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IDENTIFYING LAND USE PLANNING GOALS OF
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**Identifying land use planning goals
of residents of Region V in Iowa**

by

Ardelle Anne Lundeen

**A Dissertation Submitted to the
Graduate Faculty in Partial Fulfillment of
The Requirements for the Degree of
DOCTOR OF PHILOSOPHY**

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CHAPTER I. INTRODUCTION

Citizens and their governmental representatives are becoming increasingly concerned with the present and prospective uses of land resources and the natural environment. Numerous initiatives are being undertaken at national, state, and local governmental levels to define and achieve improvements in land use. These activities, currently known as "land use planning," require the articulation and specification of objectives that citizens desire to achieve in the land use planning process.

Current land use planning efforts are being thwarted and confused by vague and conflicting goals to be achieved. Among such goals being discussed are "orderly development of land uses," "preservation of prime agricultural land," and "protection of property rights." In an effort to clarify and resolve these and other problems associated with land use planning, three studies were initiated in cooperation with the Iowa Regional Rural Development Advisory Committee of MIDAS Council of Governments Region V (hereafter in this report referred to as Region V) in North Central Iowa.

This report presents results of one of these studies which endeavors to develop and apply methodology in the identification and formulation of goals for land use planning preferred by citizens within Region V. These results should be helpful in the Region V land use planning process and in other land use

planning regions of Iowa as well as in other states.

Nature of Land and its Resources

Land is viewed in many contexts. The speculator looks upon land as an investment with possibilities of yielding returns when traded in the market. The farmer and rancher view land as the primary source of their livelihood. The economist views land, along with labor, capital, and entrepreneurship, as one of the factors of production. Cities view land as a means of enlarging their boundaries to provide needed space for growing populations. Land is also viewed as the source of minerals which in turn provide machines and energy which are the foundation of modern industrial society. An increasing number of persons look to land to provide recreational opportunities for themselves and their families. Almost everyone views land as the primary source of food needed to feed an increasing and more affluent population both at home and abroad.

In this study, land is viewed in the spatial context as a territory marked out on the earth's surface with subsurface and supersurface dimensions included. The spatial concept of land is characterized by 1) variability, 2) irreplaceability, 3) indestructibility, and 4) immobility (1, p. 13). The primary reason for using this concept is stated by Harris (29, p. 74), "All aspects of governmental jurisdiction and landed

rights are related to space marked out upon the earth's surface, whether described definitively or vaguely." Thus, space identifies particular parcels of land and locates the resources of the land (soil, climate, topography, minerals, water, plant and animal life, and location) which have the capacity of satisfying man's wants. Both concepts are essential in land use planning efforts.

Current Conflicts and Confusion in Land Use Shifts

Characteristics of land and its resources provide the basis for potential conflicts among various uses and users of land resources. An increasing population portends increasing competition for the limited quantity of available land as more space is needed for residence as well as for provision of food. Extreme variability implies that all land is not suited for every use. Care must be exercised that uses are consistent with the soil and other natural characteristics of the land. Immobility places a premium on location of sites.

Forces of conflict were not strong in the United States in early times because of an abundant supply of land available to support a sparse population. When land became scarce in one area, individuals moved to new land. Thus the farmer, the speculator, and the industrialist proceeded to acquire and use land through operation of the market which allocated land among the various users.

With population growth and the accompanying scarcity of free land, conflicts and problems arose that could no longer be solved through individual action, by piecemeal legislation, or through limited intervention by government. As early as the 1920's, the need for a national land policy was voiced by Hibbard (32, p. 451), "The Reclamation Act and the situation developed in its operation emphasize perhaps more clearly than any other American land law and its administration the need of a comprehensive national policy." He points out further that no attempts have been made to coordinate land policies with the need for food nor with the various demands for land by settlers (32, p. 550).

By 1950, incompatibilities between individual interests and the public interest were becoming increasingly evident. Individuals, with limited planning horizons, may be shortsighted in relation to public interest and policy which require consideration for future generations (64, p. 238). Interrelationships between individual land use and control decisions and public decisions in environmental quality, resource conservation, and land use allocation were becoming evident.

Traditionally, in the United States, land has been considered a commodity and the absolute property of the owner who may dispose of or use his property as he wishes within limited exercise of the public rights of taxation, eminent domain, and police power retained by the government (27). The commodity

concept of land may be changing as noted by Bosselman and Callies (71, p. 98) who state that no longer is the only function of land to make money for its owner. Increasingly land is viewed as a resource which may fill many needs over time. Timmons (62, p. 2) notes that in the context of land as a resource, ". . . public land use policy embraces the various uses of natural resources and environment by people in satisfying their wants and the effects of those uses on natural resources and the environment in terms of their ability to yield a continuing flow of goods and services (quantities and qualities) desired by people over time."

Currently, conflicts in land use exist among users of land and between private and public interests. Some individuals view land as property for the private owner to use as he wishes while others view land as a continuing resource for future as well as present generations with multiple uses which have far-ranging effects to be considered. Land use planning has been suggested as a complement for the market in protecting society's interests in land use and in alleviating conflicts and confusions engendered by shifts in land use.

The Concept of and Need for Land Use Planning

As used throughout this study, land use planning is defined as a spatial plan to designate land for specific purposes in consideration of use effects on surrounding areas

as well as within the spatial area and on the total environment. As defined earlier in this report, land includes the sub-surface and the supersurface as well as the surface resources of land. Planning should include the purposes of fulfilling goals of the citizens involved in the area as well as resolving or preventing conflicts among uses of these land resources.

Land use planning has been utilized for most of this century by cities in the form of comprehensive city plans enforced through zoning ordinances. However, these plans and ordinances usually include only the area within the city limit and usually do not consider the total effect of the plans on the environment and surrounding areas. Leap frog residential and industrial developments in rural areas outside cities have been occurring with increasing frequency. Soil and water conservation entities have developed plans for soil or water districts which involve farm land or recreational areas but usually do not consider the multiple uses for which land may be designated.

