THE RELATIONSHIP BETWEEN FARMERS' SOIL CONSERVATION ETHICS AND SOIL EROSION

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PREFACE

This research explored the relationships between farmer-held soil conservation ethics and soil erosion. The primary objectives were to define the conservation ethic and determine how it influences farmers' decisions regarding the use of the soil and its protection from erosion.

I wish to express my appreciation to my chairman, Dr. Richard Hecock, for encouraging me to enroll in the Environmental Sciences doctoral program and for his guidance throughout the program. Appreciation is also expressed to my thesis adviser, Dr. Joseph Westphal, for his assistance in the preparation of the final manuscript; to Dr. William Warde for his assistance in analyzing research data; and to Dr. Daniel Badger and Dr. Fenton Gray for their encouragement and support throughout the program.

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THE RESEARCH PROBLEM

Introduction

Although soil erosion has been recognized as a national menace since the 1930s (6, 34, 62, 64), recent estimates of soil losses due to sheet and rill erosion have stimulated renewed interest and additional concern (16). Current concern has been aroused by reports that increasing soil loss by erosion is reducing the productive potential of the soil--to the point of its becoming a serious threat to civilization which depends on soil for food and fiber. The 1977 inventory and appraisal of the nation's soil and water resources mandated by the Soil and Water Resources Conservation Act of 1977 (RCA) (Public Law 95-192) provided the major stimulus for this concern. The press provided the forum for public discussion and debate (18, 61).

Statement of the Problem

This research attempted to ascertain the relationship between farmer-held ethics regarding the soil resource and soil erosion rates. Although soil erosion has been attributed to many causes, some recent soil conservation literature suggests that ethics is at the root of the problem. It is argued that erosion has reached alarming rates because the "conservation ethic" has been lost and that a return to the "old" ethic is necessary. Another argument is that the "old" ethic is inadequate in today's complex

farm economy and that a "new" conservation ethic is needed. Even those who believe erosion is mostly caused by other factors concede that "ethics" may be relevant to the problem (31, 66).

Erosion on cropland persists and in parts of the nation it has reached alarming proportions. Some professional soil conservationists, politicians, farmers and others concerned about the current problem attribute it to a "loss of conservation ethics" and also argue that a "return to the ethical position we had in the past" offers the best solution to the problem (12, 18). This will not be easy and some contend that the attitude and behavior which have led to the current dilemma are deep within us and may not be mitigated without internalized pressure from a very strong ethic (11).

While the literature does not suggest a consensus as to what is meant by "conservation ethics," many assume there is a relationship between what they perceive as conservation ethics and soil erosion. Although ethics is properly the task of philosophers (21), the fact that ethics is perceived by many to be associated with soil erosion, provided the stimulus for this researcher to explore the issue. Conservation ethics is perceived by some to have been ignored in the past (14). If ethics indeed are related in any way to the prevention of soil erosion it deserves to be discovered, defined, and nourished.

Erosion is not easily perceived because it is a chronic slow process. Lessons from history have not been well received because erosion is still not understood by many as being an urgent issue (8). The peril of soil loss is more remote than danger from nuclear arms, but the effect could be just as devastating in the long-run (35). When the soil is depleted and deteriorates so that it no longer produces adequately, people perish (9, 34).

Objectives of the Research

The purpose of this research is to explore the relationship between the soil conservation ethic held by farmers and soil erosion. One objective is to define the soil conservation ethic held by farmers today. It is undertaken with the full knowledge that conservation ethics will be difficult to define (32). However, until conservation ethics has been defined it will be impossible to know whether it has been "lost", or is "old", or a "new" one is needed.

A second objective is to ascertain whether and to what extent the soil conservation ethic influences farmers' decisions to use and manage their soil so as to protect it from erosion.

A third objective is to ascertain farmers' perception of soil erosion. Their view of soil erosion -- and they may not agree that it poses a problem -- may be the most important factor in determining whether policies and programs designed to help control erosion achieve the desired results. Consequently, it is imperative that their views be known.

Definition Of Terms

Soil Conservation Ethic

Although one of the objectives of this research is to define soil conservation ethic, it is not this researcher's purpose here to present the definition in detail. Soil conservation ethic as used throughout this dissertation refers to the set of principles which serve as the standard that farmers use in assessing what is right or wrong regarding the soil, and which leads them to care for the soil and guides their behavior toward it. It has to do not merely with actual conduct, but

with right and good conduct, and accordingly with an ideal from which rules issue for proper conduct. These rules provide instruction for each farmer in how to govern his own conduct in the use and care of the soil. They indicate the right course of action in particular situations.

In other words, a soil conservation ethic suggests the right way for caring for the soil and provides the principles underlying the realization of these values in the farmers relationship with the soil.

Soil Loss Tolerance

Soil loss tolerance (T-value) is defined as the maximum rate of annual soil erosion that will permit the maintenance of soil productivity indefinitely (40). Soil loss is measured in tons, and soil and plant scientists have established the maximum T-value of five tons per acre per year (11.2 metric tons/hectare/year). T-values have been determined for all of the major soils in the watershed and the range is from one through five t/ac/yr (2.2 through 11.2 t/ha/yr). Wherever the word tolerable or tolerable levels is used in this dissertation the reference is to soil losses that are lower than established T-values. Wherever excessive is used in the context of erosion the reference is to soil loss rates that are greater than T-values.

Hypotheses

A basic assumption underlying this research is that, even though it may not be clearly defined, there is a soil conservation ethic among today's farmers. Although they may not have the same "degree" of "love and respect" for the soil as did farmers in earlier generations, it is assumed that a majority of today's farmers try to conserve the soil by attempting to protect it from erosion.

The general hypothesis (H_9) providing the basic framework for this research is that there is an inverse relationship between farmers' soil conservation ethics and soil erosion. Exploring this relationship involves a range of variables that describe the general hypothesis which conveniently can be stated as specific hypotheses. They are:

H_1: There is an inverse relationship between the farmers' "degree" of soil conservation ethic and the rate at which the soil erodes.

H_2: There is an inverse relationship between farmers' soil conservation ethic and the freqency with which the soil is subjected to the risk of increased erosion.

H_3: There is an inverse relationship between farmers' consideration of the nature of the soil in the decision-making process and the rates at which soils erode.

H_4: There is a positive relationship between farmers' soil conservation ethic and the adoption of soil conserving practices.

The Research Area

The Deer Creek Watershed in Blaine, Caddo, Custer, and Dewey counties in Oklahoma was selected as the area in which to study the relationships between soil conservation ethics and soil erosion. The area was chosen primarily because of its size and the number of primary sample units (PSUs) located within its boundaries. The Soil Conservation Service had previously identified the number of samples that would give the area reliable erosion data. The location of the PSUs had also been indicated on published soil survey maps. Land use was also an important consideration. The watershed consists of 221,730 acres (346.45 square miles), is roughly rectangular in shape, and lies in a northwest to southeast direction (Figure 1). Deer Creek begins north of Putnam in Dewey County and runs southeasterly about 26 miles, then turns easterly

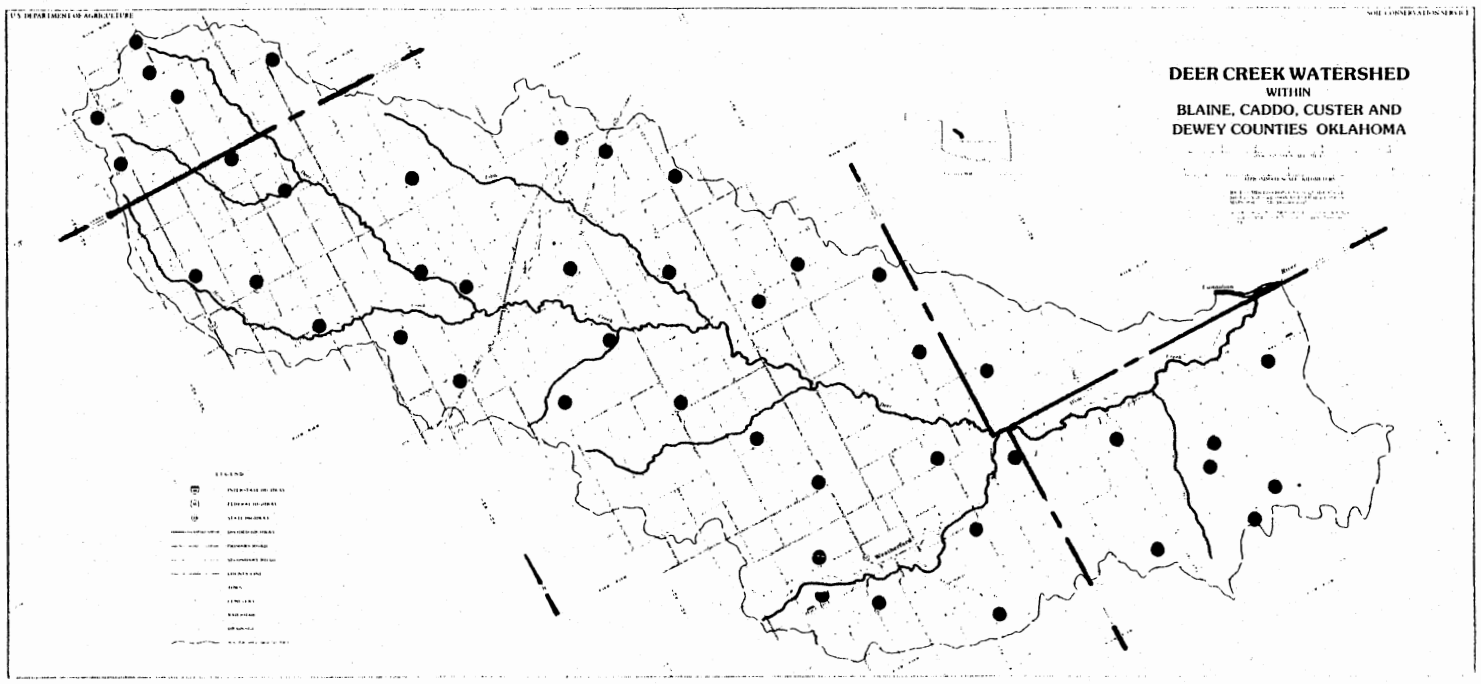

Figure 1. Location of the Primary Sample Units (PSU's) for Which Farmers Soil Conservation Ethics and Soil Erosion Data Were Obtained.

about eight miles to its confluence with the South Canadian River.

The city of Weatherford, and the towns of Hydro, and Putnam, and a portion of Thomas and Custer City are in the watershed. The populations of these towns in 1980 were 9,640, 938, 530, 1,515, and 74, respectively. Many of the farmers live in these towns and drive to the "country" to engage in the farming operation per se.

The watershed has dry-subhumid climate and is subject to drought. The average annual rainfall at Weatherford is 27.7 inches. Nearly 80 percent of the normal annual precipitation comes during the frost-free season. A large percentage of the precipitation is from thunderstorms, which frequently produce high intensity rainfall. Thunderstorms occur on an average of 50 days in a normal 205 day crop season.

Temperatures of 90° F or higher occur frequently from May through September. Temperatures of 100° or higher are experienced about 22 days each year, mainly in July and August.

The watershed is in the Rolling Red Plains Soil Resource Area. It is named for the red geologic materials and soils which characterize the area. The area is dominated by broad undulating and rolling plains interrupted irregularly by highly dissected areas that have V-shaped valleys with steep sides and narrow ridgetops.

The Carey, Grant, Pond Creek, and St. Paul are major soils on the extensive plains. Woodward and Quinlan are the dominant soils on the eroded uplands. The Clairmont and Dale soils are on the creek bottoms and adjacent terraces. Except Clairmont, all of these soils are highly susceptible to erosion.

Land use in the watershed is: cropland, 143,237 acres (64%); rangeland, 54,767 acres (25%); pastureland, 6,874 acres (3%); forest

land, 10,865 acres (5%); and other land (farmsteads, roads, etc.), 5,987 acres (3%).

In fiscal 1981 the Agricultural Conservation Program and the Great Plains Conservation Program shared in the cost of installing land treatment practices in the amounts of about $33,000 and $22,000, respectively. Technical assistance provided the area by the Soil Conservation Service cost about $13,800.

There are 1,146 operating units (farms) in the watershed. Seven hundred ninety-nine farmers cooperate with the conservation districts. Although farm conservation plans have been prepared on 84.3 percent (189,991 acres) of the area not all plans are current.

The watershed is oil-gas energy rich, and increased oilfield activity that began with the 1973 energy crisis has greatly increased the wealth of the area in general. Most farmers benefit from the oilfield activity through leases and royalties. Much of this sudden and unexpected income has been invested in land, livestock, equipment, residences, and to improve the general standard of living. Additional income provides more money for investments in soil and water conservation but this resesarch did not explore the effect of increased income on the application of soil conserving measures on the land. Although it might seem reasonable to expect that an increase in income would have the overall effect of reducing soil loss by erosion, this researcher believes it would be incorrect simply to make that assumption. If farmers do not care for the soil in the first place, there is little likelihood they will invest in measures that protect it from erosion.

Farming is a major source of income in the watershed. Two-thirds of the land area is used for cropland. Wheat is the major crop although

other small grains, cotton, grain sorghum, peanuts, and alfalfa are also grown.

Beef cattle are important in the farming operations in the watershed. Much of the wheat is grazed by stocker calves from about November 1 to March 15. The calves are then sold as feeder calves and the wheat then is allowed to mature and is harvested for grain. Some wheat is grazed out. Cow-calf operations are generally maintained on native grass rangeland or Bermuda grass pastures.

