hypothesis number three.

Age of Farmer[13]

Proxy Hypothesis Number One: Increasing age of the farmer is not related to participation in public land conservation programs.

The frequency of consultation with the SCS and Extension Service

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[13] The variables age of farmer, years lived in the area, and years farmed in the area are all related at significant levels. The correlation for age and years lived is 0.55, age and years farmed 0.70, and years lived and years farmed 0.66.

and participation in the Conservation Reserve and ACP programs versus the variable age of farmer is random. Tables XXII through XXIV display the specific patterns for each program and the results of each statistical test. Computation of the statistics for each program produces no significant relationships. On this basis proxy number one is accepted. The data do not substantiate any systematic relationship between program participation and age of the farmer.

TABLE XXII. Frequency of Contact with SCS by Age of Farmer.

Age	Almost Never	Annually	Every Few Months
30 years or less	2	1	1
31 to 40 years	7	6	3
41 to 50 years	10	1	1
51 to 60 years	8	5	2
Over 60 years	6	2	0
Totals	33	15	7

Statistical Test: $\underline{r} = -0.187$ (not significant)

Source: Author, based on farmer interviews.

TABLE XXIII. Participation in the Conservation Reserve and ACP Programs by Age of Farmer.

Age of Farmer	Conservation Reserve Participation		ACP Participation	
	Yes	No	Yes	No
30 years or less	1	2	1	2
31 to 40 years	4	10	7	6
41 to 50 years	1	11	4	7
51 to 60 years	4	11	10	4
Over 60 years	2	6	6	2
Totals	12	40	28	21
Statistical Tests:	lambda = 0.0 (not significant)		$\underline{X}^2$ = 4.90 (not significant)	

Source: Author, based on farmer interviews.

TABLE XXIV. Frequency of Contact with the Cooperative Extension Service by Age of Farmer.

Age	Almost Never	Annually	Every Few Months
30 years or less	2	1	1
31 to 40 years	7	4	4
41 to 50 years	10	0	2
51 to 60 years	6	5	4
Over 60 years	7	1	0
Totals	32	11	11

Statistical Test: $\underline{r}$ = -0.153 (not significant)

Source: Author, based on farmer interviews.

Years Lived in the Area

Proxy Hypothesis Number Two: Increasing number of years lived in the area does not lead to participation in public land conservation programs.

The pattern of consultation with the SCS and Extension Service and participation in the Conservation Reserve and ACP programs by the variable number of years lived in the area is random. Tables XXV through XXVII display the specific patterns for each program and the results of each statistical test. Computation of the statistics for each program by the variable produces no significant relationships. On this basis proxy number two is accepted for all four

TABLE XXV. Frequency of Contact with SCS by Years Lived in the Area.

Years Lived in the Area	Almost Never	Annually	Every Few Months
10 years or less	1	1	1
11 to 20 years	5	0	0
21 to 30 years	6	3	2
31 to 40 years	6	7	2
41 to 50 years	7	0	1
51 to 60 years	5	3	1
Over 60 years	3	1	0
Totals	33	15	7

Statistical Test: $r = -0.075$ (not significant)

Source: Author, based on farmer interviews.

TABLE XXVI. Participation in the Conservation Reserve and ACP Programs by Years Lived in the Area.

Years Lived in the Area	Conservation Reserve Participation		ACP Participation	
	Yes	No	Yes	No
10 years or Less	0	2	1	0
11 to 20 years	2	3	1	3
21 to 30 years	2	8	6	5
31 to 40 years	4	10	7	5
41 to 50 years	1	7	3	5
51 to 60 years	2	7	6	3
Over 60 years	1	3	4	0
Totals	12	40	28	21
Statistical Tests:	lambda = 0.0 (not significant)		$\underline{X}^2$ = 7.069 (not significant)	

Source: Author, based on farmer interviews.

TABLE XXVII. Frequency of Contact with the Cooperative Extension Service by Years Lived in the Area.

Years Lived in the Area	Almost Never	Annually	Every Few Months
10 years or less	2	0	1
11 to 20 years	4	0	1
21 to 30 years	6	1	3
31 to 40 years	5	7	3
41 to 50 years	6	0	2
51 to 60 years	5	3	1
Over 60 years	4	0	0
Totals	32	11	11

Statistical Test: $\underline{r}$ = -0.129 (not significant)

Source: Author, based on farmer interviews.

programs. There is no apparent relationship between the number of years lived in the area and participation in the programs.

Years Farmed in the Area

Proxy Hypothesis Number Three: Increasing number of years farmed in the area does not lead to participation in public land conservation programs.

The frequency of consultation with the SCS and Extension Service is random among sample farmers in relation to the variable years farmed in the area. Tables XXVIII through XXX display the specific patterns of participation for each program and the results of each statistical test. Computation of the statistical tests yield no

TABLE XXVIII. Frequency of Contact with SCS by Years Farmed in the Area.

Years Farmed in the Area	Almost Never	Annually	Every Few Months
10 years or less	8	3	2
11 to 20 years	7	5	3
21 to 30 years	11	2	1
31 to 40 years	3	4	1
Over 40 years	4	1	0
Totals	33	15	7

Statistical Test: $r = -0.075$ (not significant)

Source: Author, based on farmer interviews.

TABLE XXIX. Participation in the Conservation Reserve and ACP Programs by Years Farmed in the Area.

Years Farmed in the Area	Conservation Reserve Participation		ACP Participation	
	Yes	No	Yes	No
10 years or less	1	10	5	5
11 to 20 years	5	9	7	7
21 to 30 years	3	11	7	6
31 to 40 years	2	6	5	2
Over 40 years	1	4	4	1
Totals	12	40	28	21
Statistical Tests:	lambda = 0.053 (not significant)		$\underline{X}^2$ = 2.412 (not significant)	

Source: Author, based on farmer interviews.

TABLE XXX. Frequency of Contact with the Cooperative Extension Service by Years Farmed in the Area.

Years Farmed in the Area	Almost Never	Annually	Every Few Months
10 years or less	7	1	4
11 to 20 years	6	4	5
21 to 30 years	11	1	2
31 to 40 years	3	5	0
Over 40 years	5	0	0
Totals	32	11	11
Statistical Test:	$\underline{r}$ = -0.266 (not significant)		

Source: Author, based on farmer interviews.

relationship between years farmed in the area and participation in any of the examined public programs. On this basis proxy number three is accepted. The data do not demonstrate the existence of a systematic relationship between participation and the variable.

Farmer Education[14]

Proxy Hypothesis Number Four: Increasing education of the farmer does not lead to participation in public land conservation programs.

There is a very strong systematic relationship between frequency of consultation with the SCS and the variable farmer education. Computation of r yields a relationship that is significant at the 99 percent confidence level. In this instance, r equals 0.450. Tabular examination of the data (Table XXXI) reveals a positive correlation between increasing education and increasing frequency of consultation with SCS. Based on this information proxy number four is rejected. The alternative proxy, expressed as an assumption in an earlier section in this chapter is that education does lead to participation due to a better understanding of long term conservation needs and a pragmatic approach conducive to participation.

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[14] Farmer education is weakly correlated in a negative manner at a statistically significant level with farmer age (-0.35). Farmer education is very weakly correlated with income (0.11) and farm size (0.12), both less than statistically significant.

TABLE XXXI. Frequency of Contact with SCS by Farmer Education.

Level of Education	Almost Never	Annually	Every Few Months
Did Not Finish High School	13	1	0
Finished High School	17	8	4
More than High School	3	6	3
Totals	33	15	7

Statistical Test: $\underline{r} = 0.450$ (significant)

Source: Author, based on farmer interviews.

The relationship between farmer education and participation in the Conservation Reserve program is not systematic, but it does not display the random characteristics of most of the previous variables. Computation of lambda yields zero. Table XXXII displays the slightly negative pattern of participation by the variable farmer education. Based on this information proxy number four must be accepted.

The distribution of participation in the ACP program by the variable farmer education falls into the same category as the immediately preceding example. Computation of chi square does not yield any statistically significant systematic relationship between the two. Yet examination of Table XXXII reveals a negative, albeit

TABLE XXXII. Participation in the Conservation Reserve and ACP Programs by Farmer Education.

Level of Education	Conservation Reserve Participation		ACP Participation	
	Yes	No	Yes	No
Did Not Finish High School	3	11	5	7
Finished High School	4	23	15	11
More than High School	5	6	8	3
Totals	12	40	28	21
Statistical Tests:	lambda = 0.0 (not significant)		$\underline{X}^2$ = 2.268 (not significant)	

Source: Author, based on farmer interviews.

weak pattern of increased education leading to decreased participation in ACP. Again, proxy number four is accepted due to less than a significant level of statistical confidence.