As early as the 1920's, the need for comprehensive land planning was voiced by the eminent land policy historian, Benjamin Hibbard (32, p. 562), "Thus far there has been no genuine land policy in and for the United States. True enough, there have been temporizing plans, some of them good for a time, and for certain sections. But a plan involving and comprehending the welfare of the whole nation, varied to fit the different parts of the country, we have not had."

Recently, recognition of the need for land use planning at the local and state as well as national level has been evinced by citizens in bills introduced in state legislatures and the United States Congress. Hearings and discussions on those bills suggest reasons for this need. A partial listing of these reasons is detailed in the following paragraphs.

Recent crises in environmental issues and energy use have sharpened awareness of the need for planning for land resources in an ". . . ecological framework of multiple needs" (71, p. 98). Some of the problems have been exacerbated by the rapid and continued growth of the nation's population, expanding urban development, proliferating transportation systems, large-scale industrial and economic growth, and conflicts in patterns of land use (71, p. 1).

Thirty-eight states responded to a questionnaire in 1971, citing as needs for land use planning; 1) lack of adequate provision for future needs of all sectors of the economy, 2) inadequate protection of the environment, and 3) rapid, uncoordinated and piecemeal development (71, p. 96).

On a national level, need for land use planning has been articulated in hearings on land use bills introduced in the United States Congress. Effects of land use decisions pervade environmental management decisions and energy issues and are influenced by decisions on public facilities, all of which affect the quality of life of the American people. A national

land use policy is needed to identify trade-offs and to compare alternative proposals and demands these proposals make upon land (72, p. 1).

Despite the need recognized by certain segments of the population, land use planning has not received universal approval. Some reservations on land use planning may be attributed to questions raised by and problems associated with the concept of land use planning. The problems are wide-ranging, diverse, and cannot be covered exhaustively in this report. Only problems associated with goals of land use planning are examined in this report as introduced in the following section.

Need for Citizen Participation in Articulating Acceptable Goals for Land Use Planning

Despite recognition of the need for land use planning, only a few states have enacted legislation for controlling land use and none of the major land use bills introduced in the United States Congress have been enacted into law. The slow pace of legislation may be attributed to many problems, only two of which are examined here; 1) the lack of citizen input into the planning process and 2) the need for explicitly stated goals to guide land use planning efforts.

Need for citizen participation

Democracy implies citizen participation but direct citizen input into decision making is increasingly difficult to achieve because of size of population, insulation provided by layers of bureaucracy between citizens and governments, and growing complexity of the issues involved. If democracy is to continue to function adequately in land use planning, mechanisms are needed which allow citizens to present their views and to participate more fully in the planning decision making process. Active participation in land use decisions not only assures citizens of the importance and impact of their views, but encourages support for policies and programs.

During the 1930's, natural resource boards carried out extensive planning at the national, state, and local levels and technicians formulated detailed plans which never reached fruition. It has been hypothesized that citizens had little incentive to implement plans into which they had limited input. With greater participation in formulation, citizens would have been motivated to execute the plans, and more successful results may have been forthcoming.

The Council of State Governments encourages states to involve citizens in the land use planning process since the complexity and magnitude of land use planning affects most people in some form. Specific reasons cited for citizen involvement are:

1. The traditional attitude of Americans that land ownership involved a virtually unlimited private use of land.
2. Due to continuing growth and development, conflicting demands and intense economic pressures are being exerted on the Nation's finite supply of land.
3. Too many land use judgments have been single-purpose, economically motivated, and have often overlooked or neglected complementary social and environmental needs of the community.
4. Citizens will more fully comprehend the ramifications of the process and program if they have participated in its development and administration.
5. Constant involvement of the public in the process provides a means for insuring that it reflects the real aspirations of the citizenry. (14, p. 11)

Need for explicitly stated goals

Governmental entities, recognizing the need for land use planning, have introduced legislation at both state and national levels. A few bills have been passed and adopted while others remain in the discussion stage. Existing and proposed legislation usually requires a comprehensive plan for the use of land under the jurisdiction of each governmental unit, but objectives of the plans are often diffused, ambiguous, and conflicting. Resource project proposals and administrative orders dealing with land use also tend to lack specificity in goals or objectives. Problems arise because of 1) the confusion of goals with means for achieving those goals and/or 2) vague and ambiguous statement of goals.

Although terminology differs among authors and disciplines, this study follows the approach of Tinbergen, Timmons, and MacCrimmon (65; 63; 42) in differentiating means and goals.

With allowance for different nomenclature by the authors, the model is basically as outlined below. Within this approach, means and goals form a continuum with the connotation that goals are more ultimate ends of particular actions. Means are methods of achieving goals. Means may become ends-in-view or subgoals for other means in the continuum. For example, preserving an area for public recreation may be a goal in itself as well as one means for achieving the higher goal of social well-being. Laws may be written in such a manner that means are substituted for goals resulting in planning directed toward achievement of means rather than higher goals. For example, the State Land Use Policy Act introduced in the 1974 Iowa General Assembly lists as one objective ". . . provision for future recreational areas and facilities. . ." (55, p. 14). A similar provision is found in the Colorado Land Use Act (11). Specification of goals allows planners and decision makers to choose from alternative means of achieving a particular goal. If a particular means is the only method accepted by citizens for achieving a goal, both goal and means should be stated and clearly identified.

Another problem associated with goal specification is vagueness or ambiguity. Planning and evaluation are facilitated if goals are clearly stated in measurable terms which is seldom done presently. A quote from the Colorado land use law reads, ". . . to encourage planned and orderly land use

development. . ." (11). The State Land Use Policy Act introduced in the 1974 Iowa General Assembly contains, among other objectives, ". . . provision for an orderly and efficient transition from rural to urban land use" (55). Contrast these two examples with the objective stated in the land utilization project proposed by the Iowa State Planning Board in the 1930's, ". . . the formulation of clearly defined plans in regard to the improvement of income and living conditions" (37).

