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An analysis of factors and policies relating to use of highly erodible land in West Tennessee for crop production

Robert Jamey Menard

To the Graduate Council:

I am submitting herewith a thesis written by Robert Jamey Menard entitled "An analysis of factors and policies relating to use of highly erodible land in West Tennessee for crop production." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

William L. Park, Major Professor

We have read this thesis and recommend its acceptance:

Luther Keller, Thomas Klindt

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

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AN ANALYSIS OF FACTORS AND POLICIES RELATING TO USE OF HIGHLY ERODIBLE LAND IN WEST TENNESSEE FOR CROP PRODUCTION

A Thesis

Presented for the

Master of Science

Degree

The University of Tennessee, Knoxville

Robert Jamey Menard

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ABSTRACT

Off-site effects of soil erosion from cropland on water quality and flooding are of increasing social concern. The objective of reducing off-site damaging effects from soil erosion has gained in prominence relative to maintaining on-site soil productivity. However, there has been limited success of past Federal soil erosion control programs to induce erosion control on the most highly erosive land, especially the conversion of highly eroding cropland to a permanent vegetative cover. Therefore, the purpose of this study was to evaluate factors and policies relating to use of highly erosive land in West Tennessee for crop production. A survey was conducted in Dyer and Fayette Counties in West Tennessee to obtain data for the analyses.

The Soil Conservation Service's 1982 National Resource Inventory data reveals that West Tennessee has 438,000 acres of cropland designated by the Soil Conservation Service as Class IV, VI, and VII--land considered unsuitable for crop production. However, the distribution of this marginal cropland in relation to field operating units is not well known. Landowners' farms in Fayette County are analyzed in this respect. The results indicate that at a field level of analysis, Class IV, VI, and VII cropland is intermingled with many lower land capability classes. As such, most of this land is in fields where it represents less than half of the acreage. This

distribution may create an unwillingness for landowners to voluntarily participate in conservation programs to induce conversion of this type of land to a permanent vegetative cover and would also cause difficulty in administering a regulatory approach to require conversion.

A logit regression model was used to evaluate factors which may influence landowners to row-crop Class IV, VI, and VII land. In addition, farmers' estimates of their yields, prices, and variable production expenses for row-crops grown on the highly erosive fields in the study were analyzed to ascertain what level of net returns farmers perceived they were obtaining. Implications for policies to influence conversion of highly erosive land to a permanent vegetative cover were investigated.

The Food Security Act of 1985 has a Conservation Reserve Program where farm operators would submit bids for the amount of payment they would accept from the Federal government to convert highly erosive land to a permanent vegetative cover. Hypothetical bids were obtained from the landowners in both Dyer and Fayette Counties and then analyzed. The results from this study indicate that a bidding approach to retire highly erosive cropland is more cost effective from a public policy perspctive than traditional uniform offer approaches. Finally, information on owner, farm, and field characteristics was utilized in a regression model to estimate the relationship of these characteristics to landowners' bid levels.

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CHAPTER I

INTRODUCTION

Concerns about the problem of soil erosion have grown in the United States recently. Past erosion concerns focused on primarily on-farm soil productivity losses and the threat they pose to our agricultural and economic base [Crosson, 1983]. According to Crosson [1986], the present annualized costs of cropland erosion on soil productivity -- taking into account the yield declines over the next 100 years -- are about 1.7 to 1.8 billion dollars. This cost estimate is comprised of costs occurring for preventive measures, production loss despite preventive measures, and erosion damage compensation by adding certain soil amendments (fertilizer and lime) and tilling.

Recently, off-farm damages have gained increased attention from society. Crosson further estimates the off-farm cost from all sources of erosion to be 0.6 to 2.2 times greater than soil productivity costs [Crosson, 1986]. Agricultural land contributes sediment which fills up streams, lakes, and reservoirs; pesticides that are toxic to fish and wildlife; and fertilizers that accelerate the eutrophication of lakes and reservoirs [Clark, Haverkamp, and Chapman, 1985]. Further, water quality is diminished--threatening industries' production processes and municipalities' drinking water.

Yet even though we have a surplus of major crops, 47 million acres of our 375 million acres of cropland are considered highly erodible or fragile land [Webb, Ogg, and Huang, 1986]. Why then is this land in production? One reason is certainly that while society

may benefit a great deal from long-term retirement of this highly erodible land, landowners may benefit very little themselves compared to the cost they bear in terms of foregone net returns. Consequently, convincing landowners to retire this type of land may be difficult unless financial disincentives are reduced or financial incentives are increased [Hoag and Young, 1985]. The primary objective of this study was to evaluate the magnitude of financial incentives needed to retire highly eroding cropland in West Tennessee under a conservation reserve bid approach. Before turning to the empirical analyses, further discussion of the question of why this land is in production and why past policy approaches to encourage conversion have not been very successful is warranted.

One explanation for why much of this land is in production is that the structure of our commodity programs may discourage conversion to a non-program crop or use. Several studies have concentrated on the connection between price support and acreage reduction provisions of commodity programs and crop production on highly erosive land [Ogg, Webb, and Huang; Ogg and Zellner; Hoag, Taylor, and Young; Reichelderfer]. There is some evidence that farmers keep such land in production to maintain crop bases and to maximize program benefits. Commodity program participants are often required to set aside or divert cropland acreage in order to receive program benefits [Grano, Schaller, Clark, Huang, Ogg, and Webb, 1985]. However, diverted acreage need not be highly erosive [Ogg, Webb, and Huang, 1984]. In addition, one study reveals that one-half to two-thirds of the excessively eroding cropland is operated by individuals not

participating in USDA's commodity or conservation programs [Reichelderfer, 1984]. One major reason -- and an important consideration in this research study -- for the limited overlap of commodity program participants and serious erosion is the lack of an acreage diversion program for soybeans, a particularly erosive crop.

Thus, structural changes in commodity programs will not fully address the issue of crop production on highly erodible land. Increased financial incentives will be necessary for the many farmers who perceive positive net returns from row-cropping this type of land apart from the direct influence of commodity programs. In the 1970s, crop production on this type of land may have been profitable because of the jump in price for soybeans and other crops. But during the last part of that decade and into the early 1980s, prices declined and production costs increased to the point that enterprise budgets now show negative net returns when yields for highly erodible land (Class IV, VI, and VII[1]) and all costs are considered [Ray and Walch, 1985].

The 1982 National Resource Inventory (NRI) estimated that West Tennessee had 438,000 acres of highly eroding (Class IV, VI, and VII) cropland. But a consideration not usually addressed is the distribution of this type land among farm or field operating units. If much of this Class IV, VI, and VII cropland is intermingled with

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[1]Based on the Soil Conservation Services' Land Capability Classification (LCC) system. The LCC system ranges from Class I (few limitations) to Class VIII (restricted to recreation, wildlife, and aesthetic purposes). Another definition for "highly erodible" land is given by Bills and Heimlich, 1984.

lower land capability classes in single fields, this may help explain why so much of this land is in crop production. This finding would also have important implications for the design of policies to induce conversion of such land to permanent vegetative cover. Another possible explanation for widespread row-cropping of this type of land is that farmers may be thinking "short-run" or consider such land as "marginal" in relation to their overall operation. That is, they may row-crop this land as long as returns cover variable costs of production.

Federally funded conservation programs provide technical and financial assistance to landowners so that they may voluntarily develop conservation plans and apply conservation practices. In the past, the financial assistance has been allocated across the nation primarily on the basis of land acreage in agriculture and offered to farmers in the form of uniform percentage cost sharing, without regard to a particular field or practice involved. It has been argued that this latter characteristic generates sizeable rents or income transfers to farmers and limits cost effectiveness [Park and Sawyer, 1984; Ogg, Webb, and Huang, 1984]. According to one program review, Federal conservation programs have cost $18 billion since their inception in the 1930's yet soil erosion has not been controlled as it could have been [USGAO, 1983]. Particular concern has been expressed about the limited effectiveness of these programs in inducing farmers to convert highly eroding, marginal cropland to grass or trees.

As à result, several changes have been made. In 1981 USDA began a national program to target conservation technical and financial

assistance to critical resource areas [Nielson, 1986]. Farmers with more serious erosion problems would, hopefully, take advantage of USDA's increased technical and financial incentives to apply conservation practices on the more highly erodible land. Yet, in one critically eroding watershed in West Tennessee, the North Fork Forked Deer, over a million dollars in special water quality funding was targeted to provide 75-percent cost sharing, but relatively little highly eroding cropland was converted to a permanent vegetative cover [Park and Sawyer, 1985]. In 1982 USDA initiated a variable cost sharing program. Under this program, the greater the percentage reduction in erosion and the greater the pre-practice erosion rate, the greater the cost sharing level received. This shifts the incentive structure but doesn't necessarily reduce rents. However, the 1984 Conservation Reporting and Evaluation System (CRES) data for West Tennessee reveals that the impact of variable cost sharing on establishment of permanent vegetative cover for highly eroding land is relatively small. By policy design, the targeting and variable cost sharing programs addressed erosion problems on all land capability classes with hopes that these programs would have an effect on conversion of the more highly erodible land.

Policy has evolved recently to deal exclusively with the conversion of highly eroding cropland--specifically, the sodbuster, conservation plan, and conservation reserve program (CRP) provisions in the Food Security Act of 1985. Under the first, farm program benefits would be denied to operators who convert potentially highly erosive land to crop production. Under the second, farmers would be

required to have a conservation plan and to begin implementing it by 1990, with full compliance by 1995 [Cook, 1986]. Under the third, farmers submit bids they would accept to retire highly erodible land and receive annual rental payments on a per acre basis from the Federal government over the 10-year contract period. The CRP approach seeks to reduce payments received by farmers above the minimum amount of financial incentive they would accept to convert their highly eroding cropland and thus explicitly recognizes the need to compensate them for net returns foregone. Past cost sharing approaches which provide reimbursement for only 50 to 75-percent of the out-of-pocket cash costs of establishing permanent cover have provided insufficient incentive in many cases. Some have argued for the CRP from the standpoint of supply control benefits as well [Benbrook, 1986; Ogg and Zellner, 1984].

Policy-makers recognize weaknesses in past approaches for encouraging conversion of highly eroding cropland to a conserving use. However, information is needed on how well these new approaches can be expected to perform in improving cost effectiveness. Furthermore, information is needed on how national policies may work in particular regions given differences in characteristics of crop enterprises, resource constraints, financial situations, etc. [House, Ogg, Clayton, and Johnson, 1982].

I. Objectives

The overall objective of this study was to evaluate factors and policies relating to use of highly erodible land in West Tennessee for crop production. Specific objectives were as follows:

(A) Identify the location of Class IV, VI, and VII land used for row-crop production in West Tennessee in general and in relation to farm and field operating units.

(B) Determine the farm, field, and personal variables that may influence row-cropping Class IV, VI, and VII land in West Tennessee.

(C) Analyze whether West Tennessee farmers may have overly optimistic perceptions and expectations concerning yields, prices, and variable production costs that may influence row-crop production on Class IV, VI, and VII land.

(D) Analyze the magnitude of economic incentives needed to induce conversion of Class IV, VI, and VII land being row-cropped -- based on landowner's bids -- and evaluate the cost-effectiveness of offering such incentive through alternative approaches.

(E) Determine the different farm, field, and personal level variables that may influence a landowner's bid for those landowners who do row-crop Class IV, VI, and VII land in West Tennessee.

II. Procedure for Accomplishing Objectives

To accomplish objective (A), information from the county SCS and ASCS offices and county soil survey were utilized to determine the distribution and the relationship of Class IV, VI, and VII land at the whole farm and field level of analysis across farm operating units.

Objective (B) was accomplished with data from a survey of farm operators. Information gathered was utilized in a logit model to determine whether factors such as a landowner's debt structure, education, etc., may influence row-cropping Class IV, VI, and VII land in West Tennessee.

Objective (C) was accomplished by using survey data in regard to landowners' costs of production, yields, and prices. This data was compared to budgets for the West Tennessee area to determine whether West Tennessee farmers that row-crop Class IV, VI, and VII land may have overly optimistic expectations regarding their net returns.

To accomplish objective (D) and (E), farm operators who farm Class IV, VI, and VII land in the sample were asked to give an acceptable bid price which would induce their willingness to retire highly erodible cropland. Regression analysis was used to analyze different farm, field, and personal factors that may influence bid levels.

III. Outline of the Report

The remaining report is structured in the following manner. A conceptual discussion of policies for inducing soil erosion control is presented in an economic framework in Chapter II. Procedures and

methods for county and sample selection, land capability class findings, and descriptive statistics from the survey are presented in Chapter III. Findings from investigation of the use of Class IV, VI, and VII land for row-crops and cost and return data are presented in Chapter IV. Findings from analyses of the bid data are presented in Chapter V. Finally, conclusions and policy implications are presented in Chapter VI.

CHAPTER II

THEORETICAL CONSIDERATIONS FOR SOIL EROSION CONTROL POLICY

Attention must be given to both physical properties of soil erosion control and economic principles in order to properly evaluate policies for retiring highly eroding cropland in West Tennessee. Policies for retiring Class IV, VI, and VII cropland must be cost effective and must address relevant aspects of the problem.

I. Soil Erosion as an Externality

Erosion from marginal cropland poses a threat to the quality of the environment. According to Baumol and Oates [1975], environmental quality can be considered a public good, consumed jointly by all members of society. Damaging effects, however, may result from both on-farm loss of soil productivity and off-farm pollution and accelerated sedimentation of water resources. According to economic theory, costs due to productivity losses are internal to the farm and the farmer is considered to bear them. Whenever the cost of productivity loss threatens to exceed the cost of erosion control, the farmer has an incentive to hold it in check. Stated differently, farmers' and society's interests are similar in soil erosion control to reduce the effects of on-farm damages and to maintain the soils' productivity for future generations. However, this assumes that planning horizons and discount rates of farmers and society are the same. As a practical matter, a farmer's planning horizon may be shorter and discount rate higher than those of society. Thus farmers

may undertake too little erosion control from the standpoint of society's interests.