A faint pattern appears between consultation with the Extension Service and the variable farmer education. Table XXXIII shows that the percentage of farmers who almost never consult with the Extension Service decreases with each educational category. Also, the table shows an increase in frequency of contact at annual and more frequent intervals as education increases. However, computation of $\underline{r}$ equals 0.174 which is less than a significant relationship between consultation and farmer education. As a result, proxy number four

is accepted.

TABLE XXXIII. Frequency of Contact with the Cooperative Extension Service by Farmer Education.

Level of Education	Almost Never	Annually	Every Few Months
Did Not Finish High School	10	2	2
Finished High School	17	5	6
More than High School	5	4	3
Totals	32	11	11

Statistical Tests: $r = 0.174$ (not significant)

Source: Author, based on farmer interviews.

Farmer Income[15]

Proxy Hypothesis Number Five: Increasing income of the farmer does not lead to participation in public land conservation programs.

The pattern of consultation with the SCS among study area farmers by the variable farmer income is random. Table XXXIV displays the irregular distribution of this variable. Computation of

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[15] The variable farmer income is not significantly correlated with amount of land owned or rented, type of rental agreement, farmer age and education, or percentage of non-farm income. There is a strong negative correlation (-0.54) between income and farm size.

TABLE XXXIV. Frequency of Contact with SCS by Farmer Income.

Farmer Income	Almost Never	Annually	Every Few Months
Lost Money or Just Broke Even	4	1	1
Less than $10,000	7	2	1
$10,000 to $14,999	10	2	1
$15,000 to $24,999	8	6	3
$25,000 or more	3	3	1
Totals	31	15	7

Statistical Test: $\underline{r} = 0.083$ (not significant)

Source: Author, based on farmer interviews.

$\underline{r}$ equals 0.083 indicating no significant relationship between the two. On this basis proxy number five is accepted.

Participation in the Conservation Reserve program among sample farmers by the variable farmer income is non-systematic. Table XXXV displays the random pattern of the variable. Computation of lambda equals 0.067 indicating no relationship between participation and the variable. Proxy number five is therefore accepted.

The distribution of participation in ACP among study area farmers by the variable farmer income is asymmetrical. Table XXXV displays the irregular pattern of the variable. Computation of chi square renders no significant relationship between farmer income and participation in ACP. Based on these data, proxy number five is accepted.

TABLE XXXV. Participation in the Conservation Reserve and ACP Programs by Farmer Income.

Farmer Income	Conservation Reserve Participation		ACP Participation	
	Yes	No	Yes	No
Lost Money or Just Broke Even	2	4	2	4
Less than $10,000	2	8	6	2
$10,000 to $14,999	0	11	5	5
$15,000 to $24,999	3	13	9	7
$25,000 or more	4	3	5	2
Don't Know	1	1	1	1
Totals	28	21	28	21
Statistical Test:	lambda = 0.083 (not significant)		$\underline{X}^2$ = 8.927 (not significant)	

Source: Author, based on farmer interviews.

TABLE XXXVI. Frequency of Contact with the Cooperative Extension Service by Farmer Income.

Farmer Income	Almost Never	Annually	Every Few Months
Lost Money or Just Broke Even	5	1	0
Less than $10,000	6	2	2
$10,000 to $14,999	10	1	2
$14,999 to $24,999	8	4	5
$25,000 or more	3	2	2
Don't Know	0	1	0
Totals	32	11	11
Statistical Test:	$\underline{r}$ = 0.214 (not significant)		

Source: Author, based on farmer interviews.

There is a weak pattern between consultation with the Extension Service among sample farmers and the variable farmer income. Table XXXVI displays the distribution of increasing frequency of contact with the Extension Service as farmer income increases. Computation of $\underline{r}$, however, reveals a correlation of 0.214 at less than a significant level. Based on this information, proxy number five is accepted.

Non-Farm Income[16]

Proxy Hypothesis Number Six: Decreasing percentage of farmer income derived from non-agricultural sources does not lead to participation in public land conservation programs.

The frequency of consultation with the SCS and Extension Service and participation in Conservation Reserve and ACP programs among sample farmers is random in relation to the variable non-farm income. Tables XXXVII through XXIX display the pattern of participation for each program and the results of the statistical tests. Computation of each statistic produces no significant systematic relationship between participation and the variables. On this basis proxy number six is accepted.

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[16] Non-farm income is weakly correlated to education (0.141) and income (0.133), but strongly correlated to farm size (0.59) at a statistically significant level.

TABLE XXXVII. Frequency of Contact with SCS by Percentage of Non-Farm Income.

Percentage of Non-Farm Income	Almost Never	Annually	Every Few Months
25 Percent or Less	11	7	4
26 to 50 Percent	7	1	0
51 to 75 Percent	7	1	2
76 Percent or More	8	6	1
Totals	33	15	7

Statistical test: $r = -0.071$ (not significant)

Source: Author, based on farmer interviews.

TABLE XXXVIII. Participation in the Conservation Reserve and ACP Programs by Percentage of Non-Farm Income.

Percentage of Non-Farm Income	Conservation Reserve Participation		ACP Participation	
	Yes	No	Yes	No
25 Percent or Less	6	16	15	6
26 to 50 Percent	0	7	1	5
51 to 75 Percent	2	8	5	4
76 Percent or More	4	9	7	6
Totals	12	40	28	21
Statistical Tests:	lambda = 0.0 (not significant)		$\chi^2 = 5.381$ (not significant)	

Source: Author, based on farmer interviews.

TABLE XXXIX. Frequency of Contact with the Cooperative Extension Service by Percentage of Non-Farm Income.

Percentage of Non-Farm Income	Almost Never	Annually	Every Few Months
25 Percent or Less	12	5	5
26 to 50 Percent	4	2	1
51 to 75 Percent	7	1	2
76 Percent or More	9	3	3
Totals	32	11	11

Statistical Test: $r = -0.055$ (not significant)

Source: Author, based on farmer interviews.

Farm Size[17]

Proxy Hypothesis Number Seven: Increasing size of farm does not lead to participation in public land conservation programs.

The pattern of consultation with the SCS among sample farmers by the variable farm size is random. Table XL displays the irregular distribution. Computation of r equals 0.119 indicating a less than significant relationship between participation and the variable. Based on this information proxy number seven is accepted.

The relationship between participation in the Conservation

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[17] Farm size is strongly correlated with the amount of land rented (0.844), percent of non-farm income (-0.585), and income (-0.54).

TABLE XL. Frequency of Contact with SCS by Farm Size.

Farm Size	Almost Never	Annually	Every Few Months
Less than 4 hectares	3	1	0
4 to 20 hectares	9	4	1
20 to 72 hectares	13	5	2
72 to 202 hectares	3	5	3
More than 202 hectares	5	0	1
Totals	33	15	7

Statistical Test: $r = 0.119$ (not significant)

Source: Author, based on farmer interviews.

Reserve program and the variable farm size is non-systematic. Table XLI displays the random pattern of participation by the variable. Therefore, proxy number seven is accepted.

The distribution of participation in the ACP program with the farm size variable is irregular. Table XLI displays the non-systematic pattern of participation by farm size. Computation of chi square produces no significant relationship between the two. The results of the data treatment require acceptance of proxy number seven.

The pattern of consultation with the Extension Service regarding conservation management practices and study area farmers with farm size variable is weakly correlated. Table XLII displays the

TABLE XLI. Participation in Conservation Reserve and ACP Programs by Farm Size

Farm Size	Conservation Reserve Participation		ACP Participation	
	Yes	No	Yes	No
Less than 4 hectares	1	3	3	0
4 to 20 hectares	2	11	7	4
20 to 72 hectares	5	14	7	11
72 to 202 hectares	3	7	7	4
More than 202 hectares	1	5	4	2
Totals	12	40	28	21
Statistical Tests:	lambda = 0.0 (not significant)		$\underline{X}^2$ = 6.661 (not significant)	

Source: Author, based on farmer interviews.

TABLE XLII. Frequency of Contact with the Cooperative Extension Service by Farm Size.

Farm Size	Almost Never	Annually	Every Few Months
Less than 4 hectares	3	1	0
4 to 20 hectares	11	1	2
20 to 72 hectares	10	6	3
72 to 202 hectares	4	3	4
More than 202 hectares	4	0	2
Totals	32	11	11

Statistical Test: $\underline{r}$ = 0.238 (not significant)

Source: Author, based on farmer interviews.

pattern of consultation. Computation of r equals 0.238 indicating a weak relationship. On this basis proxy number seven is accepted.

Amount of Land Owned[18]

Proxy Hypothesis Number Eight: Increasing size of total landownership does not lead to participation in public land conservation programs.