Planning and evaluating achievement of the first two goals presents problems. What is meant by orderly land use development? Whose standards define orderly? Connotation of "orderly" differs among individuals. How is orderly measured? What unit of measurement is applicable? Conversely, the objective in the last example, improvement in income, is amenable to planning and evaluation. Income is measurable in dollars per time period. Stating this objective in terms such as, an increase in real income in dollars per year with no decrease in other amenities, further clarifies the meaning.

An administrative order illustrating both clarity of wording and differentiation between means and goals is that of the United States Water Resources Council (74) establishing principles and standards for planning water and land resources. The Council assumes society's preferences are reflected in the two principal objectives: 1) to enhance national economic development by increasing the value of the nation's output of

goods and services and improving national economic efficiency and 2) to enhance the quality of the environment by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems. Two auxiliary objectives to be achieved, where appropriate, are stated in terms of 1) regional development and 2) social well-being. The Council's report establishes means for attaining these objectives by the management and use of the nation's water and land resources. In addition, measurements for the various objectives are included; i.e., national economic development is measured by value to users of increased output of goods and services and value of output resulting from external economies. The Council's report states the objectives clearly, explains each more fully, stipulates the means available for achievement of the objectives, and defines the criteria by which each shall be measured.

One further need for clearly stated goals for land use planning is the interrelationship between national, state, and local governmental units as well as between government and private individuals and businesses. Both public and private units are involved in land use and their objectives should be compatible rather than competitive. Clearly defined objectives will permit, though not necessarily ensure, closer cooperation among various levels of government and private interests.

In summary, awareness of the need for land use planning has resulted in introduction and enactment of laws which include comprehensive plans for land use. To plan properly, to encourage consumation of plans, and to evaluate results, citizen participation in selecting clear and unambiguous goals is needed.

Difficulties arise in articulating goals of land use as well as in molding these goals into an order acceptable to a majority of the population. Full agreement among those affected by the plans is hardly conceivable since individual preferences vary. Nevertheless, since land use planning will likely be carried on with or without stated objectives formulated with citizen participation, the attempt to enunciate goals seems worthwhile. Without stated objectives, the consequences of land use planning become the inferred goals. These inferred goals may not be the goals citizens would choose if given the opportunity to express their wishes.

Statement of the Specific Problem Treated in this Study

This study focuses on identifying the goals for land use planning preferred by the citizens of MIDAS Council of Governments Region V in North Central Iowa. Region V is one of sixteen regions into which the State of Iowa is divided for planning purposes. Planning in this region is carried on by the MIDAS Planning Commission in conjunction with the Council

of Government committee. Some of the most productive agricultural land in the state lies within this region. Light industries and agri-business firms are also located within the region.

Norms for judging the problem of this study must be established and articulated. Adapting norms from economic policy to land use planning seems to constitute a reasonable approach. Production and distribution implications of decisions are two basic considerations of economic policy recognized by federal and state agencies in formulating land and resource planning goals.

In economic policy, production efficiency implies combining a stated quantity of inputs to achieve maximum output or achieving a stated quantity of output from a minimum amount of inputs. In resource and land use planning goals formulated by the Water Resources Council, productive efficiency is recognized in the goal to enhance national economic development by increasing the value of the nation's output of goods and services and improving national economic efficiency. However, agencies such as the Water Resources Council, the Environmental Protection Agency, and Iowa Department of Environmental Quality, temper productive efficiency with consideration of environmental quality impacts of decisions. The goal of environmental quality is accorded equal status with that of economic development.

As an economic concept, distribution involves the question of how income from produced goods is distributed. This concept is also recognized by the Water Resources Council in the goal of social well-being which includes income equity as one of its components.

Development and resolution of any problem in land use planning must consider the production, distribution, and environmental quality impacts of the decision.

Hypotheses to guide research

To guide and direct research, hypotheses were formulated to delimit, diagnose, and offer solutions to the problem as stated above.

The problem delimiting hypothesis Land evolved into its current uses via a process involving a myriad of decisions and actions in the market place, political arena, and institutions. Changes in land use continue through this process. Patterns of land use could be projected into the future based upon the trends discerned in this process. This pattern of land use may be termed the existential situation.

If, however, society's preferences in the goals of land use planning were articulated, a pattern of land use based upon these goal preferences could be projected. This pattern of land use might be termed the norm.

If the above two projected patterns coincide, no problem exists and no reason to act to change the course of land use.

If, however, the patterns do not coincide, a problematic gap exists and actions may be required to remove the gap. It is hypothesized that such a gap exists. This study deals specifically with the problem of articulating goals to be used as the basis of projecting patterns of land use.

The diagnostic hypothesis The existence of a problematic gap results from failure to consider society's interests directly in the land use decision making process. Market place decisions are based largely upon individual considerations and, in the words of Adam Smith, "for self-interest." Thus, if land decisions are the exclusive province of the market place, these decisions may violate the usually accepted criteria of production and distribution because of the many externalities associated with land use and the lack of distributive considerations in the market place.

Another reason for the gap may be lack of participation by society in land use decisions. As a result, decision makers are unaware of citizens' desires in goals of land use. Decision makers may hesitate to seek citizen input because of the many problems involved in eliciting and aggregating individual preferences into group preferences.

The gap between the pattern of land use projected from trends and the pattern projected from citizens' goals may be no larger than it is because land use decisions are not exclusively the province of the market but are also based upon

institutional and political considerations. Effects of externalities have been assuaged through planning, zoning laws, and other restrictions on uses. Also, approximately one-third of the land in the United States is publicly owned. Decision makers concerned with equity impacts proceed to make decisions on public lands with this end in view.

The remedial hypothesis The remedial hypothesis is to minimize the gap between projected land uses based upon aggregate trends and those uses based upon citizens' preferences. Society's goals must be articulated and formulated into a function which can be used as a guide for land use patterns.