With off-farm damages, downstream landowners and society as a whole are affected. These damages are considered external costs of farm operations. Coase [1960] theorized that private bargaining among the affected parties could lead to internalization of costs resulting in a socially satisfactory outcome. External costs in this situation, however, are imposed under technical and institutional conditions which makes private bargaining unfeasible. With off-farm costs, farmers' and society's interest in off-farm damages due to soil erosion can be expected to be widely divergent. Thus, individual members of society are motivated to "free-ride" or to let other members incur the cost of soil erosion control. As a result, off-farm damages predispose public intervention because of the failure of the free market system to allocate resources in society's best interest. The incentive is lacking for private landowners to reduce these external effects, resulting in other landowners and society bearing the cost; thus, the divergence between private and social cost is not being accounted for in the marketplace [Baumol and Oates, 1975; Hirshleifer, 1984; Klindt, Hass, and Park, 1982; Sawyer, 1983; Crosson et al, 1986]. The costs of this conservation effort, however, are both direct and indirect. Direct costs -- program outlays and administrative costs -- are encountered by the government in inducing landowners to adopt soil conservation practices. Indirect costs, from a societal perspective, are reduced current farm output that is foregone. The direct benefits of soil erosion control are the

reductions in off-site damages because of sedimentation and pesticides [Eleveld and Halcrow, 1982].

However, the optimum level of soil erosion control for reducing both on-farm and off-farm damages is controversial. All soil conservation programs, either directly or indirectly, rely on tolerance (T) values to identify areas where soil erosion exceeds socially acceptable amounts. According to McCormack, Young, and Kimberlin, T values are defined as "the maximum rate of annual soil erosion that will permit a high level of crop productivity to be obtained economically and indefinitely." [McCormack, Young, and Kimberlin, 1982, p.99]. Yet T values are purely physical; no economic dimension is specified. The costs of erosion control need to be compared with the costs of erosion by both farmers and policy-makers, so that wise decisions about soil conservation can be made [Crosson et al, 1986]. In addition, T has no time dimension, and the standard signals everyone to conserve "now". But it may be many years before costs of productivity loss exceeds control costs, and to control erosion on these soils now would be an inefficient use of farmers' and society's resources. Findings from research by soil scientists indicate that erosion-productivity relationships vary widely among soils and across regions [Crosson, 1986].

II. Soil Erosion Control Policy

As pointed out in the previous section, government involvement is justified for inducing farmers to adopt some form of soil erosion control. Alternative soil conservation programs proposed to reduce

erosion are information/education and technical assistance, regulation, taxation, cross-compliance with other agricultural programs, and subsidies.

The informational/educational and technical assistance approach has been a component of traditional soil erosion control programs. Batie [1983] has suggested that if a landowner decides to adopt soil conservation practices, he must first perceive a problem and have the technical knowledge to solve it. But farmers who do receive educational assistance may not all be equally well informed; and if they were, the perceived need for a change may not be the same. Consequently, this policy approach usually is considered more viable when complemented with other approaches.

Crosson suggests that "...regulation in soil conservation policy increasingly looks like an idea whose time is steadily approaching, if it is not already here," especially for the more highly eroding cropland [Crosson, 1986, p.38]. Studies have considered a number of regulatory approaches, such as a 5-ton-per-acre soil loss limit, a ban on fall moldboard plowing, or a ban on straight-row cultivation on slopes over 2-percent [Walker and Timmon, 1980; Heady and Daines, 1982]. However, a recent task force study concluded it is unlikely that productivity costs alone on even the more highly erosive land are high enough to justify adoption of regulatory controls, though the presence of severe off-site impacts seems likely to increase consideration of such controls. Also, political costs would be high [Crosson et al, 1986]. Protection of private property rights is a major deterrent as well [Batie, 1983]. A Missouri study analyzed the

effects of a mandatory soil loss tolerance level approach. The results revealed that smaller farm operators would be at a disadvantage under this regulatory approach. Therefore, program designs in this area must be careful to consider impacts on farm structure [Ervin, Bryant, and Stampley, 1984].

Taxation is often considered the most cost-effective approach for reducing soil erosion [Benbrook, 1979]. According to economic theory, the proper (Pigovian) tax level administered to landowners generating excessive soil erosion should be equal to the marginal net damage produced by this activity. However, the money value of the marginal net damage is difficult to estimate [Baumol and Oates, 1975]. Also, farmers' profits may be significantly reduced, and the administration of a tax program could be costly because of annual monitoring procedures that would be needed [Benbrook, 1979].

Cross-compliance, as a policy tool for erosion control, has been proposed to improve the effectiveness of soil conservation programs by linking them with commodity programs. The argument supporting this approach is that farmers who participate in commodity programs and who have erosion problems should be required to address their erosion problems in order to receive commodity program benefits. For this program to be successful, however, there must be an overlap between the erosive land, land planted in program crops, and cropland entering Federal government programs [Ogg and Zellner, 1984]. Yet many of the landowners who do have erosion problems do not participate in commodity programs. Many of these landowners produce soybeans, and no acreage diversion program exists for this crop [Reichelderfer, 1984].

Although cross-compliance has often been discussed as an instrument for soil conservation programs, its main purpose, more than likely, is to improve the character of USDA's commodity programs [Kaplan-Wildmann, 1983]. A form of cross-compliance is to be implemented, based on the 1985 Farm Bill provisions.

Subsidies in the form of cost-share payments have been the traditional program approach to induce farmers to voluntarily adopt soil erosion control practices. Furthermore, cost-sharing has been for out-of-pocket costs only, which can limit participation in applying conservation on the land. New program developments need to consider foregone returns from a current enterprise plus out-of-pocket costs. With foregone returns considered, however, net cost may be more than 100-percent of out-of-pocket costs. In addition, financial assistance has generally been available on a first come-first serve basis, allowing practices to be applied to low priority or non-existent problems [Sawyer, 1983]. Yet equal access to these funds without regard to soil types, conservation practices involved, and landowner characteristics may be inefficient [Johnson, Eleveld, and Setia, 1984]. Financial assistance has also generally been in the form of uniform percentage cost-sharing, regardless of the particular field or practice involved. This leads to subsidy payments in excess of the minimum amount necessary to induce a given level of soil erosion control. Cost-share payments (rents) in excess of the net conservation practice costs (gross costs for practice adoption minus economic return from on-farm productivity benefits) may result [Park and Sawyer, 1984].

Farmers are believed to participate in the ACP program whenever the perceived sum of the on-farm productivity benefit and cost-share payment exceeded the cost of the practice [Sawyer, 1983]. Controversy exists, however, as to whether the on-farm productivity benefits -- being long term in nature -- are readily perceived by the farmer when compared to the short-run cost of the conservation practice itself. One study revealed that failure of farmers to consider long-run productivity advantages of soil conservation may contribute to almost one-third of the agricultural soil loss [Heady and Daines, 1982].

The conservation reserve bid approach considered in this study is designed to address some of theses weaknesses. This approach would deal with the priority weakness of previous programs by restricting eligibility to only highly eroding land. The ways in which the approach deals with the problems of excessive rents and lack of compensation for foregone earnings are illustrated in Figures 1 and 2, respectively.

The net cost to farmers of converting the 438,000 acres of highly erodible cropland in West Tennessee to a permanent vegetative cover is represented in Figure 1. For example, with an offer approach involving uniform cost-sharing in the amount of $60 per acre to induce farmers to convert their highly erosive fields, government payments in excess of the minimum amount necessary to achieve X acres of conversion (area B) will result [Park and Sawyer, 1984]. However, with a bidding approach to retire highly eroding land, windfall payments to program participants may be eliminated (area A) if landowners' bids are close to their true reservation price (minimum

Bid versus Offer Approach

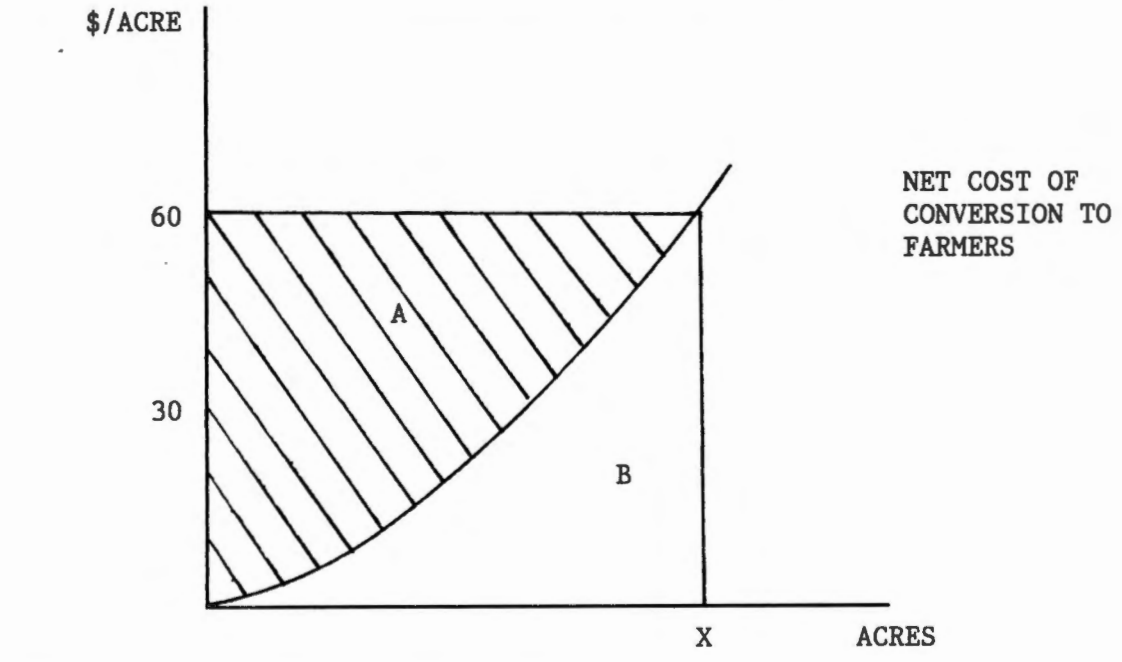

Figure 1. Diagram of Bid versus Offer Approach.

Cost Sharing versus Per Acre Subsidy

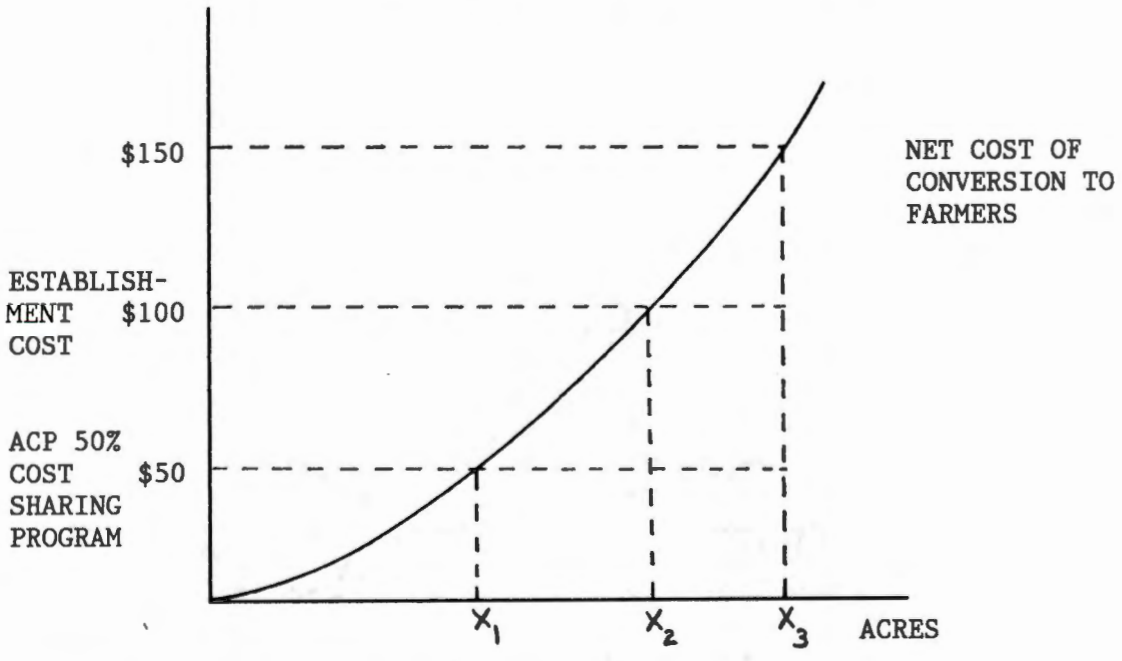

Figure 2. Diagram of Cost Sharing versus Per Acre Subsidy.

bid level required to be a program participant). In other words, some farmers may be willing to accept $30 per acre to convert their highly eroding fields. Since the program is designed to offer them $60, this results in a $30-per-acre windfall payment to each of these farmers. With a bidding approach, public cost-effectiveness for erosion control would increase as a result of reducing income transfers (area A) to program participants [Ogg, Webb, and Huang, 1984].

The conservation reserve bid approach allows farmers to incorporate establishment costs for a permanent vegetative cover practice and foregone net returns into the bid. This provides more incentive to landowners to enroll highly erodible acres, compared to the typical 50-percent cost sharing for establishment costs only. As an example, assume that the net cost of conversion to farmers in Figure 2 includes the establishment cost of a permanent vegetative cover plus the present value of foregone net returns from a row-crop operation. Further assume that the per-acre establishment cost for a permanent vegetative cover is $100. Thus, at X_2 net returns from a row-crop operation are just equal to net returns from a grass-based use (ignoring establishment costs). To the left of X_2 net returns from a row-crop operation are less than net returns from a grass-based use (ignoring establishment costs). To the right of X_2 just the opposite is true. With the typical 50-percent cost-sharing for establishment costs only, X_1 acres would be voluntarily converted. Under the conservation reserve bid approach landowners with land to the right of X_1 can incorporate full establishment costs and their foregone earnings into their bids. For example, farmers with land at

X_3 could incorporate the $100 establishment cost plus foregone net returns of $50 into their bid. Thus, compared to past conservation programs, this approach allows more flexibility and input for the farmer and allows a farmer's bid to reflect the economics of their specific farming enterprise.