The pattern of consultation with the SCS and Extension Service and participation in the Conservation Reserve and ACP Programs is random among sample farmers with amount of land owned as the variable. Tables XLIII through XLV display the irregular pattern of participation for each program and the results of each statistical test. Computation of the statistics for each program produces no significant relationships. Therefore, proxy number eight is accepted.

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[18] Amount of land owned is very weakly correlated with income (0.19), and significantly correlated with farm size although at a relatively low level (0.361).

TABLE XLIII. Frequency of Contact with SCS by Amount of Land Owned.

Amount of Land Owned	Almost Never	Annually	Every Few Months
Less than 4 hectares	9	3	1
4 to 20 hectares	7	2	2
20 to 72 hectares	12	6	1
72 to 202 hectares	4	4	1
More than 202 hectares	1	0	2
Totals	33	15	7

Statistical Test: $r = 0.215$ (not significant)

Source: Author, based on farmer interviews.

TABLE XLIV. Participation in the Conservation Reserve and ACP Programs by Amount of Land Owned.

Amount of Land Owned	Conservation Reserve Participation		ACP Participation	
	Yes	No	Yes	No
Less than 4 hectares	3	10	5	4
4 to 20 hectares	0	9	3	7
20 to 72 hectares	4	14	11	7
72 to 202 hectares	4	5	7	2
More than 202 hectares	1	2	2	1
Totals	12	40	28	21
Statistical Tests:	lambda = 0.0 (not significant)		$X^2 = 5.490$ (not significant)	

Source: Author, based on farmer interviews.

TABLE XLV. Frequency of Contact with the Cooperative Extension Service by Amount of Land Owned.

Amount of Land Owned	Almost Never	Annually	Every Few Months
Less than 4 hectares	10	3	0
4 to 20 hectares	6	1	3
20 to 72 hectares	10	5	4
72 to 202 hectares	5	2	2
More than 202 hectares	1	0	2
Totals	32	11	11

Statistical Test: $r = 0.266$ (not significant)

Source: Author, based on farmer interviews.

Amount of Land Rented[19]

Proxy Hypothesis Number Nine: There is no relationship between the amount of land rental and participation in public land conservation programs.

The frequency of consultation with the SCS and Extension Service and participation in the Conservation Reserve and ACP Programs is random among sample farmers in relation to the variable amount of land rented. Tables XLVI through XLVIII display the irregular patterns of participation for each program and the results of each

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[19] Amount of land rented is weakly correlated with income (-0.141) and strongly correlated with farm size (0.845).

TABLE XLVI. Frequency of Contact with SCS by Amount of Land Rented.

Amount of Land Rented	Almost Never	Annually	Every Few Months
Less than 4 hectares	12	5	2
4 to 20 hectares	9	2	1
20 to 72 hectares	5	6	2
72 to 202 hectares	2	2	2
More than 202 hectares	5	0	0
Totals	33	15	7

Statistical Test: $r = 0.261$ (not significant)

Source: Author, based on farmer interviews.

TABLE XLVII. Participation in the Conservation Reserve and ACP Programs by Amount of Land Rented.

Amount of Land Rented	Conservation Reserve Participation		ACP Participation	
	Yes	No	Yes	No
Less than 4 hectares	5	13	9	7
4 to 20 hectares	1	10	7	4
20 to 72 hectares	2	10	5	6
72 to 202 hectares	3	3	4	2
More than 202 hectares	1	4	3	2
Totals	12	40	28	21
Statistical Tests:	lambda = 0.0 (not significant)		$\chi^2 = 1.864$ (not significant)	

Source: Author, based on farmer interviews.

TABLE XLVIII. Frequency of Contact with the Cooperative Extension Service by Amount of Land Rented.

Amount of Land Rented	Almost Never	Annually	Every Few Months
Less than 4 hectares	13	3	3
4 to 20 hectares	7	1	3
20 to 72 hectares	6	5	2
72 to 202 hectares	2	2	2
More than 202 hectares	4	0	1
Totals	32	11	11

Statistical Test: $r = 0.078$ (not significant)

Source: Author, based on farmer interviews.

statistical test. Computation of the statistics for each program produces no significant relationships. On this basis, proxy number nine is accepted.

Type of Rental Agreement[20]

Proxy Hypothesis Number Ten: There is no relationship between rental agreement type and participation in public land conservation programs.

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[20] Because the variables type of rental agreement, rental agreement restrictions, and changing cultivation techniques were recorded on the nominal level, lambda is used in place of the Pearson correlation coefficient.

The patterns of consultation with the SCS and Extension Service and participation in the Conservation Reserve and ACP Programs are non-systematic when compared to the variable type of rental agreement. Tables XLIX through LI display these random distributions.

TABLE XLIX. Frequency of Contact with SCS by Type of Rental Agreement.

Type of Rental Agreement	Almost Never	Annually	Every Few Months
Cash	4	0	0
Share Crop	13	9	3
Combination of Cash & Share Crop	5	1	2
Totals	22	10	5
Statistical Test:	lambda = 0.0 (not significant)		

Source: Author, based on farmer interviews.

TABLE L. Participation in the Conservation Reserve and ACP Programs by Type of Rental Agreement.

Type of Rental Agreement	Conservation Reserve Participation		ACP Participation	
	Yes	No	Yes	No
Cash	0	4	1	3
Share Crop	4	19	14	9
Combination of Cash & Share Crop	3	5	5	2
Totals	7	28	20	14
Statistical Tests:	lambda = 0.0 (not significant)		$\underline{X}^2$ = 2.388 (not significant)	

Source: Author, based on farmer interviews.

TABLE LI. Frequency of Contact with the Cooperative Extension Service by Type of Rental Agreement.

Type of Rental Agreement	Almost Never	Annually	Every Few Months
Cash	2	0	2
Share Crop	15	5	4
Combination of Cash & Share Crop	3	3	2
Totals	20	8	8

Statistical Test: lambda = 0.0 (not significant)

Source: Author, based on farmer interviews.

Computation of the statistics for each program by the variable produces no significant relationships. Based on these data proxy number ten is accepted for all four agencies and programs.

Rental Agreement Restrictions[21]

Proxy Hypothesis Number Eleven: There is no relationship between rental agreement restrictions and participation in public land conservation programs.

The distributions of participation in the SCS, Conservation Reserve, ACP, and Extension Service are asymmentrical when compared to the variable rental agreement restrictions.

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[21] Field interviews revealed that the actual restrictions were limited to landlords requiring that cotton be grown.

Tables LII through LIV display the irregular pattern of participation. Computation of the statistics for each program reveals no systematic relationships. Therefore, proxy number eleven is accepted for all four agencies and programs.

TABLE LII. Frequency of Contact with SCS by Rental Agreement Restrictions.

Rental Agreement Restrictions	Almost Never	Annually	Every Few Months
No Restrictions	21	8	3
Crop Restrictions	1	1	2
Totals	22	9	5
Statistical Tests:	lambda = 0.0 (not significant)		

Source: Author, based on farmer interviews.

TABLE LIII. Participation in the Conservation Reserve and ACP Programs by Rental Agreement Restrictions.

Rental Agreement Restrictions	Conservation Reserve Participation		ACP Participation	
	Yes	No	Yes	No
No Restrictions	5	25	18	12
Crop Restrictions	2	2	2	2
Totals	7	27	20	14
Statistical Tests:	lambda = 0.0 (not significant)		X^2 = 0.025 (not significant)	

Source: Author, based on farmer interviews.

TABLE LIV. Frequency of Contact with the Cooperative Extension Service Rental Agreement Restrictions.

Rental Agreement Restrictions	Almost Never	Annually	Every Few Months
No Restrictions	17	7	7
Crop Restrictions	2	1	1
Totals	19	8	8

Statistical Test: lambda = 0.0 (not significant)

Source: Author, based on farmer interviews.

Changing Cultivation Techniques[22]

Proxy Hypothesis Number Twelve: A change in cultivation techniques over the last ten years does not lead to participation in public land conservation programs.

The distributions of consultation with the SCS and Extension Service, and participation in the Conservation Reserve and ACP Programs versus the variable changing cultivation techniques are non-systematic. Tables LV through LVII display the specific pattern for each program. Computation of statistics for each of the programs reveals no systematic relationships. Proxy number twelve must

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22 This variable accounts for changes over the last ten years in the way a farmer cultivates the ground. Increasing occurrence of large farm machinery is not segregated by this variable. It is assumed that some farmers in each category increased their use of large equipment.

therefore be accepted for all four agencies and programs.

TABLE LV. Frequency of Contact with SCS by Changing Cultivation Techniques.

Changing Cultivation Techniques	Almost Never	Annually	Every Few Months
Yes	15	6	3
No	8	4	3
Totals	23	10	6

Statistical Test: lambda = 0.0 (not significant)

Source: Author, based on farmer interviews.