Objectives of this Study

To better understand, evaluate, and mitigate the problem of land use planning goals, objectives of this study are:

1. to develop a methodology for obtaining, ordering, and reconciling citizens preferences for goals of land use,
2. to apply this procedure to Region V in obtaining and analyzing citizen preferences for land use planning goals, and
3. to suggest further research needs in methodology and identification of land use goals.

A methodology for deriving an ordered social choice of goals is formulated as part of objective one. Along with this, the means-goals continuum is examined, and variables suitable as goals for land use planning are isolated and articulated.

In objective two, the methodology as formulated above is applied and tested to derive the goals of citizens of Region V for land use planning. Objective three suggests new problems or areas that need further research particularly if the methodology is to find application in other areas in Iowa or in other states.

Methods Used in Pursuing These Objectives

Theoretical and empirical considerations

The theoretical portion of the study deals with the first objective. Theoretical concepts of economic policy are reviewed to isolate measurable target variables and instrument variables utilized to achieve desired economic policies. Methods for measuring achievement of policies and trade-offs between target variables are explored. Since land use planning defines and effects land use policy, concepts of economic policy are transferrable to land use planning.

Similarly, theoretical concepts of constructing a welfare function are reviewed. A welfare function and ordered social choice for goals of land use planning are similar in that both attempt to aggregate preferences of individuals and mold these preferences into a single ordered social choice set. Both involve constraints and trade-offs between alternative goals to be considered when maximizing the function. Literature on theoretical concepts is reviewed, but as this is essentially an

applied project, literature on applications receives emphasis.

The empirical section of the study deals with objective two by using the methodology developed as part of objective one to obtain citizens' preferences among goals of land use planning in Region V and to draw these preferences into a social choice order in a manner which is acceptable and supportable by citizens affected. A personal interview survey of the residents of Region V is selected as the means for obtaining citizens' preferences on goals of land use planning.

As a result of the experiences and problems encountered in this study, recommendations for further research on goals for land use planning are suggested. Changes and improvements which may be adapted in applying the methodology to other areas in Iowa or the United States are indicated. These suggestions are encompassed in objective three.

Study procedure in Region V

This study is one segment of a larger research project consisting of three highly interrelated parts aimed at analyzing land use in Region V and developing and testing methodologies for land use research suitable within the region and for application in other regions of the state and nation. One segment of the project focuses on gathering basic data on current uses of land in the region and projecting future uses based upon trends. A second segment reviews and analyzes tools available to guide land use toward identified goals. This

third segment, Identifying Land Use Planning Goals of Residents of Region V in Iowa, is designed to contribute to the above two segments in providing an integrated project.

The decision was made to concentrate the use of federal funds received by the State of Iowa under Title V of the Rural Development Act in several projects in one area of the state rather than dispersing projects throughout the state. Region V was chosen as the area of concentration for Title V funds, and a series of projects involving research and education were undertaken with the cooperation and approval of the Iowa Regional Rural Development Advisory Committee in Region V. The three-segment Land Use Study is one of the projects funded under the above plan.

Data from the personal interview survey is being made available for decision makers and other interested persons in Region V.

Organization of the Report

Chapter I provides introductory background on land use planning, introduces the problem as delimited in this study, and states the study objectives. Goals of previous land use and resource legislation are reviewed in Chapter II for the purpose of providing background on the problems associated with articulating goals of land use planning. In Chapter III, economic policy methodology is examined and relevant aspects

transferred and adapted to land use planning. Chapter IV describes the personal survey conducted in Region V to obtain data on goal preferences of citizens of that region for land use planning while the empirical results of the survey are analyzed in Chapter V. Chapter VI contains a summary of the conclusions along with recommendations for further study.

CHAPTER II. STATED AND IMPLIED GOALS IN UNITED STATES AND STATE LAND POLICIES AND PROGRAMS

Legislation involving land resource policy and planning includes either explicitly or implicitly the goals of the legislation. In order to put current problems and planning goals of land use policy into perspective, goals of past land legislation are examined as part of this study. Implied and stated goals of land use policy derived from this examination provide departure points for this study.

Colonial Land Use Goals Prior to 1776

Initial activities involving land in America centered about the acquisition and disposition of rights to land. As quoted from Harris (29, p. 74) in Chapter I, all jurisdiction and rights in land are related to the spatial concept. As such, the rights to land in space became the most important feature of early land policies. In the original Thirteen Colonies, initial grantors had power to decide the type of rights and tenure granted to the settlers. Governmental units were empowered to make adjustments later in the original terms. This pattern continued as new sections of the continent were added to the United States.

Native American Indians held the first known rights to land encompassing the Thirteen Original colonies. British, Dutch, French, Spanish and Swedish sovereigns gained rights to

the space through the doctrine of right of discovery and colonization. In turn, the sovereigns granted rights in the land to trade-monopoly or land-settlement companies. The rights granted were neither homogeneous nor total. In keeping with worldwide practice, sovereigns retained certain rights such as power of taxation and type of government allowed. Land companies retained trade and expansion rights when transferring land to actual settlers. Goals which the various groups wished to achieve through land use differed according to the situation of each group. The British crown wished to develop a colonial empire to supply raw materials and markets for manufactured goods. Colonizing agencies looked to development of a feudal-type system to replace the dying European feudal system. Early settlers wanted cheap land on easy terms with as few restrictions on their rights as possible (29). The problem was not resolved but the protagonists changed as a result of the Revolutionary War which extinguished the rights of the British crown and transferred its rights to the new national government of the United States.

As a nation, the United States inherited the structure of tenure and rights prevailing in the Thirteen Colonies; however, the new national government became the original grantor of land rights in lieu of the crown with states making needed adjustments during disposal of vast holdings of public lands. As each new frontier was opened, land statutes were copied or

adapted from those existing in colonies organized earlier. Experiences with mining in Wisconsin, Illinois, and Iowa were applied to mining laws in the Sierras. Indian laws were a series of experiments with the opening of each successive frontier (66, p. 10).