Although economic efficiency or cost effectiveness is a useful criteria for comparing policy approaches, it cannot be the sole objective for soil erosion control policy. Other policy ramifications such as political acceptability and administrative costs must be evaluated for practical policy implementation [Walker and Timmons, 1980]. Perhaps because of ease of administration and farmers' acceptance, subsidies will continue to be the main policy approach to induce farmers to adopt soil erosion control practices. However, as soil erosion control programs continue to evolve and budget cost concerns mount, regulation and cross-compliance features to complement this policy approach seem likely to become more widely used.

CHAPTER III

SURVEY PROCEDURES AND GENERAL FINDINGS

The first section of this chapter focuses on selection of counties and drawing of samples, as well as the format and assumptions of the survey. The second section focuses on the distribution of land capability classes at a whole farm and field level of analysis. Descriptive statistics of selected farm, field, and personal variables are presented in the third section.

I. County and Sample Selection

West Tennessee is comprised of two major land resource areas; thus, the survey counties were selected to reflect the soils associated with these areas and the agricultural production activities associated with these soils. Dyer and Fayette Counties in West Tennessee were selected for the study area (see Figure 3) based on the following criteria: 1) both have a published soil survey; 2) land-use maps were available at a county level in lieu of soil survey maps; 3) the soil base was typical and represenative for the West Tennessee area; and 4) the percentage of Class IV, VI, and VII land being row-cropped (Dyer 46.1-percent, Fayette 37-percent) was high [SCS, 1982].

Dyer County is representative of the northwestern part of West Tennessee, where loess-derived (silty windblown) soils are deep and fertile, but also highly erodible. In 1982, of the 272,129 acres of land in farms in Dyer County, 243,127 acres were in crop production,

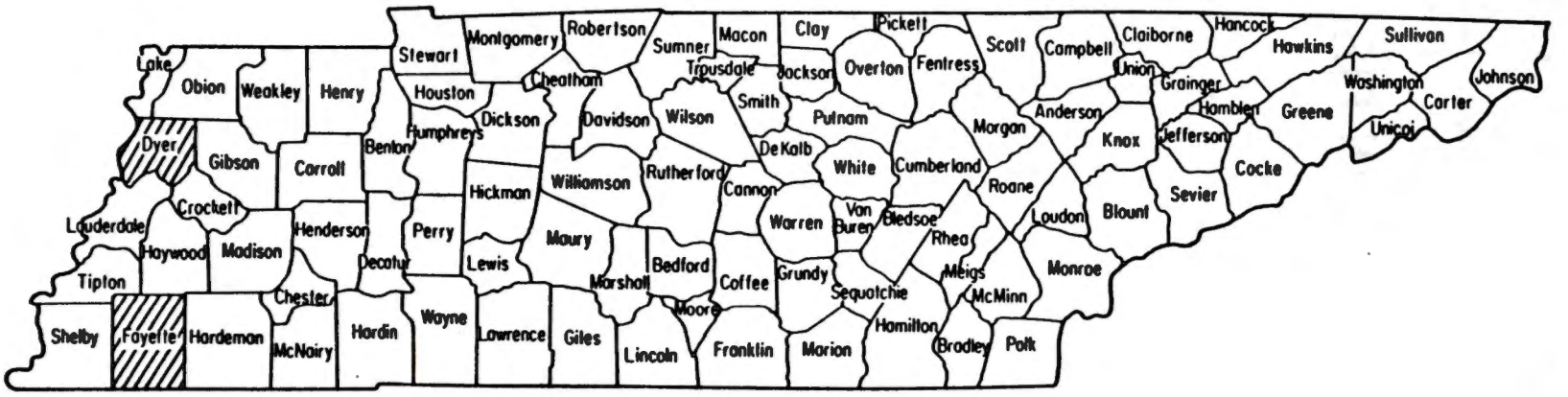

Figure 3. Location of Dyer and Fayette Counties in West Tennessee.

with 182,251 acres in soybeans. The average size farm in 1982 was 345 acres in Dyer County [USDC, 1982].

Fayette County is representative of the southeastern part of West Tennessee where coastal plain derived soils are lower in fertility but are also highly erosive. In 1982, of the 311,577 acres of land in farms in Fayette County, 200,064 acres were in crop production, with 91,590 and 27,616 acres in soybeans and cotton, respectively. The average size farm in Fayette County in 1982 was 369 acres [USDC, 1982].

A random sample of farms was drawn from highly eroding areas in each county from Agricultural Stabilization and Conservation Service (ASCS) office files for the detailed survey. Because the western part of Dyer County is made up of Mississippi bottomland, the north and northeast sections were chosen. Based on discussions with local SCS personnel in Fayette County, the northeast and southeast sections of the county were chosen. These areas in both counties were already divided into districts by the ASCS. Using Fayette County as an example, the districts that comprised the northeast and southeast sections of the county were called the C, A, and M districts. For every tenth landowner's file drawn from ASCS's office files in these districts, the name(s) of the owner(s) (and operators if applicable), farm numbers and locations, and farm acreages (both totaled and cleared) were recorded. Once the farm boundaries and the fields within the farm were located on the aerial photograph, this information was transferred and drawn on the soil survey. The goal in drawing the random sample of farms was to identify 50 to 60 farms that

had cleared fields made up of more than 50-percent Class IV, VI, and VII land. Next, the cropping histories for the landowners' fields were recorded to help identify the number of qualifying fields (i.e., with greater than 50-percent Class IV, VI, and VII land) that were in row-crop production in 1984 or 1985. Likewise, for the three districts that covered the highly erodible areas selected in Dyer County, this same procedure was used. For both counties, a 13-percent random sample was drawn from each district. In Dyer County, 55 of 137 farms drawn had qualifying fields; in Fayette County, 61 of 107 farms. The 244 farms were used as the sample for the analyses of the distribution of Class IV, VI, and VII land at the farm and field level reported later in this chapter. The 116 farms with qualifying fields provided the sample for analyses of factors affecting the use of Class IV, VI, and VII land reported in Chapter IV. The subset of these farms with qualifying fields having been row-cropped recently provided the sample for analyses of bid levels for converting such cropland reported in Chapter V.

Personal interviews with owners of 106 of these 116 farms were conducted in January 1986 for Dyer and in March 1986 for Fayette.[2] Two enumerators from the Statistical Reporting Service administered the survey for each county. The survey (Appendix) was designed to obtain the following: 1) information from all landowners on their

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[2]The other ten landowners either expressed an unwillingness to participate in the study or the owners were residing out of state.

overall farming operation; 2) information on prices, yields, costs of production, and landowner's bids only if landowners had row-cropped qualifying fields in 1984 and/or 1985 or were planning to in 1986; and 3) information from all landowners on personal data (age, education, etc).

Bids were solicited from landowners on a maximum of two fields for 5-year, 10-year, 15-year, and permanent retirement options. However, since the actual Conservation Reserve Program (CRP) requires permanent vegetative cover for 10-years and since the survey respondents indicated a stronger preferences for short contracts, the estimated cost of a conservation reserve bid approach and the regression model results presented in Chapter V are for only the 10-year bid. In the survey, assumptions of the conservation reserve contracts were as follows: 1) fields could be used for forage production (hay, alfalfa), grazing, or for growing and harvesting forest products; 2) base acreage for commodity program purposes would not be reduced by the acreage of the field enrolled; 3) participants would be eligible for 100-percent cost sharing for establishment of forage and timber crops; 4) the landowner would receive an annual rental payment from the Federal government, based on the landowner's bid; 5) no other potentially highly erosive land in hay, pasture, or timberland could be brought into row-crop production to offset the loss of the row-crop land if a field was enrolled in the program; and 6) the bids were competitive, and limited number of acres would be enrolled in the program in each county. It should be noted that the first three assumptions differ from the actual characteristics of the

current Conservation Reserve Program, in which fields cannot be used for productive purposes, base acreages are reduced, and only 50-percent cosh-sharing is provided for cover establishment.

In addition, for the actual CRP controversy exists on the definition of "highly erodible" land and the eligibility of cropland acreage associated with these definitions. For our study in West Tennessee, given the topography and the physical nature of the soils in this area, the SCS's Land Capability Classification System was believed to adequately classify highly erodible land. Over the next four years, however, the eligibility requirements for the actual CRP can be redefined by the Secretary for each bidding period. For the 1986 CRP, eligibility is limited to land with an existing erosion rate three times the soil loss tolerance value. One equity issue associated with this change is that the conservation oriented farmer may be penalized. Some researchers and policy-makers favor moving to a potential erodibility criterion so other farmers can come into the program. The total number of eligible acres and the regional distribution of acres varies significantly, however, with each one of these definitions [Boggess, 1986].

Since this study uses a hypothetical bidding methodology to generate estimates of the costs of achieving a given level of soil erosion control and data for statistical analyses, recognition of potential sources of bias associated with this contingent valuation method must be acknowledged. Since our bidding format was non-iterative and open-ended, strategic, informational, survey instrument, or hypothetical bias could have occured. Strategic bias

occurs when individuals intentionally attempt to influence the results by incorrectly stating their preferences. With regard to the second, the type of information included in the description of the contingent situation can predispose highly dependent bids. With regard to the third, the type of bidding used, the starting point, and method of payment, can cause variability in bids. Finally, the hypothetical nature of the method can produce inaccurate results [Stoll, Smathers, and Shulstad, 1983; Randall, 1981]. For this study, informational and survey instrument biases were capable of being controlled more so than the other two. The structure of the hypothetical program and the descriptive information given in the survey (method of payment, who made the payment) were realistic and similar to past and current Federal soil conservation programs. The main concern was to eliminate descriptive and explanatory information in the survey form itself that could influence the landowner's bid level.

II. Analysis of the Location and Distribution of Class IV, VI, and VII Cropland

As mentioned previously in Chapter I, the intermingling of Class IV, VI, and VII cropland with lower land capability classes in single fields may help explain why so much "marginal" land is in crop production. Data from the 1982 Natural Resource Inventory are valid only at the major land resource area level or higher; thus, county level estimates must be analyzed cautiously. Yet, farmers make decisions at the individual farm and field level. Therefore, even if county level estimates were reliable, they still would not provide

information on the distribution of Class IV, VI, and VII land at the farm and field level of analysis. Since complete information could not be obtained for Dyer County, the findings from analysis of the distribution of Class IV, VI, and VII land are presented only for Fayette County. Of the 107 sample farms drawn in Fayette County, the distribution of land by capability classes presented in Table 1 indicates that 47.9-percent of the land on these farms (7,482.91 acres) was in Class IV, VI, and VII. There were only 105 cleared criterion on 61 of these farms. Class IV, VI, and VII land accounted for 841.36 acres on these 105 fields. Furthermore, only 72 of these 105 fields totaling 917.36 acres had been in row-crop production in

Table 1. Distribution of Land by Capability Class on 107 Sample Farms in Fayette County.

Land Capability Class	All Land		Cleared Fields (105) with > 50% Class IV, VI, or VII		Cropland Fields (72) with > 50% Class IV, VI, or VII	
	Acres	Percent	Acres	Percent	Acres	Percent
I	1,933.80	12.7	79.20	5.8	50.58	5.5
II	2,896.99	18.5	227.58	16.7	144.23	15.7
III	3,262.78	20.9	215.45	15.8	147.78	16.1
IV	2,517.90	16.1	215.06	15.7	164.06	17.8
VI	811.95	5.2	223.25	16.3	174.75	19.0
VII	4,153.06	26.6	403.05	29.5	235.96	25.7
Total	15,636.48	100.0	1,363.59	100.0	917.36	100.0

fields totaling 1,363.59 acres meeting the 50-percent or greater in 1984 or 1985. Class IV, VI, and VII land accounted for 574.77 acres on these 72 fields or less than 10 acres per farm for the 61 farms. Thus, only 7.7-percent (574.77 ÷ 7,482.91) of the Class IV, VI, and VII land on these 107 farms was in row-cropped fields where it constituted more than 50-percent of the field.

Of interest too would be an estimate of the percentage of Class IV, VI, and VII cropland which is in fields where it constitutes 50-percent or more. Data from our survey did not allow a direct answer to this question. However, at least a rough estimate could be made based on 1982 NRI data, recognizing its limitations at the county level. Analyzing the estimated proportions of Class IV, VI, and VII land in crop production in Fayette County as a whole from the 1982 NRI, it was projected that 30-percent or 2,244.45 acres of the total 7,482.91 acres of Class IV, VI, and VII acres on the sample farms would be in crop production. If this projection is accurate, then only 25.6-percent (574.77 ÷ 2,244.45) of the Class IV, VI, and VII cropland on the 107 sample farms is in fields where it constitutes 50-percent or more of the field.

In consideration of the design of strategies to gain conversion of Class IV, VI, and VII cropland, these findings reveal important implications that must be recognized. First, since cropland fields with more than 50-percent Class IV, VI, and VII land were spread over many farms (more than half in this survey area of Fayette County), instead of being concentrated on just a few, strategies will have to reach many farmers. Further, because of the small percentage of Class

IV, VI, and VII cropland acreage for a farm operating unit, farmers may consider such land as "marginal" in relation to their overall operation. That is, they may row-crop this land as long as returns cover variable costs of production. If this is the case, such land may stay in production since conversion would not be perceived as saving any fixed costs associated with their overall operation in the short-run. Another possibility is that yields and returns may be viewed on an average basis for the row-crop enterprise as a whole. Thus, while enterprise budgets suggest farmers could not earn positive net returns on Class IV, VI, and VII cropland, the fact that most of this land constitutes less than 50-percent of a field means net returns may be positive when averaged over the whole field. As mentioned previously, the farmers' operating units are fields, not land capability classes. These findings support the provision of the new Conservation Reserve Program that allows fields to be subdivided to qualify for participation, but also suggests that farmers may not be very willing to do so. Furthermore, a regulatory approach to require conversion of Class IV, VI, and VII cropland would be difficult to administer because of this high degree of intermingling in fields.

III. Descriptive Statistics of Selected Variables

Analyses of variables focusing on characteristics and preferences of landowners in the sample and on their farming operations are presented in this section. Variables were selected based on their relevance to the CRP-type program considered in the study. For

example, landowners can convert their cropland fields to grass for livestock purposes or to trees for timber production. Therefore, information regarding the importance of livestock and timber to the landowners is informative.