Farms are increasing in size. According to the 1978 Census of Agriculture, the average farm size in Custer County in which most of the watershed is located, was 633 acres, an increase of 56 acres from 1974 and 145 acres from 1968. Conversely the number of farms is decreasing. In 1978 there were 980 farms in Custer County, a decrease of 48 from 1974 and 314 from 1968.

Summary

Soil erosion is a national menace, and although much has been and is being done to arrest the problem, it persists. Literature is replete with evidence which suggests that ethics is important in man's relationship to the soil. Moreover, current literature suggests ethics is at the root of the soil erosion problem. Indeed it may be the key factor in determining whether soil conservation is practiced and soil erosion control is achieved.

This research explored the relationship between farmers' soil conservation ethic and soil erosion. This researcher hypothesized that there is a soil conservation ethic among farmers and that most try to protect their soil from the ravages of erosion. The objectives were to

define the conservation ethic, and to determine its influence on the farmer's decision making as it relates to soil use and management from the perspective of soil erosion. The Deer Creek Watershed in Southwest Oklahoma was chosen as the area in which to conduct the research. It was believed this research would contribute to the body of knowledge concerning soil conservation generally and to soil conservation ethics specifically.

CHAPTER II

REVIEW OF LITERATURE

Historical Perspective

Long before the "conservation movement" from which might have issued soil conservation ethics, genuine concern that man would act responsibly toward nature (including soil) and choose to live in harmony with her already had been expressed:

> Man has too long forgotten that the earth was given him for usufruct alone, not for consumption, still less for profligate waste. Nature has provided against the absolute destruction of any of her elementary matter, the raw materials of her works . . . . But she has left it within the power of man irreparably to derange the combinations of inorganic matter and of organic life, . . . which through the night aeons she has been proportioning and balancing to prepare the earth for his habitation, when in the fullness of time, his creator should call him forth to enter into its possession (37, p. 35).

Man's relationship to things created involved even the deeper springs of mysticism. If one were searching for a statement that describes the union of man and God that might be achieved through contemplation of things created, perhaps he could find none better than the statement by Muir about his beloved Sierra Nevada:

> Benevolent, solemn, fateful pervaded with clirune light, every landscape glows like a countenance hallowed in external repose; and every one of its living creatures, clad in flesh and leaves, and every crystal of its rocks, whether on the surface shining in the sun or buried miles deep in what we call darkness, is throbbing and pulsing with the heartbeats of God (49, p. 76).

For whatever reasons, these concepts of man's relationship to

nature and God, and of the good that might accrue to man as a result, did not carry over into the "conservation movement" that began in the United States in the first decade of this century.

The word conservation had, until the end of the nineteenth century, been a lonely sleeping obscurity in the dictionary but almost overnight it became the label of a national issue. Though the concept first applied to forest preservation the word began in the late nineteenth century to be used for the conservation of natural resources.

That movement has been described as the ". . . most conspicious cause on the American political scene . . . the like of which we shall not see again" (43, p. 189). Although "on its face the conservation movement is material--ultra material . . . in truth . . . it was firmly grounded in ethics . . ." (42, p. 46).

Of the movement Pinchot (53) said:

> . . . the idea was so new it did not even have a name. Of course, it had to have a name. Our little inside group discussed it a great deal. Finally Overton Price suggested that we should call it 'conservation' and the President said 'O.K.'. So we called it the conservation movement (p. 322).

In contrast to the concepts of Marsh and Muir, ". . . the passion which came from the political leadership which infused vitality into the movement, was arrogant and materialistic" (43, p. 191).

Literature that traces the early conservation movement from about 1900 to about 1950 indicates that the nation became aware of soil erosion problems about the turn of the century. For a short time many vigorously sought to do something about it but were soon confronted with special interest groups which believed they were being damaged. Legislators, administrators and the media of mass education were influenced; and most national conservation efforts that had been started were halted

or checked. Public interest subsided until the Great Depression and accompanying dust storms gave birth to a crusade to control soil erosion. (35, 38, 41). Literature is replete with references to the beginning of that era (41, 42, 43, 49, 52, 54).

If the soil conservation movement that began with Hugh Hammond Bennett's crusade against soil erosion provided a special stimulus for the development of a soil conservation ethic, it was in the embryonic stage for Leopold (31, p. 218) said in the late 1940s, "There is as yet is no ethic dealing with man's relation to the land." What is distinctive about the land ethic he continues is that it "enlarges the boundaries of the community to include soils, water, plants and animals, or collectively: the land" (31, p. 204). Echoing essentially the same concept enunciated a century earlier by George Marsh, Leopold (31, p. 222) held that conservation is the attainment and maintenance of ". . . a state of harmony between man and the land." That ethics was implied in the concept of conservation is evident in the statement:

> All ethics so far evolved rest upon a single premise: that the individual is a member of a community of interdependent parts. His instincts prompt him to compete for his place in that community, but his ethics prompt him also to cooperate, (perhaps in order that there may be a place to compete for) (31, p. 219).

Leopold also believed that:

> . . . conservation is getting nowhere because it is incompatible with our Abrahamic concept of land, we abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect. There is no other way for land to survive the impact of mechanized man . . . (31, p. [X]).

Furthermore, conservation was being hampered because the concept of man-to-man ethics had not been extended to man-land relationships.

> It is inconceivable to me that an ethical relation to land can exist without love, respect and admiration for land, and a high

> regard for its value. By value, I of course mean something far broader than mere economic value. I mean value in the philosophical sense (31, p. 239).

Of what it takes to bring about what was needed, he said:

> No important change in ethics was ever accomplished without an internal change in our intellectual emphases, . . . affections and conviction . . . . Conservation has not yet touched these foundations of conduct (31, p. 225).

Stark evidence of the truth of Leopold's appraisal is contained in Lowdermilk's personal report of an extensive study of erosion he made in 1938 and 1939. After viewing and contemplating the record written on the land by earlier civilizations from the Holy Land of the Near East, he gave on one occasion what he believed God might have said through Moses had he addressed further man's responsibilities to the land. He might have said:

> Thou shalt inherit the Holy Earth as a faithful steward, consuming its resources and productivity from generation to generation. Thou shalt safeguard thy fields from erosion, thy living waters from drying up, thy forest from desolation, and protect thy hills from overgrazing by thy herds that thy descendants may have abundance.
>
> If thou shalt fail in this stewardship of the land thy fruitful fields shall become sterile, strong ground and wasting gullies. And thy descendants shall decrease and live in poverty or perish from off the face of the earth (34, p. 30).

This statement, which came to be known as an "Eleventh Commandment," would have commanded man to establish the relationship with the earth which Leopold believed so necessary. This relationship, Hyams (26) asserts, would profoundly modify the character of man.

Current Views

For the most part the current concern for the issue of ethics has arisen from relatively recent attempts to assess soil conservation policies and procedures in view of the continuing problem of erosion. In

searching for answers as to why erosion remains a severe problem after 50 years of cooperative effort between farmers and institutions and the expenditure of billions of dollars in private and public funds, ethics emerges as an issue. Bauer (4) and Barkley (2) suggest the last 50 years were not conducive to the development of a strong conservation ethic. Indeed some believe the current erosion problem is the direct result of the conservation ethic having been lost and plead for a return to ethics (69, 12). It has been said that conservation is ethics, and the conservation ethic once embraced must be rekindled and "preached" to the whole of society with the single-minded zeal and enthusiasm that characterized the conservation movement in the 1930s (66, 18).

What is really needed, according to McCormack and Larson (39, p. 403) is "a new land ethic and a new reverence for the land--one that won't let harm come to the soil." Almost as if in response to this perceived need Professor Graham Ashworth of Salford University in England included in a new code of ethics prepared for the Piedmont Environmental Council the prescription, "If you are presently trusted with the management of a piece of land, you ought to use it in a manner that benefits the land and does not damage it" (3, p. 61).

In the context of Ashworth's land ethic prescription, Sampson (58) suggests it is not enough to say that land owners/operators should avoid abusive land uses without also adding how public officials and others should conduct themselves in trying to achieve proper land use and treatment. He also employs the ethical form to address the public's and elected and appointed individuals' responsibility to the landowner. One of his prescriptions reads: "You ought to recognize that land is an important part of our lives, and that we have strong feelings about the

right and responsibility that attend land ownership" (p. 303). Sampson suggests that a new statement of ethical behavior and responsibility on the part of both the private landowner and public policies and actions that affect his ability to use the land is a vitally important and timely national need (58).

Libby (32, p. 4) contends the institution of soil conservation is undergoing an "agonizing appraisal" and that "out of this must come, if the vitality of conservation is to be maintained and extinction avoided, a more careful statement of the rationale for conservation." He suggests it must contribute to a better understanding of <u>why</u> one conserves soil and argues that what is needed is a modern conservation ethic.

Collins (15, p. 35) points out that ". . . an ethic powerful enough to alter . . . land use must necessarily challenge other accepted habits and vested interests." He says:

> Land because it is so intrinsically important as a source of nurture for life . . . as well as being the basis for deeply-rooted Jeffersonian ideals of individualism and human freedom, is the battleground for the nation's future (p. 56).

Bruce (11, p. 12) believes that conservation ethics can provide the principles that will ". . . enable us to use the productivity of the biosphere in a fashion that meets the needs of present and future generations." He also shares the concern of others who have already been noted, that man should live in harmony with nature, and that future well being may well depend on incorporating an appropriate set of ethics in selecting policy options and decision-making (11).

Kaufman indicates that although ethics <u>per se</u> are rarely cited in day-to-day decision-making, ethical considerations are alive and well, although often subsumed, in the processes that lead to resource policies and decision-making (29).

Any new ethic must be a product of education and social evolution. It cannot be written, legislated, or imposed upon people. It must provide the bases to change first the way Americans think about land (27). Culver (19) indicates soil conservation is a "religion" and Reece (55) suggests respect for God's creation could provide the base for a new value structure.

Finally, the ethical issues and ethical dilemmas involved in soil conservation must be sorted out and better defined. And when this is accomplished, given the probability that some reality remains, "we must constantly, even tediously, preach the conservation ethic, repeating the litany of urgency" (44, p. 76).

Ethics

To situate soil conservation ethics properly within the more general discipline of ethics, it is necessary to review the nature of ethics. Ethics is a practical discipline which belongs to philosophy. "Its teachings are of the greatest importance to life. He who recognizes the goal at which he ought to aim is like the marksman who sees his target: he has far better chance of striking it than someone who just shoots at random" (7, p. 4).

The words ethics and morals are often used synonymously when reference is made indifferently to the ethics or the morality of a person or group, to their ethical or moral virtues or qualities. There is a clear etymological basis for this synonymy: the Greek word ethos, from which ethics is derived, and the Latin word mores, from which morals is derived, both mean habits or customs (24, 60). The ethics or morality of persons or groups, however, consists not merely of what they habitually or customarily do but of what they think is fitting, right

or obligatory in actual experience (57). Men's actions are often, but not always, a sign of what they believe. Their actions may diverge from their beliefs, and both actions and beliefs may differ from what men say they ought to do or believe (7, 50, 60, 74). Morality contains an inevitable normative element. Whereas a person may engage in habitual and customary conduct without any reflective thought, ethics always involve reflective evaluation or prescription concerning the conduct in question. Even when "customary morality" is spoken of, the reference of the term is not merely to the customs as such, that is regular, repeated sequences of behavior. It also includes the view, at least implicitly held by the participants, that what they regularly do is in some way right. It is not merely what is done, it is also what is to be done.

Traditionally ethics has been concerned with analysis, evaluation and development of normative moral criteria for dealing with moral problems (48). Ethics provides a set of moral principles (or perhaps only one moral principle) which is used in assessing what is morally right and what is morally wrong with regard to human action (7, 36).

The main discussion base for intra-ethical differences has been between the deontologists and the teleologists. The deontologists (Greek: deontos, "of the obligatory") who take as basic such concepts as right and ought, hold that other moral concepts are definable in terms of these concepts. The teleologists (Greek: teleios, "brought to its end or purpose"), on the other hand, take as basic such axiological concepts (Greek: axios, "worthy" or "valuable") as good and value; they hold that the deontic concepts are to be defined in terms of these concepts and that moral judgments are to be justified by reference to the goodness of the purposes or consequences achieved by these

actions. This difference largely determines their views of what makes certain kinds of actions morally right (21).

Deontologists typically hold that certain kinds of actions are inherently right or are right as a matter of principle because of the kinds of actions they are or because they conform to some formal principle. Teleologists, on the other hand, typically hold that actions are right because of the goodness of their consequences.

Normative Ethical Theories

The answers to the central question of normative ethics, that is, which actions are morally right and morally wrong, fall into two broad groups, deontological and teleological (60). The main difference between them is that deontological theories do not and teleological theories do appeal to value considerations in answering the question.

Deontological theories fall into two main groups, material and formal. Material theories hold that the criterion of the rightness or obligatoriness of actions consist in some feature either of the actions themselves or of the background of the actions. Formal theories hold that the criterion consists rather in some logically necessary relation between the judgments or rules in accordance with which the actions are performed.

Teleogolical theories of moral rightness emphasize the vital component that is lacking in deontological theories: goodness or value. An initial way of defining such theories is to say that, in contradistinction from deontological theories, they ground their moral rightness on actions, not on non-valuational features of the actions themselves or of their backgrounds or formal relational principles, but rather on the

consequences of the actions evaulated in terms of their non-moral goodness or badness.