Post Revolutionary Public Land Use Goals

Property rights are the basis for division of land into two types: 1) land in public domain owned by the United States and subject to sale or transfer by the United States government and 2) national domain which is the total area under the jurisdiction of the federal government. For approximately the first one and one-half century of nationhood, United States land legislation dealt primarily with land in the public domain, the size of which fluctuated as new land was acquired and other land transferred to private ownership. Public domain was acquired in several ways. Through their original charters, Georgia, South Carolina, North Carolina, Virginia, Connecticut, and Massachusetts claimed land as far west as the Mississippi River and ceded much of this land to the federal government (5, pp. 143-4). Outright purchase accounted for another major segment of the public domain including the Louisiana Purchase in 1803, the Florida Purchase in 1819, the Texas Purchase in 1850, the Gadsen Purchase in 1853, and the Alaska Purchase in 1867. The United States acquired Oregon through negotiation

with Great Britain in 1846 and much south-western territory from Mexico by treaty at the close of the Mexican War in 1848.

The newly formed United States government was faced with dual problems of colonizing this vast area of land and raising much needed revenue for the government. The relative importance of these problems and the use of public lands to solve them is revealed in this quote from Alexander Hamilton cited by Hibbard (32, p. 2):

That in the formation of a plan for the disposition of vacant lands of the United States there appear to be two leading objects of consideration: on the facility of advantageous sales, according to the probable course of circumstances; the other the accomodation of individuals now inhabiting the western country, or who may hereafter emigrate thither. The former as an operation of finance claims primary attention; the latter is important, as it relates to the satisfaction of the inhabitants of the Western country.

Raising revenue remained the primary objective of the federal government's public land policy for approximately the first half of the 19th century. This objective directly contravened the objectives of the original eastern and later western settlers. Public land disposal failed dismally in raising revenue for the nation or states and, in almost every case, policies were revised or amended to provide cheap and, after 1862, free land to those who wanted to settle and improve the land.

The Ordinances of 1784, 1785, and 1787 provided for land surveys, methods of settlement, price of land, and type of

government. The provision that land be surveyed before settlement and sale proved troublesome in public lands for many years and ultimately lead to pre-emption measures which finally passed in 1841. One objective of the 1784 Ordinance was division of land into townships and sections (32, pp. 32-42).

The federal government granted public lands to soldiers of the Revolutionary War, the War of 1812, and the Mexican War with the objective of strengthening the army. At first, Congress imposed restrictive rules on recipients and amounts of land, but after 1850 the rules were relaxed, grants of land were more liberal, and warrants to land were assignable. Because the price of warrants was lower than the minimum price of land at public sale, relaxation of restrictions on warrants led to speculation. In Iowa during the 1850's, a few individuals entered many thousands of acres in western land offices (32, pp. 118-27). Once again, land policy objectives were contravened. Passage of the Homestead Act in 1862 removed the necessity for issuing land warrants to veterans in the wars of the later nineteenth century.

Frederick Jackson Turner notes that in the period of 1830-50 federal legislation was diverse and changing with Clay urging that net proceeds from sale of lands go to the states; Benton pressed the policies of graduation, pre-emption, and reduction of price to settlers; Calhoun wanted land ceded to states in which it lay; and John Quincy Adams supported use of

lands to provide federal internal improvements. Sectional jealousy and divisions can be noted--still true in land questions. "The land question showed itself to be intimately connected with American social ideals, as well as with the economic and political interests of the rival sections" (68, pp. 590-1).

Public Land Use Goals During Westward
Expansion After Mid 1850's

Objectives of public land policy gradually changed as policymakers realized that only inconsequential amounts of revenue would be raised through the sale of public land.

A pre-emption measure in 1841, the Graduation Act of 1854, and the Homestead Act of 1862 were federal land policies representing adoption of a plan designed to settle land, place it in private ownership, and on tax rolls as rapidly as possible (48, p. 60). During this period Congress held vast amounts of land in the public domain and wished to place it in private ownership. The exact number of acres varied as new territories were acquired and older territories settled, but by the 1850's there were still 71 million acres of unsold land in the eleven states of the Mississippi Valley (5, p. 158).

Implied objectives of the Homestead Act were diffusion of wealth and creation of a land owning people, achievements which were at best temporary. In selected counties almost totally homesteaded by the 1870's, tenancy had reached 50 percent in

the early 1900's. The great weakness of the Homestead Act was its inappropriateness for many types of land or agricultural practices because of limitations on size or because of requirements which were impossible to meet. The Homestead Act required that settlers reside on or cultivate their claim for five years after which title would be granted to them. Much of the land opened for homesteading was west of the 100th meridian and included mineral, timber, grazing, and semiarid lands. Agriculture appropriate to these types of land required more than 160 acres of land to be profitable. Cultivation of this land was expensive and many settlers did not have the financial resources to carry out needed improvements. Thus many settlers were forced to vacate or sell their claims before they had gained clear title (5, pp. 348-49).

In addition to general objectives of raising revenue and settling the west, legislation was enacted for specific situations and particular types of land with objectives geared to those specific purposes. Goals of some of the more important special land use legislation are detailed below.

During the period of 1841 to 1890, one objective of public land policy was the fostering of national development, and many acres of land were granted to provide roads, canals, and railroads. Part of this land was ceded to states to encourage general improvements in transportation while other grants were for specific purposes or to private companies, e.g., railroad

companies. Transportation was needed to carry settlers west and take produce to eastern and foreign markets. The objective of encouraging development of a transportation system was fairly well met.

Public lands have provided means to foster public education since colonial times. The colonies donated free land for support of schools and the United States government continued this policy. The Ordinance of 1787 provided that section number sixteen in every township be given to the inhabitants of that township for support of schools. Minor amounts of land were granted in the interim, but the major educational land grant was the Morrill Act signed into law on July 2, 1862 with the objective of establishing agricultural and mechanics arts colleges in the states. Land for other institutions of higher learning, including private colleges, was granted later (32, pp. 309-43).