Statistics for variables at the farm level are presented in Table 2. Soybeans and grain sorghum were the largest acreages of row-crops grown in Dyer County. For Fayette County, soybeans and cotton were the dominant crops grown. The dominant types of land ownership and agricultural enterprises were "individual" and "row-crop operation only", respectively, for the landowners in both Dyer and Fayette Counties. A crop-share lease was the dominant rental arrangement for the landowners in Dyer County; the cash-lease rental arrangement was more dominant for Fayette County's landowners. It was "very likely" that landowners in the sample would have livestock three years from now for Dyer County, but "not likely at all" for the landowners in Fayette. The order of dominant use for existing woodland on landowners' farms was erosion control, firewood, and timber production for Dyer County's landowners and firewood, erosion control and wildlife (tied), and timber production for Fayette County's landowners.

Personal level statistics for landowners in both counties are presented in Table 2. The average age of landowners in both counties was 59. The average education grade levels for landowners in Dyer and Fayette Counties were 11 and 12, respectively. A "retired" vocational status was more common among landowners in Dyer County. For Fayette County, a "part-time" vocational status was more common among

Table 2. Farm and Personal Level Statistics for the Landowners with Qualifying Fields in Dyer and Fayette Counties.

		Dyer County (n=54)[a]	Fayette County (n=52)[a]
I.	Total Acreage of Owned Land[b]	12,609.0	20,473.0
II.	Total Acreage of Rented Land	5,926.5	2,939.0
III.	Average Acreage of Owned Land	233.5	393.7
IV.	Average Acreage of Rented Land	109.7	56.5
V.	Total Acreage of Major Land Uses		
	a) Cropland		
	1) Owned		
	Soybeans	4890.0	3059.0
	Corn	144.0	485.0
	Cotton	153.5	1926.0
	Grain Sorghum	2120.0	1409.2
	Wheat	747.0	214.0
	Other (idled)	131.0	208.0
	2) Rented		
	Soybeans	3440.0	1479.0
	Corn	455.0	60.0
	Cotton	340.5	940.0
	Grain Sorghum	1081.0	450.0
	Wheat	222.0	0.0
	b) Hayland		
	1) Owned	242.0	526.0
	2) Rented	77.0	0.0
	c) Pastureland		
	1) Owned	1322.0	2108.0
	2) Rented	311.0	0.0
	d) Woodland		
	1) Owned	386.0	9232.7
	2) Rented	0.0	10.0
	e) Other Owned Land[c]	2473.5	1305.1
VI.	Type of Land Ownership (%)		
	a) Individually	90.2	80.8
	b) Partnership	7.8	19.2
	c) Other	2.0	0.0

Table 2 (Continued).

		Dyer County (n=54)	Fayette County (n=52)
VII.	Farm Type (%)		
	a) Row-crop only	46.1	50.0
	b) Livestock only	15.4	13.4
	c) Combination live-stock and row-crop	34.6	34.6
	d) Dairy	0.0	0.0
	e) Other	3.9	2.0
VIII.	Rent Additional Acreage to Supplement Farming Operation? (%)		
	a) Yes	30.0	16.3
	b) No	70.0	83.7
IX.	Type of Rental Arrangement on this Rented Land (%)		
	a) Cash lease	20.0	57.2
	b) Crop share lease	75.0	42.8
	c) Other	5.0	0.0
X.	Percent of Survey Farms Rented (%)	24.1	40.0
XII.	Own Livestock? (%)		
	a) Yes	43.2	39.2
	b) No	56.8	60.8
XIII.	Likely to have Livestock 3 Years from now? (%)		
	a) Very likely	56.3	34.0
	b) Somewhat likely	12.5	12.0
	c) Not likely at all	31.2	54.0
XIV.	Expect Woodland to be an Important Land-Use 3 Years from now? (%)		
	a) Yes	28.8	25.5
	b) No	71.2	74.5
XV.	Average Age	59	59
XVI.	Average Grade Level Education	11	12

Table 2 (Continued).

		Dyer County (n=54)	Fayette County (n=52)
XVII.	Full-time or Part-time Farmer? (%)		
	a) Full-time	28.0	16.4
	b) Part-time	32.0	46.9
	c) Retired	38.0	26.5
	d) Land rented out	2.0	10.2
XVIII.	How would having Children Influence Program Participation? (%)		
	a) Eliminate desire to participate	0.0	5.0
	b) Make participation unlikely	10.0	17.5
	c) Make participation likely	40.0	67.5
	d) Make participation highly desirable	13.3	7.5
	e) No influence	36.7	2.5
XIX.	Annual Gross Sales from all Farming Operations Over the Last 5 Years (%)		
	a) Under $20,000	53.3	73.0
	b) $20,000-$40,000	17.8	14.5
	c) $40,000-$100,000	6.7	6.2
	d) $100,000-$250,000	15.6	4.3
	e) $250,000-$500,000	4.4	2.0
	f) Over $500,000	2.2	0.0
	g) None	0.0	0.0
XX.	Real Estate Debt on Farm (%)		
	a) None	66.0	58.3
	b) Under $100,000	22.0	33.3
	c) $100,000-$199,999	2.0	2.1
	d) $200,000-$299,999	2.0	4.2
	e) $300,000-$399,999	0.0	2.1
	f) $400,000-$499,999	2.0	0.0
	g) $500,000-$599,999	2.0	0.0
	h) $600,000-$749,999	0.0	0.0
	i) $750,000-$999,999	0.0	0.0
	j) Over $1,000,000	4.0	0.0

Table 2 (Continued).

		Dyer County (n=54)	Fayette County (n=52)
XXI.	Operating Debt on Farm (%)		
	a) Under $20,000	16.3	75.5
	b) $20,000-$40,000	2.3	2.0
	c) $40,000-$100,000	7.0	4.1
	d) $100,000-$250,000	7.0	0.0
	e) $250,000-$500,000	0.0	0.0
	f) Over $500,000	2.3	0.0
	g) None	65.1	18.4
XXII.	Average Interest Rate for Operating and Real Estate Loans (%)		
	a) Operating	11.6	12.7
	b) Real Estate	10.5	10.3

[a]Due to a lack of responses from survey participants for some of the questions, the percentage of responses associated with variables may be less than the total number (n).

[b]Represents the total acreage of farmland landowners own.

[c]Represents acreage of the total owned farmland in which a major land use is not accounted for.

landowners. More landowners in Fayette County expressed that having children would "make participation likely" in a CRP-type program. For Dyer County's landowners, having children would have "no influence" and "make participation likely" categories were more often expressed. More landowners in Dyer County expressed annual gross sales over the last five years at being under $20,000, and a zero current real estate and operating debt. For Fayette County, the more often expressed annual gross sales over the last five years was under $20,000, and a zero current real estate debt and a current operating debt was under $20,000. The average interest rate that is currently being paid for operating and real estate loans are 11.6-percent and 10.5-percent, respectively, for Dyer County's landowners, and 12.7-percent and 10.3-percent, respectively, for Fayette County's landowners.

Statistics for variables at the field level are presented in Table 3. The average bid for all four retirement options is presented. Because of communication misunderstandings of the permanent retirement option in the survey process for Fayette County, this information was considered unreliable and, therefore, was omitted. Of the Dyer County landowners who submitted bids, 12 were owner-operators and 20 were non-operating owners; in Fayette County, 21 were owner-operators and 11 were non-operating owners. In both counties landowners strongly preferred the five year retirement option, though more than half were willing to retire the entire tract of land. More than half of the landowners in both counties revealed that their bids would change if the haying and grazing option was eliminated. However, while almost two-thirds of Fayette County

Table 3. Field Level Statistics for the Landowners Who Submitted Bids in Dyer and Fayette Counties.

		Dyer County (n=32)	Fayette County (n=32)
I.	Average Field Size (ac.)	16.5	12.4
II.	Tenure Arrangement of Landowners Who Submitted Bids		
	a) Owner-operator	12	21
	b) Non-operating owner	20	11
III.	Average Bid ($)		
	a) 5-year option	54.00	43.00
	b) 10-year option	55.86	44.00
	c) 15-year option	62.64	45.43
	d) Permanent option	807.70	-----
IV.	Which Option Prefer? (%)		
	a) 5-year option	66.6	98.1
	b) 10-year option	21.6	0.0
	c) 15-year option	4.0	0.0
	d) Permanent option	7.8	1.9
V.	Change Bid if can't Cut Hay or Graze? (%)		
	a) Yes	75.0	56.2
	b) No	25.0	43.8
VI.	Change Bid if Base Acreage Reduced? (%)		
	a) Yes	34.5	62.5
	b) No	65.5	37.5
VII.	Willing to Retire Entire Tract? (%)		
	a) Very willing	68.8	51.7
	b) Not very willing	15.6	27.6
	c) Not willing at all	15.6	20.7
VIII.	Number of Landowners Who Preferred Trees	0	2

landowners revealed loss of base acreages would change their bid this was the case for only one-third of Dyer County landowners. This finding is consistent with the fact that commodity program crops, particularly cotton, are more prevalent in Fayette County. Almost all landowners would choose pasture or hay as a land use if they participated in the CRP-type program. None of the landowners preferred trees in Dyer County. For Fayette County, only two participants preferred trees.

The information from Table 2 is used in an attempt to identify factors associated with the use of Class IV, VI, and VII land for row-crop production in Chapter IV. Information from Table 2 and Table 3 is used in the consideration of the cost of a CRP-type program and for analysis of factors associated with bid levels in Chapter V.

CHAPTER IV

ANALYSES OF FACTORS ASSOCIATED WITH LANDOWNERS' USE OF CLASS IV, VI, AND VII LAND

I. Introduction

In terms of acres, soybeans are the leading crop in almost every Southern state. In 1929, the South had 1.3 million acres in soybeans; in 1964, 8.8 million acres; and by 1982, 25 million acres [Healy and Sojka, 1985]. Of the 1.7 million acres of land in row-crop production in West Tennessee in 1970, soybeans accounted for 1.0 million of these acres. As a result of soybean prices tripling between 1969 and 1974 (from $2.31 per bushel to $6.90 per bushel, respectively), and then averaging $6.00 for the rest of the decade, soybean acreage reached 2.0 million acres by 1979. However, weed and disease problems associated with monoculture production of this crop and the rapid rise of production costs at the end of the 1970s and the beginning of the 1980s caused a drop in soybean acreage to about 1.4 million acres in 1984 [Tennessee Crop Reporting Service, 1969-84].

Of the land that was converted to soybean production during the 1970s, most came from the conversion of permanent pasture and hay land. Much of this land was highly erosive Class IV, VI, and VII land. Although the soils on these land capability classes are fairly productive in many West Tennessee areas, soybeans did not become profitable to grow until the surge in soybean prices. The previous discussion emphasized the fact that farmers' expectations of prices or

net returns is an important factor influencing the use of Class IV, VI, and VII land.

Factors that were believed to influence the decision to row-crop Class IV, VI, and VII land are focused on in this chapter. The first section utilizes information from the questionnaire to develop variables that are hypothesized to influence farmers' decision to row-crop Class IV, VI, and VII land. The second section also focuses on information from the questionnaire regarding farmers' production costs, price, and yield expectations.

II. The Model

A logit regression model was used to identify factors that influence row-cropping class IV, VI, and VII land. Several recent studies have used the logit form for similar analyses where the dependent variable is binary (see Capps and Kramer, Young and Shortle, and Jamnick and Klindt, for example). The dependent variable in this study equals one if the field was row-cropped in 1984 or 1985 and zero if not.

The logit model is based on the cumulative logistic probability function. The model allows for transformation of the linear probability model in a manner that predictions will lie in the (0,1) interval.

> One important appeal of the logit model is that it transforms the problem of predicting probabilities within an (0,1) interval to the problem of predicting the odds of an event occurring within the range of the entire real line [Pindyck and Rubinfeld, 1981, p.289].

The transformation of the logit model allows the dependent variable to become the natural logarithm of the odds that a choice will be made [Pindyck and Rubinfeld, 1981]. The form of the logit model is as follows:

$$\ln \frac{P_i}{1 - P_i} = a + BX_i$$

where:

P_i = the probability that an event will occur

a = intercept

B = slope

X_i = explanatory variable.

Maximum likelihood estimation was used to estimate the logit model parameters in this study. The objective of this technique "is to find the estimator $\hat{\beta}$ that maximizes the likelihood of observing the pattern of choices in the sample" [Capps and Kramer, 1985, p.50]. The conventional tests of significance are applicable with a maximum likelihood estimation procedure. Although this procedure requires the use of iterative algorithms, this procedure assures the large sample properties of consistency and asymptotic normality of the parameter vector $\hat{\beta}$ [Capps and Kramer, 1985].

The independent variables CROPFARM, DEBT, and OWNED ACRES were used to focus on farm level characteristics that were believed to influence a farmer's decision about row-cropping a field. The binary variable CROPFARM represented the farm type and was defined as being zero, if the owner had some type of cattle enterprise, and one, if they were exclusively a crop farmer. The variable DEBT represented

the farm debt and was measured as real estate plus operating debt per cleared acre. The variable OWNED ACRES represented the farm size, which included farm units in addition to the one in the sample. Both CROPFARM and DEBT were hypothesized to have a positive relationship with the dependent variable. However, for OWNED ACRES, a sign was not hypothesized because different farming situations and circumstances were recognized that would suggest either sign.

Independent variables used to focus on field level characteristics were EROSION and OWN-OP. The landowner's perspective of the severity of erosion if the field in question was actually being row-cropped was represented by the variable EROSION, which was zero if the owner believed the erosion potential would be none, one if slight, two if moderate, and three if severe. The tenure arrangement of the cropland field was represented by the binary variable OWN-OP and was defined as being zero if the field was leased or rented and one if farmed by the owner. Both variables were hypothesized to have a negative relationship with the dependent variable.

Personal variables included EDUCATION, SCSASSIST, and FULLTIME. The number of years of formal schooling completed was represented by the variable EDUCATION. The binary variable SCSASSIST was defined as one if the owner had received technical assistance from SCS regarding their cropland fields and zero if not. Both EDUCATION and SCSASSIST were hypothesized to have a negative relationship with the dependent variable. The binary variable FULLTIME was used to represent the vocational status of the farmer and was defined as one if the owner

was a full-time farmer and zero if not. FULLTIME was hypothesized to have a positive relationship with the dependent variable.