Teological theories are differentiated from one another according to what they say is (1) the nature of the goods or values to be maximized and (2) the locus of the goods; that is, the persons or groups whose good is to be considered or for whose interests the goods are to be maximized. Egoism holds that the duty of each person is to maximize his own perspective good. Utilitarianism holds that what one should do is promote the maximum good for everyone, in other words, the general good.

Ethics and particularly normative ethical theories have obvious ramifications for some social problems of our time. Soil erosion is considered by some to be a social problem that impinges on the soil resource which is one of man's most important goods. Indeed it has been described as "an important symptom of a bad relationship between people and the soil" (30, p. 304).

Summary

Literature indicates the steady deterioration of the soil over the last ten thousand years. There have been calls from many articulate, knowledgeable spokesmen for the establishment of better man-soil relationships but these have been either unheard or mostly ignored. At the same time scientific and technological progress in the last fifty years have masked the effect of soil erosion on soil productivitiy. This has hindered the evolution of a soil conservation ethic that would help keep soil erosion within tolerable levels.

Many believe whatever soil conservation ethic might have existed, even for a short while, have been lost. Current erosion problems are

attributed to a neglected, if not lost, ethic. Consequently, those who are intimately acquainted with the problem and have seriously sought ways to overcome it, perceive that "ethics" may be the cornerstone on which all other efforts to conserve the soil are built.

CHAPTER III

METHODS AND PROCEDURE

Introduction

To determine the relationship between farmer-held soil conservation ethics and soil erosion a measure of both soil conservation ethics and soil erosion was needed. This chapter describes how the measures were obtained.

Sampling

This research utilized the sample drawn for the 1982 National Resources Inventory which is designed to appraise the status and condition of the Nation's soil, water and related resources. Prior to this research a stratified non-aligned, random sampling procedure developed jointly by the Soil Conservation Service and the Iowa State University Statistical Laboratory had been used by the Laboratory to determine the number of samples needed for different levels of reliability (i.e. state, major land resource area and county). Stratification of the counties is on the basis of primary sample units (PSU's) 160 acres in size. The location of selected PSUs that would give county-level reliable data had previously been noted on a small-scale map of each county in which the watershed lies. This researcher delineated that portion of the watershed in each of the counties on the maps and composed a map of the watershed which shows the location of PSUs in the research area.

The selected PSUs were located on published soil survey maps and a point at which data would be collected to estimate soil erosion was located within each PSU. The location of the point also had previously been determined through a random selection procedure by the statistical laboratory. A search of USDA Agriculture Stabilization and Conservation Service (ASCS) files was made to determine who farmed (owner or operator) the land on which the points were located. The name and address of the farmer were obtained so that he/she could be contacted and an interview arranged. Telephone numbers were obtained from telephone directories.

Forty-seven farmers were identified as farming the points within 52 selected PSUs. Five farmers were farming two points but only one of these points was used in this sample.

Of the 47 farmers identified, interviews were completed with 45. One farmer was in the last stage of a terminal illness and another did not wish to be interviewed "unless he had to." Obviously this was not the case so interviews were conducted with 45 farmers who manage 55,372 acres or 25 percent of the total area within the watershed. The location of the PSUs in which the points are located is shown in Figure 1.

Data for estimating soil erosion rates had previously been collected by the Soil Conservation Service (SCS) area and field office staffs on a few of the 45 points. Data were collected on the remaining points by this researcher and his colleagues in the SCS during the course of this research process.

Interview Schedule Design

The basic purpose of this research was to ascertain farmers' ethics in the context of conserving the soil resource. This necessitated the

development of an interview schedule designed to determine farmers' ethics toward soil conservation generally and soil erosion particularly. In as much as ethics is considered to be nebulous by some, this researcher decided to develop an instrument which could be administered in the presence of the respondent. The face-to-face interview was chosen because it yields higher quality data in that the interviewer can probe for added detail when the response suggests it is needed or would be helpful in the analysis of the information (59). The respondent oftentimes reveals significant information if he has the opportunity to "explain a little" of what he had in mind when he gave his response (65).

Types of Questions

The Interview Schedule employs a variety of question types noted by Warwick and Lininger (59). This researcher believed that due to the amount of information to be collected during the interview and the time required to conduct the interview, variety in approach would stimulate the respondent and facilitate the interview process.

1. Story Identification - The respondent was presented with a reasonably plausible vignette concerning the issue of soil erosion and asked to indicate his own position with respect to those expressed.
2. Frequency Scales - The respondent was asked to rate an event in the single dimension of frequency, that is, "how often" the concern for erosion enters the decision-making process of using and managing the soil.

3. Intensity (Likert) Scale - The respondent was presented with a statement, and on a continuum from "strongly agree" to "strongly disagree", asked to indicate his position regarding the statement on this five-point rating scale.
4. Checklists - The respondent was read a statement and shown a list of possible answers and asked to indicate those that applied.
5. Semantic Differential Method - The respondent was presented with two opposite statements--very positive on one end and very negative on the other end and asked to indicate his position on a seven-point intervening scale.
6. Objective Information Questions - These questions were used to obtain fairly precise land and owner/operator information.

Pretest

The Draft Interview Schedule was reviewed by professors of Agronomy, Agricultural Economics, and Communication and Speech. It was pretested with five farmers in Payne County, Oklahoma to evaluate the interview items and to determine the amount of time required to compute the interview. The reviews and pretests provided information which helped sharpen the focus of the instrument. The final schedule is included as an Appendix.

Soil Loss Estimation

The Universal Soil Loss Estimation Equation (USLE) was used to determine erosion rates (63). The erosion rate at a given site is determined by the particular way in which the levels on numerous physical and management variables are combined at that site. Physical

measurements of soil loss for each of the large number of possible combinations in which the levels of these variable factors can occur under field conditions would not be feasible. The USLE was developed to enable conservation planners to project limited erosion data to the many localities and conditions that have not been directly represented in the research.

The USLE is an erosion model designed to predict the longtime average soil losses in runoff from specific field areas in specified cropping and management systems. Widespread field use has substantiated its usefulness and validity for this purpose.

With appropriate selection of its factor values, the equation computes the average soil loss for a multicrop system, for a particular crop year in a rotation, or for a particular cropstage period within a crop year. It computes the soil loss for a given site as the product of six major factors whose values at a particular location can be expressed numerically. Erosion variables reflected by these factors vary considerably about their means from storm to storm, but effects of the random fluctuations tend to average out over extended periods. Because of the unpredictable short-time fluctuations in the levels of influential variables, however, the USLE is substantially less accurate for prediction of specific events than for prediction of longtime averages.

The soil loss equation is:

$$A = RKLSCP$$

where:

A is the computed soil loss per unit area, expressed in the units selected for K and for the period selected for R. These are

so selected that they compute A in tons per acre per year.

R, the rainfall and runoff factor, is the number of rainfall erosion index units, plus a factor for applied water where such runoff is significant.

K, the soil erodibility factor, is the soil loss rate per erosion index unit for a specified soil as measured on a unit plot, which is defined as a 72.6-ft length of uniform nine-percent slope continuously in clean-tilled fallow.

L, the slope-length factor, is the ratio of soil loss from the field slope length to that from a 72.6-ft length under identical conditions.

S, the slope-steepness factor, is the ratio of soil loss from the field slope gradient to that from a nine-percent slope under otherwise identical conditions.

C, the cover and management factor, is the ratio of soil loss from an area with specified cover and management to that from an identical area in tilled continuous fallow.

P, the support practice factor, is the ratio of soil loss with a support practice like contouring, stripcropping, or terracing to that with straight-row farming up and down the slope.

The National Resource Inventory's Data Worksheet, which this researcher helped develop, was used for recording the data collected.

Data Collection Procedures

Since a major part of the study area lies within the Deer Creek Conservation District, before any farmers were contacted this researcher attended a meeting of the directors of the district to inform them of the

nature and purpose of the planned research. The proposed research was heartily endorsed and the chairman suggested that the board write a letter to each of the farmers who had been selected for interviews introducing this researcher and providing a brief explanation of the research. The letter provided an open door for easy access to the farmers when this researcher was trying to arrange interviews with farmers in the Deer Creek District. A letter was not sent to farmers who lived in other conservation districts and although arranging for interviews was never difficult the effect of the letter was sorely missed.

Schedules for interviews were developed a day in advance by contacting farmers between 7:30 p.m. and 10:30 p.m. and arranging for interviews on the following (or later) day. The earliest interview was at 7:00 a.m. and the latest at 9:30 p.m. The number of interviews per day ranged from three to seven.

Most interviews were conducted in the family room or breakfast room in the farmer's home. Two interviews were conducted in a local restaurant, one in the researcher's motel room and one in the researcher's automobile.

The Interview Schedule was administered by the researcher. As the statements were read, the respondent made his choice, and the schedule was marked appropriately. For those statements that required the respondent to "agree" or "disagree", a 5" x 8" card with the five possible responses printed on it was provided to the respondent. This helped facilitate the process and allowed an equal possibility of being chosen for each response category. The respondents were permitted to view the schedule itself when checklist items or objective information (e.g., income) were being considered.

To obtain physical data needed to estimate the rate at which soil is being lost through erosion each of the 45 sample points was visited. Land cover and land use were determined by observing the site. Percent slope was measured and length of slope estimated. Soil conservation measures and practices that had been installed were noted. All of the data were recorded on the Inventory Data Worksheet.

Statistical Analysis

The statistical analysis was performed using the Statistical Analysis System (SAS-795). A table of correlation coefficients for several variables: ethic, soil loss, concern for future generations, break-out of new land, soil stewardship, mandatory soil conservation, and conservation effort was generated.

The analysis of variance procedure was used to determine whether differences in the dependent variables were related to differences in the independent variable. The general one-way ANOVA setting has a null hypothesis that all means are equal versus the alternative--at least one different mean. Duncan's New Multiple Range Test was employed to try to determine which mean(s) were different, i.e. how the means actually grouped.

A "t-test" was used to determine if the mean ethic was the same for farmers who had adopted soil conservation practices as for farmers who had not adopted soil conservation practices.

On some items in the interview schedule, there seemed to be inconsistencies in farmers' responses. A chi-square contingency table was produced to determine whether the apparent inconsistencies were real. The results of this analysis indicated that the apparent inconsistencies amoung respondents were not statistically significant and were therefore ignored.

The Interview Schedules and Inventory Data Worksheets provided the structure and the data for statistical analysis. Statements included in the Interview Schedules relating to ethics per se were designed to yield interval data that could be subjected to statistical analysis. A soil conservation ethic was "constructed" by using 22 of the items in the Interview Schedule. Sample farmers responses to items 1, 9-12, 14, 15, 17, 19, 21, 27, 29, 30, 35-41, 45 and 46 (see Appendix) were summed to obtain an ethics score. An attempt made to determine the "degree" of ethic held by each farmer. Also, an attempt was made to determine the effect of the ethic on soil erosion by comparing it with the soil loss estimated at the sample points.

For this research, erosion rates were determined utilizing USLE "program" developed by SCS personnel in Oklahoma.

Summary

This research explored the relationships between farmers' soil conservation ethics and soil erosion. To obtain data needed a sample which had been drawn previously using a stratified, non-aligned, random sampling procedure was utilized in selecting sample farmers and soil sites. Forty-five farm owners/operators were selected for interviewing, and a point on a farm operated by each of the sample farmers was identified. An Interview Schedule was developed for conducting face-to-face interviews and used for collecting information relating to the soil conservation ethic. Field methods, including on-site observation and measurements, were employed in collecting physical data needed to estimate soil loss. The SAS system was used in analyzing the data.

CHAPTER IV

RESEARCH RESULTS

Introduction

All of the data collected for this research were obtained through interviews and direct observations. Information obtained during interviews was recorded on the Interview Schedule; and soil, climate, and crop data were recorded in the field in a section of the Inventory Data Worksheet. The purpose of this chapter is to provide a summary of the more significant aspects of the research.

Farmer Characteristics

Information about the farmer was obtained in order to ascertain the relationship between selected characteristics and the farmers' soil conservation ethic. Variables on which information was collected included age, formal education, years of farming experience, nature of ownership, lease/rent arrangements, income, place of residence, etc. A description of these characteristics follows.

Age

The age of farmers was considered an important variable since the values and norms of one's upbringing could affect one's feelings for the soil. Age is also important because as one gains more experience working with the soil the nature of the relationship could possibly change.

The ages of those surveyed ranged from 25 to 75 years. Note in Table I that about 75 percent of the farmers are over 44 years of age which suggests that fewer young people are entering farming than in the last generation.

TABLE I

AGES OF FARMERS BY GROUPS IN DEER CREEK WATERSHED

Age Group	Number	Percent of Total
Under 34	6	13.3
35 - 44	6	13.3
44 - 54	13	28.9
54 - 64	13	28.9
Over 65	7	15.6
Total	45	100.0

Education

Formal education, like age, could also have a significant affect on one's relationship with the soil. To ascertain the influence of education on the soil conservation ethic information concerning the sample farmers education was obtained. It was discovered that the amount of formal education that farmers have varies from the sixth grade to doctor of philosophy. The years of formal educational level attained is indicated in Table II.