The educational objectives of land policy were probably as well achieved as any other objective if allowance is made for other forces that may also have contributed to the nation's system of public and higher education.

In the late 1860's concern over the diminishing supply of timber led to the Timber Culture Act of 1873 and its amendments with the purpose of ". . . encouraging the growth of timber on Western prairies" (32, p. 414). A person planting and protecting trees as specified in the Act could acquire one quarter of

land. In spite of several attempts to correct its deficiencies through amendment, the Act failed to achieve its purpose and was repealed in 1891. Achievement of the objectives was summarized in this quote from Hibbard (32, pp. 421-22), "It is another instance of a law successful in giving a large amount of land mostly to people who did not deserve it, and bringing to the government another chapter of experience in how public domain ought not to be handled."

Over 64 million acres of land were granted to fifteen states by the national government as a result of passage of the Swamp Land Act of 1849 and succeeding amendments. The intent of the Act was for states to drain overflow lands or build dams and levees to prevent unsanitary conditions and to reclaim land for cultivation. Reclaimed land could then be sold to pay for the improvements. As noted by Hibbard (32, pp. 269-88), the Swamp Land Act is important, not because the objectives of the act were achieved, but because of the vast amount of land which passed from the ownership of the federal government. A larger amount of land was granted than the original intent of the act and many conflicts arose in land acquisition and disposition. Designation of swamp land was imprecise, and states claimed and received many more acres than qualified as swamp land under the original intent of the act. Often both national and state governments sold the same land to different purchasers because of conflicting claims and misunderstandings. When disposal of the land was left to counties, fraud often prevailed as well.

In Iowa, where counties disposed of the land, commissioners bartered land for county improvements, sold it cheaply to land companies or to themselves (32, p. 286). The original intent to drain and reclaim swamp land by the states was never fully realized and many critics feel the problem would have been better resolved if left in the hands of the national government.

To encourage irrigation of arid lands, the Desert Land Act was passed in 1876 offering land at \$1.25 per acre to anyone promising to irrigate land within three years of filing. To correct deficiencies in the original legislation, additional Acts were passed in 1891 and 1894. Many difficulties were encountered with private irrigation so, in 1902, the Reclamation Act was enacted placing irrigation into the hands of the government which would sell land to settlers who would pay costs of irrigation. Lenient credit terms resulted in many cases of default. The Act is significant because it brought the government into land resource development conservation practices.

Acts cited above refer to land used for agriculture. Land suitable for other purposes required special consideration. Laws were enacted to protect timber land from depredation and theft as early as 1817. Subsequent acts were passed culminating in the Timber and Stone Act of 1878 designed to protect against depredation and provide means for private acquisition of timber and stone. Prior to enactment of this Act, timber

was taken by theft because other means of acquisition were lacking. The Act provided for sale of land at a minimum price of \$2.50 per acre (32, p. 459).

One other type of land requiring special attention was mineral land. Laws governing specific geographical regions or specific minerals were passed in the first half of the 19th century, but not until 1866 was a general law covering all mineral deposits in all public domain enacted. The Mineral Land Act of 1866 provided that mineral lands be open to exploration and occupation by all citizens of the United States, subject to regulations prescribed by law. Subsequent refinements of the Act culminated in the withdrawal of coal lands in 1905. A leasing system was instituted in 1920 (32, p. 528).

The objective of legislation for each of the special types of land was conservation of a particular resource or provision for its more judicious use which was also the basic purpose behind the reservation of more than a quarter billion acres consisting of mineral reserves and water power sites in the "interest of the public" (32, p. 537).

In summary, goals of early public land use policies of various groups were contradictory, regionally-oriented, group-oriented, and rarely successfully achieved. The primary national objective, raising revenue, was never fully realized while the secondary objective, settlement of the West, was not achieved without a great deal of controversy and stress.

Public Land Use Goals in Iowa

The entire land area of Iowa was once included in the public domain, governed and disposed of under federal public land legislation enacted and in force after 1832 (40, p. 266). The land became public domain after Indian tribes ceded or sold the land to the United States government during the period between 1832 and 1851. Before settlers could move onto the land however, Indians had to be relocated on other land farther west. The pattern of cession, survey, and disposal of public lands in Iowa flowed from the east near the Mississippi River to the Missouri River in the west and northwest.

In general, problems and objectives of public land legislation outlined earlier in this chapter carried over to Iowa public lands. The national government wished to sell the land for revenue purposes; settlers desired cheap land on easy credit terms. The federal government legislated against squatters and settlement or sale before survey; early white settlers followed closely on the heels of the departing Indians. In 1836 the federal government initiated a survey of the land acquired in 1832. In the interim between 1832 and 1836, settlers moved onto the land and started movements to protect their interests culminating in the Pre-emption Act of 1842 (40, p. 14).

Approximately twelve million acres of Iowa land were offered for private or public sale in the period between 1838

when the first land office opened in Dubuque until disposal of all public land was completed. Nevertheless, the federal government gave away the bulk of public land in Iowa. Veterans who were given land or scrip in exchange for service in the army selected almost fourteen million acres of Iowa land. Another nine million acres were granted to the state by the federal government for internal improvements or educational purposes. About 240,000 acres were accepted by the state under the Morrill Act and granted to Iowa State University on March 29, 1864. Less than one million acres were homesteaded in Iowa (40, p. 154).

With the bulk of public land disposed of within a relatively short period of time, Iowa avoided some of the problems encountered later in western states. These problems are detailed in the section explaining legislation covering special types of land such as arid, timber, swamp, and mineral lands. Some problems of fraud were uncovered, however, especially in the disposition of assignable military warrants and in disposition of swamp lands.

The pattern of public land acquisition, legislation, and disposition in Iowa closely paralleled that on the national level except that in Iowa the entire process was completed in a much shorter period of time.

Land Use Goals After 1900

The focus of land legislation and resource project proposals shifted from public land to all land in the early 1900's.

