AWARENESS OF SOIL EROSION IN EASTERN KANSAS

by

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Chapter I

INTRODUCTION

Resource management decisions are a reflection of individual or group perception of a given environment in time and space. Examples such as the extended settlement of the American prairies and eastern Oregon, awareness of the drought hazard in the Great Plains and perception of accelerated soil erosion exemplify the conflicts which may occur in resource management questions where a disparity between attitudes exists. Conflicts arising between individuals and groups or between behavior and physical environments in the form of hostilities between ranchers and farmers, cattlemen and sheepherders, or attitudes exclusive of drought found among Great Plains wheat farmers demonstrate how management decisions, based on perceptual environments, influence decisions and give human character to physical environments. This study focuses on farmers perception of the erosion hazard, and their awareness and adoption of conservation practices. It is intended to extend knowledge of the overall erosion problem and add insight into the resource management decision making process.

To provide the background necessary for understanding perception of erosion, Chapter I considers the study of erosion and the place of perception in resource management. The second chapter describes the study area in terms of physical and socio-

economic characteristics, develops the methodology and considers the survey sample. Later chapters examine the empirical data detailing erosion as an agricultural problem and the variability of manager perception of the hazard and alternative conservation measures.

THE EROSION PROBLEM

The problem of accelerated soil erosion is a multi-faceted association of physical, economic, and institutional considerations.[1] In the following pages are described the various factors associated with the problem of erosion. Emphasis is placed on erosion problems in general, leaving consideration of the study area until later.

The Physical Factors of Erosion

The physical processes of erosion concern the detachment and transportation of soil and associated organic matter from one place to another by the action of falling or running water.[2]

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[1]Through this paper "accelerated soil erosion" is defined as the detachment and transportation of soil and organic matter from one place to another and the reduction of plant nutrients through excessive leaching or puddling when caused by human action in combination with the physical processes of falling and running water. As used in this thesis, the words "soil erosion" and "erosion" are synonymous with "accelerated soil erosion," whereas the term "normal erosion" is used when referring only to geologic or normal erosion.

[2]Melvin G. Blase and John F. Timmons, Soil Erosion Control in Western Iowa: Progress and Problems (Iowa Agricultural Experiment Station Research Bulletin 498. Ames, Iowa: Iowa State University, 1961), p. 277.

A secondary problem associated with the physical processes of erosion results from accumulations of sediments on low lying fields and in stream channels and reservoirs.[3]

Of the physical factors involved with erosion, mean annual rainfall, intensity and duration of rainfall, slope length and steepness, and the protective vegetative cover are the most important.[4] Under natural conditions, maximum erosion is most closely associated with conditions found in areas with a mean annual rainfall of between 400 and 1000mm (16 to 40 inches)[5] as shown on Figures 1 and 2. However, severe erosion does occur in arid or semi-arid areas as the result of high intensity rainfall,[6] steep slopes, soil texture and sparse vegetation.[7]

A refined soil-loss index, or erosion equation stressing the factors of erosion under agricultural management draws upon both physical and cultural processes. The equation is:

$$A = R\ K\ L\ S\ C\ P$$

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[3]James Henry Stallings, Soil Conservation (Englewood Cliffs, N. J.: Prentice-Hall, 1957), p. 46.

[4]Norman Hudson, Soil Conservation (London: B. T. Batsford Ltd., 1971), p. 26.

[5]Ibid., p. 27.

[6]R. P. Beasley, Erosion and Sediment Pollution Control (Ames, Iowa: Iowa State University Press, 1972), p. 16.

[7]Forrest Shreve, "Rainfall, Runoff and Soil Moisture Under Desert Conditions," Annals of the American Association of Geographers, Vol. 24, No. 3 (1934), pp. 140-141.

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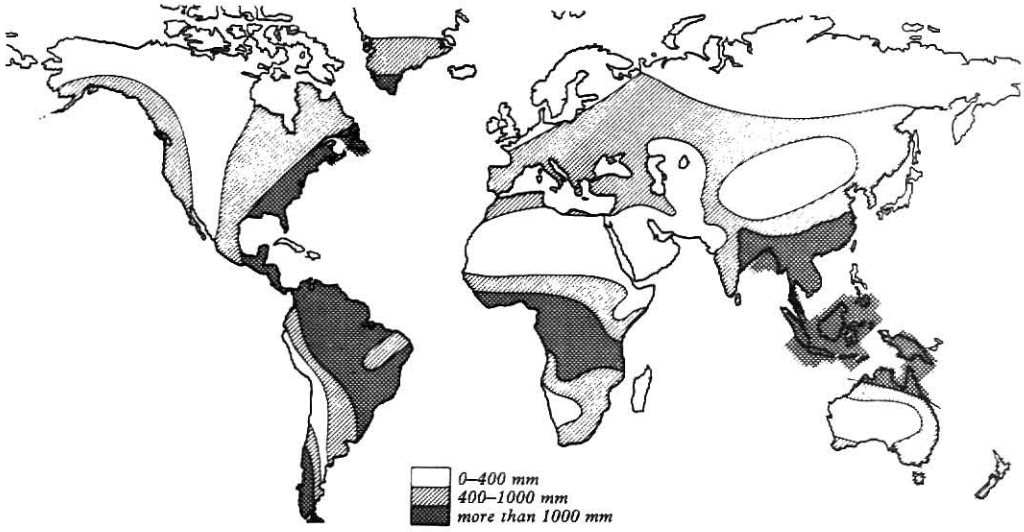

Figure 1 - *Generalized map of mean annual rainfall*

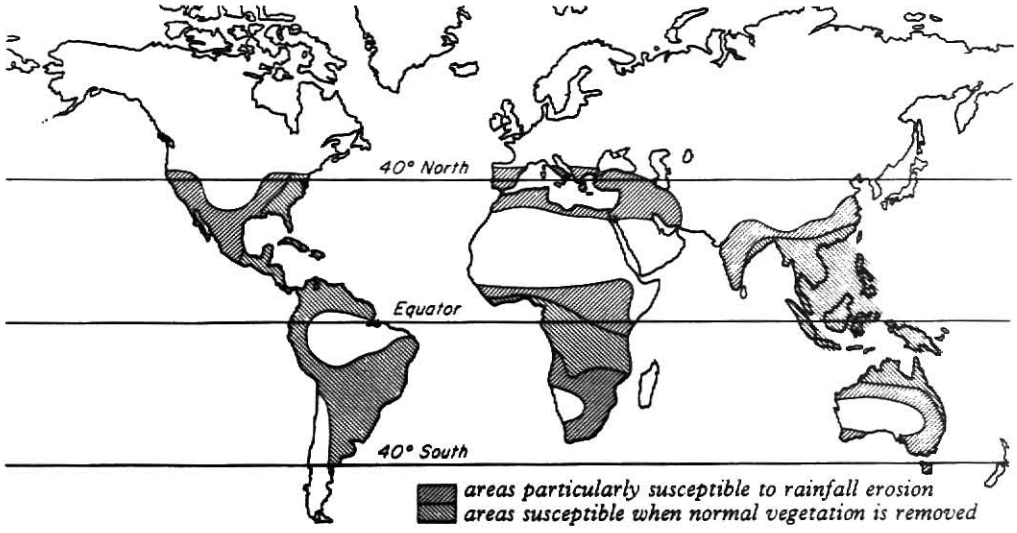

Figure 2 - ***Generalized map of the geographical distribution of rainfall erosion***

Source for Figures 1 and 2: Norman Hudson,"Soil Conservation" London: BT Batsford Ltd., 1971, p. 29.

Where A = Soil loss in tons per acre

R = Rainfall factor

K = Soil erodibility factor

L = Slope length factor

S = Slope steepness factor

C = Cropping management factor

P = Erosion control practice factor.

It stresses the three physical factors of rainfall, soil and slope, and is mainly employed as a cropland erosion control planning device but can be used to great advantage in suburban development and construction planning.[8] Because this equation or a similar one has been used by the Soil Conservation Service in the preparation of county Soil Surveys, the factors included in the soil-loss index will be considered in this thesis in the evaluation of soil survey information.

Economic Factors of Erosion

The economic implications of the problem are closely related to the physical processes of erosion. As accelerated soil erosion progresses the farm operator may face economic loss, downstream locations may suffer siltation or flood problems, and the overall society, whose outlook extends beyond the individual flood or farm operation in time and space, may suffer from both consequences.

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[8]W. H. Wischeier and D. D. Smith, Predicting Rainfall Erosion Losses from Cropland East of the Rocky Mountains, United States Department of Agriculture, Agricultural Handbook 282 (Washington, D. C.: Government Printing Office, 1965).

To the individual resource manager, the economic impact of accelerated erosion varies with the character of the physical erosion problem he encounters and the conservation techniques he has employed. Under a given management scheme the timing of particularly severe erosion may greatly influence the short run economic impact of erosion for any individual operator.[9] In time the loss of topsoil may decrease fertility, produce impassable gullies or otherwise reduce overall farm production, resulting in economic loss. Economics must also be considered when and if erosion control measures are considered. Unfortunately, as erosion progresses the cost of reclaiming land by employing various conservation measures increases, rendering such practices less attractive to resource managers.

Over the past decade industrial countries have become increasingly aware of the quality of their air and water. Much of the concern has centered around the accumulation of chemical waste materials emitted by industry or dispersed by agriculture. Of particular interest to agriculturalists has been pesticide and herbicide residues and chemical fertilizers washed into

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[9]The combination of rainfall and planting characteristics in the eastern Great Plains places considerable short term economic importance on the amount of soil erosion during the months of April and May. Severe erosion during this time may inflict economic loss on the resource manager in one of two ways. First, if severe erosion occurs prior to planting, managers may be forced to reapply their herbicides or plan on extra cultivation to control weeds. Second, if erosion is severe enough just after planting, seeds may be washed away or covered with sediment forcing the farmer to replant. For many farmers this will mean a doubling of the cost of seed, pesticide and fuel. If replanting is not carried out the reduced plant population will result in lower yields and less economic gains at harvest time.

streams by excess runoff. McCarty's task force report stressed that agricultural runoff was the greatest contributor of nitrogen and phosphate in our streams and rivers.[10] However, in volume and economic expenditures, soil sediment is the leading pollutant of most of the world's major rivers.[11] As many agricultural residues are carried off in suspension during the erosion process,[12] the control of erosion should greatly reduce the level of sediment and agricultural wastes in streams and rivers.

Directly related to high sediment rates are the increased costs of maintaining navigable channels and harbors, obtaining suitable water supplies,[13] and securing capital to maintain irrigation canals and storage reservoirs.[14] Of still greater economic significance is the damage caused by floods. Annual flood costs exceed one billion dollars on upstream watersheds alone, whereas areas below flood dams still suffer from periodic damage,[15] as shown in Tables I and II.

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[10] P. L. McCarty, "Sources of Nitrogen and Phosphorous in Water Supplies, Report of Task Group 2610P," Journal of American Water Works Association, Vol. 59, pp. 344-366.

[11] A. R. Robinson, "Sediment, Our Greatest Pollutant," Agricultural Engineering, Vol. 52, No. 1, 1971, p. 26.

[12] J. B. Stall, "Soil Conservation Can Reduce Reservoir Sedimentation," Public Works Magazine, September 1962.

[13] Beasley, op. cit., p. 18.

[14] Stallings, op. cit., p. 48.

[15] Beasley, op. cit., p. 17.

Table I

ESTIMATED AVERAGE ANNUAL UPSTREAM AGRICULTURAL DAMAGE FROM FLOODWATER AND SEDIMENT, UNITED STATES[a]

Type of Damage	Average Annual Damage	
		TOTALS
Floodwater		
Crops and pasture	$205,694,000	
Floodplain scour, gully and valley trenching	31,468,000	
Other agricultural (farm buildings, stored crops, etc.)	73,059,000	
		$310,221,000
Sediment		
Infertile overwash	20,320,000	
Swamping	13,977,000	
Drainage and irrigation facilities	12,634,000	
		46,931,000
Indirect		
Interruption of essential farm work, etc.		34,622,000
Total		$391,774,000

[a]James Henry Stallings, Soil Conservation (Englewood Cliffs, N. J.: Prentice-Hall, 1957), p. 42.

Table II

ESTIMATED AVERAGE ANNUAL UPSTREAM FLOOD DAMAGE IN THE CONTERMINOUS UNITED STATES[a]

Type of Damages	Annual Cost	Percentage of Total Cost
Crops and pasture	$ 459,512,000	44.9
Floodplain scour	39,972,000	3.4
Stream bank erosion	7,083,000	0.7
Gully erosion	78,397,000	7.7
Other erosion	4,082,000	0.4
Other agricultural	77,606,000	7.6
Sediment	87,652,000	8.6
Nonagricultural	182,871,000	17.9
Indirect	90,377,000	8.8
TOTAL	$1,022,552,000	100.0

[a]E. C. Ford, "Upstream Flood Damage," Journal of Soil and Water Conservation, Vol. 19, November-December 1964.