TABLE II

FORMAL EDUCATION OF SAMPLE FARMERS IN DEER CREEK WATERSHED

Years of Formal Education	Number	Percent of Total
Less than 12	5	11.1
12 - 15	29	64.5
16 or more	11	24.4
Total	45	100.0

This researcher, regardless of the formal educational level achieved by the respondents, was impressed with the knowledge, skills and abilities of those interviewed. Without exception during the interview process each demonstrated in-depth knowledge of some facet of the farm economy in general and soil conservation in particular. Not only did they have a "handle" on the basics of farming, they were well informed on the then current political and economic issues that impact on farmers' present and future prospect. All of those interviewed would be able to understand the jargon of any number of "technical specialists", who might provide some kind of special assistance.

Experience

The respondent's farming experience is shown in Table III. The amount of farming experience ranged from four to 60 years. In response to the question as to how many years he had been farming, the farmer with 60 years' experience said, "I have been a custodian of this land 60 years."

Note that about 65 percent of the respondents have more than 24 years' experience.

TABLE III

YEARS OF FARMING EXPERIENCE OF SAMPLE FARMERS IN DEER CREEK WATERSHED

Years of Farming Experience	Number	Percent of Total
Less than 10	4	8.9
10 - 24	12	26.7
24 - 45	24	53.3
More than 46	5	11.1
Total	45	100.0

Ownership

Eighty-seven percent of the farmers interviewed were both owners and operators. Eight percent were operators only (tenants) and four percent were owners not actually engaged in farming.

It is sometimes said that how one obtains ownership of the land influences the subsequent care and concern the owner provides the land. In response to the question designed to ascertain how land was acquired, 84 percent of the sample indicated it had been purchased. Twenty percent of the respondents indicated they had inherited land. One owner received his land as a gift.

Joint ownership with the spouse was indicated by 61 percent of those owning land. Twelve percent indicated land was owned in partnership with others, mostly family members. Nine percent were operating as a corporation. Various combinations of these kinds of ownership were also indicated.

Rent/Lease Arrangements

Ninety-one percent of the respondents rent or lease land from others, whereas only 13 percent rent or lease land to others. Seventy-three percent of these who rent or lease from others are required by the owner to protect the soil from erosion. Although 18 percent of the respondents indicated they were not formally required to practice conservation, according to the respondents it was mutually assumed by both owner and operator, that conservation farming would be practiced and the soil protected from erosion. Sixty-one percent of those who own land have developed conservation plans on the land they own, but 39 percent have not developed conservation plans. It is interesting to note that although 74 percent of the respondents indicated farmers are more likely to protect soil they own from erosion than soil they rent, a larger number, 75 percent, have developed conservation plans on land they rent or lease from others than on land they own (61 percent).

Income

Respondents' income in 1981 varied greatly. Net farm income ranged from none to more than $50,000.00. Income for 1981, by source and category is indicated in Table IV.

It is interesting to note in the table that near the low end of the

TABLE IV

SAMPLE FARMERS 1981 INCOME BY SOURCE AND CATEGORY

Category	Number	Percent of Respondents
Net Farm Income:		
(Loss)		
No income	4	8.9
More than $10,000	8	17.8
1 - $9,999	3	6.6
(Gain)		
0 - $6,999	3	6.6
$7,000 - $9,999	5	11.2
$10,000 - $14,999	2	4.4
$15,000 - $19,999	4	8.9
$20,000 - $24,999	6	13.4
$25,000 - $49,000	9	20.0
More than $50,000	1	2.2
Total	45	100.0
Non-Farm Income:		
None	3	6.6
0 - $6,999	5	11.2
$7,000 - $9,999	5	11.2
$10,000 - $19,999	6	13.4
$20,000 - $24,999	3	6.6
$25,000 - $49,999	11	24.4
More than $50,000	12	26.6
Total	45	100.0

range in Net Farm Income, 17 percent lost more than $10,000.00 whereas in the upper income level about 20 percent received between $25,000.00 and $50,000.00. Non-Farm Income, mostly from oil and gas leases and royalties, exceeded Net Farm Income in 1981. Fifty-one percent received Non-Farm income of more than $25,000.00 which provided additional money for investing in soil conserving measures if money for that purpose had been lacking in the past.

Place of Residence

All of those interviewed live in the watershed. Seventy-five percent of them live on the farm, and the rest live in one of the towns in the watershed. In some instances farmers in the sample were next-door neighbors in town. The fact that so many live on the land may have affected their soil conservation ethic. Also being neighbors in town may have provided some respondents the opportunity for nourishing their soil conservation ethic.

Size of Farming Operation

The average size of operation which the respondents manage is 1,228 acres. The smallest operation is 160 acres and the largest is 8,000 acres. The size of the farming operation itself could be a significant variable in the relationship between the soil conservation ethic and soil erosion. Even some of the respondents voiced concern that some farming operations had become so large they were afraid the operators could not "say grace" over them.

Farmers' Perception of Soil Erosion

Others have suggested farmers' perception of the seriousness of soil erosion indicates to some degree their awareness of the problem (22) and its influence in their decision-making process. Therefore, several questions were asked to ascertain those perceptions.

When presented with a reasonably plausible vignette concerning the seriousness of soil erosion as a threat to civilization, 85 percent of the respondents agreed with the imaginary person who believed soil erosion is a serious problem and a threat to civilization which could lead to disaster if allowed to continue unchecked. Many noted that the decline and eventual decay of some earlier civilizations could be attributed to the ravages of soil erosion. Some of the respondents personally experienced the Dust Bowl that devastated the Plains and vividly recalled the impoverished land and people left in its wake. Many expressed concern that the public in general was unaware, maybe unconcerned, that soil erosion could destroy the land and impoverish the people. Sixty-seven percent of the respondents believed their nearest neighbors would agree with their appraisal of the problem. Interestingly, the remaining 33 percent indicated their neighbors would agree with the imaginary person who said, "the soil erosion problem is exaggerated and that a civilization is not affected by erosion."

Farmers' perception of the erosion problem and the progress being made to control it are indicated in Table V.

TABLE V

FARMERS' PERCEPTION OF SOIL EROSION
IN DEER CREEK WATERSHED

	On your Farm	In The Watershed	In The State
Current Problem:			
Major	12	12	14
Moderate	19	27	28
Minor	14	4	0
Uncertain	0	0	3
Progress Being Made:			
Much	16	14	10
Some	28	30	30
Little or none	1	1	0
Uncertain	0	0	5

There was no consensus among respondents as to the degree of severity of the soil erosion problem on their farms. About 60 percent think it is a moderate problem in the watershed and in the state. When questioned as to what they considered in making the response, the persistence of the phenomenon itself, the loss of soil and plant nutrients which is considered a bank account, maintenance of conservation measures established on the land, and off-site (including on farm) damage were most often mentioned.

About 67 percent of the respondents indicated they believe some progress is being made in the battle with erosion on their farm, in the watershed, and in the state. Many of those who indicated much progress is being made hastened to add, "but we still have a long way to go."

About 58 percent of the respondents indicated that the amount of soil being lost on their farm today is lower than it was five years ago.

Conservation structures, cropping systems, and tillage methods employed are good indications of the farmers' commitment to care for and protect the soil from erosion. All of the respondents indicated they utilize terraces in their effort to control erosion, and contrary to what is sometimes charged (28), have exercised care which make them effective. Terraces reduce effective slope length and thus reduce runoff accumulation and flow velocity which reduces soil loss and prevents gully formation. Greatest benefits are obtained when contouring accompanies terracing and about 90 percent of the respondents indicated they practice contour farming.

Many farmers suggested that the principles and standards governing terraces should be reevaluated in view of larger implements now used on farms. Specifically they believe distances between terraces should be increased to better accomodate large equipment. They realize this would result in higher initial installation costs because more earth would be moved in constructing larger terraces; but believe it would result in lower maintenance costs and reduced erosion in the long run because more farming would be done on the contour.

Two respondents noted with pride that the first terraces built in the county in which they lived were built on their farms. The respondents indicated the terraces have been properly maintained and are still functioning satisfactorily. While reminiscing about the advent of terraces as a soil conservation measure, both of these respondents related that their fathers vehemently opposed the installation of terraces saying they would ruin the soil and make it impossible to farm. One of the

respondents noted that terraces caused more enmity between his father and himself than had any other issue. The other respondent recalled that his father left home before installation began and did not return until it had been completed.

Conservation tillage increases water infiltration and reduces runoff and erosion. A variety of names have been given to individual tillage systems that provide erosion control by leaving crop residue on the surface. Seventy-two percent of the respondents indicated some kind of conservation tillage is practiced on their farm. About 94 percent of the respondents indicate other conservation measures and practices including diversions, grassed waterways, drop structures and chutes, sediment dams, etc., are used to help control erosion.

Ninety-eight percent of the respondents believe farmers have the primary responsibility to protect the soil from erosion, and 85 percent believe it is the farmer who must finally decide whether the soil will be protected from erosion. Thus they would have agreed with Hugh Bennett that soil conservation is ultimately a one-person task (45). How well farmers think they are meeting that responsibility on their own farm is indicated in Table VI. It is interesting that when viewed from the perspective of what is presently being done versus what should be done to control erosion, fewer believe they are doing <u>all</u> or <u>most</u> of what they should do whereas a greater number indicate they are only doing <u>some</u> of what they should do.

TABLE VI

FARMERS' ASSESSMENT OF THEIR EFFORTS TO CONTROL EROSION

Farmers Perspective	Number	Percent
Presently Doing		
I'm doing all I can do	6	13.3
I'm doing most of what I could do	31	68.9
I'm doing some of what I could do	8	17.8
Total	45	100.0
Should Be Doing		
I'm doing all I should do	4	8.8
I'm doing most of what I should do	25	55.5
I'm doing some of what I should do	16	35.7
Total	45	100.00

Eighty-eight percent of the respondents believe most farmers are aware of the assistance available from government in the battle against erosion. Sixty-six percent indicate that of current conservation programs available a combination of technical assistance and cost sharing is most conducive to getting soil conservation practices applied to the land. Technical assistance and cost sharing are perceived by most sample farmers as complementing each other. About 8 percent of the respondents suggested government should not be involved in farming, including soil conservation.

Sixty-seven percent of the respondents indicated that farmers believe the public should share in the cost of protecting the soil from erosion. Ninety-one percent believe farmers would increase their investment in conservation and adopt more erosion control practices if

better tax advantages, more technical assistance, and greater cost sharing were available.

About 75 percent of the respondents agreed with the statement "the current erosion problem is largely the result of farmers relaxing their efforts to control erosion in the face of a combination of increased farming costs, high inflation and low farm prices." In this researcher's opinion, the respondents considered the world "outside" the watershed in responding to the interview statement. This opinion is based on the fact that during the interview period and process many farmers noted they had learned from television and the printed media the serious current erosion problem in other "depressed" parts of the nation. They recalled seeing the Secretary of Agriculture and others whom they believed knowledgeable of the situation being interviewed on television and his/their attribution of these factors to the problem. It is also based on the fact that many respondents noted "there is always enough money to protect the soil from erosion." Clearly, the evidence indicates the respondents have not relaxed their commitment to conserve the soil.

Farmers' Consideration of Soil Erosion In Decision Making

One objective of this research was to determine the influence that farmers' concern for erosion had on their soil use and management decisions. Although the majority (58 percent) of respondents indicated they know some soils are more erosive than others, they indicated they do not know how much top soil each kind of soil could lose and remain productive over time. Ninety-one percent of the respondents indicated that if farmers learned that an excessive amount of soil was being lost from their

fields they would attempt to reduce the loss to tolerable levels. They agree with others that this would be in their best interest (17).

Approximately 42 percent indicated that in the planning process, erosion is considered all of the time, 51 percent indicated it is considered most of the time, and six percent take it into account some of the time. Seventy-five percent of the respondents believe those who do not consider erosion in their decision-making process and allow their soils to erode unchecked are aware of the damage to the soil itself and that erosion causes other problems.

Farmers treasure the freedom they have to choose how to use and manage their land. Ninety-nine percent of the respondents believe that the farmer ultimately decides whether the soil is protected from erosion. And 100 percent of the respondents believe that as long as their decisions demonstrate their acceptance of the responsibility to care for and protect the soil from erosion, they will continue to have freedom to use and manage their soils as they wish.

Farmers' Concern for Future Generations

Although it is argued future generations have no rights (20) sample farmers are concerned about the next and later generations. Eighty-nine percent of the respondents feel an obligation to pass the soil on to those who come after them in as good or better condition than they received it. Indeed, 99 percent consider the soil a God-given resource that is theirs for a time but also held in trust for the future. All of the respondents believe farmers' feeling of stewardship leads them to adopt erosion control practices that do not increase their immediate income.

Ninety-nine percent of the respondents believe that investments they

make in soil conservation may benefit future generations more than themselves. Eighty-nine percent believe the care and protection they are now providing the soil will guarantee adequate soil resources in the future. Indeed, many are instructing those to whom they will leave the farm in how to continue the husbandry they have provided. For example, one of the older respondents related how, just a few days before the interview, he had taken his only heir over all of his farm and explained to her how the land should be managed when she becomes the decision maker. He informed her that those to whom she might rent or lease some of the land would try to persuade her to allow them to use for cropland some steep slopes but that it should not be permitted. He explained to her that the soils on those slopes were naturally shallow and should not be subjected to increased erosion that would inevitably follow their conversion to cropland.