By the time the National Resources Board undertook major land use planning in the 1930's, the trend was toward more acquisition of land to be administered by the government for forests and public reclamation projects for the "public good" (48, p. 93). The Board explicitly stated in their 1935 report, "The broad objectives of land planning should be the greatest good to the largest number in the long run, as distinguished from merely exclusive individual profit or advantage" (48, p. 97).

The Iowa State Planning Board in its land utilization project in process in the early 1930's stated project goals more precisely, "This project anticipates the formulation of clearly defined plans in regard to the improvement of income and living conditions. This will be done by the adjustment of agricultural production to domestic and foreign demand" (37). Land use planning in Iowa in this period was confined mainly to agricultural land with emphasis on conservation, erosion control, and improved farming techniques.

A second trend to emerge in the post-1900 period was that of active management of land and its resource. Legislation had been enacted earlier for partial regulation of some types

of land such as timber, mineral, and arid lands; however, the Taylor Grazing Act enacted on June 28, 1934 was a significant departure from earlier legislation in that active management of grazing land and retention of mineral rights by the government were included in the act. Grazing had been permitted on the public domain from its inception but no definitive policy was established early. Since 1900, livestock grazed on national forests under the permit system (42, p. 486). The Taylor Grazing Act defines the role of government regarding grazing land ". . . Secretary of Interior shall make provision for protection, administration, regulation, and improvement [italics mine] of grazing districts established under the act" (57). Another provision of the act allows for exchange of land between the federal government and other units, but if the government land to be exchanged is mineral in character, mineral rights are to be reserved by the United States government.

A further indication of the trend toward land management was the establishment of the Bureau of Land Management under the 1946 Reorganization Plan no. 3, effective July 16, 1946. Under this plan, land management activities of several departments were gathered into one bureau (7).

State and local legislation

Recent land use legislation has tended to concentrate on the conflicts between uses of land, recognizing that problems arise in both the rural and urban sectors.

Objectives of land use legislation in Colorado and Florida are aimed at all sectors of the economy. To quote from Colorado law

. . . to encourage planned and orderly land use development; to provide for the needs of agriculture, forestry, industry, business, residential communities, and recreation in future growth; to encourage uses of land and other natural resources which are in accordance with their character and adaptability; to conserve soil, water, and forest resources; to protect the beauty of the landscape; and to promote the efficient and economical use of public resources. (11)

Florida's law is equally all-inclusive,

It is the legislative intent in order to protect natural resources and environment of this state. . . and to insure a water management system that will reverse the deterioration of water quality and provide optimum utilization of our limited water resources, and to facilitate orderly and well-planned development, and to protect the health, welfare, safety, and quality of life of the residents of this state, it is necessary to adequately plan for and guide growth and development within this state. (22)

The State Land Use Policy Act introduced in the 1974 Iowa General Assembly, passed by the House but not the Senate, contains fifteen explicitly stated objectives. Some objectives are concise and measurable such as Objective One, preservation of agricultural land for food and fiber production, and Objective Nine, provision for future recreational areas and facilities. Other objectives, however, are vague, ambiguous, and difficult to measure, e.g., Objective Ten, provision for an orderly and efficient transition from rural to urban land use (55).

Although a state land use bill has not yet been enacted in Iowa, state policies currently in force are enunciated in statutes which empower several state agencies to deal with land and resource use. The policy statement for Soil Conservation Districts reads:

It is hereby declared to be the policy of the state of Iowa and the objectives of this chapter to preserve and protect the public interest in the soil and water resources of this state for future generations, and for this purpose to encourage, promote, facilitate, and where such public interest requires, to mandate the conservation and proper control and use of the soil and water resources of this state, by measures including but not limited to the control of floods, the control of erosion by water or by wind, the preservation of the quantity and quality of water for its optimum use for agricultural, irrigation, recreational, industrial, and domestic purposes, all of which shall be presumed conducive to the public health, convenience, and welfare, both present and prospective. (36)

Through taxation policies, land owners are encouraged to maintain forest areas. Tax exemptions are allowed for forest reservations which meet certain specifications (34).

Among other duties, the Department of Natural Resources is empowered to establish and enforce a state-wide plan for the control, utilization, and protection of water resources of the state (35).

The Department of Environmental Quality is concerned with the effects of pollution on resources of the state and, as such, is charged with development of comprehensive plans for the abatement, control, and prevention of air and water pollution in the state (33).

Although not an official state agency, the Natural Resources Task Force of the Iowa 2000 Conference confronted the land use issue. The Conference's final report contains this goal for Iowa, ". . . the preservation of Iowa's best agricultural land for agricultural purposes and development of all classes of land for the most beneficial use of that land for the maximum number of Iowans--identifying our growth, energy, and recreational needs and preserving our forests and wilderness areas" (38, p. 4).

Zoning laws Local governments deal with land use through zoning laws which tend to specifically enunciate many objectives in general terms not amenable to measurement. As an example, the zoning ordinance of Pocahontas, Iowa reads:

The zoning regulations and districts herein set forth are made in accordance with a comprehensive plan for the general welfare of the community. They are designed to lessen congestion in the streets; secure safety from fire, panic, and other dangers; promote health, morals, or the general welfare; provide adequate light and air; prevent the overcrowding of land or buildings; avoid undue concentration of population. They are made with reasonable consideration, among other things, to the character of each district and its peculiar suitability for particular uses, and with a view of conserving the value of property and encouraging the most appropriate use of land throughout the city. (43)

A review of other local and county zoning ordinances reveals similar objectives.

National land use legislation

On the national level S. 632, the proposed Land and Water Resources Planning Act of 1971, in its declaration of policy states, "In order to promote the general welfare and to provide full and wise application of the resources of the Federal Government in strengthening the environmental, recreational, economic, and social well-being of the people of the United States, the Congress declares that it is a continuing responsibility of State and local government for land use planning and management, to undertake development of a national policy, to be known as the national land use policy. . ." (72, p. 27).