TABLE LVI. Participation in the Conservation Reserve and ACP Programs by Changing Cultivation Techniques.

Changing Cultivation Techniques	Conservation Reserve Participation		ACP Participation	
	Yes	No	Yes	No
Yes	6	18	14	9
No	2	12	8	6
Totals	8	30	22	15
Statistical Tests:	lambda = 0.0 (not significant)		$\underline{X}^2$ = 0.015 (not significant)	

Source: Author, based on farmer interviews.

TABLE LVII. Frequency of Contact with Cooperative Extension Service by Changing Cultivation Techniques.

Changing Cultivation Techniques	Almost Never	Annually	Every Few Months
Yes	16	4	4
No	6	5	4
Totals	22	9	8

Statistical Test: lambda = 0.067 (not significant)

Source: Author, based on farmer interviews.

Summary

This chapter reveals that single variable characteristics are weakly related to participation in any of the programs. Murphey warns of setting forth single-factor explanations for complex problems. He states that "single factor explanations are to be distrusted if not rejected" (Murphey, 1973, p. 9). That generalization certainly applies to this research. Although several systematic relationships were found, only one null proxy from a total of 48 was rejected. Table LVIII displays the status of each null proxy.

Conclusions

An obvious conclusion to be drawn from the data is that the decision making process is complex. No single variable, however apparently important, dominates the process.

TABLE LVIII. Status of Null Proxies.

Proxies	SCS	Conservation Reserve	ACP	Extension Service
Age	A	A	A	A
Years Lived in Area	A	A	A	A
Years Farmed in Area	A	A	A	A
Education	R	A	A	A
Income	A	A	A	A
Non-Farm Income	A	A	A	A
Farm Size	A	A	A	A
Land Owned	A	A	A	A
Land Rented	A	A	A	A
Rental Agreement	A	A	A	A
Rental Restrictions	A	A	A	A
Changing Techniques	A	A	A	A

Key: A = Null Proxy Accepted. R = Null Proxy Rejected.

Source: Author, based on farmer interviews.

The acceptance of 47 of the 48 null proxies is strong evidence requiring acceptance of hypothesis number three. The assumptions made at the beginning of the chapter have been demonstrated to be invalid. The programs and agencies have had a representative

cross-section of farmer participation. The resulting conclusion is that no socio-economic or cultural subgroup of farmers derives an inordinate benefit from the publically sponsored conservation programs.

The one proxy that was rejected raises almost as many questions as it answers. It would seem axiomatic that the more educated farmer would consult with the SCS on a more frequent basis than his lesser educated counterpart. But why is this not so with the other programs as well?

Unfortunately, there seems to be no new explanation that brings into rational order the heterogeneous elements involved. One is left with the well worn stereotype of the independence of the American farmer. Other scholars have documented this concept. Kollmorgen noted in 1941 the "pride" and "missionary zeal" exemplified by Southern farmers who for reasons of personal perference maintained the physical land base much more efficiently than their neighbors (Kollmorgen, October 1941, p. 429-430.). Van Otten found a similar situation in his research area in Oregon's Willamette Valley. He states that "farm organization is reflective of the attitudes and personal preferences of the operator" (Van Otten, 1977, p. 146). A similar process seems to be at work in the Cypress area as well.

CHAPTER VI

MULTIPLE VARIABLE PARTICIPATION CHARACTERISTICS

Introduction

It is evident from the previous chapter that single variable characteristics do little to explain participation in public land conservation programs. This chapter takes the next logical step and combines several variables. The Pearson product moment correlation coefficient is the statistic used for analysis of SCS and Extension Service participation. Asymmetric lambda is used for analysis of Conservation Reserve and ACP participation. As in the previous chapter, the confidence level for r is 0.95, and a score of 0.75 for lambda.

Method of Analysis

The method of combining two or three variables for a test of significance against participation is accomplished by the Crosstabs subprogram of S.P.S.S. Crosstabs calculates the statistics by combining one independent variable to participation while controlling for each category of a second and/or third independent variable. For example, the combined variable of farm income and non-farm income were tested against consultation with SCS as follows: each farmer

income category was calculated against the frequency of contact with SCS while controlling for 25 percent or less non-farm income. The procedure was repeated while controlling for 26 to 50 percent non-farm income, again for the 51 to 75 percent, and 76 percent or greater non-farm income categories.

The three way Crosstabs differs from the above procedure only in that an additional independent variable is added and controlled. To continue with the above example of farmer income and non-farm income, farm size is also added. Again, farmer income is tested against the frequency of contact with SCS while controlling for each given value of non-farm income and farm size. In this instance, farmer income is tested controlling for 25 percent or less non-farm income and farm size of four hectares or less. This procedure is repeated so that every possible combination of the controlled variable is compared.

Rationale for Variable Combinations

A limited number of variable combinations were chosen. With a total of 12 variables the maximum number of two-way combinations is 66, and the maximum number of three-way combinations is 220. Combining variables every possible way would have been excessively expensive as well as unnecessarily lengthy. As a result, a subjective combination of variables was made. The primary focus of the

combined variables center around farmer income, non-farm income, farmer education, and farm size. These combinations were made after the initial analysis of single variables. Only the most productive single variables were chosen for combinations.

The variables farmer income and non-farm income were combined to determine if any relationship exists between participation and the level of income as dependence upon agriculture for a living changes. The assumption is that an increase in farmer income and percent of non-farm income leads to participation in the public programs. The basis for this assumption is that as both variables increase, the farmer can increasingly afford to postpone economic return from the present to the future. For the variable farmer income, the ability to postpone gain would increase absolutely while the variable non-farm income would increase this ability in a relative sense.

When adding either age or education to the variable farmer income, one would expect an increase in participation in public land conservation programs. The assumption with age is that the longer one lives the more time he has in which to participate, and the increased experience with age leads to knowledge of problems and motivation to act accordingly. The assumption with increasing education is that it equates with knowledge of conservation problems and a cooperative flexibility that leads to public program participation.

The variables amount of land owned and amount of land rented were combined with farmer income in order to determine whether or not there is a difference in size relationships between owning and renting land. The assumption regarding farmer income and amount of land owned is that an income in both leads to participation in the public program. The basis for this assumption is that increasing income permits the farmer to postpone income returns from the present to the future, and that an individual is likely to be a careful steward of his own land. The combination of the two leads to participation. The assumption made regarding farmer income and amount of land rental is that increasing income in each land rented category leads to participation.

Farmer income was combined with type of rental agreement in order to determine whether or not a size relationship exists between the two and the dependent variable of participation. It is assumed that an increase in farmer income for each agreement type will positively correlate with participation in public land conservation programs. It is also assumed that a cash rather than share crop agreement along with increasing income leads to participation.

Farmer education was combined with several variables. In each instance it is assumed that increasing education leads to participation for reasons previously outlined. The assumptions regarding age, non-farm income, farm size, amount of land owned,

and type of rental agreement were previously in this section or at the beginning of Chapter V. In each case they are combined with the education assumption.

The variables farm size and amount of land rental were combined in order to determine what, if any, relationship exists between the two and participation. These variables are very strongly correlated (0.845). It is assumed that an increase in farm size in each land rental category leads to participation.

The variables non-farm income, farmer income and farm size were combined with the assumption that an increase in all three leads to participation. The basis for this assumption is stated in previous sections.

Non-farm income, farmer income, and type of rental agreement were combined in order to determine what, if any, effect increasing income, decreasing dependence on agriculture for income, and type of rental agreement have on participation in the public programs. It is assumed that an increase in the first two correlates highly with participation when there is a cash rental agreement, but not as highly when the rental agreement is share crop.

The variables farm size, amount of land owned, and amount of land rented were combined because they are the fundamental components of the agricultural land management unit. As such it is essential to know whether or not they have a systematic relationship

with public program participation. The assumption is that an increase in farm size and amount of land owned leads to greater participation in each land rental category.

Farmer income, age, and education were combined with the assumption that an increase in all three leads to participation in the public land conservation programs. The basis for this assumption is stated in previous sections.

Variable Combinations

Farmer Income and Non-Farm Income

There are no statistically significant relationships between participation in any of the four public land conservation programs by the variable farmer income and non-farm income. Correlation coefficient and lambda scores are less than significant in all categories.

Farmer Income and Age

There are no strong correlations between participation in the four agencies and programs and the variable farmer income and age. The highest r value for any category is less than 0.5. The highest lambda score is 1.0, occurring in the 30 years or less age category for Conservation Reserve. The relationship is negative as one would expect since few farmers under 30 years were farming while

Conservation Reserve existed.