It is obvious that many of the economic problems associated with erosion are mainly societal in scope. Recognizing this, public funds provide for the upkeep of our navigable waters and provide the major share of flood control costs.

Increasing population and higher living standards in the United States, plus larger exports abroad, will place added pressure on agriculture to produce more low priced agricultural food and fiber. Expanded production must be forthcoming either by utilizing more land or by raising the productivity of the acreage now under cultivation. According to United States Secretary of Agriculture Earl Butz, the former alternative is to be employed. As part of the current feed grain program the secretary expects 13.5 million acres to be placed back into cultivation in 1973.[16] Unfortunately much of this land was idled because it was poor quality farm land. Although figures are not available, a conservative estimate places at least 50 percent of this acreage in the category of being inadequately treated for erosion prevention under intensive row crop cultivation.[17] Increased cultivation of marginal lands may produce short term economic gains but continued use under previous management practices will lead to severe soil erosion resulting in lower production and higher prices.

Institutional Factors

The institutional part of the problem concerns the role

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[16] "Monthly Newsletter to Producers," Pottawatomie County ASCS Office (Westmoreland, Kansas, 1973).

[17] Blase et al., op. cit., p. 277.

of social guides or cultural limitations as they affect the other elements in the decision making process.[18] Institutional problems are defined as social controls over individual or group actions which may either facilitate or retard awareness of erosion and adoption of conservation measures.[19] Blaut found that within the framework of Jamaican farming, traditional conservation measures, and political factors seemed most responsible for the degree and extent of erosion, while social relationships most limited individual awareness of soil erosion and the adoption of conservation practices.[20]

Whereas many social controls change yearly or otherwise quite regularly, making necessary continued adjustments to maintain an equilibrium, others change very slowly. Both types of factors are important in erosion abatement.

One of the slowest changing social institutions in the United States is private land ownership and the right of almost unrestricted exploitation of natural resources.[21] The right to

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[18] B. D. Blakely, J. J. Coyle, and J. G. Steele, "Erosion on Cultivated Land," Yearbook of Agriculture (Washington, D. C.: Government Printing Office, 1957), p. 290.

[19] Blase et al., op. cit., p. 277.

[20] J. Blaut and others, "A Study of Cultural Determinants of Soil Erosion and Conservation in the Blue Mountains of Jamaica," Social and Economic Studies, Vol. 8, 1959.

[21] L. C. Gray, John B. Bennett, Erich Kraemer, and W. N. Sparhawk, "The Causes: Traditional Attitudes and Institutions," Yearbook of Agriculture (Washington, D.C.: Government Printing Office, 1938), p. 112.

hold title to land has been guaranteed to the American public since the founding of the country. Exploitation of the natural resources went hand in hand with ownership and even was encouraged to accelerate settlement. As the geographer and conservationist Guy-Harold Smith put it: "To possess the land and bring it under cultivation meant the destruction of a great forest resource. Wasteful exploitation was condoned in the midst of such abundance."[22] Though less eloquently stated the same idea of ownership and the right of exploitation of natural resources is evident in one farmers attitude: "You can't tell me how to farm; I have already worn out two farms."[23]

Other long lasting social institutions that persist in agriculture are straight-angle field boundries, tax assessments of landed property and established types of tenancy. Nearly all land in the United States with the exception of the New England States and Atlantic Coast states has been surveyed in accordance with the rectangular grid system. Resulting square or rectangular fields offer several obstacles to the adoption of conservation measures. Fence rows existing in place for a hundred years or more and fields that have been cultivated parallel to section lines for generations are two of the obstacles associated with the rectangular survey. Other related quasi-technical problems arise with the development of contour farming. More turn space must be allowed when rows meet a fence barrier at an oblique angle

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[22]Guy-Harold Smith, Conservation of Natural Resources (New York: Wiley, 1965), p. vii.

[23]Quoted in Beasley, op. cit., p. 6.

as opposed to a right angle, and fence lines are more difficult to build and maintain on curved contours than on traditional straight rows.

Tax assessments are based on market value of the land not land use capability. As such they reflect many non agricultural based social and economic conditions. As the economy of an area fluctuates so do land taxes even though land use and productive capacity may remain constant. Tenancy problems center around the length of farm rentals. Short term, one to five year rentals have shown a tendency to encourage exploitation, whereas long term agreements encourage tenants to conserve the land resource and improve farm productivity.[24]

EROSION STUDIES IN GEOGRAPHY

A review of the literature reveals that geographers have approached the study of erosion from two major viewpoints: physical and cultural. In historical development and volume of work, the most frequent vantage point has been that taken by the physical geographer, or more accurately the geomorphologist. Far less developed in quantity and in theory is the study of the interrelationships of man and erosion.

Physical geographers, emphasizing the study of natural processes on the earth's surface, have in large measure studied erosion as a process in the formation of sequential landforms. The identification of erosional and depositional landforms along

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[24]Blase et al., op. cit., p. 299.

with other features resulting from erosional processes has played an important role not only in geography but also in Hydrology, Soil Science and Agronomy.

George Perkins Marsh, lawyer, architect, and diplomat in his 1864 classic The Earth as Modified by Human Action: A New Edition of Man and Nature, expounds on the "destructiveness of man." He noted that it is "within the power of man irreparably to derange the combinations of inorganic matter of organic life."[25] Marsh believed that nature did not heal itself, an opinion contrary to the thinking of his time.

In 1890, W. N. Blair proposed that not all geomorphic sculpturing was the act of nature but was rather artificial in that man's actions were working as a geomorphic process.[26] In the mid 1950's Arthur N. Strahler, then Associate Professor of Geomorphology at Columbia University, attempted to synthesize empirical observations of accelerated erosion with generalized theories of fluvial erosion and deposition to gain insight into man as an agent of landform change.[27] Strahler was attempting to use accelerated erosion data from field slopes to ascertain total drainage basin morphology.

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[25]Donald R. Coates, Environmental Geomorphology and Landscape Conservation, Benchmark Papers in Geology (1972), pp. 131-136; George Perkins Marsh, The Earth as Modified by Human Action: A New Edition of Man and Nature (1864).

[26]W. N. Blair, "Artificial Earth Sculpture," reprint in Earth Science Journal, Vol. 2 (1968), pp. 171-175.

[27]Arthur N. Strahler, "The Nature of Induced Erosion and Aggradation," from Thomas, Man's Role in Changing the Face of the Earth.

Emphasizing man as a part of the geomorphological process, Brown considered him as both a direct instrument of change and a diversionary influence upon other natural processes.[28] He concluded that "soil erosion is the best known and documented of all Man's geomorphological effects."[29] Brown goes on to illustrate the growing concern among physical scientists about man's realistic place in nature. His conclusion points out the essence of the accelerated erosion problem; "If we permit the removal of soil at a faster rate than it is produced we are destroying our very being."[30]

Social geographers have given considerable attention to the relationship of man and the erosion process. Since the late 19th century, when it was first demonstrated how man destroyed the land that he cultivated by increasing the rate of erosion,[31] cultural geographers along with economists, sociologists and conservationists have studied man's relationship with this very important segment of the natural environment. One noticeable example is Guy-Harold Smith, whose works on conservation and natural resources rank as major contributions to the field.[32]

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[28]Eric H. Brown, "Man Shapes the Earth," Geographical Journal, Vol. 136, Pt. 1, 1970.

[29]Ibid., p. 74.

[30]Ibid., p. 83.

[31]Hudson, op. cit., p. 13.

[32]Smith, op. cit., p.

In many instances where geographers examined this relationship it was secondary to other problems. Such was the case of O. E. Baker's study of migration in the United States. Baker, well known for his cultural and agricultural studies gave one page consideration to soil erosion as a contributing factor in the out migration of farmers from the severely eroded Southeastern Piedmont.[33]

One study has been found that focused solely on cultural determinates of soil erosion[34] and at least one other is known to be under investigation.[35] The former inquire by James Blaut investigates perception of erosion, its causes, consequences and control. In their report Blaut and his associates conclude that political factors and social relationships most limited perception of erosion and adoption of conservation practices.[36] The research currently underway by M. J. Kirkby and D. Brunsden, concerns soil erosion and landslides in Calabria, Italy, and the behavioral geographer. The behavioral part of the study aimes at examining differences in land use, social organization and perception of erosion and its causes by local farmers and officials, perception of the range of

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[33] O. E. Baker, "Rural-Urban Migration and the National Welfare," Annals of the Association of American Geographers, Vol. 23, No. 2 (1933), p. 78.

[34] Blaut et al., op. cit., p. 257.

[35] M. J. Kirkby and D. Brunsden, Draft project proposal for submission to I. R. P. I., Corenza, Calabria. "Rates and Distribution of Soil Erosion and Landslides in Calabria," (to be conducted in the Spring of 1973).

[36] Blaut et al., op. cit., p. 257.

choice in adjustment to erosion and adoption of perceived adjustments.[37]

MAN/ENVIRONMENT STUDIES IN GEOGRAPHY

The relationship between man and the rest of the environment has been a major concern in geography for many years, and the uncertain nature of this relationship has led to various interpretations of fact and image as geographers have attempted to explain human activity on the earth's surface. Some early approaches to the problem included environmental determinism, possiblism and probabilism, all of which related human action to variations in the natural environment.

Several contemporary investigators analyzing the resource process have developed various theories and models to explain the recognition and utilization of resources by a society. Certain factors such as population size and age structure, technical level and human wants and desires, have characterized most modern theories.[38]

The functional concept of resources, which centers around the interaction of human wants and the environment, was conceptualized by the resource economist Erich W. Zimmerman.[39] In Zimmerman's theory the decision making process is viewed as

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[37] Kirkby, et al., op. cit., p. 7.

[38] Michael Eliot Hurst, A Geography of Economic Behavior (North Scituate, Massachusetts: Duxbury Press, 1972), p. 68.

[39] Erich W. Zimmerman, World Resources and Industries (New York: Harper, 1951), Chapter 1.

the assessment of the usefulness of the environment to man. Zimmerman saw resources as changing with increased knowledge, improved arts, and expanded science but most of all with changing individual wants and social objectives.[40]

The economic geographer W. Kirk developed a decision making model based on the principles of "gestalt psychology."[41] His model controls the introduction of physical and social facts into the decision making process by means of human values which act to filter facts of the phenomenal environment. Kirk postulates that faced with a problem and having equal availability to environmental information, some groups will make a "satisfactory" choice while others will fail to perceive even the rudimentary aspects of the problem.

The well known human geographer Carl Sauer considered decisions in resource management as being constrained by cultural experience, and natural resources as being in fact cultural appraisals.[42] Peter Gould, a game theorist and behavioral geographer, when speaking of mental maps contended that varied development of the environment results from different dimensions in the minds of people aware of new opportunities, new technolo-

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[40] Zimmerman, op. cit., p. 11.

[41] W. Kirk, "Problems of Geography," Geography, Vol. 48, (1933), pp. 357-371. Kirk notes that two basic principles of Gestalt Psychology are: (1) objects have different meaning when viewed as parts as opposed to a whole; and (2) organization of perceived facts develop in an orderly and simple fashion not a chaotic or haphazard manner.

[42] C. O. Sauer, Agricultural Origins and Dispersals (New York: The American Geographical Society, 1952), pp. 2-3.

gies and new values.[43]

Another economic geographer, H. C. Brookfield, has developed a simplified systems model to account for resource decisions.[44] Intended as a heuristic device, the model is highly suggestive at the general level, but because of problems of measurement is limited in its application to individual or group behavior. Its overall strength is that it is an open system and as such is influenced by other systems and exchanges with the phenomenal environment. This allows much more noise into the model but creates a more realistic situation. In the system Brookfield separates the objective environment and the perceived environment. This permits changes to take place within each environment without affecting the absolute configuration of the other.

In the context of soil erosion several of these assumptions will be investigated. It has been assumed that soil erosion presents a problem to the resource users of the study area. If Kirk's theory is correct, there should be some managers who have adjusted to the problem whereas others will deny that the erosion hazard exists. In addition some measure of cultural, economic and human parameters to decision making should be suggested, shedding light on Brookfield's simplified systems model.

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[43] P. R. Gould, "On Mental Maps," MICMG Discussion Paper, No. 9, 1966.

[44] H. C. Brookfield, "On the Environment as Perceived," Progress in Geography, Vol. 1, 1969, pp. 51-80.

Perception in Hazards Research

Conceptions of the role of perception in resource management continues to exceed empirical knowledge about the subject. Although a growing number of studies are aimed at understanding perception of natural, quasi-natural and social hazards as they affect resource management, the results so far mostly serve to answer very specific questions and stimulate further research.[45] Though restricted in scope by the limited research, Burton and Kates point out the influence of magnitude and frequency of the hazard and individual experience on decision making in the process of resource management.[46] They argue that more frequent and intense hazards have a greater impact on resource management, and experience with a particular hazard plays a significant role in the management of resources perceived to be affected by that hazard.