Of the 106 owners who were interviewed in the survey, seven observations had to be omitted for the logit analysis because of insufficient information for some of the independent variables. A high level of correlation among binary variables in the Dyer County data caused estimation problems. As a result, only a combined model with data from both counties was used. A binary variable for county was initially included in the combined model to allow for a difference in intercept values between counties but proved insignificant.

The model results are presented in Table 4. The amount of variation explained by the model is indicated by the likelihood ratio test statistic. Its value of 55.67 indicates that the model is significantly different from zero at the 0.01 level. The Efron's R^2 value of 0.520, which measures the overall fit of the model, indicates that 52-percent of the total variation in the dependent variable is explained by the independent variables. It is derived by squaring the correlation coefficient between the binary dependent variable and the predicted probabilities. According to Capps and Kramer [1985], dichotomous dependent variable models are not likely to yield a very high R^2; in fact, its upper limit is likely to be substantially less than one. Another indication of the overall fit of the logit model is to measure the correct categorization of the farmers in the sample who did row-crop Class IV, VI, and VII land versus farmers who did not. A correct classification is when the model's predicted choice matches the actual situation. The model used in this study correctly

Table 4. Results from the Logit Model for the Row Crop Decision.

Independent Variables (n=99)	Coefficient Estimate	T Statistic
Intercept	2.559	1.444
Farm Level		
CROPFARM	3.785	4.623***
DEBT	-0.000252	-1.055
OWNED ACRES	-0.000587	-1.210
Field Level		
EROSION	-1.012	-1.973**
OWN-OP	-0.365	-0.516
Personal Level		
EDUCATION	-0.145	-1.621*
SCSASSIST	2.149	2.709***
FULLTIME	2.922	2.965***

* Significant at the 0.10 level.
** Significant at the 0.05 level.
*** Significant at the 0.01 level.

classified 94-percent of the farmers.

Five of the eight independent variables were significant at the 0.10 level or lower. However, SCSASSIST had the opposite sign to what was hypothesized. As a result, this would indicate that farmers who have received technical assistance from SCS for their cropland fields are more likely to have their Class IV, VI, and VII fields in row-crop production. This lack of a significant negative relationship may be explained by reasoning that SCS technical assistance is usually in connection with structural measures like terraces on moderately

eroding fields. However, the presence of a significant positive sign is difficult to understand.

In addition, full-time and crop-only farmers were more likely to have highly erosive fields in row-crop production. With no off-farm income sources, a farmer may feel pressured to spread labor and management input over as many crop acres as possible. And crop-only farmers may see row-crop production as their only alternative, since without a cattle enterprise they would have no use for pasture or hay. Further, farmers were less likely to be producing row crops if they had more education and if they had a higher estimate of the erosion potential for the field if row-cropped. The inconsistency of the model results associated with the SCS contact (a technical/educational role agency) and the educational findings provide unclear signals on the influence an information and education program approach would have on the use of highly erosive land.

Of interest too is the lack of significance of the tenure arrangement of the cropland fields. Contrary to conventional wisdom there was no evidence of a more intensive land-use under a rental arrangement. This finding is consistent with past studies (see Ervin, 1982; Bills, 1985).

III. Landowners' Yields, Prices, and Production Cost Estimates

To gain additional insight on why so much Class IV, VI, and VII land is in row-crop production, this section focuses on how farmers may frame their decisions regarding the use of such land. Perhaps West Tennessee farmers who do row-crop this type of land think they

are earning or can earn positive net returns from such an intensive land use. The extent to which they may have overly optimistic price and yield expectations and the extent to which they may underestimate their costs in regard to production decisions is unknown. For the qualifying fields on the survey farm which were row-cropped, farmers were asked to provide estimates of their yields, prices, and variable production costs. These items provide the information needed to calculate expected net returns in the short-run. Since soybeans is the dominant crop produced in both counties and the number of observations on other crops is quite limited, only findings for soybeans are reported.

Before focusing on landowners' yields for soybeans, attention must first be given to the dominant soil mapping units on the qualifying fields and their estimated yield potential. In Dyer County, Grenada (GrC3); Loring (LoD3, LoE3); and Memphis (MfF, MfF3) were the dominant soils and mapping units on the study fields. The Grenada and Loring mapping units are considered severely eroded. For Fayette County, Grenada (GaC3, GaD, GaD3); Loring (LoE, LoE3); Lexington-Ruston complex (LeD3, LeF); and Gullied land complexes (GgC, GgD, LfD, LfF) were the dominant soils and mapping units. The Grenada (GaC3, GaD3); Loring (LoE3); and Lexington (LeD3) are considered severely eroded. According to crop yield estimates for West Tennessee soils in 1976, both GrC3 and GaD (both Class IVe) mapping units averaged 20 bushels per acre for soybeans. The data source, however, does not reveal yield estimates for mapping units with steeper slope classes. As a result, the steepest slope class for each soil group

(Grenada, Loring, Memphis, etc.) was analyzed. For example, yield estimates were not given for slope classes greater than 8 to 12-percent and for severely eroded mapping units; thus, 8 to 12-percent slopes and eroded mapping units were used as a proxy. The estimated yields for Grenada, Loring, Memphis, with 8 to 12-percent slopes with eroded mapping units, were 16, 18, and 24 bushels per acre, respectively. For Lexington-Ruston soils with 8 to 12-percent slopes, the estimated yields were 20 bushels per acre [Buntley and Bell, 1976].

An alternative data source was also investigated--the Soil Conservation Service's Soil Interpretation Record (Soils 5). However, yield estimates for the mapping units with the steeper slope classes were not given in this source either. From this data source, a Class IVe, Grenada soil mapping unit was estimated to yield 20 bushels per acre. In addition, a Class VIe, Memphis soil mapping unit was estimated to yield 15 bushels per acre. However, no yield estimates were found for Gullied land and Gullied land complexes--mapping units more predominant for Fayette County [SCS, Soil Interpretations Record].

Apparently the main attribute contributing to differences in yields among these major soil groups is their soil profiles. Since the Grenada and Loring soils have fragipans, root zone restriction and susceptibility to moisture stress in dry weather occurs. Further, erosion on these soils lowers their available water holding capacity causing yields to decline. As a result, the variation in yields on Grenada and Loring soils will be greater because of weather

differences than on Memphis and Lexington soils [Denton, 1978]. Although the previous estimates do not reflect what may be experienced on the more erodible and steeper slope classes, these estimates will be used for comparison purposes for this analysis.

For the two-year period 1984 and 1985 in Dyer County, the average yield estimated by farmers on 71 fields was 29 bushels per acre. For the same two-year period, the average yield for Dyer County as a whole was 32 bushels per acre. These yield estimates seem high compared to the county-wide average and the estimates for the somewhat less steep or highly eroded soil mapping units previously discussed. One possible explanation for the high yield figure is that farmers may not figure yields on a field level but on an enterprise level for the farm as a whole. Another possibility is that many of these qualifying fields may have almost 50-percent Class III or lower, as was pointed out in Chapter 3; thus, higher yields would be observed.

The average prices for soybeans reported by farmers in Dyer County in 1984 and 1985 were $6.02 and $5.03, respectively. In comparison, the season average price for soybeans in Tennessee for 1984 and 1985 was $6.00 and $5.15, respectively [Tennessee Crop Reporting Service, 1985]. Many farmers in the survey indicated they did not anticipate such a large drop in soybean prices at planting time, and they were expecting prices to be much nearer to the 1984 price. Therefore, a $6.00-per-bushel price will be used to calculate expected net returns for 1984 and 1985.

For the soybean fields in Dyer County for the 1984-85 period, farmers' estimates of variable or cash production costs averaged

approximately $59 per acre, with a range of $45 to $100. These variable costs appeared quite low compared to other budget data. According to one enterprise budget constructed in 1982 for West Tennessee by University of Tennessee researchers for the SCS, the per-acre variable costs for conventional tillage soybeans were $110 [SCS, 1982]. According to a 1985 extension farm planning manual, total variable expenses for conventional tillage soybeans for Tennessee in general were projected at $100 per acre [Ray and Walch, 1985]. One possible explanation for the lower production expenses given by the farmers when compared to budget data is that farmers may not use as many variable inputs as standard budgets suggest. In addition, many farmers were asked this question without access to their accounting records, which may have caused underestimation of this information.

For all three variables analyzed -- yields, prices, and production costs -- there was some evidence that farmers may not have accurate expectations or perceptions. Overly optimistic price (at least in 1985), yield, and cost expectations could result in a false perception of positive net returns from crop production on these highly erosive fields. According to economic theory, farmers will continue to row-crop this type of land in the short-run, as long as net returns cover variable production costs. Recognizing the limitations in the use of the above data to make any definitive conclusions, the following discussion seeks to evaluate whether short-run behavior may help explain the intensive use of this land.

For the ten-year period 1976-85, the average yield in Dyer County as a whole was 25.4 bushels per acre. If yields on Class IV, VI, and VII land over this ten-year period were the same percentage of county-wide yields as farmers estimated them to be in the 1984-85 period, they would have averaged 23.0 bushels per acre. With a $6.00 per bushel price, total revenue per acre would be $138.00. Taking the average of the variable cost figures estimated by landowners and from West Tennessee enterprise budgets, variable costs would be $84.50 per acre, thus net returns above variable costs would be $53.50 per acre. With this same soybean price per bushel and variable cost per acre, a yield of only 15 bushels per acre would still cover variable costs. Thus, with such expectations, perceptions of positive net returns are understandable. If variable costs were $110.00 per acre as West Tennessee budgets suggest, a yield of 19 bushels per acre would be needed to cover variable costs at a price $6.00 per bushel. And at a price of $5.15 per bushel, a yield of 22 bushels per acre would be needed to cover variable costs of $110.00 per acre.

For Fayette County, farmers' 1984-85 yield estimates averaged 22.8 bushels per acre for soybeans. The county-wide average for the 1984-85 period was 26.5 bushels per acre. Adjusting this for the difference between average county-wide yields in 1984-85 versus 1976-85 county wide yields, which averaged of 22 bushels per acre, gives an expected yield of 18.9 bushels per acre. Taking the average variable cost figures estimated by landowners ($81.89 per acre) and West Tennessee enterprise budgets ($110.00 per acre), variable costs would be $95.95. Following the same procedure used for Dyer County, a

$6.00-per-bushel price and a yield of 18.9 bushels per acre would give a total revenue of $113.40. With variable costs of $95.95 per acre, net returns above variable costs would be $17.45 per acre. A yield of 16 bushels per acre would be needed to cover variable expenses. However, soybean prices well below $6.00 per bushel (which was the case in 1985 and more than likely will be in 1986) and using this same variable production expense of $95.95 would likely discourage soybean production on Class IV, VI, and VII land in Fayette County.

Conclusions from this analysis are difficult to derive. Net returns above variable costs for the period considered may be sufficient to encourage soybean production in the short-run, but probably not in the long-run. However, uncertainty of past agricultural policies (both domestic and international), incentives in the commodity programs to maintain base acreages, and farmers' price, yield, and costs expectations may lead to "short-run" thinking being extended indefinitely on this type of land.

IV. Summary Comments

A logit model was used to identify factors that were believed likely to influence the use of Class IV, VI, and VII land in West Tennessee. The type of farming enterprise, landowners' vocational status, and whether they had SCS contact were found to be highly significant in relation to whether such land was row-cropped or not. Landowners' erosion perception and educational level exhibited weak significance. Landowners' yields, prices, and variable production expenses for the highly eroding fields in the study were also

analyzed. Yield estimates appeared high and variable production costs appeared low compared to research on yields and enterprise budgets for West Tennessee. Overly optimistic expectations then may explain why some Class IV, VI, and VII land is in intensive row-crop production.

CHAPTER V

ANALYSIS OF A CONSERVATION RESERVE BID APPROACH

I. Introduction

According to the Soil Conservation Service, of the 104 million acres of cropland that are eligible for the CRP nationally, 29 million acres are in the nine southeastern states [Fedkiw, 1986]. For the farmers who do row-crop this type of land, what magnitude of economic incentives is needed to induce them to convert this cropland to a permanent vegetative cover? The focus of the first section in this chapter is on farmers' bid levels to induce conversion of Class IV, VI, and VII cropland and the cost from a Federal government perspective in using this type of approach to achieve a given level of soil erosion control. The focus of the second section is on analysis of variables believed to influence a landowner's bid. In addition, attention toward woodland as a potential land-use on the highly erosive fields in the study and the potential demand of timber in the future for the South will be analyzed briefly in the third section.

II. Bid Levels and the Cost of a Conservation Reserve Bid Approach

The means, ranges, and standard deviations for the 10-year bid level for each county are given in Table 5. The high degree of variability of the bids from landowners in both counties should be noted. The average increase in the bid level for Dyer and Fayette

Table 5. Descriptive Statistics of Landowners' Bids for a CRP-Type Approach in Dyer and Fayette Counties, 1986.

	Dyer County ($/AC)	Fayette County ($/AC)
Statistics for 10-year Bid Option		
Average Bid	55.86	44.00
Bid Range	30.00-85.00	20.00-125.00
Standard Deviation	15.23	19.00
Statistics for All Bid Options		
Average Increase if No-Grazing Option	14.68	5.77
Average Increase if Base-Acreage Reduced	4.18	6.02
Average Increase if Only 50% Cost Sharing[a]	6.46	6.46

[a]Average establishment cost for SL-1 from 1984 CRES was $86.61, which when amortized over 10 years at 8-percent gives an annual cost of $12.91 per acre.

Counties under certain conditions is also indicated in Table 5. These conditions include prohibition of livestock grazing or hay operations on their enrolled fields, reduction in base acreages for commodity program purposes, and provision of only 50-percent cost sharing for establishment costs, as was the case in the actual CRP. If these three increases were added to the average bid, the resulting adjusted average bid would be $81.18 per acre for Dyer County and $62.25 per acre for Fayette County. For comparison, the average bids in Dyer County during the first and second round of bidding for the actual CRP in March and May, 1986, were $82.75 and $61.19 per acre, respectively,

while the average bids in Fayette County were $76.79 and $69.27 per acre respectively. Only bids up to $55.00 per acre in Dyer County and $60.00 per acre in Fayette County were accepted in the first and second round of the actual CRP. Bids accepted from the first and second rounds of bidding in Dyer County covered 187 acres and 958 acres, respectively; for Fayette County, 2,256 acres and 2,843 acres, respectively [ASCS, 1986].