Farmer Income and Education

There are no significant systematic relationships between participation in any of the programs and agencies and the variable farmer income and education. Correlation coefficients varied between -0.397 and +0.275 indicating weak relationships. Lambda scores for Conservation Reserve and ACP participation ranged from zero to 0.6.

Farmer Income and Amount of Land Owned

Participation in the ACP Program and Extension Service is not related to the variable farmer income and amount of land owned in a systematic manner. Correlation coefficient scores are low overall. Most categories of the variable for SCS and Conservation Reserve participation are similar. However, two systematic relationships are noted. There is a strong tendency for farmers who own four hectares or less to not participate in Conservation Reserve and SCS as their income increases. The lambda score for Conservation Reserve is 0.667 which is fairly strong but not statistically significant. The correlation coefficient of -0.746 for SCS participation indicates decreasing participation with increasing income.

Farmer Income and Amount of Land Rented

Participation in the SCS, ACP, and Extension Service is distributed against the variable farmer income and amount of land rented in a random manner. All three programs are characterized by low r values at less than significant levels. The Conservation Reserve program, on the other hand, has a similar pattern of participation as described for the previous variable. Among farmers who rent four or less hectares, there is a pattern of increasing participation as income increases. In this category the lambda score is 0.60 indicating some relationship but less than statistically significant. All other categories of the variable for Conservation Reserve display random distributions.

Farmer Income and Type of Rental Agreement

The relationship between farmer income and type of rental agreement and participation in Conservation Reserve, ACP, and Extension Service is non-systematic. Correlation coefficients are low for all variable combinations. However, there is a systematic relationship between the variable and consultation with the SCS. All four farmers who had cash rental agreements almost never consult with the SCS.[23]

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[23] Two of the four earned $10,000 to $14,999, one earned $15,000 to $24,999, and one earned $25,000 to $34,999.

Share crop farmers responded much differently than those who have cash rental agreements. Table LIX displays the random pattern of participation among share croppers of varying incomes. The correlation coefficient for this table is zero.

TABLE LIX. Frequency of Contact with SCS by Farmer Income and Type of Rental Agreement.

CONTROLLING FOR SHARE CROP RENTAL AGREEMENT			
Farmer Income	Almost Never	Annually	Every Few Months
Lost Money or Broke Even	2	1	0
Less Than $10,000	3	2	0
$10,000 to $14,999	4	1	1
$15,000 to $24,999	3	4	2
$25,000 to $34,999	0	1	0
Don't Know	1	0	0
Totals	13	9	3

Source: Author, based on farmer interviews.

Farmer Education and Age

There is no significant relationship between participation among sample farmers in Conservation Reserve, Extension Service, or ACP Programs for the variable farmer education and age. Most

categories of the variable for participation in the SCS are also non-systematic. However, there is an exception.

One statistically significant relationship was found in SCS participation. Controlling for age group 41 to 50 years there is a strong tendency to increase the frequency of contact with SCS as education increases. Computation of r equals 0.633 and is statistically significant. This relationship did not appear in the other age groups.

The opposite is true for Extension Service participation. In the 41 to 50 years age group, participation decreased as education increased. Among farmers who did not finish high school there is a 1:2 participation ratio. This ratio increased to 1:8 among farmers who received a high school or greater education. However, this relationship is not significantly correlated.

Farmer Education and Non-Farm Income

Participation in the Conservation Reserve and ACP Programs by sample farmers by the variable farmer education and non-farm income is irregular. Lambda scores are low for these programs. One category of the variable shows a systematic relationship at a significant level for SCS and Extension Service participation. Farmers in the 50 to 75 percent non-farm income range increased their frequency of contact with the SCS and Extension Service as

education increased. In both cases the confidence level is greater than 95 percent with identical r values of 0.797. All other combinations of education and non-farm income displayed a random-like relationship to participation in the SCS and Extension Service.

Farmer Education and Farm Size

Participation in all the public land conservation programs among study area farmers by the variable farmer education and farm size is not related in a systematic manner. Only one farm size category (4 to 20 hectares) demonstrated a weak relationship for participation in Conservation Reserve. In this category lambda equals 0.50 which is less than statistically significant.

Farm Size and Amount of Land Owned

Participation in all programs and agencies among sample farmers by the variable farm size and amount of land owned is related in a non-systematic manner. Correlation coefficients and lambda scores are generally low in all categories and are not statistically significant.

Farmer Education and Type of Rental Agreement

There are no statistically significant patterns of farmer participation in any of the four programs for the variable farmer

education and type of rental agreement. However, an interesting but less than significant pattern exists in all programs except the Conservation Reserve for those farmers who have cash rental agreements. All farmers who have cash agreements "almost never" consult with the SCS no matter what their level of education. Likewise, farmers with cash rental agreements decrease their participation in the Extension Service and ACP as education increases. The correlation coefficient for Extension Service by the variable is -0.707, but due to the reduced sample size it is not statistically significant. Lambda equals the maximum score of 1.0 for ACP participation.

Farm Size and Amount of Land Rented

Participation in all programs and agencies among sample farmers by the variable farm size and amount of land rented is related in a non-systematic manner. Correlation coefficients nor lambda scores are not significant in any category.

Non-Farm Income and Farmer Income and Farm Size

Participation in SCS, Conservation Reserve, and Extension Service among sample farmers by the variable non-farm income and farmer income and farm size is related in a non-systematic manner. Only one category of ACP participation is significantly related.

At income level $10,000 through $14,999, and farm size 20 to

72 hectares, decreasing dependence on agriculture for income correlates with decreasing participation in ACP. The lambda score in this instance is 1.0 which is statistically significant.

Non-Farm Income and Farmer Income and Type of Rental Agreement

The pattern of participation in all programs and agencies among sample farmers by the variable non-farm income and farmer income and type of rental agreement is asymmetrical. Correlation coefficient and lambda scores are generally low and less than significant. Table LX displays an irregular participation response to SCS. The correlation coefficient for this set of variables is 0.0273 indicating a near random distribution.

TABLE LX. Frequency of Contact with SCS by Non-Farm Income and Farmer Income and Type of Rental Agreement.

CONTROLLING FOR FARMER INCOME: $15,000 to $24,999
CONTROLLING FOR SHARE CROP RENTAL AGREEMENT

Percent of Non-Farm Income	Almost Never	Annually	Every Few Months
25 Percent or Less	1	2	1
26 to 50 Percent	1	0	0
51 to 75 Percent	1	0	1
76 Percent or More	0	2	0
Totals	3	4	2

Source: Author, based on farmer interviews.

Farm Size and Amount of Land Owned and Amount of Land Rented

Participation in the SCS, Conservation Reserve, and Extension Service among sample farmers by the variable farm size and amount of land owned and amount of land rented is related in an asymmetrical manner. Correlation coefficient and lambda scores are generally low and less than significant.

One category of the variable for participation in the ACP Program displays a systematic relationship. For those farmers who own 20 to 72 hectares and rent four or less hectares, participation in ACP decreases as farm size increases. The fact that lambda equals 1.0 demonstrates the strength of the relationship.

Farmer Income and Age and Education

There are no systematic relationships between participation in any of the programs and the variable farmer income and age and education. Low r and lambda scores at less than significance are typical for this variable.

Summary

There are a few instances in which variables related in a systematic manner to frequency of contact with the SCS. Those variables are primarily limited to combinations of income, non-farm

income, and education. For the most part, however, no consistent relationships exist that link the variables with SCS participation.

A similar situation exists regarding participation in the Conservation Reserve program. The variable income, land rented, land owned, and farm size account for the few significant relationships. All other participation variables occur in a random pattern.

Participation in the ACP program occurs in the most consistently random pattern of all the programs and agencies. The only combination of variables producing a participation relationship is farm size and amount of land owned and amount of land rented, and in this case the relationship proved to be negative.

Significant participation relationships in the Extension Service were limited to age, education, and non-farm income. The pattern of participation by all other combinations of variables was irregular.

Conclusions

As in the previous chapter, analysis of multiple variables points to the apparent complexity of the decision making process. This is especially evident when variables are combined into groups of threes. Individual categories of three way combinations produced an occasionally high correlation, while most were nearly random. Such phenomena defy logical explanation because there is no systematic pattern among the variables.

One can conclude, therefore, that either the decision making process is based to a great extent on farmer attitudes, preferences, and short term economics, or the variables considered in this research are not at all relevant. The logic presented at the beginning of the chapter suggests that the chosen variables do have some impact on whether or not a farmer participates in a public conservation program. Analysis of the data does not demonstrate any irrelevance of the variables, rather, it demonstrates the complexity of the process. Based on such reasoning, one can therefore conclude that attitudes, personal preferences, and short term economics do play a major role in participation in the programs.