Saarinen, in his study of perception of drought on the Great Plains, stated that personal experience was most important in determining the role of drought in resource management.[47] At

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[45]Burton and Kates in their article, "The Perception of Natural Hazards in Resource Management," Natural Resource Journal, Vol. 3, No. 3, 1964, define natural hazards as those elements in the physical environment, harmful to man and caused by forces extraneous to him. Quasi-natural hazards are created by man, but their harmful effects are transmitted through natural processes. Social hazards are thought of as being created and transmitted by man within the bounds of society.

[46]Ian Burton and Robert W. Kates, "The Perception of Natural Hazards in Resource Management," Natural Resource Journal, Vol. 3, No. 3, 1964, pp. 412-441.

[47]Thomas F. Saarinen, "Perception of the Drought Hazard on the Great Plains." (Chicago: University of Chicago, Department of Geography Research Paper No. 106, 1966), p. 12.

the same time he indicated that the socio-economic level seemed to have little affect on perception of drought. Burton and Kates also found that generalized indicators of social class or education had no significant effect on the perception of flood hazards.[48]

Shue Tuck Wong identified the following four factors as having the greatest effect on managerial perception and adoption of adjustments in the decisions affecting industrial water supply: (1) an economic-technical dimension; (2) a water-supply dimension; (3) a social guide dimension; and (4) a temporal dimension.[49] Differences in choice perception varied most in reference to size of the industry, the age of the plant, the composite source of the water supply and experience of a water supply.[50] Factors in Wong's study which may find parallel in soil erosion perception are age of the plant and size of the industry. The amount of erosion on a given farm which has taken place in the past should affect the attitudes of the present manager. Also the absolute size of the farming unit may act to either enlarge or decrease the awareness of erosion on a given unit.

Again looking at water supply alternatives but this time in an urban setting, MacIver found that among water officials,

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[48]Burton et al., op. cit., p. 428.

[49]Shue Tuck Wong, "Perception of Choice and Factors Affecting Industrial Water Supply Decisions in Northeastern Illinois." (Chicago: University of Chicago, Department of Geography Research Paper No. 117, 1969), p. 73.

[50]Ibid., p. 74.

level of experience and institutions or interest groups were most important in resource management.[51] Thus both MacIver and Wong found social guides to be important explanatory factors among technical persons dealing with water management. The apparent difference in the role of social guides between these last two examples and those of Burton and Kates and Saarinen may be explained in MacIver's investigation of perception among the general public. He was able to show that there existed a complete lack of information or ignorance of the problems. It would appear that the level of technical knowledge among lay persons plays a significant role in their perception of a problem.

Perception of Erosion

In order to fully understand perception of erosion, we must accept Burton and Kates concept of cultural appraisal of natural hazards. By doing this we may develop working definitions of erosion hazard. The first level or definition of erosion hazard is associated with the images developed after initial introduction to the erosion process. Such awareness may develop as the result of direct contact with the erosion process or by way of media coverage of the erosion hazard. Although this level of awareness may be popularly associated only with public demands for action, it may well influence decision making. In the case of erosion in the United States, direct contact with the consequences of erosion during the 1930's in the form of dust clouds

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[51] Ian MacIver, "Urban Water Supply Alternatives." (Chicago: University of Chicago, Department of Geography Research Paper No. 126, 1971), p.

which blanketed much of the country east of the Great Plains, along with media coverage of the associated drought, no doubt played a major role in focusing public attention on erosion.

The second level of awareness is most evident among individuals involved in the decision making process. At this level perception becomes directly related to decisions concerning resource use and, as such, is affected by the same physical, economic, technical and institutional factors which affect all resource management questions. Technical knowledge becomes more noticeable and experience is translated into more satisfactory adjustments. It must be remembered, however, that management does not itself demand a specific level of awareness. It is in the framework of varying levels of awareness that management decisions are made which determine the construct of the phenomenal environment.

STATEMENT OF PROBLEM

For nearly 40 years official Federal and State policy has urged farmers to practice soil conservation. Progress has been made, but many problems persist and many questions remain unanswered. This paper will investigate the question of resource user perception of soil erosion. It is hypothesized that perception will determine variations in both user knowledge and adoption of conservation practices. It is further postulated that managers grossly underestimate the magnitude of erosion. The study will also assess how resource managers view alternative conservation measures, how they actually adjust to soil erosion and how attitudes vary between individual and group managers and professional conservationists.

Chapter II

THE STUDY: SITE, METHOD AND SAMPLE

The preceding chapter explored several aspects of erosion and environmental behavior and described the conceptual framework behind perception in resource management. In this chapter the problems of erosion in eastern Kansas are examined. The focus shifts from general decisions about erosion perception to the challenges facing resource managers in eastern Kansas. The research strategy called for a survey of resource users within the Kansas counties of Shawnee and Geary. Consideration of some relevant physical and socio-economic conditions for the study area follows, along with a description of the techniques employed.

THE STUDY AREA

Within the eastern Great Plains diversified grain and cattle farming dominate rural acreages and incomes. For the 10 year period 1960-69, cattle and calves averaged 46 percent of total farm cash receipts in Kansas while the corresponding figure for grain crops was 39 percent.[1] Because of different physical requirements and management practices peculiar to each activity

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[1]Kansas State Board of Agriculture, Farm Facts, 1970/1971. (Topeka: Robert R. (Bob) Sanders, State Printer, 1971), p. 84.

it was expected that erosion problems would vary according to type of farm operation. The Kansas counties of Shawnee and Geary were chosen for study on the available data assumption that they were representative of interior Plains counties, and because there were available recent soil surveys and aerial photographs which insured relatively current erosion data. Furthermore, the distance from Manhattan made these two counties readily accessible for study.

The Physical Conditions

The Kansas Flint Hills physiographic province varies in size from 800,000 acres to approximately 4 million acres depending on the interpretation that is made.[2] Geary county is located wholly within the usual boundries of the Flint Hills, whereas Shawnee county lies just to the east of this region. The combined area of the study site is about 600,000 acres, 255,000 acres in Geary county and 345,000 acres in Shawnee county (Figure 3).

The Flint Hills are predominately rolling uplands with few major rivers but with numerous small permanent and intermittent streams and V-notch gullies. The topography is generally characterized by broad nearly level divides with steep valley slopes and narrow flood plains. Though the area inherited its name from the flint rock contained in the limestone bedrock, only about 850,000 acres have cherty or flinty soils. For the entire

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[2] O. W. Bidwell, "The Flint Hills Range Sites," Transactions of the Kansas Academy of Science, Vol. 69, No. 3-4, 1966, pp. 205-213.

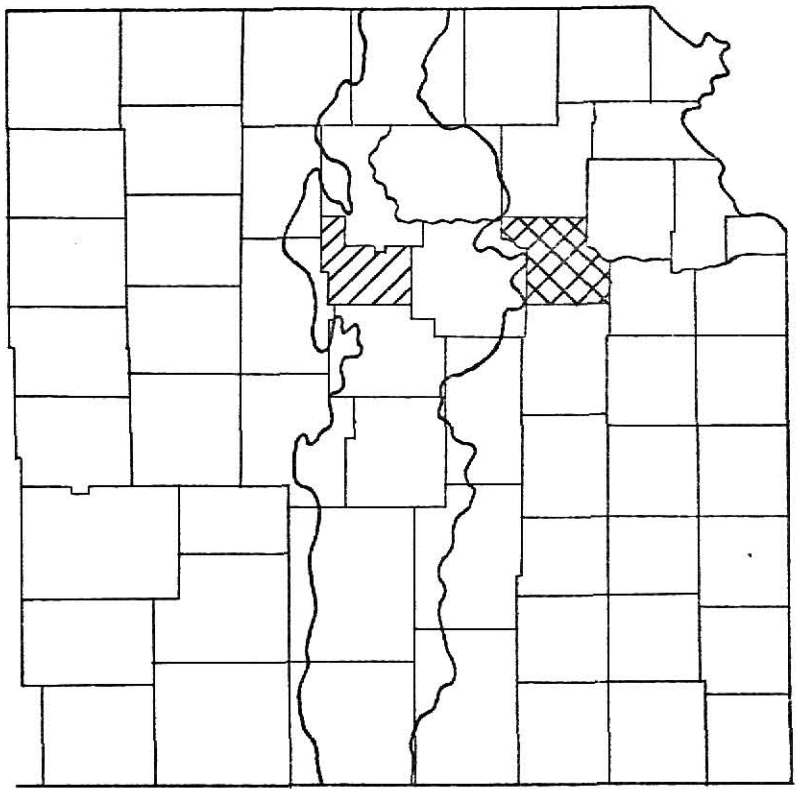

Figure 3 - Shawnee and Geary County Study Area.

Geary County

Shawnee County

Flint Hills Grazing Area

Source: O.W. Bidwell, "The Flint Hills Range Sites" Transactions of the Kansas Academy of Science, Vol. 69 no. 3-4, 1966. p. 206.

Flint Hills area over 2.5 million acres are characterized by shallow steeply sloping soils. Shawnee and Geary counties vary only slightly from this regional characterization.

In Shawnee and Geary counties, uplands occupy about 75 percent of the acreage, with the valleys of the Kansas, Smokey Hill, Republican and Wakarusa rivers yielding most of the bottomland. The large river valleys and broad divides give rise to mixed grain farming which is not characteristic of most of the Flint Hills. Most of the nearly flat alluvial flood plain lands are under intensive row crop cultivation while pasture and rangeland dominate the more sloping uplands. Away from the river bottoms slopes vary from nearly level to over 20 percent with the steepest slopes associated with the limestone break sites in the Flint Hills. In Shawnee county nearly half of all land has a slope factor of 3 percent or greater with approximately 20,000 acres exceeding 7 percent.[3] In Geary county only about 11 percent of the land is on slopes of 4 percent or more.[4]

On sharply sloping land the potential for severe erosion, though varying with soil characteristics, is normally quite high. In numerous instances damage by erosion has already removed the topsoil and gullies are advancing in the poorly structured sub-

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[3]United States Department of Agriculture. Soil Conservation Service, Soil Survey, Shawnee County, Kansas; 1970. (Washington, D. C.: Government Printing Office, 1970), p. 7.

[4]United States Department of Agriculture. Soil Conservation Service, Soil Survey, Geary County, Kansas; 1960. (Washington, D. C.: Government Printing Office, 1960), p. 16.

soil (Figure 4). In such cases practices are needed that will control surface runoff and establish and maintain adequate stands of perennial grasses.[5] For farmers intent on continuing field cultivation the problems center around controlling surface runoff and erosion and maintaining soil tilth and fertility.[6]

Having a humid continental climate, the area experiences wide yearly and seasonal variations in temperature and precipitation. However, yearly averages indicate only a small variation between the two study areas. In most years, three-fourths of the precipitation occurs during the six month growing season, April through September, as shown on Figures 5 and 6, and most often comes in the form of medium to heavy intensity thunderstorms. One problem confronting agricultural managers in this area is that crop production is planned around monthly or seasonally adjusted rainfall estimates, whereas erosion control must be planned around maximum 30 minute rainfall intensities for which data is not readily available to resource managers.[7]

Vegetation cover varies from native species of grasses and trees to cultivated crops such as corn, oats or alfalfa. On the approximately 45 percent of the area under native grasses, mainly big and little bluestem, switchgrass and Indian grass,

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[5]USDA. Soil Survey, Shawnee County, op. cit., p. 17.

[6]Ibid., p. 17.

[7]W. H. Wischmeier and D. D. Smith, Predicting Rainfall Erosion Losses from Cropland East of the Rocky Mountains. United States Department of Agriculture, Agricultural Handbook 282 (Washington, D. C.: Government Printing Office, 1965), pp. 73-78.

THIS BOOK CONTAINS SEVERAL DOCUMENTS THAT ARE OF POOR QUALITY DUE TO BEING A PHOTOCOPY OF A PHOTO.

THIS IS AS RECEIVED FROM CUSTOMER.

Figure 4 - Deep gullies on eroded grazing land.