Farmer's Feelings Toward the Soil

Ninety-four percent of the respondents indicated they have a special love for the soil and believe there are right ways and wrong ways of treating it. They also indicated there are standards against which they measure their own behavior toward the soil. These standards serve as principles and guidelines which suggest how farmers ought to behave toward the soil. And although they have not as yet been prescribed in writing, the respondents were evenly divided over the question as to whether they should be written. Some said they expect farmers to be responsible for themselves and a code of ethics is not needed. However, because some see farmers lacking in personal responsibility they would agree with Berhman (5) that a written code of ethics might be beneficial.

Whether written or not, 89 percent of the respondents indicated these principles are basic and are more important in determining whether a farmer does or does not protect the soil from erosion than are ever-changing economic, social, and political issues.

In an attempt to ascertain the source of these principles, respondents were shown a list of people and places--which included grandparents, parents, school, Bible, neighbors, experience, all of these, other, and uncertain--and asked to check those that were applicable. No one was uncertain as to the source of these principles. Fifty-five percent of the respondents indicated that the principles were learned from parents and through experience. Grandparents, school, the Bible and neighbors were noted as a source by about 20 percent of the respondents. About 20 percent indicated all of the sources listed contributed to their feelings for the soil.

The State of the Conservation Ethic

Some statements in the interview schedule were designed to ascertain the "status" of the perceived "conservation ethic". Sixty-six percent of the respondents do not believe today's soil erosion problem is the result of farmers having "lost" their conservation ethic to the extent that they no longer care for their soil. The remaining 33 percent of the respondents would attribute the current problem to a loss of "conservation ethics". It is not a contradiction that about 66 percent of the respondents also believe "that today's farmers do not feel as 'close' to the soil, that is, they do not have as much 'love and respect' for it as did the farmers thirty years ago." At first glance it would seem there might be a contradiction in these statements.

However, statistical analysis indicates there is no contradiction.

A chi-square test of sample farmers' response (f) shown in Table VII indicates χ^2 2.376, df=1, and $p > .10$. Thus the relationship between items 32 and 33 is not statistically significant.

TABLE VII

CHI-SQUARE TEST TO DETERMINE THE RELATIONSHIP BETWEEN ITEMS 32 AND 33 IN THE INTERVIEW SCHEDULE

	Farmers today do feel close to the land	Farmers today do not feel close to the land	
Soil erosion is the result of the "lost" conservation ethic	f=12 26.7 percent	f=17 37.8 percent	29
Soil erosion is not the result of the lost conservation ethic	f=3 6.6 percent	f=13 28.9 percent	16
Total	15	30	45

Seventy-eight percent of the respondents believe some of the "spirit" has gone out of conservation and that a revival led by zealous and enthusiastic "preachers" who exhort farmers to be good stewards of the soil is needed. Some hastened to add they did not expect an immediate revival because they believe the spirit may also have gone out

of the leaders! Cutler (19) would have been pleased to hear, as this researcher did, that the kind of zeal and enthusiasm exhibited by Hugh Hammond Bennett and Angus (T-Bone) McDonald are needed again. Perhaps this is what Peter Myers, the nation's "chief" soil conservationist is promising (16).

Although most believe farmers have good intentions, 94 percent of the respondents indicated that farming was was a lot like religion in that participants in both need to be reminded that "good works" are also necessary. Call it elan or esprit, these farmers indicated they needed to sense being a part of a soil conservation movement committed to better protection of the soil from erosion.

An attempt was made to determine what might cause the diminution of the soil conservation ethic. Since this researcher often hears that modern farming methods and farm implements are largely reponsible, a statement which addressed this possibility was included in the Interview Schedule. This research area provided a good test of this attribution because all of the respondents employ the very latest technology. About 66 percent of the respondents indicated that modern farming methods and implements had not removed the farmer so far from the soil that he had lost contact with, and even "feelings" for, the soil. The remaining respondents (34 percent) indicated modern methods and machinery had in effect estranged the farmer and the soil. Just to be sure this did not happen to him, one respondent related to the researcher that occasionally he would "get on that old tractor you saw back there and ride around a freshly plowed field and smell the good earth."

Some Factors Which Contribute To Increased Risk of Erosion

Although farmers know the soil should always be protected from erosion, situations do arise in which they may choose to use and manage the soil in ways which they normally do not do and risk more erosion. When asked how often they make such decisions, 62 percent indicated they might make such a decision once in five years, 33 percent indicated they might make such a choice twice in five years, and two respondents suggested they might make such a decision about half the time. The two making this response suggested that in reality, every time the decision is made to disturb the soil, the risk of erosion is increased, given the unknowns of climate, and especially rainfall and drought.

Probing further for reasons as to why farmers might choose to use the soil in such ways as to increase the risk of erosion revealed that about 66 percent of the respondents believed the major reason was the need for additional income to meet special and especially unforeseen needs. College tuition for children was given as an example of a special need and catastrophic illness as an example of an unforeseen need.

About 13 percent of the respondents indicated goverment policies and/or programs contribute to the erosion problem. The method by which wheat allotments are determined, according to the respondents, exacerbates the erosion problem. Crop history is an important consideration in determining the acreage of wheat a farmer can produce and be eligible to participate in government price support programs.

Since acreage allotments are based on the acres of wheat produced in prior years, the farmer, wishing to maintain the maximum acreage, is prone to crop soils that are subject to excessive erosion to maximize the

acreage allotment. Respondents contend those farmers who, take soil out of wheat production because they are concerned that the soil is severely eroding, are penalized through the allotment process for caring for their soil. Although the farmers' concern that they are caught in a dilemma appears to be valid, it is beyond the scope of this research to probe more deeply into the issue.

Compulsory Soil Erosion Control

The rights acquired through fee simple ownership are prized by farmers (10). About 89 percent of the respondents indicated they do not feel as commonly alleged (13) that they have the "right" to use and manage their soil totally oblivious to their responsibility to society. Thus these respondents agree with what Thomas Jefferson is reported to have said about ownership and rights (1). Although strongly averse to soil erosion, about 74 percent of the respondents would not favor forcing farmers who are either unwilling or unable to reduce soil loss to tolerable levels to do so. The remaining 26 percent would favor some sort of mandatory control to ensure the soil resource is protected from erosion. Many of these only reluctantly agreed with the interview schedule statement which purposely emphasized the words mandatory and forcing. What they prefer is to see erosion made extremely unpopular even to the point of exercising some sort of community sanction, as a penalty for not providing better care and protection of the soil.

Many of the respondents mentioned they knew at least one farmer for whom they wished there were a "law" by which he could be forced to control the erosion occurring on his farm.

All of the respondents manifested a benevolent attitude toward those

who make some effort to keep soil losses within tolerable levels but are not completely successful. They would favor making special efforts to help them achieve better erosion control.

Sample Farmers' Description of Other Farmers in Deer Creek Watershed

One section of the interview instrument contained some reasons why farmers use and treat their soil as they do. A semantic technique was used with a seven-point scale with a positive or negative phrase at either end of the scale. For example, to obtain a measure of the respondents' opinion of other farmers' stewardship, respondents were shown the material presented here as Table VIII and asked to check (✓) the space which they thought best described the farmers in the community.

The responses (numbers in the spaces) in Table VII show a belief by sample farmers that their neighbors in the watershed share a consistent set of principles. These may be described as follows:

1. They are good stewards of the soil.
2. They are concerned about future generations.
3. They care about what their neighbors think of their farming operation.
4. They believe the soil is special and should be conserved.
5. They recognize the impact of farming on the environment.
6. They are aware of the effects of erosion on water quality.

There is obvious uncertainty as to whether respondents believe those in the community work together as a group in their efforts to control soil erosion. A majority indicated they do work together, however.

TABLE VIII

SAMPLE FARMERS' OPINIONS AS TO WHY OTHER FARMERS IN THE DEER CREEK WATERSHED USE AND TREAT THEIR SOILS AS THEY DO

They have a deep sense of steward-ship toward the soil.	3	27	8	5	11			They do not have a deep sense of stewardship toward the soil.
The are con-cerned about future generations' needs for soil.	25	10	5	1	4			They are not concerned about future genera-tions' needs for soil.
They care about what their neighbors think.	1	33	8	9	2	2		They do not care about what their neighbors think.
They believe the soil is special and worth protecting.	6	31	4	3				They do not believe the soil is special and worth protecting.
They work together as a community to control soil erosion.	2	10	14	9	2	8		They do not work together as a community to control soil erosion.
They are conscious of the impact of farming on the total environment.	4	24	8	5	4	1		They are not conscious of the impact of farming on the total environment.
They are aware of the effects of soil erosion on water quality.	7	24	4	4	3	3		They are not aware of the effects of soil erosion on water quality.

Leadership for Soil Conservation

When asked from where they believed future primary leadership should come, about 76 percent indicated the local conservation district. This is not surprising since the Deer Creek Conservation District has provided assistance to most of the respondents in their effort to reduce erosion on their farms. Those respondents noted that although soil erosion is a national problem, local leadership is needed to develop new approaches to soil conservation and to lead in adapting national policies and programs to local needs. They perceive the Deer Creek Conservation District as an effective liaison between the United States Department of Agriculture (USDA) and those who farm in the District.

About 18 percent of the respondents indicated they believed future primary leadership should come from USDA. These respondents were considering the "big-picture" when making their response, and believing that soil erosion is a national menace, think national leaders play an important primary role in developing policies and programs that address the problem. These respondents also noted the important role the local district plays in implementing any policy or program developed by "higher-ups."

Six percent of the respondents indicated that future leadership should come from the Oklahoma Conservation Commission. While not eliminating entirely the USDA role, they recommend it be diminished and the state assume a larger role in developing soil conservation policies and programs. They also see the local district as a liaison between the Commission and farmers.

Estimated Soil Erosion Rates

Soil erosion refers to the physical removal of surface soil by the action of water and wind. (Wind erosion was not a concern of this research.) Although human use is the major cause of soil erosion, erosion is not an inevitable concomitant of cultivation. By matching crops and soils, and utilizing soil conserving practices that improve water absorption and water holding capacities of the soil, it is possible to use the soil and at the same time prevent it from being wasted through erosion. Any measure which helps prevent rapid movement of water over the surface, helps achieve erosion control.

The rate of soil erosion is estimated by the USLE which integrates physical parameters of rainfall energy, soil erodibility, percent slope and length of slope with management practices such as contour tillage and terraces, to estimate the average annual soil loss over several years.

Data were collected at one point on land owned or operated by each of the sample 45 farmers to determine the rate at which soil is presently being lost through erosion. Data on the kind of soil, T-value, estimated soil loss and land use for each point are presented in Table IX. The entries in the column, Soil Loss, denote estimated soil erosion in terms of tons per acre per year.

Analysis indicated the estimated soil loss on 84 percent of the points for which erosion was calculated was well below established soil loss tolerance. The average annual soil loss for all points is 2.10 tons per acre per year.

To determine whether soil losses are exceeding the estimated

TABLE IX

ESTIMATED SOIL LOSS AT SELECTED SAMPLE POINTS IN DEER CREEK WATERSHED

Point Sample	Soil Name	Soil Loss	T-value	Land Use
1	St. Paul silt loam, 4% slope	.01	5	Rangeland
2	Minco silt loam, 2% slope	.04	5	Rangeland
3	Pond Creek lime sandy loam, 1% slope	.07	5	Pastureland
4	Shellabarger fine sandy loam , 1% slope	.30	5	Wheat
5	Shellabarger fine sandy loam, 1% slope	.32	5	Wheat
6	Pond Creek silt loam, 4% slope	.40	5	Wheat
7	Woodward silt loam, 8% slope	.51	3	Rangeland
8	Pond Creek silt loam, 5% slope	.63	5	Wheat
9	St. Paul silt loam, 2% slope	.66	5	Wheat
10	Pond Creek silt loam, 1% slope	.69	5	Wheat
11	St. Paul silt loam, 3% slope	.69	5	Rangeland
12	Shellabarger fine sandy loam, 3% slope	.76	5	Wheat
13	Dale silt loam, 1% slope	.78	5	Wheat
14	Cornick silt loam, 9% slope	.79	1	Rangeland
15	Pratt loamy fine sand, 4% slope	.82	5	Wheat
16	Shellabarger fine sandy loam, 1% slope	.83	5	Wheat
17	St. Paul silt loam, 1% slope	1.02	5	Wheat
18	Shellabarger fine sandy loam, 5% slope	1.06	5	Rangeland
19	Shellabarger fine sandy loam, 2% slope	1.12	5	Wheat
20	Dale silt loam, 1% slope	1.35	5	Wheat
21	Grant loam, 3% slope	1.49	5	Wheat
22	Pond Creek silt loam, 1% slope	1.55	5	Wheat
23	St. Paul silt loam, 2% slope	1.62	5	Wheat
24	Pond Creek silt loam, 2% slope	1.69	5	Wheat
25	Carey silt loam, 3% slope	1.86	5	Barley
26	St. Paul clay loam, 5% slope	1.89	5	Wheat
27	Pond Creek fine sandy loam, 2% slope	2.16	5	Wheat
28	Pond Creek silt loam, 2% slope	2.18	5	Wheat
29	Pond Creek silt loam, 2% slope	2.35	5	Wheat
30	Grant loam, 4% slope	2.37	5	Wheat
31	Grant loam, 2% slope	2.42	5	Wheat
32	Shellabarger , 2% slope	2.43	5	Grain Sorghum
33	Minco very fine sandy loam, 5% slope	2.70	5	Wheat
34	St. Paul silt loam, 3% slope	2.82	5	Wheat
35	St. Paul silt loam, 3% slope	3.49	5	Wheat
36	Vanoss silt loam, 3% slope	3.59	5	Wheat
37	Woodward silt loam, 3% slope	3.60	3	Rangeland
38	Woodward silt loam, 7% slope	3.70	3	Wheat
39	Grant loam, 3% slope	4.55	5	Wheat
40	Quinlan silt loam, 10% slope	4.68	2	Rangeland
41	Carey silt loam, 4% slope	4.95	5	Wheat
42	St. Paul silt loam, 5% slope	5.60	5	Wheat
43	Carey silt loam, 5% slope	6.00	5	Wheat
44	Grant loam, 3% slope	6.21	5	Grain Sorghum
45	St. Paul silt loam, 10% slope	10.20	5	Wheat

T-value (tolerable level), which is the level of erosion that may be sustained without significantly reducing the soils long term productivity, compare the values in the Soil Loss and T-value columns. Note that the estimated losses at points 37, 38, 42 and 43 exceed T-value by less than one ton; the loss at point 44 is 1.21 tons greater than T-value; and the loss at point 45 exceed T-value by about five tons. The greatest loss, in terms of T-value, is at point 40 where 2.7 tons in excess of "T" are being lost.