CHAPTER VII

GOALS AND FARMER OPINION OF PUBLIC CONSERVATION PROGRAMS

Introduction

The purpose of this chapter is to assess the fulfillment of program goals and objectives, and to analyze and report farmer opinion of programs.

Public Program Goals

HYPOTHESIS NUMBER FOUR: The public land conservation programs have not successfully fulfilled their own goals and objectives.

Conservation Reserve

The Conservation Reserve Program seems to have effectively enhanced the conservation of soil, water, timber, and wildlife on farms on which the operator voluntarily participated. Its effect, however, lasted little longer than the duration of the program. Several sample farmers volunteered information to the effect that within one or two years of the end of the program practices were pursued that resulted in soil fertility and tilth reduction, and an increase in erosion.

In spite of the acreage retired by Conservation Reserve between

1956 and 1969, crop agriculture with few management safeguards increased dramatically in the study area between 1941 and 1971. Soil erosion was more serious in 1971 than it had been three decades earlier. This information was the basis for the rejection of the first hypothesis and serves an opposite function for the fourth hypothesis. Hypothesis number four is therefore accepted in respect to the Conservation Reserve Program.

Agricultural Conservation Payments Program

The results of ACP are similar to those of the Conservation Reserve. Practices instituted under this program and observed in the field by the author are reducing erosion and improving soil and water quality on participating farms. However, the evidence of erosion presented in Chapter Three shows that not enough has been done voluntarily to significantly reduce the problem on an area-wide basis. Hypothesis number four is therefore accepted in respect to ACP.

SCS and Cooperative Extension Service

The SCS and Extension Service are considered together in this analysis because both offer advice and expertise to the farmer and land manager on a broad range of conservation topics, and neither has direct subsidy payments to land owners or land managers.

The author has personally observed the improvement in soil and water management as a direct result of implementing the suggestions of SCS and Extension Service. For the most part, farmers who have sought advice from either agency have benefited from its implementation.

Both agencies have done an effective job of promoting the conservation of soil and water on participating farms. However, the participation rate has been too low to have had a significant impact on the Cypress area as a whole. Consequently, the fourth hypothesis is accepted in respect to the SCS and Extension Service.

Summary of Public Agency Goal Fulfillment

All four programs have done an adequate job of conserving soil and water on land that voluntarily participated by choice of the land owner or land manager. However, the programs neither separately nor collectively have had a significant area wide impact on the reduction of soil erosion. Field observations made as late as September 1977 revealed a cropping and management pattern that resembled historical tradition much more than it does an adjustment to the productive capacity of the land. Based on this information, hypothesis number four is accepted for all four programs.

Conclusions Regarding Public Agency Goal Fulfillment

It has been demonstrated that all four programs have been effective in conserving soil and water on participating lands. Furthermore, it has been demonstrated that the participation rates have been inadequate to significantly reduce the soil erosion problem on an area-wide basis. There are several inadequacies in the programs that account for this situation.

First, it has never been an objective of any of the programs to permanently retire selected fields from crop production. While Conservation Reserve did temporarily retire land from crop production, the specific land was chosen by individual farmers who may or may not have acted in society's best interest. It is the author's opinion that the lack of mandatory retirement and proper treatment of selected fields has greatly weakened the overall conservation effort in the Cypress area.

Second, it has never been the objective of any of the programs to establish planting, cultivation, and harvesting techniques based on conservation principles that are to be adopted as standard farming practices. Whereas the SCS and Extension Service devote considerable effort to formulating such techniques, it is not their policy to persuade unenthusiastic land owners. Rather, they respond to the problem only when asked by a land owner or manager. The author

believes that a more active recruitment of farmers would be more effective. A passive educational program works as long as sufficient numbers participate, and it is inadequate participation that holds back the progress towards soil and water conservation.

Third, and finally, actions such as ditching, construction of levees, and channelization cannot be subject to the existing programs because these actions are taken as part of the property rights inherent in fee simple ownership. Even though the actions affect other property owners, new programs with much more broad management features are required for proper regulation.

Farmer Opinion of Public Programs

Objective number three as stated in Chapter One is to determine farmer opinion of agencies and programs concerned with land conservation in the study area. The purpose of this section is to fulfill that objective by analyzing and reporting data obtained through the field interviews.

Farmer opinion of conservation programs is important because their perception of present and past programs may influence a future decision. Conservation programs have so far been voluntary.[24]

[24] Crop limitations for wheat, cotton, tobacco, and other basic commodities were not conservation programs as such. The reduction of the commodity surplus of earlier years was the primary purpose of such programs. However, because large amounts of land were held back from crop production, it is easy to confuse the separate but related functions.

As such it is the farmer who controls the land and is the decision maker in respect to its use. His cooperation is necessary for the success of any public conservation program. Also, the actual success or failure of a program may to some extent be reflected in farmer opinion. Independent verification would be necessary to corroborate any such evidence owing to perception and prejudice considerations. These qualifications notwithstanding, farmer opinion would serve as prima facie evidence of success or failure of public land conservation programs.

Awareness of Programs

Farmers in the area seem to be reasonably aware of conservation programs available to them in the study area. However, it is the impression of the researcher that many do not fully understand what the various programs offer. For example, 93 percent of the farmers know about the Conservation Reserve program and 86 percent know about ACP, but often the sample farmer would have difficulty in differentiating between the particular programs offered by each agency.

A few miles east of the study area begins the Tennessee Valley in which TVA has expended considerable resources to research and correct imprudent farm management practices. Worldwide attention has been focused on TVA and its acclaimed programs that deal with

such problems. Yet, when sample farmers were asked if they happen to know if TVA is interested in agricultural land use and conservation, a surprising 84 percent said they did not know.

Soil Conservation Service

Of the total sample of 55 farmers, 30 have consulted with the SCS at one time or another and therefore responded as participants. The overall rate of participation is 54.5 percent. Table LXI shows the response of farmers when they were asked to rate the success of various public programs in promoting soil conservation and land improvement on the land they farm.

TABLE LXI. Farmer Opinion of the Soil Conservation Service.

	Number	Percent
Not At All Successful	2	6.7%
Not Too Successful	2	6.7%
Somewhat Successful	10	33.3%
Very Successful	12	40.0%
DK or NA	4	13.3%

Note: Twenty-five of 55 sample farmers responded as non-participants.

Source: Author, based on farmer interviews.

Agricultural Stabilization and Conservation Service

Conservation Reserve

Only 12 of the 55 sample farmers participated in the Conservation Reserve program. This is an overall participation rate of 21.8 percent. Table LXII displays the response of farmers when asked to rate the success of the Conservation Reserve program.

TABLE LXII. Farmer Opinion of Conservation Reserve.

	Number	Percent
Not At All Successful	0	0.0%
Not Too Successful	1	8.3%
Somewhat Successful	3	25.0%
Very Successful	7	58.3%
DK or NA	1	8.3%

Note: Forty-three of 55 sample farmers responded as non-participants.

Source: Author, based on farmer interviews.

Agricultural Conservation Payments Program

Thirty of the 55 sample farmers participated in ACP one or more times, for a participation rate of 54.5 percent. Table LXIII displays the response of farmers when asked to rate the success of ACP.

TABLE LXIII. Farmer Opinion of the Agricultural Conservation Payments Program.

	Number	Percent
Not At All Successful	1	3.3%
Not Too Successful	2	6.7%
Somewhat Successful	15	50.0%
Very Successful	12	40.0%
DK or NA	0	0.0%

Note: Twenty-five of 55 sample farmers responded as non-participants.

Source: Author, based on farmer interviews.

Cooperative Extension Service

Out of the 55 sample farmers, 30 have consulted with the Extension Service regarding conservation management practices. This is a participation rate of 54.5 percent, identical to SCS and ACP. Table LXIV displays the response of farmers when asked to rate the success of the Extension Service.

TABLE LXIV. Farmer Opinion of the Cooperative Extension Service.

	Number	Percent
Not At All Successful	1	3.3%
Not Too Successful	3	10.0%
Somewhat Successful	12	40.0%
Very Successful	11	36.7%
DK or NA	3	10.0%

Note: Twenty-five of 55 sample farmers responded as non-participants.

Source: Author, based on farmer interviews.

Summary of Farmer Opinion

Farmer opinion of public land conservation programs is apparently much more positive than negative. The lowest percentage response to a program being "very successful" is the Extension Service at 36.7 percent. Conversely, the highest percentage response to a program being "not at all successful" is the Conservation Reserve program at only 6.7 percent.

However, analysis in this manner does not account for the non-participants. A skeptical conclusion of these data would be that the reason some did not participate is that they held the programs in low regard. Following this line of thinking, one would therefore conclude that farmer opinion of each program is indeed very low. But this puts one in the dilemma of judging one's opinion when what they say is one thing and what they do is another. In spite of the dilemma, one cannot minimize the failure of such a large portion of the sample to not participate in the programs.