Due to the variability in the bid levels, the public cost of a uniform-offer approach would be substantially higher than for a differential-bid approach, as indicated in Table 6. Under a uniform offer approach, it is assumed that annual rental payments equal to the mean bid level in each county would be offered, with land considered enrolled if the landowner's bid was equal to or less than the mean. For the differential-bid approach, actual bid levels were used as the basis for rental payments, and as in the uniform-offer approach fields were considered enrolled if the landowner's bid was equal to or less than the mean bid. For the two counties combined, costs in the form of rental payments to the Federal government would be 26.0-percent less with a differential-bid approach compared to a uniform-offer approach. However, the relative advantage in cost effectiveness of differential-bid approach may be dulled after more than one round of bidding. The actual CRP, so far, has used multiple bidding rounds with bid cut-off levels being relatively stable. Thus, farmers have to some extent begun to bid just under this expected cut-off level.

The total annualized cost for a differential-bid approach is also shown in Table 6. This was computed assuming cover establishment

Table 6. Cost Effectiveness of a CRP-Type Approach for Retiring Highly Eroding Cropland in West Tennessee, 1986.

	Dyer Co.	Fayette Co.	Combined
Annual Rental Payment Cost Under			
Uniform Offer Approach[a] ($)	23,070.18	12,218.80	35,288.98
Differential Bid Approach[b] ($)	17,414.00	8,710.50	26,124.50
Total Cost (Annualized) for Differential Bid Approach			
Rental Cost ($)	17,414.00	8,710.50	26,124.50
Establishment Cost ($)[c]	+5,332.00	+3,585.11	+8,917.11
	22,746.00	12,295.61	35,041.61
Total Acres Enrolled	413.0	277.7	690.7
Total Annual Erosion Reduction (tons)	19,335.2	12,514.1	31,849.3
Erosion Reduction Per Acre (tons)	46.8	45.1	46.1
Cost Per Ton ($)	1.18	.98	1.10

[a]Assumes mean annual rental payment bid of $55.00 per acre in Dyer County and $44.00 per acre in Fayette County is offered and all landowners bidding less than or equal to these levels accept the offer.

[b]Assumes annual rental payment bids up to the mean of $55.00 per acre in Dyer County and $44.00 per acre in Fayette County are accepted by program managers.

[c]Average establishment cost for SL-1 from 1984 CRES was $86.61, which when amortized over 10 years at 8-percent gives an annual cost of $12.91 per acre.

costs of $86.61 per acre are amortized over 10 years at 8-percent. Total acres enrolled, total annual erosion reduction, erosion reduction per acre, and amortized cost per ton of erosion reduction are also indicated in Table 6.

The average erosion rate reduction per acre for both counties combined was 46.1 tons per acre per year (TAY). In comparison, the average erosion rate reduction for permanent vegetative cover (SL-1) in West Tennessee from the 1984 Conservation Reporting and Evaluation System (CRES) data on the Agricultural Conservation Program was 21.5 TAY for variable rate cost-sharing counties and 13.7 TAY for other West Tennessee counties. For the first and second round of bids for the CRP in 1986, preliminary estimates for the U.S. as a whole revealed an average erosion rate reduction per acre of 27 TAY [Boggess, 1986]. The higher erosion rate reduction per acre in the study area compared to the actual CRP results from the generally more highly erosive land in West Tennessee and the more restrictive qualification standard employed in this study.

The amortized total cost per ton of erosion reduction is $1.10 for both counties combined. This compares with the 1984 amortized cost share per ton for the ACP practice of permanent vegetative cover (SL-1) in West Tennessee of $.42 per ton for variable rate cost sharing counties and $.60 per ton for other counties. Preliminary estimates for the U.S. for the first and second round of bids for the CRP in 1986 reveal that the cost per ton of erosion reduction is $1.61 [Boggess, 1986]. The lower cost per ton of erosion in this study compared to the actual CRP results from the lower bid cut-off level

used in this study and the more highly erosive land in the West Tennessee area. In addition, with the assumptions of this study (100 percent establishment costs provided, no commodity base acreage denial, and allowance of alternative agricultural enterprises), lower bids would be expected.

So, although erosion reduction per acre would be two to three times as great under the CRP-type bid approach as compared to the ACP cost sharing approach, cost per ton of reduction would be approximately twice as high. However, the previous analysis has ignored supply control considerations, which is another important goal of the new CRP. According to USDA analysts, $40 of indirect benefits toward supply control goals may be expected for each acre enrolled in the CRP [Benbrook, 1986]. Another study reveals that even if maximizing erosion reduction had been the criteria for accepting bids in the first and second rounds of the CRP, supply control savings of $17 per acre or $61 million would have been realized [Boggess, 1986].

III. Analysis of Factors Influencing Landowners' Bids

The Ordinary Least Squares (OLS) regression method was used to test the hypothesized relationship between landowners' 10-year bids as a dependent variable and several independent variables. Thirty-two landowners in each counties submitted bids for at least one of the four retirement options, but for the 10-year retirement option, only 24 and 27 landowners submitted bids in Dyer and Fayette Counties, respectively. However, some landowners submitted bids for two fields. Consequently, a total of 38 field bids was submitted in Dyer County

for the 10-year option and 46 for Fayette County. The specification of the regression model developed for this analysis was:

$$BIDS10YR = a + B_1ROWCROP + B_2FULLTIME + B_3DEBT + B_4CASHRENT - B_5ERODE + B_6FIELDSIZE - B_7AGE + B_8OWN\text{-}OP$$

where:

BIDS10YR = landowner's 10-year bid

a = intercept

B_i = slope (parameter estimate)

ROWCROP = 1 if farm was row-crop only; 0 if farm had livestock

FULLTIME = 1 if full-time farmer; 0 if part-time or retired

DEBT = real estate plus operating debt per cleared acre

CASHRENT = annual dollar rental rate for actual field (if rented) or similar field (if owner-operated)

ERODE = field level degree of erodibility; RK(LS)/T from Universal Soil Loss Equation

FIELDSIZE = field size divided by the sum of the total acres of cropland in the landowner's total farming operation

AGE = age of landowner

OWN-OP = 1 if owner-operated; 0 if rented.

The means, ranges, and standard deviations for the independent variables in the regression model are presented in Table 7.

The independent variables ROWCROP, FULLTIME, and DEBT were used to focus on farm level characteristics. All three variables were expected to have a positive relationship with the landowner's bid. A landowner with a ROWCROP enterprise may not have the willingness or

Table 7. Descriptive Statistics for the Independent Variables in the Regression Model.

Independent Variables	Mean	Range	Standard Deviation
		Dyer County	
DEBT ($/Acre)	829.26	0.00-6666.66	1500.85
CASHRENT ($)	54.60	27.50-76.00	12.94
ERODE (RKLS/T)	60.51	25.64-127.47	27.46
FIELDSIZE	0.22	0.01-1.00	0.21
AGE	----	-----	----
ROWCROP	0.65	0-1	0.48
FULLTIME	0.34	0-1	0.48
OWN-OP	----	-----	----
		Fayette County	
DEBT ($/Acre)	487.20	0.00-2055.33	603.32
CASHRENT ($)	36.42	15.00-97.50	15.38
ERODE (RKLS/T)	54.60	4.50-100.83	24.94
FIELDSIZE	0.15	0.00-0.83	0.16
AGE	61.20	25.0-84.0	13.44
ROWCROP	0.54	0-1	0.50
FULLTIME	0.28	0-1	0.45
OWN-OP	0.71	0-1	0.45

necessary inputs to enter into a cattle or hay operation (fencing, cattle, and haying equipment). A FULLTIME operator may be more dependent on income from farming and less likely to have off-farm earning opportunities. Finally, a higher DEBT servicing pressure per cleared acre may lead to a higher bid price.

Independent variables used to focus on field level characteristics were CASHRENT, ERODE, and FIELDSIZE. CASHRENT and FIELDSIZE were expected to have a positive relationship with a landowner's bid. CASHRENT was used to represent the productivity and the potential earnings of the cropland field. For FIELDSIZE, a landowner with 100 acres of row-cropped land was expected to submit a larger bid if the field in question was 30 acres compared to 15 acres, since the adjustment would be less of a marginal one. The expected relationship between ERODE and a landowner's bid was negative because a more erodible field is likely to be less productive and likely to generate greater on-site costs if row-cropped.

AGE and OWN-OP were used to focus on personal characteristics of the landowner. AGE was expected to have a negative relationship with a landowner's bid because older farmers may be more willing to reduce their management responsibilities and may have more control of farm assets to generate adequate retirement income. Alternative credit sources and repayment ability may be the main concern of younger farmers [Boehlje and Eidman, 1984]. A positive relationship was expected for OWN-OP because a participating owner-operator would forego returns to labor and management as well as land, whereas a nonoperating owner would forego returns only to land.

The results from estimation of the regression model for each county individually are presented in Table 8. Also presented are the corresponding R^2s for each estimated model. In the Fayette model, the variables CASHRENT, DEBT, and AGE were highly significant, with CASHRENT and DEBT having expected signs. However, AGE exhibited a positive sign--the opposite of what was hypothesized. For the CASHRENT variable, each dollar increase in the rental rate was associated with a 55¢ higher bid. Each $100 per cleared acre increase in landowners' debt pressure was associated with a $1.20 higher bid. Bid levels were 54¢ higher for each year increase in the age of landowners. FIELDSIZE exhibited weak significance, but in the opposite direction to what was expected. Perhaps FIELDSIZE had an opposite sign because with part-farm retirement landowners are able to avoid only a small proportion of the variable costs associated with the enterprise; whereas, with whole-farm retirement, a greater proportion of both variable and fixed costs can be avoided. A ten percentage point increase in the size of the field as a percentage of total cleared acres was associated with a $2.54 lower bid level.

For Dyer, AGE and OWN-OP were dropped from the model because of high correlations with other variables. In the Dyer model, ERODE was the only highly significant variable, and it exhibited a positive sign--opposite to what was hypothesized. Each incremental increase in a fields' degree of erodibility was associated with a 17¢ higher bid level. One possible explanation for the difference in sign is that the erosion-productivity relationship for some soils in Dyer County

TABLE 8. Results of Regression Analysis of Variables Associated with Landowners' Bids for a CRP-Type Approach in 1986.

Dependent Variable--BIDS10YR

Explanatory Variables	Dyer County (n=38)		Fayette County (n=46)	
	Coefficient	T-ratio	Coefficient	T-ratio
Intercept	32.820	2.27***	-4.001	-0.21
ROWCROP	0.291	0.05	-1.814	-0.36
FULLTIME	7.548	1.34*	5.602	0.86
DEBT	0.0004	0.22	0.012	2.87***
CASHRENT	0.304	1.43*	0.553	3.08***
ERODE	0.171	1.85**	-0.050	-0.51
FIELDSIZE	5.266	0.40	-25.442	-1.41*
AGE	-----	----	0.543	2.29**
OWN-OP	-----	----	3.722	0.59
	R^2=.19		R^2=.46	

* Significant at .20 level
** Significant at .10 level
*** Significant at .05 level

may not necessarily be negatively correlated. CASHRENT and FULLTIME exhibited weak significance in the expected direction.

Because of the substantial differences in estimated signs between the two models and the need to drop certain variables from the Dyer model, estimation of a combined model was inappropriate. The lack of significance for other explanatory variables in either county model was surprising. For example, one would have expected ROWCROP and OWN-OP to be important variables influencing a landowner's bid. Possible explanations for the lack of more significant variables are the small sample size, interaction among some of the independent variables, and the (0,1) nature of several independent variables.

IV. Woodland as a Land Use for the Highly Erosive Fields

As mentioned previously in Chapter III, woodland was not a preferred conservation use for the farmers in this study. Provisions of the CRP state that one-eighth of the total acreage placed under contract will be planted to trees. In the first round of bids for the Conservation Reserve Program in the spring of 1986, USDA accepted bids to plant trees on 121,500 acres of highly erodible cropland in the Southeast [Fedkiw, 1986]. The South's access to inland and coastal waterways and ports and the relative benefit the region can expect from technological advancement, give it a favorable position in the market relative to the rest of the United States. Yet the region has yet to realize its agricultural development potential capacity [Healy and Sojka, 1985]. Also favorable, according to USDA, is the demand for southern pine timber, which is expected to grow steadily over the

next 50 years. Demand for southern pine roundwood by the year 2000 is expected to be 25 to 30-percent above that in the late 1970s. Current surveys for the South indicate that timber harvests are catching up with pine growth more rapidly than earlier projections had shown. Prices for southern pine stumpage are expected to continue to rise in real terms at the rate of one to two percent a year, based on projected demand and supply. Even though increased plantings may dampen the trend, it will not be significant before the 20 to 30 years required for pulpwood and small sawlog rotations [Fedkiw, 1986].

For hardwoods over the next 50 years, growth is expected to exceed harvest. In general, hardwood price levels in real terms are expected to remain fairly flat; demand, however, is expected to increase. Increased price pressure for hardwoods and reduced price pressure on pines may be expected because of improvements in technology and substitution of hardwoods for softwood pulpwood or other products. Yet, compared to hardwoods, pine price levels will remain higher and upward trends stronger. Consequently, when there is a choice between the two, pines will be a more attractive investment than hardwoods [Fedkiw, 1986].