While any loss greater than T-value is cause for concern, losses in excess of T at Points 37, 38, 42, 43, and 44 are not alarming. However, the loss at points 40 and 45 is both alarming and urgent. Based on a supply of 1000 tons of topsoil per acre, if soil loss at point 45 continues at the rate of 10.2 tons, there would be virtually no topsoil in less than one hundred years. If at point 40, the current rate continues there will be no topsoil in less than 50 years! The major physical factors which contribute to these excessive losses are percent slope, the amount of soil cover slope length and soil cover. The size of the area in which the point is located, the near soil-neighbors and the configuration of the landscape would enter into the decision as to how to reduce soil loss at the point.

CHAPTER V

DATA ANALYSIS AND DISCUSSION

Constructing the Soil Conservation Ethic

To examine the relationship between the farmers' soil conservation ethic and soil erosion in Deer Creek Watershed it was necessary to "construct" the soil conservation ethic. Although other items were included in the Interview Schedule from which inferences could be made as to the farmers ethic, 22 items were selected which form the cornerstone of the ethic.

The 22 items, and frequency of responses by response category are indicated in Table X. This table not only includes the items on which the soil conservation ethic is based, it reveals what may be masked by the statistical analysis; that is, that respondents overwhelmingly "agree" with statements purposely included in the Interview Schedule to ascertain the conservation ethic. This researcher believes that 921 (strongly agree and agree) responses agreeing with the statements versus 58 responses which disagree (uncertain, disagree and strongly disagree) provide overwhelming evidence that there is among farmers a strong ethic regarding farmer-soil relationships. Unfortunately important information contained in data so strongly skewed does not lend itself to statistical verification.

TABLE X

INTERVIEW SCHEDULE ITEMS USED TO DEFINE THE DEER CREEK SOIL CONSERVATION ETHIC AND FREQUENCY OF SAMPLE FARMERS RESPONSES

Item	Response Category*				
	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
	- Frequency -				
1	38	5		2	
9	16	28	1		
10	9	35			1
11	4	38	2		1
12	4	33		8	
14	2	39	1	3	
15	6	35		4	
17	13	32			
19	17	23	3	2	
21	7	38			
27	5	39			
29	14	31			
30	13	31		1	
35	7	38			
36	19	25		1	
37	13	32			
38	1	39	1	4	
39	1	28	1	15	
40	28	15		2	
41	19	23		3	
45	5	39		1	
46	3	41		1	
TOTAL 22	234	687	9	47	2

*Response categories were different for a few items but all were interval and were interpolated in terms of "equivalent" Likert Scale.

General Statistical Analyses

The correlation analysis provided the summary indicated in Table XI.

TABLE XI

CORRELATION COEFFICIENTS FOR SELECTED VARIABLES

(IV)	(DV)	
	Soil Loss	Mandatory Soil Conservation
Ethic	0.18250 0.2302	0.23625 0.1182

The top number in each category is the calculated (estimated) correlation coefficient. The closer the absolute value is to 1, the stronger the relationship between the variables. The bottom number is the observed significance of the test of the hypothesis that the correlation is really zero. None of these are statistically significant, but they are large enough to note.

The ANOVA procedure results are indicated in Table XII. For the dependent variables the calculated value of the F statistic, the observed significance level (OSL) and the degrees of freedom (df) is given. The F statistic is used to test whether the means for each class (category) within the independent variable(s) are all equal. There are significant differences between age and it's relationship to soil loss.

TABLE XII

SUMMARY OF ANOVA PROCEDURE OF FARMERS' CHARACTERISTICS IN DEER CREEK WATERSHED

(IV)	Explanation	(DV)	
		Ethic	Soil Loss
Age	F-value OSL df	2.12 0.0966 4,40	3.28 0.0203* 4,40
Years of Farming Experience	F-value OSL df	1.39 0.2602 3,41	1.96 0.1354 3,41
Education	F-value OSL df	4.05 0.0247* 2,42	0.24 0.7894 2,42
Ethnicity	F-value OSL df	1.47 0.2375 3,41	0.72 0.5438 3,41
Farm Size	F-value OSL df	0.65 0.5294 2,42	0.49 0.6136 2,42
Farm Conservation Plan: Landowned	F-value OSL df	0.83 0.3851 1,41	0.59 0.6401 1,41
Land Rented	F-value OSL df	0.30 0.1402 1,30	0.15 0.2665 1,30

*Significant at .05 level.

The analysis indicates that soil losses are lower on soils managed by farmers between the ages of 55 and 65 years. They are highest on soils managed by farmers between the ages of 35 and 45 years. Table XII also indicates there is a significant difference between the means of the classes within education and its relationship with the soil conservation ethic. Those farmers with less than high school education have a higher ethics score than do those with more education. In fact analysis indicates that as the educational level increases the soil conservation ethic score decreases. Possible explanations for this phenomenon include: (1) older farmers generally have less formal education but gained much of their experience in an era when far greater dependence was upon the natural quality (good tilth) and condition (natural fertility) of the soil; hence motivation to preserve and conserve the soil under those circumstances may have, as farmers grew older, evolved into even greater concern and care to protect the soil; (2) older farmers, although no easier for them to achieve in their "day" than for younger farmers today, are in better financial condition than younger farmers; (3) conversely, younger farmers have more formal education but may be in difficult financial circumstances because of large mortgages, high interest rates, high production costs, low prices for farm products etc. and are thus inclined to postpone investments in soil conservation, and; (4) educational institutions may be negligent in teaching students the value of the soil --- one of the basic natural resources --- on which this and future generations depend for food and fiber. It is possible that the political, economical and some social aspects of farming have been emphasized while the "ethics" of farming have been neglected.

In Table XIII for the dependent variables the F statistic is given

TABLE XIII

SUMMARY OF ANOVA PROCEDURES FOR SELECTED ITEMS IN THE INTERVIEW SCHEDULE ADMINISTERED TO SAMPLE FARMERS IN DEER CREEK WATERSHED

Independent Variables	Explanation	Dependent Variables	
		Soil Conservation Ethic	Soil Loss
Erosion Risk (Item 15)	F value	3.60	2.15
	OSL	0.0361*	0.1293
	df	2,42	2,42
Erosion and Decision-making (Item 14)	F value	4.03	0.07
	OSL	0.0251*	0.9320
	df	2,42	2,42
Bringing New Land Into Cultivation (Items 29 & 30)	F value	8.01	1.46
	OSL	0.0003	0.2409
	df	3,41	3,41
Mandatory Erosion Control (Items 49 & 50)	F value	2.15	0.32
	OSL	0.0928	0.8628
	df	4,40	4,40
Conservation Effort (Items 10 & 11)	F value	8.32	0.73
	OSL	0.0001	0.5743
	df	4,40	4,40
Development of Farm Conservation Plan: (Item 31) Land Owned	F value	0.29	0.22
	OSL	0.5929	0.6401
	df	1,40	1,40
Land Rented	F value	2.72	1.29
	OSL	0.1093	0.2665
	df	1,31	1,31

*Significant at the .05 level.

the OSL noted. The F statistic is used to test if the means of each class of the independent variables are all equal.

The analysis indicates there is a significant relationship between the frequency with which farmers risk exposing the soil to increased erosion and the soil conservation ethic. Those who rarely expose the soil to increased erosion have a higher soil conservation ethic score than do those who choose to run the risk more often. No other significant relationships at the .05 level were noted for other variables tested.

The analysis also indicates that there is a significant difference between the mean soil conservation ethic of the variable frequency with which soil erosion enters the decision-making process. Those who consider erosion all of the time in the decision-making process have a higher ethics score than do those who consider it some of the time.

Statistical Tests of the Hypotheses

H_1: There is a positive relationship between the farmers' "degree" of soil conservation ethic and the rate at which the soil erodes.

The statistical hypothesis H_1 is $\rho=0$, where ρ is the population correlation between soil loss and soil conservation ethic. The calculated correlation coefficient is 0.18250 with a probability that we would get a value this large or larger if H_1 is true of 0.2302. This is statistically not significant. Therefore there was no correlation between farmers' 'degree' of soil conservation ethic and soil erosion rates.

H_2: There is an inverse relationship between farmers' soil conservation ethic and the frequency in which the soil is subjected to increased risk of erosion.

The statistical hypothesis in H_2 is $\mu_1 = \mu_2 = \mu_3$. Where μ_1 is the

mean score for farmers who rarely risk erosion, μ_2 is the mean score for farmers who occasionally risk erosion, and μ_3 is the mean ethic score for farmers who frequently risk erosion. The F value for testing equality of means is 2.48 with 2 and 42 degrees of freedom. If H_2 is true, the probability of obtaining a value that large or larger is 0.0961 and it is not significant at the .05 level. Therefore there was no difference in soil conservation ethics as a function of the risk of soil erosion.

H_3: There is an inverse relationship between farmers consideration of the nature of the soil in the decision-making process and the rates at which the soil erodes.

The statistical hypothesis H_3 is $\mu_1 = \mu_2 = \mu_3$, where μ_1 is the mean ethic score for those who always consider the soil's erodibility in deciding its use, μ_2 is the mean ethic score for those who most of the time consider the soils erodibility in deciding its use, and μ_3 is the mean ethic score of those who some of the time consider the soil's erodibility in deciding its use.

The F value for testing equality of means is 4.03 with 2 and 42 degrees of freedom. If H_3 is true, the probability of obtaining a value that large or larger is 0.0251, and this <u>is</u> significant at the .05 level. Therefore, there was a difference in ethics between those who take different views of soil erosion in the decision-making process. Duncan's procedure indicates that a higher soil conservation ethic results in greater consideration of soil erodibility.

H_4: There is a positive relationship between farmers' soil conservation ethic and the adoption of soil conserving practices.

The statistical analysis, as shown in Table XIV, sub-divided H_4 into five pseudo independent subhypotheses. A 't-test' was performed on each sub-hypotheses. The statistical hypothesis for each is $\mu_1 = \mu_2$ versus the alternative $\mu_1 \neq \mu_2$.

$H_{4.1}$: That the mean ethic for those who practice conservation farming is the same as those who do not.

$H_{4.2}$: that the mean ethic for those who practice minimum tillage is the same as those who do not.

$H_{4.3}$: that the mean ethic for those who practice no-till is the same as those who do not.

$H_{4.4}$: that the mean ethic for those who use small grain in rotations is the same as those who do not.

$H_{4.5}$: that the mean ethic for those who use hay in rotations is the same as those who do not.

TABLE XIV

SUMMARY OF 'T VALUES' OF H_4 INDEPENDENT SUBHYPOTHESES REGARDING SOIL CONSERVATION ETHIC/SOIL CONSERVATION MEASURE RELATIONSHIPS

Explanation	Subhypotheses				
	$H_{4.1}$	$H_{4.2}$	$H_{4.3}$	$H_{4.4}$	$H_{4.5}$
't value'	0.6783	-2.3909	1.06	1.6504	0.5229
OSL	0.5012	0.213*	0.2950	0.1062	0.6037
df	1,43	1,43	1,43	1,43	1,43

*Significant at the .05 level.

Only in the practice of minimum tillage is there a significant statistical difference in mean ethic scores. Therefore the hypothesis is rejected that the mean ethic for those who practice minimum tillage is the same as those who do not.

For all of the other subhypotheses, there is no difference in the mean ethic score between those who use the practices and those who do not.

The Deer Creek Soil Conservation Ethic Defined

Although a brief definition of soil conservation ethics is given on pages 3 and 4, the researcher's purpose here is to define the soil conservation ethic on the basis of information gained through this research effort including review of literature, Interview Schedule, and other information resulting from the interview process.

General ethics refers to man-to-man relationships but this researcher agrees that "we must grow up ethically, and realize that concepts of right and wrong do not end with man-to-man relationship" (50, p. 204). Soil conservation has been identified as an ethical issue (23, 66), and soil erosion is a major issue contributing to the subject matter of soil conservation ethics. It is this researcher's purpose here to define a man-to-soil relationship in terms of a soil conservation ethic.

What is here termed "soil conservation ethics" has also been called "conservation ethics" but this researcher prefers "soil conservation ethic" to make explicit the concern with issues associated with soil conservation generally and with soil erosion particularly. "Conservation ethics", like "conservation," is said to have been an ambiguous, vaguely conceived notion with great disparities in the view of its proponents (25).