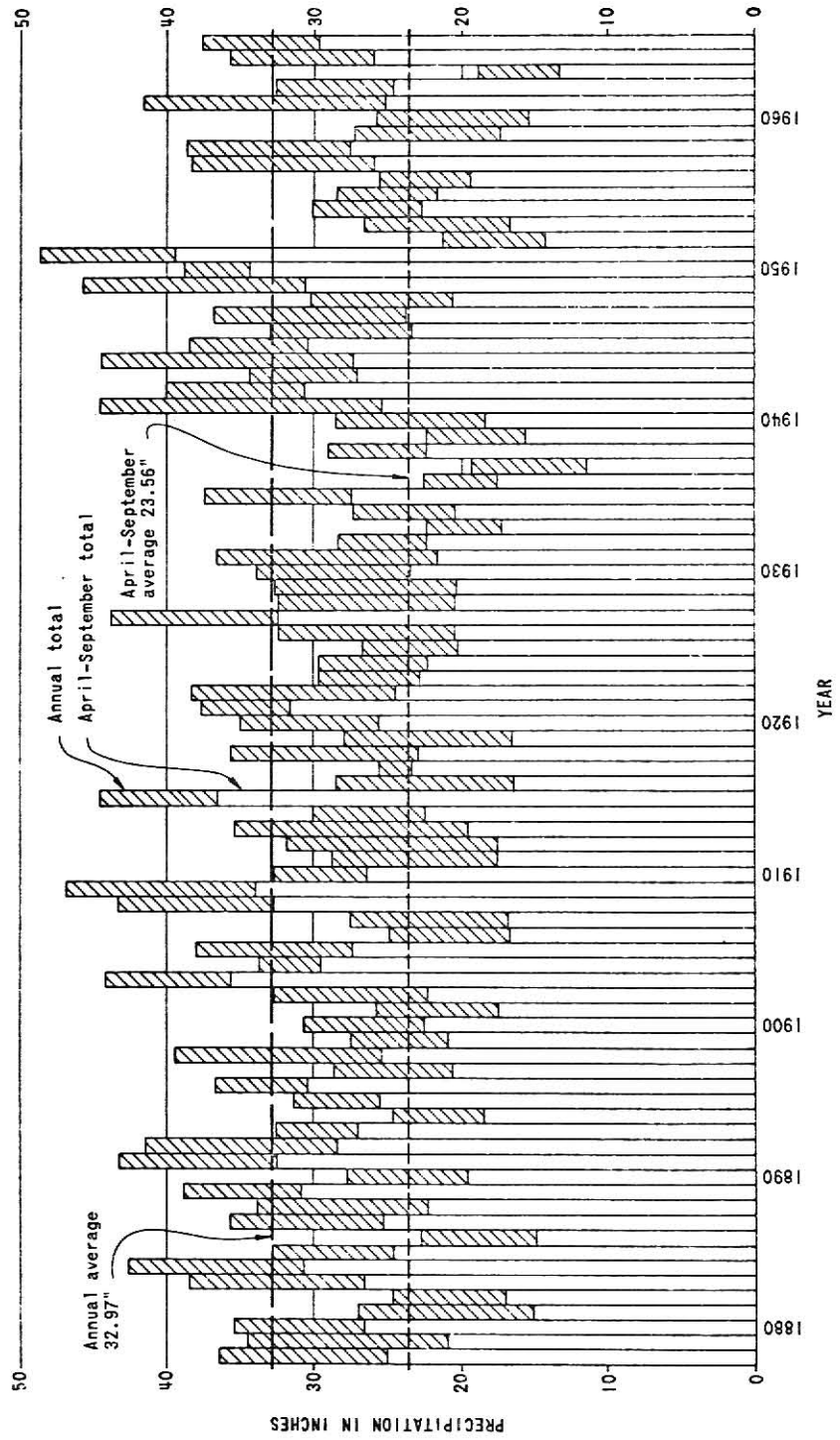

Figure 5 - Average annual precipitation for Shawnee County.

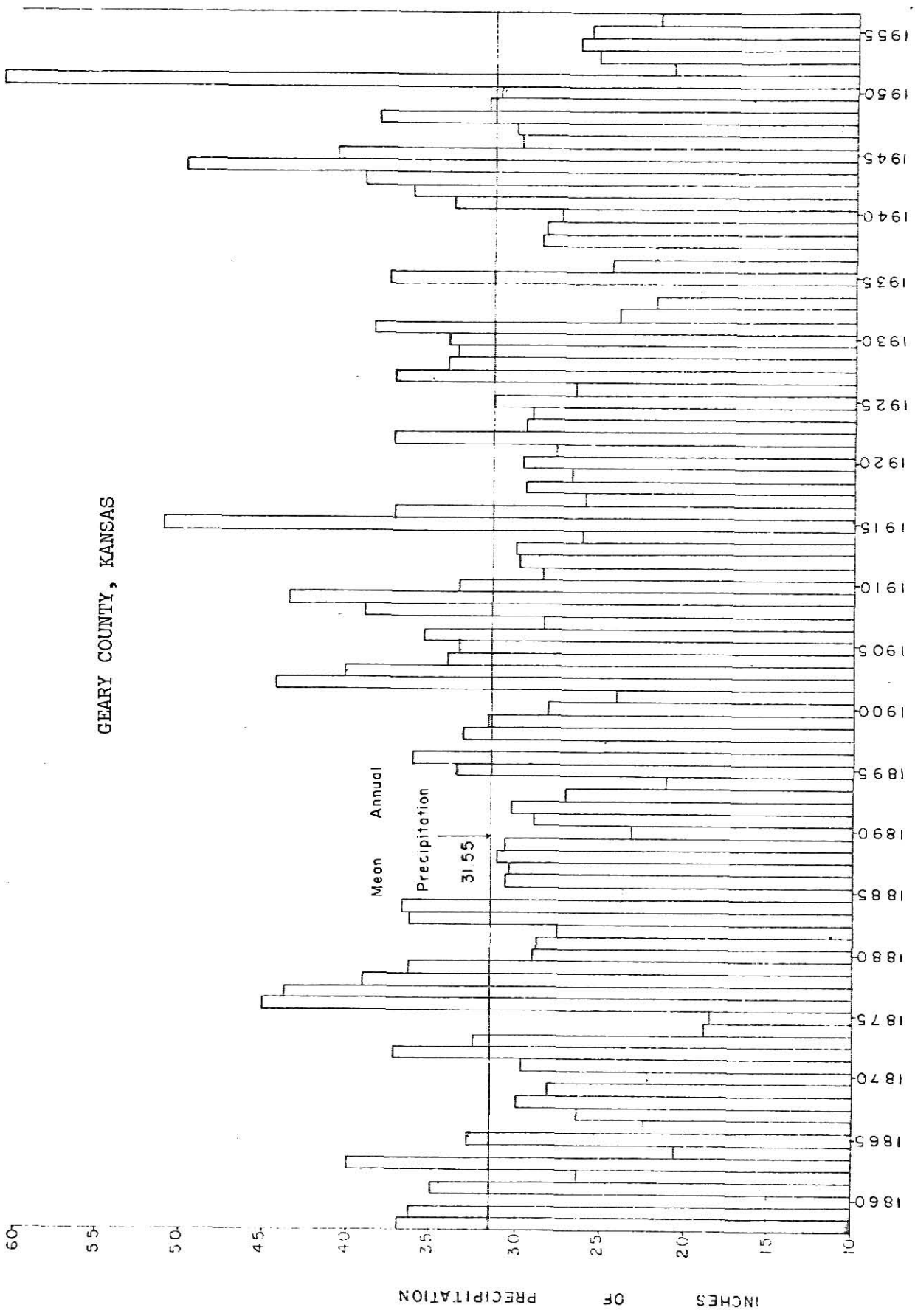

Figure 6 - Average annual precipitation for Geary County.

care must be taken to minimize the growth of underbrush and to control against overgrazing. In the Flint Hills overgrazing can be just as effective as the plow in destroying native grasses. In Shawnee county where only about 29 percent of the land is covered by native grasses, 60 percent of the rangeland is adequately treated to prevent erosion.[8] However, in Geary county which has approximately 60 percent of its land in native rangeland grasses, only about 40 percent of this land is adequately treated. Apart from native grazing land roughly 10 percent of the area is covered by improved pasture land while the remainder is divided among several other types of vegetation cover, as shown in Table III.

Socio-Economic Conditions

Settlement of the area by Europeans began about 1853, and, in the subsequent 130 years, agriculture has grown from a frontier subsistance economy into a highly mechanized and commercial enterprise. During this period of rapid growth and development, Geary county remained predominately agricultural, with most commercial activities being associated with a large military installation located to the east of the county. Although part of Shawnee county has remained agricultural, the economy of the county has been dominated by the development of Topeka as a commercial and governmental center.

Farmers today face varying erosional hazards in part

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[8]According to the Soil Conservation Service handbook, adequately treated rangeland is defined as having at least 60 percent native grasses present in the current growth.

TABLE III

Landuse for Shawnee and Geary Counties for 1958 and 1969

	Total Inventory		Cropland		Pasture[1]		Range		Forest		Other land	
	1958	1969	1958	1969	1958	1969	1958	1969	1958	1969	1958	1969
Shawnee	317110	297501	155000	155000	127068	21577		93178	26862	21000	8180	6746
Geary	241654	200568	85379	69906	140697	6053		111966	8854	10500	6724	2143
TOTAL	558764	498069	240379	226906	267765	27630		205144	25716	32500	14904	8889

[1]Pasture and Rangeland combined in 1958.

because of the length of previous cultivation. The historical period of farming functions to magnify either improved conservation techniques or increased erosion. For the study site accelerated erosion is quite evident. In large measure this can be explained by only forty years of relatively widespread adoption of conservation practices. In most instances this has resulted in perception of the erosion hazard by present resource managers being formulated from conditions that have developed over several generations.

In Shawnee county the increase in large non-farming suburban living units has noticeably changed the pattern of urban development as well as the socio-economic character of a growing number of farm managers. These "mini-farms," ranging in size from 2 acres to over 80 acres have developed along all-weather roads throughout the county, but with major concentrations in the southwestern part.

As cities and towns have grown in size the rural population has decreased. Accompanying this reduction in rural landholders has been an increase in farm size. For the entire study area the enlargement has been from an average unit size of 260 acres in 1950 to 368 acres in 1969.[9] Throughout the study area farms have grown larger in the past two decades, but the rate of increase has lessened in recent years. Age of farmers has strongly influenced this trend. The average age of farmers in the area

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[9]Farm sizes were calculated from statistics on number of farms and total farm acreages per county as reported by the Kansas State Board of Agriculture's Farm Facts, 1950/1951 and 1970/1971.

is about 56 years with many owners in their 60's and 70's. As they reach retirement age they may sell part of their holding to city investors. If the land stays in production the new owner becomes another farmer thus dividing the farmland among more producers. Another contributing factor is people buying relatively small acreages for home building, then cultivating a few acres which classifies them as farmers. This results in more farmers on less land; this reduces unit size.

STUDY METHOD

Data gathering procedures included measurement of erosion and surveying of farmers perceptions of erosion. The surveys will be described here along with a description of the method used to determine the level of erosion. The erosion measurement will be presented in the next chapter.

The Sample

A random sample of names were drawn from an Agricultural Stabilization and Conservation Service (ASCS) farm voter identification list available at the county ASCS offices.[10] A ten percent sample was taken from the list of owners, owner/operators and operators, with the first name being drawn by the Soil Con-

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[10]This list was made up of all persons in the county who were qualified, by way of farm status, to vote in the election of ASCS county committeemen. There was no ordering to the list except that owner/operators and operators were at the beginning of the list and owners were listed last. Since names were drawn in the same manner throughout the list, little chance of prejudice can be seen. Besides ownership status the list indicated the acres which each person farmed under a particular title and the farmers address.

servation Service (SCS) office secretary. After the initial selection was made, every tenth name was used in the sample. This procedure resulted in 156 producer units, 128 in Shawnee county and 38 in Geary county. The units ranged in size from two acres to over 2,500 acres.

To overcome the problem of what has been described as non-farming suburban living units, especially in Shawnee county, the original plan for selecting the survey sample had to be slightly altered. The original plan called for a 10 percent sample with only those units of less than 20 acres being eliminated. However, after consultation with the county ASCS and SCS officials in Shawnee county, it was decided that a 10 percent sample with omission of units of less than forty acres would be more representative of the general farming population. After eliminating holdings of forty acres or less a final sample size of 133 units was obtained. This sample contained 47 owners, 63 owner/operators; and 23 operators, 36 were from Geary county and 97 from Shawnee county.

The Interview

The survey instrument consisted of twenty-three questions and can be found in Appendix A. Approximately one-third of the inquiries invited unlimited expression of individual manager views. Certain questions concerning erosion frequency, however, asked respondents to frame their answers along predetermined lines. In addition to questions about erosion frequency, data was collected to identify the interviewee with respect to age, economic status and certain farm management characteristics.

Many of the survey questions were adapted from previous natural and quasi-natural hazard studies. The format for the questionnaire was a modification of the questionnaire used by Saarinen in his investigation of drought perception among Great Plains wheat farmers.

Whenever possible the resource manager was contacted by phone several days prior to the interview. This proved successful for about 60 percent of the 93 completed surveys and over 90 percent of the 31 who refused to cooperate. Telephone contact created difficulties in ten cases where interviewees required information on the exact subject of the questionnaire before consenting to be interviewed. The same request occurred only once in cases where initial contact was personal.[11]

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[11]Before the actual interviewing was started a set of preliminary interviews were held with eight resource managers to determine the efficiency of the questions. The pre-test indicated that several questions might lead to friction between respondent and interviewer, while several other questions were found to be too simplistic or too technical.

The pre-test indicated that Question 5, which asked farmers to approximate their gross farm income along lines that divided income into six categories would lead to refusal to answer the question. After changes to enlarge the groupings, the final categories were as follows: less than 10,000; 10,000 to 20,000; and over 20,000 dollars.