A more positive view, and one the author leans towards is that the opinions of those who did not participate would likely be similar to the participants. This researcher was impressed by several non-participating farmers who for some reason had no direct experience with the programs and had not formed an opinion.

Conclusions Regarding Farmer Opinion

Explaining the apparent incongruity of fairly high farmer opinion of programs on the one hand, but no more than a 54.5 percent participation rate on the other hand is by no means a simple task. However, there are at least two plausible explanations: inaccurate perception of the erosion problem and ignorance of the actual workings of the programs. It seems almost as if many farmers had enough to think about without pondering programs in which they were not participating.

Perhaps nowhere has this research uncovered more discord than in the area of erosion perception. When asked if soil erosion is a problem on other farms in the area and to what extent, sample farmers realistically assessed the problem. In contrast, farmers grossly underestimated the extent of erosion on their own farms.[25] Table LXV displays farmer opinion on the extent of erosion on other farms in the area as well as on their own farms.

Examination of the table clearly shows the dichotomous nature of farmer perception of erosion. Over three-fourths of the farmers think that the erosion problem is "not at all" or "not very" serious on the land they farm. At the same time, less than one-third of the

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[25] Table X in Chapter Three represents a field-by-field observation and estimate of actual soil erosion on the sample farms.

TABLE LXV. Farmer Estimate of Extent of Erosion.

Category	Erosion of Other Farms	Erosion of Personal Farms
Not At All Serious	3.6%	47.7%
Not Very Serious	29.1%	29.5%
Somewhat Serious	41.8%	13.4%
Very Serious	20.0%	9.4%
DK or NA	5.5%	0.0%

Source: Author, based on farmer interviews.

same sample put their neighbor's land in these categories. In fact, farmers seem very willing to recognize that erosion is a problem on a regional basis, but only on everyone elses property.

It is possible that participating farmers are satisfied with the results of conservation programs (no matter how limited) on the land they farm because they do not accurately recognize the extent of the problem. Under this assumption, virtually any land improvement brought about through the programs would be sufficient to qualify it as "successful."

A second possibility is that a large portion of farmers in the study area (nearly half) have heard about the programs but do not really know why they were created, what purpose they serve, why they should or how they can get involved. This would account for both a high non-participation rate, and assuming the effectiveness of the programs, the relatively high opinion of those who do participate.

A logical conclusion based on the evidence presented in Chapters Five and Six, as well as in this chapter is that some combination of ignorance and inaccurate perception molds farmer opinion of the programs. Certainly, if a farmer does not recognize the erosion problem on the land he farms there would be little incentive to find out about available erosion control programs. The very strong evidence of the complexity of the decision making process makes this an attractive explanation.

CHAPTER VIII

SUMMARY AND CONCLUSIONS

The primary purpose of this chapter is to summarize the evidence presented in previous chapters and to draw logical conclusions based on the evidence.

Summary of Research Evidence

Condition of the Land Resource Base

The Cypress area has a land resource base that is well adapted to biotic production. However, because of frequently intensive rainfall and easily erodable soils the land resource base is subject to severe erosion unless properly managed.

Photo-interpretation and field observation evidence presented in Chapter Three clearly shows that a soil erosion problem of a serious nature exists in Cypress Creek basin. In many fields, the "A" horizon has been totally removed. Elsewhere, organic matter has been lost to the point that it is a hindrance to crop agriculture. Large farm machinery contributes to the problem by hiding the evidence of erosion and compacting the soil.

Extent of Participation

Participation in three of the four conservation programs (all

but SCS) in the study area is equal to or greater than that in the surrounding region or the state as a whole. The SCS and Extension Service participation rates are higher than the other selected programs both inside and out of the study area. The ACP program has the next highest participation rate, while Conservation Reserve is lowest for the study area, region, and state.

Participation Variables

Virtually all of the proxy hypotheses were accepted, and thus the logical assumptions upon which the proxies were based have been shown to be invalid. Combinations of variables revealed few significant relationships. This demonstrates that the public programs have had a broad range of farmer participation.

Farmer Opinion

A dichotomy exists in farmer opinion of public conservation programs. On the one hand, farmer opinion of the programs is very high. However, the highest participation rate in any of the programs is 54.5 percent. A combination of lack of knowledge about the programs as well as inaccurate perception of the erosion problem seems to be the explanation.

Summary of Conclusions

The Erosion Problem

In spite of the efforts of the four public conservation programs, the erosion problem persists at a serious level. There are several possible explanations for this. One is that historical tradition and short-term profit motives perpetuate poor management and cultivation practices. This is reflected by attitudes about land and farming methods that have evolved during the 300 years of settlement in the eastern United States. Entrenched ideas are not easily or quickly eradicated.

Another explanation is related to the technological advance in agricultural production over the last 20 years. The use of large farm machinery in the study area has become widespread during that time. Also of significance is the proliferation of agricultural chemicals. This has led to the idea that the land is of secondary importance in agricultural production. This notion has not been conducive to proper land management.

Finally, while ACP funding has declined during the 1970's, the total cessation of acreage allotments has led to increased erosion. One would logically assume that row cropping and thus erosion would increase when allotments were lifted, and more public assistance would be needed in order to cover the increased production acreage.

While this has not been specifically demonstrated in the research nor is it as important as other factors, it is the author's impression that this situation has occurred.

Program Participation

Participation rates in the Cypress area are not significantly different from the surrounding region. The region is similar to the study area in climate, soils, topography, farm type, and history of settlement. It can, therefore, be concluded that farmer attitudes and program inadequacies existing in the study area are similar to those in the region.

The implication of the proxy hypotheses is that a subgroup of farmers primarily benefited from the expenditures of public conservation programs. National debate of farm programs in recent years has centered around inequities that result in benefits for farmers that own large farms and have high incomes. This research reveals no such pattern for the selected public programs in the Cypress area.

Program Goal Fulfillment

The public programs failed to fulfill their objectives of soil and water conservation on an area-wide basis. This happened not because of poor performance, but because of the land organization, tenure, and production system. There are three primary shortcomings in

this regard.

First, the programs have been voluntary. Farmers have not been forced into any action that is not of their own choosing. This has left the design of the programs open to assumption that farmers will participate in the programs in significant numbers. In the Cypress area this assumption has not been fulfilled and consequently the programs have not had the desired impact.

Second, there is apparently an insufficient profit incentive to induce farmers to participate. Farmers seem unwilling or unable to postpone present economic gain in favor of future gain. It is the author's opinion that it is more of an unwillingness rather than inability that halts the postponement.

Third, the programs have been too limited in management scope. Each program has focused on the individual farm with little or no regard for the surrounding area. As a result, agricultural land use and cropping patterns have reflected an adjustment to the productive capacity of the land only when the accident of ownership has provided a willing land manager.

Concluding Remarks

A great deal of attention has been focused on soil erosion, flooding, and wetlands management in West Tennessee since the beginning of this research. Pressure on officials by floodplain

landowners has resulted in a publically funded drainage program that is attempting to make the Forked Deer and Obion floodplains free from flooding. This is not the first channelization program in the area, nor is it likely the last. So far, officials seem to have missed the points heralded by H. H. Bennett 50 years ago: That accelerated erosion choaks streams with sediment and increases flooding; that bottom land is consequently ruined by coarse grained alluvium; and that stream flow is radically altered by man's cultural use of land. The current projects, typified by channelization of Cypress and Sand Creeks in 1975, merely treat the symptoms of the problem rather than its causes.

The author is not a pessimist, rather he is a realist. It is his belief that there will be a new "closing of the commons" in regard to man's use and management of agricultural land. The technical knowledge and expertise to meet the challenge of agricultural land conservation is available. What is needed is a change in the resource use system that will provide public programs with sufficient economic incentives to encourage broad scale participation, or restrictions that will require a given compliance level of conservation management.

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APPENDIX I

QUESTIONNAIRE

_____ (years) 1. How many years have you lived in this area?

_____ (years) 1a. How many years have you farmed here?

_____ (acres) 2. How many acres if any do you own?

_____ (acres) 2a. How many acres if any do you rent from others?

_____ 2b. What type rental agreement do you have?

2c. What restrictions if any are there regarding management or crops?

_____ (acres) 2d. How many acres if any do you rent to others?

---

1 soybeans
2 cotton
3 corn
4 others_____
_____

3. What crops do you grow?

1 yes
2 no
9 NA

3a. Are they the same as 10 years ago?

3b. Why is that?

---

1 yes
2 no
9 NA

4. Are you using the same cultivation techniques now that you used 10 years ago?

---

1 yes
2 no
9 NA

5. Have you ever been on an organized field day sponsored by the Extension Service, SCS, ASCS, or other public conservation agency?