Whereas the general discipline of ethics concerns issues that arise out of man-to-man relationships, a soil conservation ethic concerns formulations of value judgments and rules of conduct which issue as

principles and standards relating to man's relationship with the soil. In other words, a soil conservation ethic is a set of "moral" principles used in assessing what is right and wrong with regard to man's conduct and behavior toward the soil. These principles provide the standards for comparing alternatives and choosing those which will result in the greatest balance of good, everything and everyone considered.

The central question of soil conservation ethics is: What are the criteria which determine whether farmers' action and behavior toward the soil are right or wrong? The answers to the question fall as in general ethics, into the deontological and teleological groups. The main difference between them is that deontological theories do not, and teleological theories do, appeal to value considerations in answering the question.

To illustrate the difference between the two theories this researcher has adapted the example used by Kaufman (29, pp. 53-54) to address essentially the same issue from another perspective. Suppose a moral philosopher listened in on a conversation between two farmers as they discussed what they believed were the reasons for a specific soil conservation practice. He would probably conclude that farmers believe the consequences of installing the practice would lead to more good than bad effects: less erosion, clearer streams, higher yields and more benefit to both himself, his neighbors and others. On the other hand, he would probably conclude from the discussion that the farmers believe that without the practice, they and others would end up with fewer of these "goods" and more of the "bads": more erosion, more muddy streams, and higher food prices. The moral philosopher would describe this kind of ethical reasoning process as teleology and the farmers as teleologists.

The other theory, deontology, emphasizes the quality of action itself or the spirit in which the action is performed as determining its rightness or wrongness. Thus the act's moral value is defined in terms of the farmers' intent or attitude or in terms of the act's conformity to a rule or law (prescribed, say, by wisdom). For example, the principle, "you ought to love and respect the soil and treat it so that it is not harmed," is regarded as right within itself and needs no further explanation (7, 24). Deontological principles, in the context of man/soil relationships, form the cornerstone of the soil conservation ethic. They issue in "oughts" and "ought nots" and break through to a fundamental morality which does not change (57).

The following questions are among those typically raised regarding soil conservation ethics. Is the farmer morally obligated to use and treat his soils in such a manner that prevents erosion? Must the farmer be concerned about the capability of the soil to provide food, fiber, etc., for future generations? Should not the farmer be a good steward of the soil? What about the economics of conservation? Should there be laws to force the farmer to protect his soil? The task of the soil conservation ethic is to help resolve those "moral" problems associated with these and other questions relating to soil use and management.

These foregoing questions suggest that the soil conservation ethic may not rely only on the theories of general normative ethics but also on the theories of social-political philosophy and philosophy of law. Strictly speaking, perhaps soil conservation ethics is a type of applied ethics, and should be broadly understood as encompassing social-political and economical philosophy, the philosophy of law, and theological ethics (7, 8, 21).

The Deer Creek Soil Conservation Ethic Prescribed

This researcher believes there is a soil conservation ethic among farmers in the Deer Creek Watershed. This belief is based on farmers' response to statements and questions purposely included in the Interview statement to ascertain farmers' relationship with the soil. It is also based on information gained when the farmers "explained-a-little" of what they had in mind when they made their response. These beliefs are also based on many comments made by farmer's wives, and in a few instances, their children who asked if they could "listen" during the interview.

In proper ethical form the principles and guidelines which provide the standard are included in the following prescriptions:

1. You ought to consider the soil a God-given resource and be committed to its care and protection.
2. You ought to remember that when the soil is misused and mistreated, you and others will suffer--if not immediately then later--as a consequence.
3. You ought to use and treat the soil in such a way as to pass it on to the next generation in as good or better condition than you received it.
4. You ought to use measures and practices that have proven effective in helping control erosion.
5. You ought to inventory the soil you are farming and determine if it is reasonable to expect that it, at the rate it is presently eroding, will remain productive indefinitely. If it is not, you ought to reevaluate your management plan and include in a

revised plan the measures that will provide protection against erosion.

6. You ought to make every effort to keep your soil in place and not allow it to wash onto the property of others and into creeks, rivers, and lakes.
7. You ought to consider the erodibility of your soil when you are deciding how to use and manage it and not use and treat it in a way that would increase the possibility of it being excessively eroded.
8. You ought to consider the soil as yours only for a while and that you hold it in trust for those who come after you.
9. You treasure the rights and privileges of ownership, and you ought always to use and manage the soil in such a way that others will not deem it necessary to interfere in your decision making.
10. You ought to realize that investments you make to protect the soil from erosion will accrue to your own long-time interest and to the interests of posterity.
11. You should remember that erosion is the slow, gradual wasting of topsoil and you ought to be vigilant in your concern and efforts to prevent it from depleting and destroying the most productive part of the soil.
12. You ought not to let others influence you to use your soil in such a way as to abuse it and hasten its destruction.
13. Scientific and technological progress have revolutionized the approach to working with the soil, but you ought to exercise care in using new methods and new technologies that they do not lead to excessive erosion.

14. You ought to band together with your neighbors and others in the community and seek new approaches and discover better ways of conserving the soil.
15. You ought to use and manage your soil in such a way that, if everyone else in the community followed your example, soil losses would be below tolerable levels.
16. Although you do not wish to make erosion control mandatory, you ought to try to persuade those who allow their soil to erode unchecked to make some effort to control erosion on their farm.
17. You ought to control soil erosion for soil is vital for sustaining life and continued productivity is necessary to prevent disaster for humankind.
18. You ought to control erosion because it is the most powerful single factor contributing to the deterioration of productive land.
19. You ought to control erosion because it is the source of sediment--the most damaging pollutant entering our creeks, rivers, and lakes.
20. You ought to control erosion because it reduces the capacity of soils to produce food, fiber, and forage crops.
21. You ought to control erosion because it wastes soil at a much faster rate than it is replenished by nature.
22. You ought to control erosion because it increases costs to both the producer and consumer.
23. You ought to conserve the soil because there is are limited number of acres on which crops can be produced.

24. You ought to conserve the soil because it acts as a reservoir that also conserves water.
25. You ought to conserve the soil because God has appointed you steward over it.

These principles, which this researcher believes have been internalized by the farmers in Deer Creek Watershed, guide their decisions regarding soil use and management. They provide the standard by which farmers judge their own actions and behavior toward the soil. This researcher also believes this soil conservation ethic operates upon farmers in times of deliberation and introspection and serves as an ideal standard against which they measure their conduct toward the soil.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Summary

Soil erosion has been recognized as a national menace since the 1930s. Recent estimates of soil losses due to sheet and rill erosion indicate that the rates at which soil is being eroded has reached alarming proportions in some parts of the nation. Many of those who have written or otherwise addressed the continuing problem suggest it is the result of farmers having lost the conservation ethic.

A basic assumption underlying this research was that there was a conservation ethic among today's farmers. The purpose of the research was to ascertain the relationship between farmers' soil conservation ethic and soil erosion. The objectives were to define a soil conservation ethic and to determine how it influenced the farmers' decision-making process regarding the use and management of the soil. The general hypothesis was that there was an inverse relationship between the soil conservation ethic and soil erosion. Deer Creek Wathershed in Southwestern Oklahoma was selected as the area in which research data would be collected.

An existing sampling frame--the stratified, non-aligned random sampling procedure--was used to identify 45 primary sample units (PSUs) which provided the structure for the research. Within each PSU a single point was identified as the area from which data necessary for the

research would be collected. The point served two purposes: (1) it provided the link to a farmer (owner/tenant) from which information relevant to the soil conservation ethic could be obtained, and (2) it provided a location from which soil characteristics and site conditions could be obtained that were necessary to calculate estimated soil erosion rates.

Data for ascertaining the soil conservation ethic were obtained through interviewing 45 farmers. Data for estimating soil losses by erosion were obtained by field methods that included measuring and observing some soil and site characteristics. Statistical techniques employing the ANOVA procedure, correlation, F statistic, 't-test', and chi-square were utilized in analyzing the data.

Conclusions

This research clearly indicates the soil conservation ethic is a reality. This ethic is more than mental assent; it is internalized and exerts a direct and dynamic powerful influence upon farmers to care for and protect the soil from erosion. Although it was not substantiated by the data which lent itself to statistical analysis, this researcher believes the preponderance of evidence indicates soil conservation ethics is a basic determinant of farmers' perception of soil erosion and of the behavior toward the soil in view of present and future needs.

The research indicates that the soil conservation ethic is acquired primarily by learning from parents and through experience. The principles and guidelines thus learned help uphold farmers' values associated with the soil. They also help to decide which goals are important and to reconcile goals and values that are in conflict.

The principles included in the soil conservation ethic are not simple prohibitions: they also support positive responsibilities toward the soil.

Implications for Future Research

This research has proven there is strong conservation ethic among farmers in Deer Creek Watershed, Oklahoma. It also has determined there is an inverse relationship between the soil conservation ethic and soil erosion.

The chief limitation of the research is the generalizability of the findings. Its generalization to other areas is necessarily limited because of the homogenity of the soil conservation ethic among respondents and the corresponding low average annual rates of soil loss through erosion. The limitation can be addressed in future research in at least two different ways: (1) by exploring how the measure of ethics might have influenced the results of the present research; and (2) by providing a replication of this study on a more broadly based sample in a watershed where the average soil losses are known to be much greater than T-value.

Another important issue which should be addressed in future research is the extent to which oil-gas energy activities has affected the soil conservation ethic. This could be addressed by further research in the Deer Creek Watershed which compared the application level of conservation measures to the land before additional income became available and the application following the availability of the additional income. This could be determined by a survey of SCS and ASCS records.

Assuming the statements included in the Interview Schedule on which the soil conservation ethic is based have adequate validity--that

oil-gas energy activities has affected the soil conservation ethic, the question remains whether or not it has. This could be assessed by further research in the Deer Creek Watershed which compared the application level of conservation measures to the land before additional income became available and the application following the availability of the additional income. This could be determined by a survey of SCS and ASCS records.

Assuming the statements included in the Interview Schedule on which the soil conservation ethic is based have adequate validity--that is, they measure what the researcher wanted to measure--the Interview Schedule could be used in other study areas to develop soil conservation ethic indicies that might be useful in developing a model that would predict the relationship between soil erosion and the soil conservation ethic.

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APPENDIX

APPENDIX

INTERVIEW SCHEDULE TO ASCERTAIN RELATIONSHIPS BETWEEN FARMERS' SOIL CONSERVATION ETHICS AND SOIL EROSION

1. Check one:

Jim Thinks	Joe Thinks
Soil erosion is a serious threat to civilization and if the current rate of soil loss isn't reduced it could lead to disaster.	The belief that soil erosion could lead to disaster for mankind is exaggerated. Civilization will not be affected by soil erosion.

Part A - What is your opinion?

☐ I'm like Jim.	☐ I'm more like Jim than Joe.	☐ I'm more like Joe than Jim.	☐ I'm like Joe.

Part B - What would be the opinion of your nearest neighbor?

☐ He would agree with Jim.	☐ He would agree more with Jim than Joe.	☐ He would agree more with Joe than Jim.	☐ He would agree with Joe.

2. There is a lot of disagreement about the soil erosion problem. What's <u>your</u> view of the current problem?

   a. On your farm?

   Check One.

   ☐ Major ☐ Minor

   ☐ Moderate ☐ Uncertain

   b. In the Deer Creek watershed?

   Check One.

   ☐ Major ☐ Minor

   ☐ Moderate ☐ Uncertain

c. In Oklahoma?

Check One.

|__| Major |__| Minor

|__| Moderate |__| Uncertain

3. In the seemingly never ending battle with soil erosion what progress is being made?

a. On your farm?

Check One.

|__| Much |__| Little or none

|__| Some |__| Uncertain

b. In the watershed?

Check One.

|__| Much |__| Little or none

|__| Some |__| Uncertain

c. In the State?

Check One.

|__| Much |__| Little or none

|__| Some |__| Uncertain

4. It is almost impossible to farm and keep all of the soil in place. In terms of tons of soil loss per acre per year how, do the soil losses on your farm today compare to those of five years ago?

Check One:

|__| Higher |__| Lower

|__| About the same |__| Uncertain

5. The current erosion problem is largely the result of farmers relaxing their standards of conduct toward the soil in the face of pressure brought on them by ever increasing farming costs, inflation, and low farm prices.

   Check One.

   |__| Strongly Agree |__| Uncertain |__| Strongly Disagree

   |__| Agree |__| Disagree

6. Soil erosion doesn't have the adverse effect on crop yields that some think it has because any reduction in yields at the place where soil erosion occurs is offset by higher yields where the sediment is deposited.

   Check One.

   |__| Strongly Agree |__| Uncertain |__| Strongly Disagree

   |__| Agree |__| Disagree

7. To protect the soil from erosion which of the following soil conserving practices have you used or are you now using on your farm? Check all that apply.

   |__| Terraces

   |__| Contour farming

   |__| Mimimum tillage

   |__| No-tillage

   |__| Crop rotations with small grain

   |__| Crop rotations with hay or pasture

   |__| Other (Specify) _____

   _____

8. Those who are really concerned about erosion and want to keep soil losses within tolerable limits sometimes find this restricts what they can do, crops they can grow, etc. How has trying to keep soil losses within tolerable limits limited your operations.

   Check One.

   |__| Very severely |__| Uncertain |__| None or Slightly

   |__| Severely |__| Moderately

9. Farmers have the primary responsibility to protect the soil from erosion.

Check One.