Question 13: "Which of these terms do you associate with soil erosion?" raindrop splash; gullies; rills; sheet; leaching; and puddling, was deleted as pre-test respondents indicated that all of the answers would be mentioned. Subsequently it has been determined that paired answers asking respondents to choose between two alternatives would have rectified this problem. It was also decided that the part of Question 14 which asked respondents to indicate any noticeable soil loss observed over the last five years in terms of tons/acre/year would be deleted. This was done because even the most informed interviewees in the pre-test were unable to estimate such losses. One value the question had in the pre-test was in indicating a general ignorance on the part of resource users of precise measurements of soil erosion.

The Erosion Measurement

Detailed erosion measurement studies have been conducted only on lands that have had Soil Conservation Service plans prepared for them.[12] Because of the poor coverage of these plans, a measure of erosion was employed based on data found in the county soil surveys. On the large scale soil survey maps of each county, several erosion features or degrees of erosion are identified by letter or symbol. Although the exact degree and type of erosion varies from the 1960 Geary county soil survey to the 1970 Shawnee county soil survey, indications of moderate erosion, severe erosion and gullies are comparable. The data was then used to formulate a measure of erosion for a small number (10) of interview respondents. The subsequent erosion levels allowed a comparison to be made between perceived erosion of resource managers and soil erosion levels as viewed by professional conservationists.

At the same time it was decided not to mention the word tenant as several pre-tested respondents indicated that they thought of themselves as renters or operators but not tenants.

[12]In many cases only parts of farms have had complete plans developed by the Soil Conservation Service, and farmer permission had to be in writing before these could be used thus hindering their use in formulating farmwide erosion levels.

Chapter III

USER RESPONSE AND HAZARD INFORMATION

Farmers are constantly confronted with choices and decisions which must be made under conditions of imperfect knowledge. In this study of perception of the erosion hazard I am investigating how two groups of farmers, one emphasizing grain production and the other livestock rearing, perceive the problem of soil erosion in their uncertain environment. In this chapter erosion hazard information and varying questionnaire responses for local farm managers will be discussed. In presenting data concerning user responses emphasis will be placed on similar and dissimilar response characteristics; whereas hazard information will be described as two separate sections: source of information and range of adjustments.

INFORMATION AND THE EROSION HAZARD

Two types of information are important in the development of individual perception of accelerated erosion. Knowledge gained through communication with individuals, groups or institutions, and personal experience with the conditions of erosion. Although both categories of information are involved in the formulation of perception, it is assumed that one or the other will dominate development of individual manager attitudes.

Knowledge of Erosion

Within the study area knowledge of accelerated soil erosion ranges from embryonic awareness of "washing ground" to very detailed information about the mechanics of soil erosion and its control. The major sources of knowledge as indicated by user response to Question 23 which asked farmers to identify their three major sources of information were conversations with neighbors or friends, mass media publications and official government publications.

As Table IV shows, mass media articles were indicated to be the primary source of information for 59 (64 percent) of the 94 respondents. At the same time government sources were selected by only 18 farmers while neighborhood conversations were indicated only 17 times. If we consider all three sources combined as constituting the total knowledge base for local farmers, we then can suggest the position of each source in the overall organization of information. Following this procedure it was determined that government publications provide less than 25 percent of the total information received by farmers, whereas mass media sources account for about one-half of all farm knowledge apart from experience.

To obtain a better perspective of the information farmers were receiving from their indicated sources, a limited review of erosion literature from these sources was undertaken. Materials considered included items published by the United States Department of Agriculture which were available at either the SCS or ASCS offices, and articles in such publications as Farm Journal,

Table IV

GENERAL SOURCES OF FARM INFORMATION

Order of importance	Mass Media	Friends, Neighbors, etc.	Government Publications
First	59	17	18
Second	39	42	13
Third	32	24	38
Total	130	83	69

Kansas Farmer and Successful Farming.[1]

Although government publications were generally more technical in their approach, neither source contained much information on cultural adjustments to erosion.[2] Furthermore both sources offered only a narrow range of control alternatives; terraces, contour farming and crop residues in government publications and minimum tillage, stubble mulching and terraces in mass media sources. Thus in both instances the review indicated that farmers are getting the "hard sell" on no more than three adjustments, and in both cases emphasis has been on physical adjustments for control or modification of the erosion hazard. As information seems to have improved over the last five years, an interesting study could be developed around differences in perception of "new comers" and established farmers. Since new comers would have to be defined as someone with minimal five years experience a much larger study area would have to be drawn upon to secure an adequate field of respondents.

Experience as a Source of Information

In the process of formulating a level of erosion awareness, experience is considered to be information gained as the result of (1) years spent as a farm manager, and (2) manage-

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[1] In reviewing mass media sources only articles with the words erosion, soil control or farm management were surveyed for content. Also, no attempt was made to assess farmers' conversations as personal experience suggested the subject matter would be too diverse to classify in the time allowed.

[2] In this report cultural adjustments are considered changes in land use which come about as the result of either private or public initiative.

ment of a farm unit during periods characterized by severe erosion,[3] and, (3) actual age of the farm operator. In the second case experience is not considered dependent upon any given rate of incurred soil loss, but rather to one's physical presence in a given environmental situation.

Farm experience, as measured by years spent in farm management, ranged from three years, in the case of a 24 year old ranch operator, to over 50 years for two farm owner/operators, aged 76 and 79. The mean number of years of farm experience was 27 and was the same for both grain farmers and cattle producers. For most farmers experience was limited to the management of one self-owned unit of land and three or less units of rented land.

Experience as the result of managing a farm during periods of severe potential erosion revealed only three managers with less than minimal (one year) experience. Closer examination showed that 82 respondents had experienced at least two such periods and one-half (41) of those had managed through no less than five such years. This distribution suggests that two or less experiences would be insignificant in explaining perception differences but that variations in experience especially of more than five such experiences might be important.

As a means of analysis age parameters extend experience

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[3]Periods of potential severe erosion are defined as years in which the April to September rainfall total equals or exceeds 90 percent of the average yearly total. In Shawnee county the figure is 29 inches and for Geary county 28 inches. Over the past 50 years Shawnee county has experienced eight such years whereas Geary county has had only six.

beyond the farm management period, thus incorporating historical criteria otherwise eliminated in the use of farm experience alone. A breakdown of age distribution reveals the mean age to be 53 years, with 40 percent of the respondents being over 60 and less than 12 percent being under 40.

AWARENESS OF EROSION

To present clearly the data concerning awareness of erosion, the erosion hazard was approached first as a problem in the overall farm decision making process and second as an independent problem with specific variables of its own.

Erosion and the Farm Problem

To ascertain farmer perception of erosion in the total decision making process two questions were formulated. One was an open ended question intended for the collection of general information, and the other a diagnostic question for examination and analysis.

The first question asked farmers to name the main advantages and/or disadvantages they associated with farming in their particular area. The results, after being coded into six categories: physical, cultural and economic advantages and disadvantages are shown in Table V. Physical advantages noted were good soil, plenty of water and good grass, whereas disadvantages which were most common included weather, sloping land and small fields. Positive cultural factors mentioned were distance away from town, its home or the family farm and freedom to be your own boss, whereas negative cultural factors listed were

Table V

COMPARISON OF INDICATED ADVANTAGES AND DISADVANTAGES TO FARMING IN EASTERN KANSAS

Type of Answer	Advantages	Disadvantages	Total
Physical	73	147	220
Cultural	31	15	46
Economic	7	84	91
Total	111	246	357

government control and distance away from town.

Only seven persons mentioned economic advantages and four of these implied that they were making a good living at farming. Although this could be interpreted to be either an economic or cultural answer, it is considered as a primarily economic evaluation. Economic disadvantages were numerous with taxes being the most important, followed by land prices and farm income.

From Table V it can be seen that physical conditions were not only considered more often than economic and cultural aspects combined, but that physical disadvantages outnumbered the total advantages indicated. Taken as a group, disadvantages were mentioned more than twice as often as advantages. This distribution suggests that farmers are especially concerned with conditions which they perceive as being detrimental to their farming operation, particularly physical conditions which erosion is partly considered to be.

Looking again at Table V we see that cultural conditions were the only factors which farmers viewed more often as advantages than disadvantages. This suggests that perhaps perceived cultural advantages play a disproportionate role in individual farm decisions. The large number of disadvantages which farmers indicated they have also suggests that fewer perceived advantages are required for farmers to remain in farming than disadvantages required for them to change activity.

The second question asked respondents to look at a list of alternative farm problems and identify the three they con-

sidered most important to them. The results indicating the number of times each was mentioned as the first, second and third most important, the total times each was given by individual farmers and their rank as to importance is given in Table VI.

Looking at the distribution of first order problems in Table VI reveals wet weather to have been the primary concern of 34 of the 94 respondents, whereas soil erosion, the second most mentioned problem, was considered as such by only 12 respondents. Looking at column five of Table VI, Total Response, it can be seen that wet weather was mentioned by 69 farmers and soil erosion by 39. This breakdown may have been influenced by the timing of the study which was carried out during a very wet winter period which farmers were continually complaining about. Not shown on Table VI is the relative overall importance of soil erosion when farm problems are grouped generically. Viewed as such, weather problems were mentioned 100 times, farm receipts 72 times and farm costs 52 times. Soil erosion was mentioned only 39 times. This pattern, when compared with the general information obtained from Question 9 of the survey, suggests that erosion, though being viewed as a physical problem, is perceived to be of only minor importance in the total farm decision making process. Furthermore, since farmers view two economic problems as more important than erosion, they must consider as insignificant, economic losses incurred as the result of soil erosion.

Erosion as an Independent Problem

Viewed as an independent problem, soil erosion can be looked at in several different ways. In this paper I have chosen

Table VI

LISTED FARM PROBLEMS

Response Category	Rank	Number of Times Mentioned 1st	2nd	3rd	Total
Dry weather	(3)	8	9	11	31
Wheat prices	(6)	6	5	8	19
Cost of fertilizer	(8)	5	2	6	13
Soil erosion	(2)	12	15	12	39
Crop yields	(9)		3	7	10
Utility service					
Machinery costs	(4)	3	11	12	25
Farm labor	(7)	7	4	3	14
Weather forecasting	(10)	3		3	6
Road maintenance					
Corn prices	(3)	11	15	5	31
Wet weather	(1)	34	14	21	69
Cattle prices	(5)	3	13	6	22

to view erosion as a series of related parts in which the combined attitudes on each of the parts constitute a respondent's perception of the erosion hazard. The initial part of erosion awareness investigated was personal definitions or explanations of erosion and its causes. The first question asked respondents to explain in as much detail as they wished what the term "soil erosion" meant to them. In the following question they were asked: "What are the main causes of erosion?" Responses were most often terse and vague such as "water and wind" and "running water" in the case of the latter question, and "loss of soil," "gullies," or "washing" for the first question.

To make comparisons easier an index of erosion awareness was developed by combining responses given for the two questions. The index which classified farmers as having a high, moderate or low awareness of erosion is graphically presented in Figure 7. To determine awareness, answers given in Question 11 were first divided into three general categories according to the level of technical content and relative understanding of the erosion process conveyed. Responses to Question 12 were then broken down into two groups, those which stressed physical causes and those that recognized cultural causes. By first considering definitions, and then causes, it was possible to arrive at a single measure of erosion awareness. According to the resulting indexed awareness levels, 43 respondents had a low awareness, 38 moderate awareness and 13 high awareness.

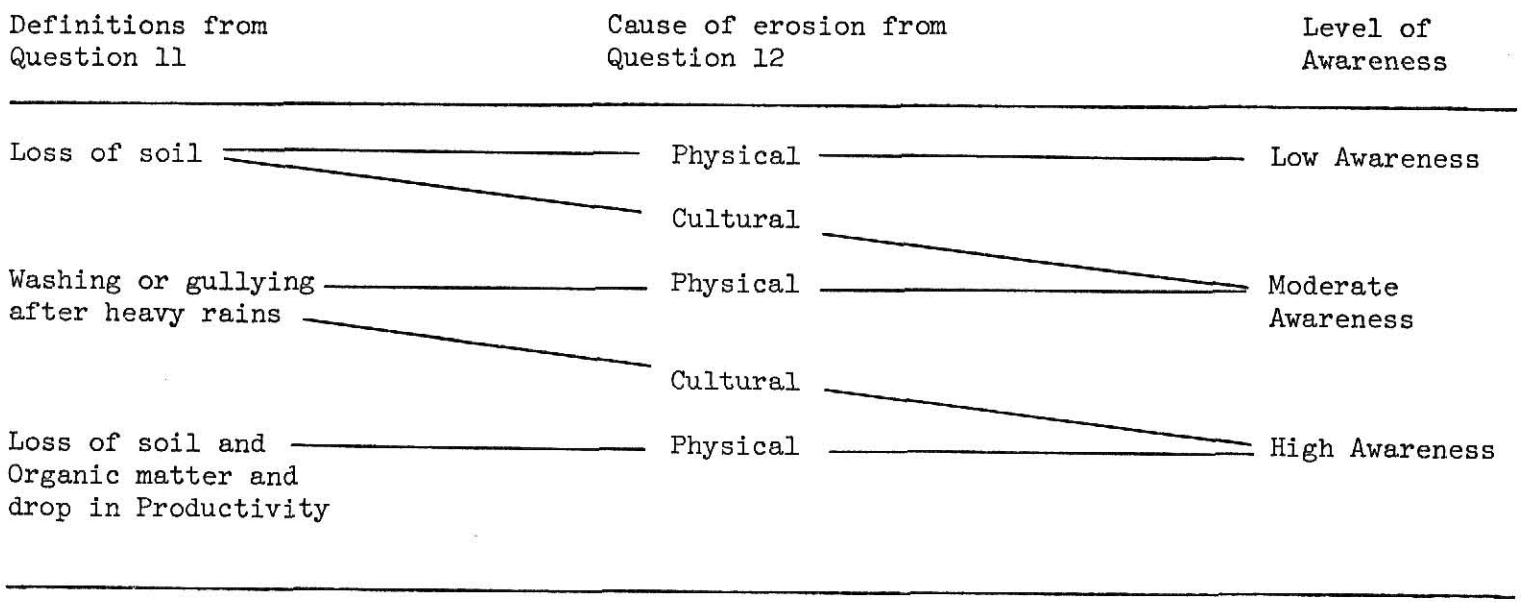

Figure 7 - Development of Erosion Awareness Index.