1 Extension Service
2 SCS
3 ASCS
4 TVA
5 other
9 NA

5a. Specify which agency.

---

6. Would you take a look at these aerial photographs and point out the fields you own or rent?

6a. How long have you owned or rented each field?

6b. Which if any fields have erosion problems?

6c. How serious do you feel this erosion problem is:

4) very serious. 3) somewhat serious. 2) not very serious.

1) not at all serious. 9) DK or NA.

6d. What are you doing about it?

6e. How long do you expect to keep each field under your management?

	own/rent	how long	erosion	how serious	what's doing	expectancy
Field 1.						
Field 2.						
Field 3.						
Field 4.						
Field 5.						
Field 6.						
Field 7.						
Field 8.						
Field 9.						
Field 10.						
Field 11.						
Field 12.						
Field 13.						
Field 14.						
Field 15.						

1 yes 7. Do you think soil erosion is a problem on the other farms
2 no in the area?
9 NA

4 very serious 7a. To what extent?
3 somewhat serious
2 not very serious
1 not at all serious
9 DK or NA

7b. Do you happen to know what others are doing about it?

---

1 yes 8. Were you aware of the ASCS Soil Bank program
2 no or not?
9 DK or NA

1 yes 8a. Did you happen to participate in this program?
2 no
9 DK or NA

_____ 8c. How long did you participate?
(years)

_____ 8d. What cover crops did you use if any?
Specify on photo.

---

1 yes 9. Were you aware of the ASCS Acreage Reserve program or not?
2 no
9 NA

1 yes 9a. Did you happen to participate in the program?
2 no
9 NA

(years) 9c. How long did you participate?

_____ 9d. What cover crops did you use if any?
Specify on photo.

---

1 yes
2 no
9 NA

10. Do you happen to know about the ACP cost sharing program for soil conservation work or not?

1 yes
2 no
9 NA

10a. Have you ever happened to participate in the program?

_____

_____

10c. What practices have you used? Specify on photo.

---

4 monthly
3 every few months
2 annually
1 almost never
9 DK or NA

11. How often do you consult with the County Extension Agent about conservation techniques and land management?

4 monthly
3 every few months
2 annually
1 almost never
9 DK or NA

11a. How often do you seek advice from the SCS?

---

1 yes
2 no
9 NA

12. Have you ever developed a farm management plan with the assistance of the SCS?

---

1 yes
2 no
9 NA

13. Do you happen to know if the TVA is interested in agricultural land use and conservation or not?

---

1 yes
2 no
9 NA

14. Have you ever been in the TVA area?

_____

14a. Did you notice whether or not the physical land base was 1) better maintained there than here, 2) about the same, or 3) not as good?

I have here a few questions about the success of some government conservation programs. As I read each one would you tell me if each program was very successful, somewhat successful, not very successful, or not at all successful in promoting soil conservation and land improvement on the land you farm.

very	somewhat	not too	not all	DK	non-participant	State
4	3	2	1	9	0	15. Soil Bank
4	3	2	1	9	0	15a. Acreage Reserve
4	3	2	1	9	0	15b. ACP
4	3	2	1	9	0	15c. SCS
4	3	2	1	9	0	15d. Extension Service

_____ (percent) 16. What percent of your income is derived from non-farming sources?

_____ 17. (Hand Card "A") Looking at this card would you please tell me your total family income before taxes last year, just your best estimate. Call your answer by letter.

1 yes 17a. Is this fairly representative of your last 3 years?
2 no
3 NA

_____ 17b. If not what is?

_____ 18. What was the last grade you completed in school?

_____ (years) 19. What is your approximate age?

Statement of Informed Consent

Hello, I'm John Avery Emison from Alamo, and I am working on a land use and conservation study in the Cypress Creek drainage basin. I would like to ask you a few questions if you don't mind. You were chosen at random and you are an important source of information. Your participation is completely voluntary and can be terminated at any time. Everything you tell me will be held in the strictest confidence. The results of the study will be tabulated for the area as a whole, not for any one person. No names will be disclosed. If you have any questions about this interview or the research project I will be glad to answer them. You may contact me at 372 East Church Street, Alamo, Tennessee 38001.

APPENDIX II

EROSION JUDGEMENT CATEGORIES

Erosion Judgement Categories

1. No Erosion: No breaks in pasture cover or forest floor, visible organic matter remaining on row crop fields.

2. Mild Sheet Erosion: Removal of surface organic matter with little or no loss of "A" horizon.

3. Widely Spaced Small Gullies: Gullies that are less than 15 centimeters deep and more than three meters apart.

4. Combination of Mild Sheet Erosion and Widely Spaced Small Gullies: See numbers two and three above.

5. Closely Spaced Small Gullies: Gullies that are less than 15 centimeters deep and less than three meters apart.

6. Closely or Widely Spaced Large Gullies: Gullies that are more than 15 centimeters deep at any spacing interval.

7. Loss of "A" Horizon: Sheet and/or gully erosion so intense that the "A" Horizon has been removed.

8. Closely or Widely Spaced Large Gullies and Loss of "A" Horizon: Gullies that are more than 15 centimeters deep at any spacing interval, and removal of "A" Horizon.

APPENDIX III

SOILS INFORMATION

Soils Information

Collins Series

The Collins are deep, moderately well drained soils consisting of recent stream deposited sediments. The sediments originally came from deep loess areas. The Collins have a brown, very friable silt loam surface soil. The subsoil is the same texture but has some gray mottles. These soils occur in areas alongside the better drained Vicksburg, and the more poorly drained Falaya and Waverly soils. These soils are occasionally flooded and on some areas early spring seeding must be delayed because of wetness. They are strongly acid and have moderate natural fertility. They have high production potential because of their good tilth and high moisture supplying capacity.

Falaya Series

The Falaya are somewhat poorly drained silty soils that have developed in materials that have recently washed from deep loess soils. The Falaya occur with and are similar to the Vicksburg, Collins, and Waverly soils. They are a friable silt loam from the surface downward to over 45 centimeters, usually much deeper. In the surface they are brown but become grayer and are mottled with depth.

The Falaya have a high water table which is near the surface in winter and spring. In summer it lowers to a depth of about one to three meters. In winter and spring the Falaya are periodically flooded. The Falaya are medium in natural fertility and respond highly to fertilizer.

Grenada Series

The Grenada are moderately well drained upland soils with fragipans at a depth of about 55 to 71 centimeters. They have developed in loess which is more than 105 centimeters thick, usually much thicker. They are on slopes of two to seven percent gradient. The Grenada have a brown to grayish brown, friable silt loam surface soil and a yellowish brown, firm to friable silt loam or silty clay loam subsoil. The Grenada are less brown than the Loring and have a strong fragipan where the Loring has a weak one. The use of the Grenada is limited by their fragipan and their slope. The soil above the fragipan is permeable to air, water, and roots. The fragipan is slowly permeable. During rainy seasons, a perched water table is formed over the fragipan. Drought periods are more severe on Grenada than on Memphis because of the shallower rooting zone.

Loring Series

The Loring are well drained to moderately well drained, silty soils on uplands. They have developed in loess which is more than 105 centimeters thick, usually much thicker. They occur on slopes mainly between three and twelve percent gradient. The Loring have a brown, friable silt loam surface soil and a yellowish-brown to strong brown, friable silty clay loam or silt loam subsoil. They have a weak fragipan at about 75 centimeters.

The use of the Loring is limited mainly by slope. The fragipan is not strong enough and not shallow enough to seriously reduce the Loring's suitability for most crops. The Loring are permeable to air, water, and roots in the upper solum and moderately permeable in the lower subsoil. Moisture supplying capacity is moderately high. The Loring are moderately high in natural fertility and acid throughout. They respond well to fertilizer.

Memphis Series

The Memphis are deep, well drained upland soils that have developed in loess which is more than 105 centimeters thick, usually much thicker. They occur on slopes that are one to seven percent. The Memphis have a brown friable silt loam surface and a brown to strong brown, friable silty clay loam, or silt loam subsoil. The

Memphis do not have a fragipan.

The use of the Memphis is limited mainly by their slope. They are moderate to high in natural fertility and respond well to fertilizer.

Waverly Series

The Waverly are poorly drained, gray silty soils consisting of materials recently deposited by streams. The material comes from Memphis, Loring, Grenada, and other deep loess soils. The surface soil is a brown to grayish brown, friable silt loam and the subsoil is a gray, friable silt loam.

The water table is near the surface in winter and spring. Flooding occurs occasionally and surface drainage is low. Water often stands on many areas. These soils are strongly acid and medium in natural fertility. They respond well to liming and fertilization.