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

10. In terms of what you are doing how would you describe your efforts to control soil erosion on your farm?

Check One.

|__| I'm doing all that I can do.

|__| I'm doing most of what I could do.

|__| I'm doing some of what I could do.

|__| I'm doing little of what I could do.

|__| I'm doing none of what I could do.

11. In terms of what you believe you should do, how would you describe your efforts to control soil erosion on your farm?

Check One.

|__| I'm doing all I should do.

|__| I'm doing most of what I should do.

|__| I'm doing some of what I should do.

|__| I'm doing a little of what I should do.

|__| I'm doing none of what I should do.

12. Farmers know that soils are not all alike and they consider each soil's nature and properties when making decisions about its use and management.

Check One.

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

13. Farmers may be concerned about the long-term effects of soil erosion, but they may sometimes ignore soil erosion for short-term economic success.

Check One.

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

14. How often does erosion influence your decisions as to how you will use and treat the soil?

Check One.

|__| All of the time |__| Uncertain |__| None of the time

|__| Most of the time |__| Some of the time

15. Although farmers may know that they should always protect the soil from erosion there are situations in which they choose to use their soil in a way which they normally would not do and risk more erosion. How often do you run such risks?

Check One:

1. _____ Never
2. _____ Rarely (once in 5 years)
3. _____ Occasionally (twice in 5 years)
4. _____ Frequently (every other year)
5. _____ All the time

16. Several reasons have been suggested as to why farmers may use their soil in such a way as to increase the risk of erosion. If farmers were asked to explain this behavior, which of the following reasons do you believe they would most likely give?

1. _____ It's my property - I can use it as I wish.
2. _____ More income was needed.
3. _____ Encouraged by government policies or programs.
4. _____ Trying to produce more food for hungry peoples of the world.
5. _____ Agricultural products are important and needed for export in international trade.
6. _____ It is easier to farm without conservation practices.

17. A farmer's feeling of stewardship will lead him to adopt soil erosion control practices even though it will not increase his income in the immediate future.

Check One.

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

18. When all is said and done, in the end it is the farmer who decides whether or not the soil will be protected from erosion.

Check One.

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

19. Farmers, by accepting the responsibility to care for and protect the soil today, will insure for themselves the continuing freedom to do with their soil what they please tomorrow.

Check One.

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

20. The care and protection now being provided the soil will guarantee the next generation adequate soil resources.

Check One.

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

21. The money that farmers spend to protect their soil from erosion may be of more benefit to future generations than to themselves.

Check One.

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

22. It is often said that how well a farmer cares for his soil depends on his age. Which of the following age groups is most likely to adopt erosion control practices?

1. _____ Under 20
2. _____ 20 to 30
3. _____ 30 to 40
4. _____ 40 to 50
5. _____ 50 to 60
6. _____ Over 60
7. _____ Age makes no difference.

23. Scientific and technological progress have freed farmers from the drudgery of farming but it has helped create erosion, sedimentation, and water pollution problems.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

24. Modern farming methods and machinery have removed the farmer so far from the soil itself that he has lost contact with, and even "feelings" for, the soil.

Check One.

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

25. Farmers know about how much topsoil their soils can lose over a period of time and remain productive.

Check One.

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

26. Farmers who abuse their soil by allowing it to erode unchecked are generally not aware of the damage they are doing.

Check One.

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

27. If farmers learned that an excessive amount of soil was being lost from their fields, they would take whatever action necessary to reduce the loss to tolerable amounts.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

28. Farmers are more likely to protect the soil from erosion on land they own than on land they rent.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

29. Even with erosion control measures some soils erode so badly they should be taken out of cropland and used for another purpose which will not cause so much erosion.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

30. Before any "new land" is brought into cultivation, its potential to erode if used for cropland should be determined and if soil losses would exceed tolerable rates, it should not be broken out.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

31. Have you developed a plan to conserve the soils which you are farming?

Check One:

a. Own |__| : Yes |__| No |__|

b. Rent |__| : Yes |__| No |__|

32. It has been suggested that today's farmers do not feel as "close", to the soil that is they do not have as much "love and respect" for it as did the farmers 30 years ago.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

33. A major cause of today's soil erosion problem is that many farmers have lost their "conservation ethic" and no longer are concerned that their soil is eroding.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

34. Some are saying that the "spirit" has gone out of soil conservation and that what is really needed is a spirited revival led by zealous and enthusiastic "preachers" who exhort them to do good works as stewards of the soil. Check One.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

35. Farmers ought to consider the soil a God-given resource that is their's for a time but also that it is held in trust for the future.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

36. Farmers are obligated to pass the soil on to those who come after them in as good or better condition than they received it.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

37. As trustees of the soil, farmers are expected to benefit from it, but they ought not use the soil in ways that cause problems for other individuals in the community.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

38. Farmers have a special love for the soil and measure their conduct toward it against an ideal standard of right or wrong.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

39. There are right ways and wrong ways of treating the soil and farmers as a group have standards they rely upon to guide them in the right way.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

40. Man's use of the soil, even for the production of food and fiber, should not lead to its degradation or destruction.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

41. When farmers make decisions about protecting their soils from erosion they place the interests of others ahead of their own interests.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

42. Those who view farming strictly as a business are less likely to protect their soil from erosion than are those who also view farming as a "way of life."

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

43. Even if farmers have good intentions toward protecting their soil from erosion, they need to be reminded continually that action is what is needed.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

44. Although a set of principles and guidelines suggesting how farmers ought to behave toward the soil has not been written, it would be helpful if there were a written code against which farmers could measure their behavior toward the soil.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

45. Long-held principles are more important than are ever changing economic, social, and political issues in determining whether one does or does not protect the soil from erosion.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

46. Where did you get the principles and guidelines that you follow in farming the soil?

Check all that apply.

1. _____ Grandparents
2. _____ Parents
3. _____ School
4. _____ Bible
5. _____ Neighbors
6. _____ Experience
7. _____ All of the above
8. _____ Other: List _____
9. _____ Uncertain

47. Erosion that takes place on your farm is really no one else's business because private property rights give you the right to use and manage the soils on you farm anyway you choose.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

48. Even those who try to protect their soil from erosion are not always successful so soil erosion should be checked closely and farmers that are making some effort to keep soil losses within tolerable limits should be identified and a special effort made to help them do a better job.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

49. Assuming that farmers do not voluntarily bring erosion losses down to tolerable levels, some sort of mandatory control should be employed to insure that soil resources are protected from erosion.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

50. Farmers who do not attempt any erosion control and allow their soils to erode unchecked should be identified and forced to reduce erosion to tolerable limits.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

51. Most farmers are aware of the current assistance available from government in their battle against erosion.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

52. Farmers would establish more erosion control practices if better tax advantages, more technical assistance, greater cost sharing, and lower interest rates were available from government.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

53. Which of the following USDA programs most encourage you to practice soil conservation on your farm?

1. _____ Technical assistance
2. _____ Cost-sharing
3. _____ Low-cost loans
4. _____ A combination of 1 and 2
5. _____ A combination of 1 and 3
6. _____ A combination of 2 and 3
7. _____ A combination of 1, 2, and 3

54. Farmers believe the public should share in the costs of protecting the soil from erosion.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

55. If "society" shares in the cost of conserving the soil on farms, it has the right to expect, even insist that farmers keep soil losses within acceptable levels.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

56. More teaching on the overall importance of the soil, and especially for human sustenance and support, is needed in all schools, colleges and universities.

Check One:

|__| Strongly Agree |__| Uncertain |__| Strongly Disagree

|__| Agree |__| Disagree

57. From whom do you believe future primary leadership for soil conservation should arise?

Check One.

|__| USDA

|__| Oklahoma Conservation Commission

|__| Local Conservation Districts

|__| Farm Organizations

|__| Other (specify) _____

58. Listed below are a few of the reasons suggested as to why farmers use and treat their soils as they do. Read both statements and put a check ([) in the space which you think best describes the farmers in your community.

They have a deep sense of stewardship toward the soil.	___: ___: ___: ___: ___: ___: ___	They do not have a deep sense of stewardship toward the soil.
The are concerned about future generations need for soil.	___: ___: ___: ___: ___: ___: ___	They are not concerned about future generations' needs for soil.
They care about what their neighbors think.	___: ___: ___: ___: ___: ___: ___	They do not care about what their neighbors think.
They believe the soil is special and worth protecting.	___: ___: ___: ___: ___: ___: ___	They do not believe the soil is special and worth protecting.
They work together as a community to control soil erosion.	___: ___: ___: ___: ___: ___: ___	They do not work together as a community to control soil erosion.

They are conscious of the impact of farming on the total environment.	___: ___: ___: ___: ___: ___: ___	not conscious of the impact of farming on the total environment.
They are aware of the effects of soil erosion on water quality	___: ___: ___: ___: ___: ___: ___	They are not aware of the effects of soil erosion on water quality

LAND AND OWNER/OPERATOR CHARACTERISTICS

LAND

1. Are you a land owner or operator?

   |__| Owner

   |__| Operator

   |__| Both

   A. If an owner, what kind of ownership?

      |__| Individual

      |__| Husband-Wife

      |__| Partnership

      |__| Corporation

      |__| Other (specify) _____

   B. How long have you owned land? Years _____.

   C. How did you acquire the land?

      |__| Purchase

      |__| Inherited

      |__| Gift

      |__| Other

   D. Do you rent or lease land to others?

      |__| Yes

      |__| No

   E. If you rent or lease to others do you require them to adequately protect the soil from erosion?

      |__| Yes

      |__| No

   F. If you rent or lease land from others, are you required by the owner to protect the soil from erosion?

      |__| Yes

      |__| No

2. Where do you live?

   A. In the watershed?

      |__| Yes

      |__| No

   B. If yes, where in the watershed?

      |__| On the land

      |__| In town

   C. If no, where outside the watershed?

      |__| Adjoining county

      |__| 'Distant' county

         |__| On the land

         |__| In town

3. What is your age? . . . . . Years _____

4. How long have you been farming? . . . . . Years _____

5. Size of farming operation?. . . . . Acres _____

6. Sex? . . . . . |__| Male . . . . . |__| Female

7. How many years of school have you completed?

   8 or less 9 10 11 12 13 14 15 16 17 18 19

8. Race

   |__| White

   |__| Black

   |__| Hispanic

   |__| American Indian

   |__| Other (Specify)

9. Although you are an American citizen of which nationality do you consider yourself to be? . . . . . _____

10. In which income range was your NET FARM income during 1981? (NET for my purpose is gross income minus operating expense and depreciation) (Check one)

			NONE	___	$ 7,000	to	$ 9,999	___
MORE than -		$10,000	Loss	___	$10,000	to	$14,999	___
-$3,000	to	$ 9,999	Loss	___	$15,000	to	$19,999	___
-$1	to	-$ 3,000	Loss	___	$20,000	to	$24,999	___
$0	to	$ 2,999	Loss	___	$25,000	to	$49,999	___
$3,000	to	$ 6,999		___	Over $50,000			___

11. In which income range was your NON-FARM income during 1981 for you and your dependents living in your home?

Include income such as . . . . . Salaries, Wages, Retirement, Social Security, Disability, Payments, Royalties, Dividends, etc.
. . NON-FARM or business NET Income

(Check one)

			NONE	___	$ 7,000	to	$ 9,999	___
MORE than -		$10,000	Loss	___	$10,000	to	$14,999	___
-$3,000	to	$ 9,999	Loss	___	$15,000	to	$19,999	___
-$1	to	-$ 3,000	Loss	___	$20,000	to	$24,999	___
$0	to	$ 2,999	Loss	___	$25,000	to	$49,999	___
$3,000	to	$ 6,999		___	Over $50,000			___

12. How many dependents (including yourself) are living in your house? . . . . . NUMBER ___

13. What kind of farming operation are you engaged in? _____

_____

14. Name: _____

Address: _____

Phone Number: _____

15. Date: _____

VITA[2]

Bobby Thomas Birdwell

Candidate for the Degree of

Doctor of Philosophy

Thesis: THE RELATIONSHIP BETWEEN FARMERS' SOIL CONSERVATION ETHICS AND SOIL EROSION

Major Field: Environmental Science

Biographical:

Personal Data: Born in Gainesboro, Tennessee, June 11, 1933, the son of Mr. and Mrs. Doxie Birdwell.

Education: Graduated from Jackson County Central High School, Gainesboro, Tennessee, May, 1950; received Bachelor of Science degree in Agronomy from Tennessee Technological University, 1956; graduate work in Agronomy at University of Tennessee, 1956; graduate work in Remote Sensing at East Tennessee State University, 1968-70; enrolled in doctoral program at Oklahoma State University, January, 1980: completed requirements for Doctor of Philosophy degree, Oklahoma State University, December, 1982.

Professional Experience: Graduate research assistant, University of Tennessee, 1956; Soil Scientist, U.S. Soil Conservation Service (SCS), 1956-59; Area Soil Scientist, 1959-1966, SCS; Soil Survey Party Leader, SCS, 1966-71; Assistant Principal Investigator, National Aeronautics and Space Administration, 1968-70; Assistant State Soil Scientist, SCS, 1971-73; Assistant Principal Soil Correlator, SCS, 1973-76; State Soil Scientist, SCS, 1976-80; Consultant to Iran's Ministry of Agriculture, 1978; Chaired group which developed SCSs National Inventory and Monitoring Manual, 1978; Member of SCSs 1985 - RCA Effort Task Force, 1979.

Professional Organizations: American Society of Agronomy; Soil Science Society of America; Soil Conservation Society of America.