Soil Loss and Frequency of Erosion

The second part of erosion as an individual problem concerned soil loss and expectations of future erosion. The first of this series of questions asked farmers to consider the amount or seriousness of erosion on their own property. The question asked: "Have you noticed any loss of soil on any of your land over the last five years?" Respondents were asked to frame their answers in terms of "a little," "a moderate amount," or "a lot." The replies were 68, 23, 0 respectively, with 3 farmers stating that they had no soil loss.[4] These answers were then compared with management positions, income and type of agricultural activity. The results given in Table VII show that between 22 and 25 percent of the owners, owner/operators and operators[5] interviewed, indicated a moderate amount of soil loss whereas 75 designated only a small amount of soil loss. When compared to income, 29 percent of those interviewed having a yearly farm gross income of less than 20,000 dollars perceived their loss to be small, whereas those with incomes over 20,000 dollars indicated a moderate soil loss.

Farmers were then asked if erosion had ever been a problem on their farm, to which 78 answered yes and 18 no. The same question went on to ask those who responded in the affirmative

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[4]For a comparison of farmer perceived soil loss and SCS indicated soil loss see PERCEIVED SOIL LOSS AND INDICATED SOIL LOSS section of this chapter.

[5]Owners are defined as persons owning a unit of land but not actively engaged in the physical operation of the farm. Owner/operators are farmers who own and operate their own land and operators are persons who physically operate land which they do not own. Many owner/operators operate more land than they own.

Table VII

AWARENESS OF EROSION

Variable Respondent Characteristics	Low	Moderate	High
Type of agricultural activity			
Grain Emphasis	8	21	4
Cattle Emphasis	32	16	6
Total	40	37	10
Management position			
Owner	12	9	1
Owner/operator	23	25	7
Operator	5	3	2
Total	40	37	10

when erosion had been a problem and how often it had been considered as such. Response indicated that 64 (85 percent) of the farmers suggesting a previous erosion problem conceived of it as being such when they started farming their present holdings. At the same time 41 of these farmers responded that erosion had been a seasonal problem, whereas 21 felt it to be an annual problem.

The last question in this group inquired about individual attitudes concerning future erosion. The question was: "Do you think water induced erosion of the magnitude of wind erosion experienced during the 1930's or the 1950's will ever occur again?" The alternatives were specified, and 16 selected "probably will," 49 "probably won't," 20"will not," and 9 "I don't know." These answers when compared with type of agricultural activity indicated that about 70 percent of all respondents, as well as respondents in both agricultural categories, felt such erosion probably wouldn't or definitely would not occur again. The answers to this series of questions suggest that farmers have a higher awareness of the erosion hazard when viewed outside the constraints of their personal farm decision making process. However, this apparent awareness of previous erosion might suggest that individual farmers view past erosion as an indication of their relative success, or that farmers are more critical of others than they are of themselves.

THE RANGE OF ADJUSTMENTS

Although a wide range of possible adjustments to soil

erosion are known, only a few are extensively used at the present time. This section discusses alternative adjustments to the erosion hazard and farmers' awareness and adoption of these choices. Table VIII presents an analysis of adjustments to the hazard of soil erosion, dividing alternative adjustments into four groups according to the intent of the adjustment. They are adjustments affecting the causes of erosion, modification of the erosion hazard, modifications of loss potential and adjustments to erosion losses.

Adjustments Affecting Causes of Erosion

Although the federal government has experimented in weather modification for several years, no cases are known where attempts have been made to limit rainfall for the stated purpose of reducing erosion. During the 1930's several technical and "folk" adjustments were made to reduce the affecting causes of wind erosion. Planting tree belts to reduce wind velocity, reducing row crop cultivation to minimize the amount of unprotected soil and seeding large acreages back to native or improved vegetation, were common technical adjustments. In contrast, hiring "rain makers" to make it rain and break the drought, was not an uncommon folk adjustment. Several of these adjustments are seen as possible adjustments in the case of water erosion, especially return to native vegetation and reduction of row crop cultivation.

Modification of the Erosion Hazard

Apart from loss bearing, (i.e. sustaining the economic losses incurred from erosion), modifications of the erosion

Table VIII

ADJUSTMENTS TO THE HAZARD OF SOIL EROSION[a]

Adjustments to Loss	Modifications of Loss Potential	Modifications of Erosion Hazard	Adjustments Affecting Hazard Cause
Loss Bearing	Land use planning	Regulations against soil loss	Storm seeding
Public assistance systems	Land retirement programs	Emergency cultivation	Return to native vegetation
	Change aricultural activity	Slope reduction	Reduce row cultivation
	Supplemental income	Diversions & dams	
		Cover crops	
		Contour farming	
		Strip cropping	

[a]Adopted from James K. Mitchell, "Global Summary of Human Response to Natural Hazards Coastal Erosion," (Paper read at the 22nd International Geographical Congress, Calgary, Canada, May, 1972).

hazard are the most common type of adjustment. Conservation measures may be technical, social or biological in construct, and a comprehensive farm plan for controlling erosion will probably incorporate all three.[6] The precise combination of measures will vary from place to place depending on the individual conditions of erosion and management. Terracing and land leveling are recommended to decrease slope length or steepness and reduce the velocity of runoff. Ponds, check dams, waterways and diversions can be installed to control the flow and direction of excess runoff to prevent erosion of cultivated fields or protect such fields from the affects of upslope erosion. Contour farming, strip cropping, chiselling, and cover crops have all been employed to reduce the adverse affects of falling and running water on cultivated land and to increase infiltration time. Reseeding of pasture, brush control, herd size control and burning are encouraged as means of maintaining native grasses and reducing runoff on rangeland sites.

Modification of Loss Potential

Although most adjustments could be classed as modifying potential loss in one way or another, four adjustments are seen as being primarily employed to reduce economic loss. Land-use planning based on soil capability groups, groups of soils showing in a general way, their suitability for most kinds of

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[6]This division was previously used to divide adjustments to coastal erosion by James K. Mitchell, "Global Summary of Human Response to Natural Hazards Coastal Erosion." (Paper read at the 22nd International Geographical Congress, Montreal, August, 1972, Symposium, Calgary, Canada, May, 1972.)

farming,[7] has been recommended by the SCS since its inception. Using these guidelines will lead to adjustments in cropping systems to place appropriate cover crops on the various soils found on a given farm. In most cases landuse planning will not only increase overall farm production but will reduce overall costs and may be implemented with a minimum amount of capital outlay for new machinery or general improvements such as roads, fences and diversions.

Land retirement programs may be carried out by individual farmers as a part of a crop rotation system or through Federal or state governmental programs. In the former case the modification of potential loss comes about through decreasing production costs on the retired land once it is put back into cultivation. Under governmental programs farmers are paid to retire eroding or low producing land by removing it from active production. Such programs insure a return to the farmer on eroded acres which were increasing his production costs and speeding the destruction of his farm.

Changing agricultural activity most usually brings land into closer compliance with soil capabilities. One common change is from row crop cultivation to livestock production with artificial pastures making up a large share of formerly cultivated land. Another change is from either row crop or livestock production to tree culture. This is recommended for several problems including

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[7] For a more detailed description of soil capability groups and their use see Appendix B.

economics of size, where grain or livestock units are too small to return a profit on investments, or where sloping ground is prohibitive of other types of cultivation.

A final way to modify loss potential is to supplement farm income with off-farm work. Although this has no absolute affect on erosion rates or on returns from eroded acres, it will serve to reduce the relative importance of erosion as an economic factor.

Adjustments to Erosion Losses

Under normal conditions erosion losses must be borne by the individual land owner, operator or some combination of these two. In the United States the most common public aid available to persons suffering loss from erosion or its consequences is associated with the extreme case of floods.[8]

AWARENESS AND ADOPTION OF CONSERVATION PRACTICES

In the investigation of awareness and adoption of various conservation practices, attention was placed on the type of measure perceived and adopted as well as individual variations in user perception and adoption of such measures. No attempt was made to correlate type of measure with a particular activity or any individual or group characteristic but they were compared with the potential range of adjustment. Table IX shows perceived and adopted conservation measures presented as to category of

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[8]James Henry Stallings, Soil Conservation (Englewood Cliffs, N. J.: Prentice-Hall, 1957), p. 42.

TABLE IX

Awareness and Adoption of Adjustments

Modification of Loss Potential	P	A	Modification of Erosion Hazard	P	A	Adjustments affecting Hazard Cause	P	A
Landuse planning [a]	58	58	Regulations against soil loss	—	—	Storm seeding	—	—
Land retirement [b]	—	—	Emergency Cultivation	—	—	Return to native vegetation	22	[13]
Change Agricultural activity [c]	48	11	Terracing	79	64	Reduce row crop cultivation [d]	31	[13]
Supplemental Income	43	43	Stubble mulching	37	32			
			Strip cropping	14	13			
			Check dams	26	12			
			Waterways	56	39			
			Cover crops	12	13			
			Crop rotation	11	1			
			Diversion ditches	28	20			
			Ponds	28	27			
			Reseeding pasture	10	8			
			Decreasing herd size	6	6			
			Brush control	29	21			
			Others [1]	5	3			

[a] Adoption rate represents the number of respondents who were listed as SCS cooperators.

[b] Data not gathered.

[c] This figure made up of those who stated they had made a change and those who indicated they could use their land in some other way.

[d] Although 31 respondents indicated perception of reduced row crop cultivation, 17 perceived an increase in row crop cultivation.

[1] Included in this category are: Burning, Chiselling, Jetties and not plowing in the fall.

[] This figure is based on adoption of cover crops which may or may not be native begetation.

potential adjustment. Table IX also indicates the number of times each measure appeared on the questionnaire results.

Perception and Adoption of Adjustments

Although time limitations and data insufficiencies made it difficult to assess awareness and adoption of adjustments important in modifying loss potential, and adjustments affecting hazard causes, three adjustments will be mentioned. Information on landuse planning and changing agricultural activity was collected which suggested that farmers cooperating with the SCS do not adopt landuse plans which are available to them, and that non-cooperators do not perceive changing agricultural activity as an adjustment to erosion. The distribution of supplemental income, another alternative, suggests it might be a relatively common adjustment.

Attitudes towards landuse planning were determined from assessing managers' willingness to cooperate with the SCS in formulating conservation plans for their farms. On this basis 62 percent of the respondents indicated awareness and adoption of landuse planning. However, SCS figures point out that only slightly over 40 percent of the land in the study area is adequately treated for soil erosion.[9] Since the SCS has on its role of cooperators just over 70 percent of all farms in the study area, we cannot expect the remaining 30 percent to be

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[9]SCS information was made available to the author by Richard Comer and George Varner, director and soil technician in the Shawnee and Geary county offices of the SCS. The cooperation of these two men throughout the study was greatly appreciated and of great assistance to the author.

farming the 60 percent of the land which is not adequately treated. This suggests that cooperating farmers are not adopting landuse plans for their entire holdings, but rather are adopting them only on land considered unproductive under current use.

Individual awareness of alternative agricultural activities was determined by analysis of answers to the question: "Could you use your land in any other way?" Response was fairly evenly divided between "yes" 48 and "no" 46. A comparison of respondents answering no indicated that 65 percent of them were not cooperators with the SCS. This suggests that persons not informed of the possibility of changing agricultural activity through the SCS do not in general perceive such changes as adjustments to the erosion hazard.

Answers given to a question asking respondents to indicate if they had any off-farm income indicated that 43 of the 94 interviewees had such incomes in excess of 10 percent of their total yearly income. This suggests that supplemental income, functioning to reduce dependence on farm income, might act as a deterrent to the development of individual awareness of erosion.

Of the four adjustments to erosion problems, changes in man or his works which aim at controlling the erosion hazard are the most common. To investigate awareness and adoption of the various control measures, several open ended questions were formulated. The first question however, concerning erosion abatement, inquired if respondents felt erosion could be controlled. The question asked respondents: "Are there ways to overcome erosion?"