From 1956-66, the Soil Bank Program in the South helped to convert two million acres of marginal cropland to pine trees. Before the Soil Bank Program era, tree planting in Tennessee was at the rate of 20,000 acres annually. Over the five-year period allotted for contract signings (1956-60), tree planting increased from a low of 31,432 acres to a high of 64,308 acres. The average Soil Bank plantation for timber was 33.9 acres for the state. But the

availability and accessability to pulp mills were important in making the program attractive [Boardman, 1972]. The average distance of the nearest mill if landowners were interested in selling timber in Dyer County was 20.6 miles and 18.8 miles in Fayette County. However, landowners in both counties expressed that they currently use their woodland for either firewood or erosion control, with timber production a less popular alternative use. In addition, 71.1-percent and 74.5-percent of the landowners surveyed in Dyer and Fayette Counties, respectively, expressed that woodland would not be an important land use on their farm three years from now. According to the foresters in Dyer and Fayette Counties, Loblolly pine is the softwood tree most recommended on highly erosive sites. Yet market conditions according to the foresters were expressed as "practically no market" for pulp in Dyer County to "fair" for Fayette County. Site indexes[3] for this species range from 80 for Grenada and Gullied land soil mapping units to 100 for Memphis soil mapping units. Site indexes in the 80-90 range are considered to be an average yield height for Loblolly pine.

Based on 1979 average prices and cropping patterns, USDA has suggested higher average net returns per acre could be realized on 17 million acres of marginal cropland if this land was converted to pine production instead of being used for row-crop or pasture use [USDA,

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[3]"Site index is the average height, in feet, that the dominant and codominant trees of a given species, growing on a specified soil, will reach in 50 years." [USDA-SCS, 1962, p.48].

1983]. Another study reveals that costs of planting pine trees on marginal farmland would be half as much compared to planting of harvested pine land. From a public policy perspective, marginal cropland planted to pine trees could be a more cost-effective way of increasing pine supplies in the southeastern states. There are also 10 million acres of marginal pastureland in the Southeast that may be eligible for pine planting in addition to the 29 million acres of eligible cropland for the CRP [Fedkiw, 1986].

Most USDA studies favor use of pine trees on highly erodible or marginal cropland. However, pine plantings do require a significant cash outlay and labor costs with returns deferred for 15 to 20 years along with foregone cash flows. Pine pulpwood and saw-timber market conditions are considered weak in Tennessee. Yet long-run questions regarding the market situation for pulpwood in 12 to 15 years and for saw-timber in 25 to 40 years are easier to ask than answer [Farmer and Hudson, 1986]. Also, the productive capacity of the soils must be weighed. Upland soils in Dyer County may be highly erosive, but they are also highly productive for row-crops. There is a higher opportunity cost associated with these soils. For Fayette County, upland soils are not as productive for row-crops and thus may be more conducive to timber production.

V. Summary Comments

For both Dyer and Fayette Counties, bids for annual rental payments under the 10-year option averaged about $50 per acre, but varied from $20 to $125. Because of this variability in bid levels,

public cost of a uniform-offer approach would be substantially higher than for a differential-bid approach. Rental payment costs to the Federal government would be 26.0-percent less with a differential-bid approach under our study program. A regression model was used to identify factors that were believed to influence landowners' bid levels. For the Dyer County model, the field level degree of erodibility was highly significant. A landowner's vocational status exhibited weak significance. For the Fayette model, the field's productivity and potential earnings, the farm's debt structure, and the age of the landowner were highly significant. Even though research suggests a strong demand for pine trees in the future for the South, woodland was not a preferred land-use for our program participants. In addition, foresters in both Dyer and Fayette Counties were not optimistic at the current market outlets for pine trees.

CHAPTER VI

CONCLUSIONS

I. Summary of Findings and Policy Implications

The focus of this study has been on the analysis of factors and policies relating to use of highly erodible land in West Tennessee for row-crop production. Care must be taken, however, in generalizing the findings to West Tennessee as a whole. Counties were selected based on major land resource areas, major soil series, and crops, but are not strictly representative of all West Tennessee. The distribution of Class IV, VI, and VII land at the farm and field level was analyzed to help provide insight into why so much of this land is in such an intensive land use. To complete the analysis, a survey was conducted in two West Tennessee counties to obtain information from landowners regarding their overall farming operation and personal level data (age, education, etc.). Information from the survey was used to develop a logit model to identify factors that were believed to influence a landowner's decision to row-crop Class IV, VI, and VII land. For the landowners that did row-crop this type of land, yields, prices, and production expenses were also obtained and analyzed to investigate whether landowners have overly optimistic expectations in regard to these three areas. In addition, landowners' bid levels indicating the magnitude of economic incentives that would be necessary to retire Class IV, VI, and VII land to a permanent vegetative cover were analyzed from a public policy perspective. Finally, a regression model was used to identify factors that were

believed to influence a landowner's bid. A summary of the findings for each of the areas outlined above presented in the order they were mentioned. Policy implications are also presented.

The Soil Conservation Service's 1982 National Resource Inventory estimated that West Tennessee has 438,000 acres of highly eroding (Class IV, VI, and VII) cropland. Yet the distribution of these land capability classes at the farm and field level of analysis is lacking or has not been questioned. The NRI data may convey a perception of Class IV, VI, and VII land that is localized and easily "reachable" if Federal government programs were implemented to retire this land to a permanent vegetative cover. However, this study reveals otherwise. First, focusing at the farm level, only 7.7-percent of the Class IV, VI, and VII land on the 107 sample farms in Fayette County is in row-cropped fields where it constitutes more than 50-percent of the field. Second, focusing at the field level, only about 25.6-percent of the Class IV, VI, and VII cropland may be in fields where it constitutes 50-percent or more of the field. In other words, as much as 74.4-percent of the Class IV, VI, and VII cropland may be in fields where it comprised less than 50-percent of the field. From a landowner's perspective, this distribution may create an unwillingness to participate in conservation programs and, consequently, may exacerbate the problem of "reaching" and retiring the more highly erosive land. The results from the land capability class calculations for Fayette County support the provision in the new CRP for redefining farmers' fields into smaller units. Since Class IV, VI, and VII land is intermingled with other lower land capability classes at the field

level of analysis, this policy approach should increase the number of eligible fields and the likelihood of participation. In addition, a regulatory approach to require conversion of Class IV, VI, and VII cropland would be difficult to administer because of this high degree of intermingling in fields.

Identification of factors that influence a landowner's decision to row-crop Class IV, VI, and VII land would be informative to policy-makers, and help in the design of strategies to improve cost effectiveness of policy. Results from the logit model for the row-crop decision indicate that full-time, crop-only farmers, and farmers who had SCS contact were more likely to have qualifying fields in row-crop production. In addition, farmers were less likely to be producing row-crops if they had more education and if they had a higher estimate of the erosion potential for a field if row-cropped.

The extent to which landowners have overly optimistic price and yield expectations and to which they underestimate their costs in regard to production decisions on Class IV, VI, and VII cropland is not known. However, this study attempted to focus on this issue. The relatively high yield and relatively low variable production cost figures given by the landowners suggest they do perceive they are earning positive net returns from row crop production on the Class IV, VI, and VII land in this study, at least in the short-run. Farmers' estimate for yields and variable costs were quite different from figures suggested by researchers and extension personnel. From a long-run perspective, net returns for the period studied are probably not sufficient to encourage production on this type of land. However,

extended "short-run" thinking may be reinforced because of the uncertainty of commodity program characteristics regarding base acreages, acreage reductions, and price support levels. Given farmers' expectations regarding net returns in the 1984-85 period, inducing voluntary conversion of much of this Class IV, VI, and VII cropland would be relatively costly. However, lower soybean prices in recent years has reduced soybean acreage on this land substantially, a trend likely to continue for the near future. The results of landowners' yields, prices, and production cost estimates support the view that effective information and education programs may play an important role in influencing the use of Class IV, VI, and VII land. The inconsistency of the results from the logit model findings, however, provide unclear signals on the effectiveness of this program approach.

For both Dyer and Fayette Counties, bids for annual rental payments for the ten year option of a CRP-type program averaged about $50 per acre but varied from $20 to $125. Program participants preferred the five year option and a grass land use instead of trees, though research suggests a strong demand for pine trees in the future for the South. Loblolly pine was the tree most recommended by the foresters in both Dyer and Fayette Counties for the highly erosive sites. Market outlets for pine trees according to the foresters in both counties, however, were not positive. The distance to the nearest mill from landowners' farms averaged 20.6 and 18.8 miles for Dyer and Fayette Counties' landowners, respectively.

With appropriate adjustments, the bid levels received from the landowners were relatively consistent with those received in these counties in the first two rounds of bidding in the actual CRP. Bids would have average $10 per acre higher if no grazing or hay production were allowed, as in the actual CRP. Some participants based their participation in the study program based on the grazing option alone. The possibility of losing commodity base acreages if farmers enrolled in the program was not as important, as bids would have only been about $5 per acre higher on average.

Because of the variation in bid levels among landowners, a differential-bid approach would cost the government 26.0-percent less in rental payments than would an uniform-offer approach. However, this is under the assumption of only one round of bidding. Variation in bid levels is likely to diminish over multiple rounds of bidding, as the actual CRP experience has indicated. For the first round of bidding in Dyer and Fayette Counties, bids ranged from $49.00 to $200.00 and $35.00 to $194.00, respectively. But with bid cut-off levels being relatively stable for successive bidding rounds, which has been the case with the actual CRP so far, the reservation price strategy and the cost effectiveness of a bid approach has been dulled because farmers have tended to bid just under these expected cut-off levels. Even with a one-round differential-bid approach, however, cost per ton of erosion reduction would be about twice what it was for establishment of permanent vegetative cover in the ACP in 1984 for West Tennessee, though erosion reduction per acre would be about three times higher.

Information to help explain variability in landowners' bids would also be helpful to policy-makers. However, because of the small sample size for the regression analysis and the differing results from each of the county models, generalizations are difficult to make. As could be expected, the bids are influenced most by prevailing cash rental rates. In addition, there was some evidence that bid levels in the study were positively related to debt pressure, age, and erodibility, negatively related to field size, and higher for full-time farmers. The positive relationships for age and erodibility were somewhat surprising.

Since 1981 a number of new programs or changes in existing programs have been introduced to increase the cost effectiveness of federal soil erosion control policy. Most government programs are designed to serve multiple objectives and the Conservation Reserve Program is no exception. In addition to conservation goals, removing inconsistencies between USDA commodity and conservation programs, reduced price support subsidies, and reduced excess capacity are other objectives of the CRP [Reichelderfer, 1985; Stucker and Collins, 1986]. The extent to which these objectives are achieved depends on the land eligible to be bid into the reserve, landowners' bids for retiring this land, and the bid selection process. Policy-makers, however, are concerned with economic efficiency, social equity, and political feasibility. Further, different agricultural demand situations may dictate different agricultural policies. The CRP is designed to help adjust our cropland base to a lower demand situation. The goal of this study was not only to evaluate a CRP-type approach

for retiring highly eroding cropland in West Tennessee, but also to evaluate new and traditional policy approaches, such as the economic and administrative feasibility of a regulatory approach and the need for additional informational/educational assistance, to complement this land retirement strategy. However, differences in resources, agricultural enterprises, and financial situations could influence the appropriateness of these policy strategies in other regions. Findings from this study may help provide additional insight for policy-makers in considering design of future policy approaches.

II. Research Implications

One research need for the future is the analysis and evaluation of the type and acreage of land that would be enrolled in a CRP for the West Tennessee area under the several alternative definitions for "highly erodible" land. In addition, the erosion-productivity relationships for various soil types on Class IV, VI, and VII land need to be more well-defined, as do linkages between erosion and off-site damages, so that particular lands can be targeted for conversion.

The results from analysis of factors influencing use of Class IV, VI, and VII land, including landowners' yield, price, and production cost estimates, suggest a need for future research activities. For example, where do farmers get the information to help them to formulate their yield, price, and cost expectations? To what extent do tax incentives or commodity program benefits increase net returns from row-cropping this land? Do lenders at financial institutions

play an important role in influencing the row-crop decision? Do some farmers view highly erodible cropland as "marginal" in relation to their overall operation and thus look only at variable costs in a short-run time frame?

With respect to the CRP, advantages and disadvantage of various bid pool levels (e.g., sub-state versus state) and criteria for prioritizing acceptance of bids needs to be considered. Research on the possibility of applying a bidding strategy within cost-sharing programs for other practices would also be valuable. Related to this would be consideration of employing cost effectiveness criteria for prioritizing allocation of funds to practices and land.

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APPENDIX

Name _____ Address _____
Date _____ _____
Farm No. _____ Interviewer _____
Time interview began _____ a.m., p.m.

The purpose of this survey is to gather information from landowners like yourself to assess the economic feasibility of retiring highly erosive cropland from certain agricultural production activities for soil conservation purposes. Your name was drawn randomly from a list of landowners in _____ County. Although participation in this survey is voluntary, your cooperation will assure that landowners' views are accurately assessed. All information gathered will be kept confidential. The information from your survey response will be combined with information obtained from other landowners. The results will be presented from a perspective on how landowners in general feel about the program.

Congress is considering ways to simultaneously reduce erosion and decrease surplus agricultural production. The use of conservation easements is one alternative being considered. With this program the federal government would voluntarily purchase the rights to grow certain crops on erosive fields from landowners. The mechanics of the program would be similar to the PIK program whereby cropping rights might be acquired through a bidding process, but payment would be in the form of cash instead of commodities. The rights purchased would be either temporarily or permanently transferred from the specified cropland fields. The following set of questions are intended to provide an overall view of your farming operation. A set of questions later in this survey pertain specifically to conservation easements.

1. How many acres of farmland do you own in total? _____

The next few questions (2-5) pertain to the tract of land you own which is outlined on this map.

2. Type of landownership? (circle)

   a. Individually
   b. Partnership
   c. Corporate
   d. Other (specify) _____

3. Was land purchased or inherited? (circle)

   a. Purchased
   b. Inherited
      (If inherited only, skip to question 5.)
   c. Both

4. If purchased, in what year(s)? _____

5. Type of farm? (circle)

   a. Row crop only
   b. Livestock only
   c. Combination livestock and row crop
   d. Dairy
   e. Other (specify) _____

6. Do you rent any additional acreage to supplement your farming operation?
   _____ Yes _____ No (If no, go to question 8.)