Alternatives were specified and 71 selected yes, 9 no, and 14 said that they did not know. The following question examined user knowledge of specific alternative measures. As stated, it read: "Would you name as many erosion control measures as you can?" The responses are shown in Column P, Table IX, from which it can be seen that only two alternatives were recognized by more than 50 percent of the interviewees. Six adjustments were named by less than 20 percent of the respondents, whereas at least seven alternatives were seen by just over one-fourth of the respondents.

The following question asked respondents: "What type of erosion control measures do you use?" Responses shown in Column A, Table IX, indicate that respondents adopted 78 percent of the adjustments they perceived. This marked contrast with adoption of landuse plans suggests the influence which limited information may have on adoption of perceived adjustments.

PERCEIVED SOIL LOSS AND INDICATED SOIL LOSS

In this section attitudes of professional conservationists will be compared with resource managers' attitudes. The comparison will focus around users perception of their erosion hazard and conservationists evaluation of individual hazard as indicated by county soil survey maps. The method of comparison, described in chapter two, called for the selection of every tenth farm from the original survey to be compared with SCS indicated soil erosion. Following this procedure it was found that users generally perceived their soil erosion problems being less serious

than did conservationists. Six respondents indicated erosion levels lower than those indicated by the SCS, whereas only four managers indicated an erosion level at or above that specified by the soil survey maps.

Seven of the sample farms were found to have erosion problems that ranged from moderate sheet erosion to severe gullying. In Shawnee county where the soil survey indicated severly eroded spots instead of sheet erosion, three of the sample farms were seen to have such erosion, whereas three of the four farms sampled from Geary county had gullies as seen in Table X.

Gullies were the most common erosion feature enumerated by the SCS, appearing on all seven farms indicated as having erosion problems. That the most readily observable erosion hazard should be so evident while only 40 percent of the respondents assessed their erosion hazard like the SCS, suggests that resource managers either fail to include gullies in their definitions of erosion or simply do not assess them as being very serious. Looking at Table X we see the three respondents who assessed their problems as similar to that indicated by the SCS, fit the pattern suggested by the other measures of erosion awareness in that differences in farm size and management position have no affect on differences in perception of erosion.

Table X

INDICATED AND PERCEIVED SOIL LOSS

Farm Sample	Farm Activity[a]	Management Position[b]	Size of Farm	Perceived Erosion	Indicated Erosion
1	C	O/P	1000	No	None
2	C	O/P	479	Slight	Moderate
3	C	O/P	685	Slight	Moderate
4	C	OP	150	Slight	Slight
5	C	O/P	80	Moderate	Moderate
6	G	O	722	Slight	None
7	G	O	418	Moderate	Severe
8	G	O	160	Slight	Moderate
9	C	O/P	160	No	Moderate
10	C	O	560	Slight	None

[a] C - cattle emphasis; G - grain emphasis

[b] O - owner; O/P - owner/operator; OP - operator

Chapter IV

ANALYSIS

In this chapter the relationship between perception of erosion, and knowledge and adoption of conservation practices is analyzed along with the relationship of erosion awareness and agricultural activity. The results of the analysis will then be discussed concentrating on the acceptance or rejection of the stated hypotheses.

PERCEPTION OF EROSION

This section will assess individual and group perception of the erosion hazard. The analysis will reflect respondents' awareness of erosion as: (1) a problem in the overall farm situation; (2) an evaluation of soil losses; and (3) awareness of erosion in time. Individual and group characteristics considered most important for analysis are age, management position, off-farm income and experience.

Erosion as a Farm Problem

Farmers view differently the importance of soil erosion in the overall farm decision making process. In the study area it was found that erosion, when presented with numerous other farm problems, was recognized to be a problem by 41 percent of the respondents. However, the data also showed that as farm

problems were consolidated into more functional groupings of costs, receipts and weather, the relative importance of the erosion hazard declined. In this study the decline was from a relatively strong second position to fourth, with only public services being seen as a lesser problem. This suggests that awareness of the erosion hazard varies with the salience of other farm problems. This situation might be expected as the impact of farm problems, such as erosion, weather, prices and costs, are seen to fluctuate generally in time and space. In this instance timing of the study during a winter season marked by unprecedented precipitation, may have had a distorting affect on the relative importance of weather as a farm problem. Interviewing during the season of minimal soil loss may also have lowered respondents concern over soil erosion.

Comparing this relatively meager concern for erosion with respondent characteristics of age, management position and supplemental income, proved inconclusive. However, when compared with agricultural activity a slightly higher concern for erosion was noted among grain farmers, whereas livestock producers tended to show less than average interest in erosion. Experience was assessed as having no significant affect on evaluation of erosion as a farm problem. Nevertheless, all three farmers indicating less than minimal experience with severe erosion, showed little worry over the erosion hazard.

Indicated Soil Loss

Most farmers were found to evaluate their soil losses as small, very small or extremely small. Only 25 percent of those

responding expressed knowledge of greater soil losses. The large percentage of farmers recognizing only small soil losses made assessment of the problem according to group characteristics difficult.

Although grain farmers were found to recognize moderate soil losses more often than livestock producers, the difference was very slight. When the time of the study is considered and the numerous problems cattlemen faced at that time (i.e. feeding, calving and shelter for their animals), the difference is considered insignificant. Comparing age and management position with soil loss revealed no meaningful relationship. However, comparing only farmers 70 years or older showed that 75 percent indicated moderate soil loss. Because there were only six respondents in this category and because no common variable was found for all four respondents recognizing a moderate level of soil loss, it was determined that either the sample was too small to determine any trend or some variable not considered in this study was responsible. Experience was rejected as the cause when comparisons indicated that no relationship existed between experience and individual evaluation of soil loss.

In part the generally low assessment of soil losses is seen to reflect farmers pride in their farming abilities. On several occasions farmers were hesitant to answer questions which requested them to choose between two or three alternative answers. This would seem to indicate that farmers were not used to evaluating the various aspects of the erosion hazard. Another suggestion would be that users simply recognized different indexes of

erosion. In the pre-test farmers indicated a lack of knowledge about soil loss. This included no comprehension of soil loss in terms of tons lost/acre/year, and difficulty in formulating loss estimates in terms of small amounts, moderate amounts or high amounts. This suggested that soil loss indications were a reflection of farmers' ignorance of the erosion process.

Frequency of Erosion

Perception of erosion in time includes awareness of past erosion and expectancy of future erosion. Viewed strictly in the historical context, farmers individually and grouped according to age, income, management position and experience agreed that erosion had in the past been a serious problem. This view of past erosion was seen to be the result of several biased user attitudes such as: subjectively viewed adjustments, a feeling of general progress shared with most Americans, and self esteem, which tend to distort individual perception of erosion. As suggested by the percentage of farmers who do not anticipate severe erosion in the future and the number who feel they are using the land as best possible, erosion is viewed as a problem farmers inherited and one which they have controlled.

EROSION PERCEPTION AND ADJUSTMENT

To test the strength of relationships between perception of erosion and perception and adoption of alternative adjustments, six chi-square tests were performed on data obtained on three of the four factors that constituted erosion perception. The computations being shown in Appendix C.

The results of these tests supported the conclusion that no relationship exists between the individual factors of erosion awareness and attitudes about alternative adjustments. These results, support a rejection of the hypothesis that perception of erosion determines variations in user knowledge and adoption of conservation practices. However, it is suggested that the rejection be qualified by the distribution of some of the data where 75 to 85 percent of the responses fell into one category, and because of the influence of timing on farmer responses.

To a large degree the qualified rejection of this hypothesis can be explained by the available erosion information which limits farmers' awareness to a very narrow range of adjustments by emphasizing a limited number of physical control measures. The writer believes that as the number of possible adjustments is reduced, perception and adoption of available alternatives increases, not as a function of perception of any level of erosion, but as a function of over emphasis of a few alternatives. Over emphasis is aided by mass media advertising techniques which emphasize successful farming measures, modern farming techniques or time saving adaptations, rather than erosion control devices. This acts to focus user attention not on his erosion problems but on his desire to be a modern well equipped and progressive farmer.

The second hypothesis, that perception of erosion varies between operators of grain farms and cattle enterprises was accepted at the .05 level of significance when indexed perception

of erosion was considered as the only variable. It was found that grain farmers more often had a moderate awareness of erosion, whereas cattle producers generally had a low awareness level. In part this difference may be explained by the timing and conditions during the study, as cattlemen generally expressed primary concern over the weather problem to the near exclusion of other farm problems.

Since it is doubtful that timing could account for the great difference of opinion between these groups of mangers, several differences in physical conditions and management practices are seen as possible explanations.

In physical configuration, grain farms usually have less sloping land than livestock farms. However, slopes are usually cultivated by grain producers, whereas they remain covered with native vegetation on farms emphasizing livestock production. Since cultivated slopes are more susceptible to erosion than grass covered slopes and because they are more intensely utilized, grain farmers' awareness of erosion may be relatively increased in several ways. Unlike cattlemen, grain producers may experience visually the effects of erosion several times during one season. They may also face the problem of physically cultivating over rills or small gullies or planning their cultivation around such obstacles each year. Gullies in pasture land, though reducing productivity in a small area, probably will not affect returns from the pasture for several years and since cattlemen do not have to operate around such erosion features on any regular basis their perception may be relatively reduced.

Once erosion is perceived as a hazard and measures are taken to control its affects, several physical and cultural adjustments suggest themselves as factors which would influence grain farmers retaining their perception of erosion longer than cattlemen.

To cattlemen erosion control measures were seen to be ponds, diversions, reseeding of range sites and brush control. Each of the first three adjustments can be accomplished in one season, and the fourth usually takes no more than two or three years. However, once an adjustment has been made, the rancher may not have to do anything with the areas involved for several more years. Thus his continued association with the erosion hazard is relatively minor. But once the grain farmer adopts control measures, such as terraces, waterways or contour cultivation, he comes in contact with them several times each year. Reinforcing his awareness may be cultural adjustments he had to make which were minimal in the case of the cattlemen. Such adjustments as curved rows, changing fences to match contoured fields and continually planting around terraces are major changes when farmers are used to straight rows and no terraces. His awareness of such changes may be increased by his neighbors continuing to plant straight rows. Most grain farmers also find that cultivating along contoured fields requires more time and more patience. Economically, terraces and waterways have to be repaired more often than dams or diversions and so grain farmers are more regularly reminded in terms of costs what the erosion hazard represents. Grain farmers may also be

faced with buying special equipment or adopting their own to facilitate cultivation along curved rows or to use in a minimum tillage plan.

Chapter V

CONCLUSIONS

The erosion hazard varies in time and space with differences in the physical, economic and institutional characteristics of the total environment. In the Kansas counties of Shawnee and Geary, soil erosion was found to vary most with differences in slope and management practices, especially those associated with the different types of agricultural activity. Perception of the erosion hazard was found to vary most between resource managers grouped according to agricultural activity. Grain farmers seen as being more closely associated with the impacts of the erosion hazard, both before and after adoption of conservation measures, were found to be more aware of soil erosion. In general, however, livestock producers who characteristically cultivate less land and have larger percentages of their farms in pasture or native range, were found to be aware of a wider range of erosion control measures. The study also indicated that no significant difference could be seen in the adoption of alternative adjustments between managers of the two types of agricultural activities.

Counter to one hypothesis, it was found that users with high awareness of erosion did not perceive or adopt conservation measures at a significantly different rate than farmers with a low awareness of erosion. It was concluded that this came about

as the result of relatively poor information sources. Most farmers were found to rely heavily on mass media sources for their farm information. These sources in turn were found to provide less technical information than the governmental sources and to sell conservation measures as modern techniques or successful farming practices rather than erosion control measures which was seen to reduce the importance of erosion awareness in farmers' perception and adoption of conservation measures.

Farmers were generally found to be protective and biased in their assessment of their own farming abilities as witnessed by their recognition of past erosion but their attitude: "It can't happen to me," towards future erosion. At the same time users generally perceived their erosion problems as being less important than did professional conservationists. From this it was concluded that farmers' self image combined with a lack of technical knowledge are important in perception of erosion.

Finally, individual farmers' perception of the erosion hazard is concluded to vary with the type of agricultural activity he is engaged in, the physical and economic problems he is faced with, and somewhat with the seasons of the year. As a whole farmers have a relatively low awareness of erosion which reflects their narrow information base, their biased opinion of personal farming ability and a general feeling of satisfaction with their life, expressed in cultural ties with the land they live on.

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APPENDICES

APPENDIX A

SURVEY QUESTIONNAIRE USED IN THE STUDY OF THE PERCEPTION OF EROSION IN EASTERN KANSAS

Background Information

1. How long have you been farming in this area? _____
   If a newcomer: Where did you farm previously?
   Similar area_____ More humid_____
   River bottom_____ More arid _____
   Hill ground _____ Other _____

2. Age? _____

3. Are you the owner, part owner, or manager?
   Owner _____
   Part Owner_____
   Manager _____
   Other _____

4. How many dependents do you have? _____

5. What was your approximate gross farm income last year?
   Less than 5,000_____ 5,000 to 10,000_____
   Over 20,000_____

6. What is the exact nature (character) of your operation?
   Straight grain_____
   Diversified (grain emphasis)_____
   Diversified (Cattle emphasis)_____
   Straight cattle_____
   Other_____

7. Could you use your land in any other way? Yes___ No___
   If yes, how:
   More row crops_____
   More pasture or range_____
   Diversified crops_____
   Other_____

8. How much land do you operate? Number of acres_____
   Cropland_____ Pasture_____

Awareness of Erosion

9. What are the main advantages or disadvantages of farming in this area? Emphasis advantages____ Emphasis disadvantages___

Advantages:	Disadvantages:
Good soil_____	Erosion_____
Level terrain_____	Poor soils_____
Good climate_____	Hilly ground_____
Good Yields_____	Too dry_____
Others_____	Weeds_____
	Others_____

10. Please look at this list and tell me which you think have been the most important problems for farmers in your area.

1. Dry farming
2. Wheat prices
3. Cost of fertilizer
4. Soil erosion
5. Crop yields
6. Utility service
7. Machinery costs
8. Farm labor
9. Weather forecasting
10. Road maintenance
11. Corn prices
12. Wet weather
13. Cattle prices
14. Labor unions

First choice_____
Second choice_____
Third choice_____

11. During the 1950's, but more so during the 1930's, there was much talk and concern over soil erosion. I would like to ask you something about erosion. Would you tell me in as much detail as you wish what the term "soil erosion" means to you.

12. What are the main causes of soil erosion?

13. Have you noticed any loss of soil on any of your land over the last five years? Yes___ No___
If yes, would you estimate how much.
A little_____ A moderate amount_____ A lot_____

14. Has erosion ever been a problem on this farm? Yes___ No___
If yes, when?

How often: Annual_____ Seasonal_____ Periodic_____

15. Do you think water induced erosion of the magnitude of wind erosion experienced during the 1930's or the 1950's will ever occur?

Definitely will_____
Probably will_____
Probably won't_____
Will not_____
Don't know_____

Awareness and Adoption of Conservation Practices

16. Are there ways to prevent soil erosion? Yes___ No___
Don't know___

17. Would you name as many erosion control measures as you can.

Contour farming_____
Terracing_____
Stubble mulch_____
Strip cropping_____
Reseeding pasture or range_____
Decreasing herd size_____
Check dams_____
Water ways_____
Brush control_____
Rip rap_____
Stream bank Jetties_____
Diversion ditches_____
Others:

18. What do you do — or what types of erosion control measures do you use?

19. What sort of rotation do you follow?
Continuous row crop_____
Row crop - wheat_____
Row crop - cover crop_____
Other:

20. Do you generally participate in government farm programs?
Yes___ No___ If yes, which ones: Conservation programs___
Watershed programs___ Feedgrain program___ Wheat program___
Others:
If no, why not:

21. Do you use commercial fertilizers? Yes___ No___
If yes, on which crops:

22. Do you have any off-farm income? Yes___ No___
If yes, what percentage of your total income comes from the farm?
50%_____ 75%_____ 90%_____

Sources of Information

23. What are the main sources from which you obtain information about new practices in farming such as new machinery, crop varieties, conservation methods, etc.

1. Farm machinery
2. Neighbors or friends
3. Family or relatives
4. County agent or extension meetings
5. Vocational ag. teacher - night school
6. Extension or experiment station bulletins
7. Radio farm show
8. TV farm show
9. Newspapers
10. State fair
11. County fair
12. Co-op extension specialist
13. Experiment station staff
14. Others

Which is the most important?
Which is second most important?

APPENDIX B[a]

CAPABILITY GROUPS OF SOILS

Capability groupings is a system of classification used to show the relative suitability of soils for crops, grazing, forestry, and wildlife. It is a practical grouping based on the needs and limitations of the soils, the risks of damage to them, and also their response to management. There are three levels above the soil mapping unit in this grouping. They are the capability unit, subclass, and class.

The capability unit, which may also be called a management group of soils, is the lowest level of soil capability grouping. A capability unit is made up of soils similar in management needs, in risk of damage, and in general suitability for use.

The next broader grouping, the subclass, is used to indicate the dominant kind of limitation. The letter symbol "e" indicated that the main limiting factor is risk of erosion if the plant cover is not maintained; "w" means that excess water retards plant growth or interferes with cultivation; and "s" shows that the soils are shallow, droughty, or generally low in fertility.

The broadest grouping, the capability class, is identified by Roman numerals. All the soils in one class have limitations and management problems of about the same degree, but of different kinds, as shown by the subclass. All of the classes except class I may have one or more subclasses.

Soils that are suitable for annual or periodic cultivation of annual or short-lived crops are in classes I, II, and III.

Class I soils are those that have the widest range of use and the least risk of damage. They are level or nearly level, productive, well drained, and easy to work. They can be cultivated with almost no risk of erosion and will remain productive if managed with normal care.

Class II soils can be cultivated regularly but do not have

quite so wide a range of suitability as class I soils. Some class II soils are gently sloping; consequently, they need moderate care to prevent erosion. Other soils in class II may be slightly droughty, or slightly wet, or somewhat limited in depth.

Class III soils can be cropped regularly, but they have a narrower range of use than class II soils and need even more careful management.

Class IV soils have greater natural limitations than those in class III, but they can be cultivated for some crops under very careful management.

The soils in classes V, VI, and VII normally should not be cultivated for annual or short-lived crops, but they can be used for pasture or range, for woodland, or for wildlife.

Class V soils are nearly level or gently sloping but are droughty, wet, low in fertility, or otherwise unsuitable for cultivation.

Class VI soils are not suitable for cultivated crops, because they are steep, or droughty, or otherwise limited, but they give fair yields of forage or forest products. Some soils in class VI can, without damage, bu cultivated enough so that fruit trees or forest trees can be set out or pasture crops seeded.

Class VII soils provide only poor to fair yields of forage or forest products. They have characteristics that limit them severely for these uses.

The soils in class VIII have practically no agricultural use. Some of them have value as watersheds, wildlife habitats, or recreational areas.

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[a]United States Department of Agriculture, Soil Conservation Service, Soil Survey: Geary County, Kansas. Series 1955, No. 6 (Washington, D. C.: Government Printing Office, 1959), pp. 3-4.

APPENDIX C

CHI-SQUARE TESTS

Relationship Between Awareness of Soil Erosion and Awareness of Conservation Measures

Awareness of Conservation Measures	Awareness of Soil Erosion: Low Awareness	Moderate Awareness	High Awareness	Total
4 or less measures	23 (22.8288)	22 (21.7360)	5 (5.4340)	50
5 or more measures	19 (19.1730)	18 (18.2600)	5 (4.5650)	42
Total	42	40		92

Computations for Chi-Square Test

Cell	fo	fe	fo - fe	$(fo - fe)^2$	$(fo - fe)^2/fe$
a	23	22.8228	0.1772	0.0313	0.0013
b	22	21.7360	0.2640	0.0696	0.0032
c	5	5.4340	-0.4340	0.1883	0.0346
d	19	19.1730	-0.1730	0.0299	0.0015
e	18	18.2600	.2600	0.0007	
f	5	4.5650	0.4350	0.1892	0.0414
Total	92	90.9908			.0520

.05 Level of Significance

$X^2 = 5.991$

Relationship Between Awareness of Soil Erosion
and
Adoption of Conservation Measures

Adoption of Conservation Measures	Awareness of Soil Erosion: Low Awareness	Moderate Awareness	High Awareness	Total
3 or less measures	19 (17.5695)	15 (15.9354)	4 (4.4946)	38
4 or less measures	24 (25.4259)	24 (23.0607)	7 (6.5043)	55
Total	43	39	11	93

Computations for Chi-Square Test

Cell	fo	fe	fo - fe	$(fo - fe)^2$	$(fo - fe)^2/fe$
a	19	17.5698	1.4302	2.0454	0.1164
b	15	15.9354	-0.9354	0.8749	0.0549
c	4	4.4946	-0.4946	0.2446	0.0544
d	24	25.4259	-1.4259	2.0331	0.0799
e	24	23.0607	0.9393	0.8822	0.0382
f	7	6.5043	0.4957	0.2457	0.0377
Total	93	92.9907			0.3815

.05 Level of Significance
$X^2 = 5.991$

Relationship Between Awareness of Soil Loss
and
Awareness of Conservation Measures

Awareness of Conservation Measures	Awareness of Soil Loss: A Little	A Moderate Amount	Total
4 or less measures	39 (37.9750)	12 (13.0200)	51
5 or more measures	31 (32.0180)	12 (10.9776)	43
Total	70	24	94

Computations for Chi-Square Test

Cell	fo	fe	fo - fe	$(fo - fe)^2$	$(fo - fe)^2/fe$
a	39	37.9750	1.0250	1.0506	0.0276
b	12	13.0202	-1.0200	1.0404	0.0799
c	31	32.0182	-1.0180	1.0363	0.0323
d	12	10.9776	1.0224	1.0453	0.0952
Total	94	93.9910			0.2350

.05 Level of Significance

$X_2 = 3.841$

Relationship Between Awareness of Soil Loss
and
Adoption of Conservation Measures

Adoption of Conservation Measures	Awareness of Soil Loss: A Little	A Moderate Amount	Total
3 or less measures	27 (26.9008)	9 (9.0988)	36
4 or more measures	41 (41.0924)	14 (13.8989)	55
Total	68	23	91

Computations for Chi-Square Test

Cell	fo	fe	fo - fe	$(fo - fe)^2$	$(fo - fe)^2/fe$
a	27	26.9008	0.0922	0.0098	0.0003
b	9	9.0988	-0.0988	0.0097	0.0010
c	41	41.0924	-0.0924	0.0085	0.0002
d	14	13.8989	0.1011	0.0102	0.0007
Total	91	90.9909			0.0022

.05 Level of Significance
$X^2 = 3.841$

Relationship Between Awareness of Soil Erosion
and
Type of Agricultural Activity

Type of Operation	Awareness of Soil Erosion: Low Awareness	Moderate Awareness	High Awareness	Total
Grain Emphasis	8 (14.9985)	21 (13.8732)	4 (4.1250)	33
Cattle Emphasis	32 (24.9975)	16 (23.1220)	7 (6.8750)	55
Total	40	37	11	88

Computations for Chi-Square Test

Cell	fo	fe	fo - fe	$(fo - fe)^2$	$(fo - fe)^2/fe$
a	8	14.9985	-6.9985	48.9790	3.2655
b	32	24.9975	7.0025	49.0350	1.9615
c	21	13.8732	7.1268	50.7912	3.6611
d	16	23.1220	-7.1220	50.7228	2.1937
e	4	4.1250	-0.1250	0.0156	0.0037
f	7	6.8750	0.1250	0.0156	0.0022
Total	88	87.9912			11.0877

.05 Level of Significance
$X^2 = 5.991$

AWARENESS OF SOIL EROSION IN EASTERN KANSAS

by

JOHN LEE JOHNSON

B. A., Kansas State University, 1967

AN ABSTRACT OF A MASTER'S THESIS

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ABSTRACT

A review of erosion data for the United States between the years 1935 and 1967 reveals very little change in the percentage of agricultural land that is eroded. It was surmised that for change to take place, resource managers, in the form of farmers, would have to perceive of erosion as a hazard and be aware of the various physical and social aspects of the problem.

This study assessed farmers awareness of and adjustment to the erosion hazard as a means of determining overall perception of erosion. It considered variations in physical, economic and institutional conditions important in the erosion process, along with farmer characteristics of age, experience, management position and agricultural activity as possible factors influencing perception of erosion.

The study area consisted of the Kansas counties of Shawnee and Geary. Data concerning the erosion hazard was compiled by field survey and Soil Conservation Service records whenever possible. User attitudes about erosion were obtained by use of a questionaire interviewing a selected sample of farmers. Some questions were formulated to allow respondents free and open expression of their attitudes; others required selection of categorized answers. The survey sample was chosen at random from county Agricultural Stabilization and Conservation Service lists of farm owners, owner/operators and operators.

It consisted of 133 farmers of which 94 cooperated in the study. Interviewing was conducted during the months of February and March, 1973, a period of unprecedented wet weather.

In the analysis, perception of erosion constituted individual evaluation of erosion in the total farm decision making process, definitions and explanations of erosion and its causes, awareness of soil loss and attitudes regarding frequency of erosion.

In assessing individual and group perception of erosion in the study area, grain farmers were found to have a moderate awareness of erosion, whereas, cattlemen expressed a low awareness. Knowledge and adoption of conservation measures were found to be a reflection of restricted information and not awareness of the erosion hazard as first postulated. Assessment of individual perception indicated that farmers place minimal importance on erosion in the total farm decision making process, view erosion losses as being noticably less important than professional conservationists and perceive erosion to be a problem which was inherited with the land but which they have brought under control.