7. What is the predominant type of rental arrangement on this rented land? (circle)

   a. Cash lease
   b. Crop share lease
   c. Other (specify) _____

8. Of all the land you operate (both owned and rented), how many acres were in the following land uses during 1985?

Cropland *Note any double-cropping.	Owned	Rented
a. Soybeans		
b. Corn		
c. Cotton		
d. Grain sorghum		
e. Wheat		
f. Other (specify) _____		
Hayland (including alfalfa)		
Pastureland		
Woodland (not grazed)		

9. Do you utilize any conservation practices on your cropland fields?
   _____ Yes _____ No

   If yes, what types? _____

10. Have you ever received any technical assistance from SCS for conservation practices on your cropland fields?
_____ Yes _____ No

11. Have you ever received any financial assistance from ASCS for conservation practices on your cropland fields?
_____ Yes _____ No

12. Do you own livestock? _____ Yes _____ No If no, skip to question 17.

13. If yes, how many of the following kinds of livestock are normally (average for last five years) kept all year? How many are being kept presently?

	Normally	Presently
a. Beef cows	_____	_____
b. Dairy cows	_____	_____
c. Hogs and pigs	_____	_____
d. Steers	_____	_____
e. Other (specify) _____	_____	_____

14. Do you normally produce enough hay for your livestock enterprise?
_____ Yes _____ No (If no, go to question 16.)

15. If you produce any excess hay, what do you do with it?

a. Sell (distance buyer or you travel _____ miles)
b. Utilize excess in a feed ration program
c. Stored in barn and utilized in bad hay crop years
d. Other (specify) _____

16. How do you supplement your hay shortage for your livestock enterprise?

_____
_____
_____

17. Which, if any, of the following pasture or hayland management practices have you performed over the last five years? (may circle more than one)

a. Liming
b. Fertilizing
c. Seeding
d. Bush-hogging
e. Chemical weed control
f. Other (specify) _____
g. None

18. How likely are you to have some type of livestock enterprise three years from now? (circle)

    a. Very likely
    b. Somewhat likely
    c. Not likely at all

19. How do you use any woodland you have on the land you farm?

    a. Timber production
    b. Erosion
    c. Firewood
    d. Wildlife
    e. Esthetics
    f. Recreation
    g. Other (specify) _____

20. Which, if any, of the following woodland management practices have you performed over the last 10 years? (may circle more than one)

    a. Girdling or chemical injection of poorer quality trees to reduce competition with higher quality trees
    b. A woodland inventory and evaluation by a professional forester
    c. Cutting of cull trees for firewood
    d. Cutting of quality trees for firewood
    e. Tree planting of an acre or more
    f. Other (specify) _____
    g. None

21. If you wanted to sell some timber, approximately how many miles is the nearest mill from your farm? _____ miles

22. Do you expect woodland to be an important land use on the land you farm three years from now? ____ Yes ____ No

    If yes, why? (may circle more than one)

    a. Timber production
    b. Erosion
    c. Firewood
    d. Wildlife
    e. Esthetics
    f. Recreation
    g. Other (specify) _____

The following questions relate to the one or two fields outlined in red on this photo.

23. | | Field 1 | Field 2 |
|---|---|---|
| a. Acreage? | | |

b. What has been the land use and/or the type of crop grown in these fields since 1971?

	1971	1972	1973	1974	1975	1976	1977	1978
Field 1								
Field 2								

	1979	1980	1981	1982	1983	1984	1985
Field 1							
Field 2							

c. Of the following erosion categories listed below check one that best describes the degree of erosion potential in fields 1 and 2 if row cropped.

	None	Slight	Moderate	Severe
Field 1				
Field 2				

d. How much soil in inches do you think would be lost from fields 1 and 2 over a period of 10 years if they were row cropped?

Field 1 _____ inches
Field 2 _____ inches

e. What are you planning to plant in 1986?

	1986
Field 1	
Field 2	

<u>If either fields 1 or 2 were row cropped in either 1984 or 1985, or row crops are planned for 1986, continue. If not, skip to question 30</u>.

f. What sequence of tillage and planting practices were performed for the row crops produced in 1984 and 1985? (If none produced in 1984 or 1985, what is planned for 1986?)

	1984	1985
Field 1	_____	_____
Field 2	_____	_____

g. What conservation practices or treatments are used in fields 1 and 2?

Field 1 _____
Field 2 _____

h. What conservation practices or treatments are needed in fields 1 and 2?

Field 1 _____
Field 2 _____

i. What would be an average yield for these fields for the row crop(s) produced in 1984 and 1985? (If none produced in 1984 or 1985, ask for what is planned for 1986.)

	1984 Bushels/Acre	1985 Bushels/Acre
Field 1	_____	_____
Field 2	_____	_____

j. What price per bushel did you receive for the row crop(s) produced in these fields in 1984 and 1985?

	1984	1985
Field 1	_____.___	_____.___
Field 2	_____.___	_____.___

k. How much different was the price you received at harvest in 1985 from the price you expected to receive at planting?

	1985 Per Bushel
Field 1	_____.___
Field 2	_____.___

l. What do you expect prices to be in 1986 for the row crop(s) planned for 1986?

	1986 Per Bushel
Field 1	_____.
Field 2	_____.

m. What were the your approximate cash costs per acre for the row crop(s) produced on these fields in 1984 and 1985? (If none produced in 1984 or 1985, ask for what is planned for 1986) These out-of-pocket costs would include seed, fertilizer, chemicals, fuel, hired labor, etc., but not land or machinery costs.

	1984	1985
Field 1	_____	_____
Field 2	_____	_____

For owner-operators

n. What has cropland like fields 1 and 2 rented for the last year or two in your area?

	Per Acre Per Year
Field 1	_____
Field 2	_____

o. What has pastureland like fields 1 and 2 rented for the last year or two in your area?

	Per Acre Per Year	or	Per Acre Per Month	or	Per Cow Per Month
Field 1	_____		_____		_____
Field 2	_____		_____		_____

For nonoperating owners

p. What type of rental arrangement exists on these fields?

a. Cash lease — Field 1 _____
b. Crop share lease — Field 2 _____
c. Other (specify) _____

q. What was the cash-rent per acre (or equivalent for other types of leases) received for these fields in 1984 and 1985?

	1984	1985
Field 1	_____	_____
Field 2	_____	_____

r. If this land was sown to a permanent pasture and used for livestock, is there an available water supply nearby that could be utilized?

	Yes	No
Field 1	_____	_____
Field 2	_____	_____

Conservation Easement

Section only for those who had row crops in 1984 or 1985 or plan to produce row crops in 1986.

Some landowners would like to shift their erosive fields from row crops to permanent grass or trees. Payments for conservation easements might make the shift from row crops to permanent grass or trees economically feasible. If the land is sold, it would sell without the cropping rights for the life of the easement since they have already been sold. Once in the program, violation of the easement provisions would not be allowed.

In some parts of the U. S. the sale of part of the rights in land is common practice by landowners. For example, near big cities the right to develop the land for nonagricultural purposes is sold to guarantee that some land stays in farming. In some areas farmers sell hunting rights on their farms. In the Southwest the right to drill for oil is frequently sold on farms. In other areas other forms of mineral rights are sold. In all these cases, some rights are sold but most are retained by the landowners. Likewise, with conservation easements the right to raise erosive crops would be sold and all other rights retained.

For the purpose of this research, we are assuming the following. You could use the fields for forage production (grass, hay, alfalfa) or for growing and harvesting forest products or some combination of both. If you sold a conservation easement on any field, no other pasture, hay or timberland that you own with high erosion potential could be brought into row crop production to offset the loss of the row cropland for which you sold the easement. You would be allowed to develop other land that you own for row crop production that has low erosion potential (such as bottomland). Your base acreage for commodity program purposes would not be reduced by the acreage for which an easement was sold.

In the past, federal programs have offered a range of cost sharing from 50% to 90% on the establishment of forage and timber crops. Assume for the purpose of this survey that a separate program, in lieu of these past programs, will offer 100% cost sharing for forage or timber establishment. In addition, the landowner would receive a single or annual payment from the conservation easement program based on the landowners' bid and type of easement selection.

Assume a conservation easement program will be implemented in _____ County this year in which only a given number of acres would be enrolled based on the lowest bid prices received in relation to the croplands' erosion rates. I would like to get your reactions to two types of easements. The first type would be for a specified period of years, like the Soil Bank Program of the 1950's, except

year-round grazing would be possible. The second type would be for an indefinite period of time, that is, it would be permanent, like when mineral rights are sold. Someone could live on the land, and it could be used for pasture, timber or hay the entire year.

24. Type I - Soil Bank Type of Program

Assume annual payments will be made for the life of the easement under this type of program. Please indicate the annual price per acre you would need to have to sell your cropping rights for each of the fields for each of the specified periods of time.

	Field 1 (per acre of cropland)	Field 2 (per acre of cropland)
a. 5-year easement - 5 equal annual payments	$_____/year	$_____/year
b. 10-year easement - 10 equal annual payments	$_____/year	$_____/year
c. 15-year easement - 15 equal annual payments	$_____/year	$_____/year

Type II - Permanent Easement - Selling Cropping Rights Like Mineral Rights

Under this type, a Permanent Easement, you would sell your cropping rights permanently for a single payment. If you were offered an opportunity to submit a bid for your cropping rights to these fields, how much would you sell each for?

d. Field 1 _____$/acre of cropland

e. Field 2 _____$/acre of cropland

25. a. Which option would you prefer for fields 1 and 2? (choose only one)

(1) 5-year easement — Field 1 _____
(2) 10-year easement
(3) 15-year easement — Field 2 _____
(4) Permanent

b. If you could not graze cattle or cut hay on the easement land, would it change your bid on your preferred option chosen in 25a?

_____ Yes _____ No

If yes, how much would you bid now on your preferred option (chosen in 25a)?

Field 1 _____
Field 2 _____

c. If your base acreage for commodity program purposes were reduced by the acreage for which an easement was sold, would it change your bid on your preferred option (chosen in 25a)?
_____ Yes _____ No

If yes, how much would you bid now on your preferred option (chosen in 25a)?

Field 1 _____
Field 2 _____

26. If you chose to participate in the easement program, which of the following land uses would you choose for fields 1 and 2?

	Field 1	Field 2
a.	Pasture (type?_____)	Pasture (type?_____)
b.	Hay (type?_____)	Hay (type?_____)
c.	Trees (type?_____)	Trees (type?_____)
d.	Idle (type of cover?_____)	Idle (type of cover?_____)

27. If your trees were chosen for either field, what objectives would you have? (may circle more than one)

a. Commercial timber production
b. Firewood production
c. Erosion control
d. Wildlife
e. Esthetics
f. Recreation
g. Other (specify) _____

28. Which of the following would you do with your machinery if you sold a conservation easement on fields 1 and 2? (check one for each year category)

	Nothing	Sell	Custom Work	Other (specify)
5 year				
10 year				
15 year				
Perm.				

29. How willing would you be to sell a conservation easement on this entire tract of land?

    a. Very willing
    b. Not very willing
    c. Not willing at all

    Why? _____
    _____
    _____
    _____

Personal Information

30. Age _____ years

31. Years of formal education _____ years

32. How long have you been farming? _____ years

33. How much longer do you plan to operate this farm? _____ years

34. How much longer do you plan to own this farm? _____ years

35. Do you farm full-time or part-time? (circle)

    a. Full-time (go to question 36)
    b. Part-time
    c. Retired

    What is your wage rate per hour if you have an off-farm job?
    _____/hour

    What percent of your yearly income do you receive from farming?
    _____% from farming (go to question 37)

36. If full-time, what wage rate per hour could you expect to earn if you worked off the farm? _____/hour

37. Do you have any children? _____ Yes _____ No

If no, go to question 38.

If yes, do you expect one of your children or relatives to own this farm in the future? _____ Yes _____ No

How would children or relatives influence your decision to participate in the easement program?

a. Eliminate desire to participate
b. Make participation unlikely
c. Make participation likely
d. Make participation highly desirable
e. No influence

38. Please answer the following by placing a number between 1 through 5 (1 - strongly agree, 2 - agree, 3 - neutral, 4 - disagree, 5 - strongly disagree) beside the following statements.

a. I consider myself willing to take more risks than the average farmer. . . . . _____

b. A farmer should diversify his operations even though some income may be sacrificed. . . . . _____

c. The use of conservation easements is a good idea. . . . _____

39. In which of the categories would your average annual gross sales over the past five years from all farming operations fall?

a. Under $20,000
b. $20,000-$40,000
c. $40,000-$100,000
d. $100,000-$250,000
e. $250,000-$500,000
f. Over $500,000

40. What is the average interest rate you are currently paying for operating and real estate loans?

a. Real estate _____%
b. Operating _____%

41. In which of the following categories does your real estate debt on this farm fall?

a. None
b. Under $100,000
c. $100,000-$199,999
d. $200,000-$299,999

e. $300,000-$399,999
f. $400,000-$499,999
g. $500,000-$599,999
h. $600,000-$749,999
i. $750,000-$999,999
j. Over $1,000,000

42. In which of the following categories does your operating debt on this farm fall?

a. Under $20,000
b. $20,000-$40,000
c. $40,000-$100,000
d. $100,000-$250,000
e. $250,000-$500,000
f. Over $500,000

43. Do you have any other comments or suggestions concerning conservation easements or other alternatives to reduce erosion on highly erodible cropland? _____

_____
_____
_____
_____
_____
_____
_____
_____

44. Are there any factors other than those we have already talked about that would influence your attitude toward using fields 1 or 2 for row crops or selling a conservation easement on either one of these fields? If so, please comment. _____

_____
_____
_____
_____
_____
_____

***Ask renting operator to fill in missing information on question 23. Also, ask for the number of cropland acres they operate in total.
_____ acres

Time interview ended _____ a.m., p.m.

VITA

Robert Jamey Menard was born in Knoxville, Tennessee, on May 7, 1957. He attended Everett High School and was graduated in May 1975. Following four years of study at The University of Tennessee, Knoxville, he received a B.S. degree in Agriculture majoring in Plant and Soil Science in 1979. Following graduation he accepted a Soil Conservationist position with the United States Department of Agriculture, Soil Conservation Service in Tennessee. In September of 1984, he accepted a Graduate Research Associate position and began a M.S. program in Agricultural Economics at The University of Tennessee, Knoxville. He completed the requirement for the Masters degree in Agricultural Economics in December 1986.