The proposed Act proceeds to list seven specific sub-objectives which elaborate on the above quote. Congress declares the national land use policy to:

1. Favor patterns of land-use planning, management, and development which are in accord with sound ecological principles and which encourage the wise and balanced use of the Nation's land and water resources;
2. foster beneficial economic activity and development in all States and regions of the United States;
3. favorably influence patterns of population distribution in a manner such that a wide range of scenic, environmental, and cultural amenities are available to the American people;
4. contribute to the revitalization of existing rural communities and encourage, where appropriate, new communities;
5. assist State government to assume land-use planning responsibility for activities within their boundaries;
6. facilitate increased coordination in the administration of Federal programs so as to encourage desirable patterns of land-use planning; and

7. systematize methods for the exchange of land use, environmental, and ecological information in order to assist all levels of government in the development and implementation of the national land-use policy. (72, pp. 28-9)

While Congress has not passed the above or other major land use legislation, other federal agencies deal with facets of land use as part of their duties. The Water Resources Council has established administrative principles for planning water and related land resources which specify objectives for planning land resources. Two principal goals are national economic development and environmental quality. Secondary objectives are listed as regional development and social well-being (74, pp. 7-10). The goals specified by the Water Resources Council are clearly stated and include means for achievement and evaluation. Items to add or subtract in evaluating each goal are specifically enumerated. Since national land use bills have not been enacted, by default the Water Resource Council goals may be interpreted as the national goals for land and resource planning at the present time.

Parts of the Reclamation Act of 1902 (51) and the Taylor Grazing Act of 1934 (57) remain in effect to guide land use policy in the areas of irrigation and grazing land.

The Secretary of Agriculture is authorized and directed to administer forest land for multiple and sustained use of the several products and services obtained from them. The statute states the policy of Congress is ". . . that the national

forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes" (47).

The Soil Conservation Service is directly involved with land use through soil conservation practices which the agency is authorized to maintain. The policy of Congress and the objectives of the act are to ". . . provide permanently for the control and prevention of soil erosion and thereby to preserve natural resources. . ." (54).

Individual departments or bureaus are charged by Congress to oversee or provide for various facets of land or its resources. However, through the National Environmental Policy, Congress has authorized all agencies of the federal government to employ a systematic, interdisciplinary approach to ensure the integrated use of the natural and social sciences in any planning and decisionmaking which has an impact on the natural environment. Further, all decisions should consider the environmental impact along with economic and technical considerations (46).

Thus, federal land use and resource goals presently in effect are found in many pieces of legislation and administrative orders covering a variety of federal agencies.

Summary of Land Policy and Program Goals

Two general national goals overshadowed all United States land legislation enacted in the first half century of nationhood; raising revenue and settling inhabitants on western lands. Raising revenue was of paramount importance to the national government hoping to retire the Revolutionary War debt through advantageous land sales. Securing cheap land for settlement was more important to emigres to the west. Each individual piece of legislation enacted throughout this period also contained an inherent conflict, and a conflict often existed between the national objectives and the specific objectives of particular pieces of legislation as well.

Gradually emphasis changed from raising revenue through land sales to settling land in private ownership and on tax rolls. Objectives of much of the land legislation enacted during the mid-1800's revolved around providing cheap land on easy credit terms or free land to those emigres willing to move onto, cultivate, and improve the many acres in the public domain. For some settlers, disposal of land in this manner provided a satisfactory means to start a new life in the west. In other cases, the end result was exploitation of the land with its accompanying waste of resources and speculation on the part of many.

In an effort to prevent waste and exploitation, in the latter part of the 1800's legislation was enacted to control

use of land resources and, after 1900, to conserve land and its resources. After 1900 the tenor of land use goals turned toward the public good rather than individual interests.

A major land use planning effort was undertaken in the 1930's by national and state resource planning boards. Goals of these planning efforts were clearly stated, at least on the state level, as improvement in income and living conditions. Even with clearly stated goals and plans so detailed that they were broken down to county level, the plans were never implemented. Two possible explanations are offered. First, the plans did not include means for implementation. Second, the plans were formulated largely by technicians on behalf of local citizens and not with active participation by local citizens. Since the persons who must effect the plans had not participated substantially in their formulation, they lacked a commitment to consummate the plans.

Goals of recent land use legislation have raised new problems in addition to those cited previously of vagueness and ambiguity. Present legislation contains conflicting goals and the laws give little indication on how conflicts should be reconciled in planning priority. For example, the State Land Use Policy Act of Iowa (55) introduced in 1974 but not enacted, lists as one objective, preservation of prime land for agriculture. Nevertheless, the bill also guarantees protection of private property rights. These two objectives are in part at

least mutually exclusive. If private owners are free to act and dispose of their land without restraint, how is "prime" land to be preserved for agricultural use only?

Two other goals cited in state and federal legislation (11; 22) are protection of environmental quality and economic development but both cannot be achieved to the fullest degree simultaneously. Stipulations must be included stating priority of goals or the degree of importance of each including trade-offs.

Other examples of conflicting goals could be cited as most of the proposed and enacted laws contain not one or two, but a list, of objectives, all of which cannot be achieved simultaneously and usually not through land use alone. Objectives of land use bills are not coordinated with other legislation and conflicting goals will likely emerge in separate pieces of legislation.

Goals of resource projects and legislation have been diverse and wide-ranging. Over a period of years, some goals have been completely reversed which is not necessarily a criticism, since circumstances have also changed and goals should fit changing circumstances (66, p. 329). As an example, the original national goal formulated in the 1780's of raising revenue by land sales turned to placing free land in the hands of the settlers by 1862. By the 1930's, land policy had evolved to the point where the goal was to obtain more land for

use in the public interest; i.e., again enlarge the public domain.

A difficulty more serious than changing goals arises from vague terminology, generalities, and conflicts encountered among the above goals. Clear, precise, measurable goals are needed not only to formulate better plans to meet the goals, but as guides to evaluate the success of planning.

Examination of past legislation provides a foundation for viewing present problems of land use goals. Chapter III examines theoretical solutions to the problem of ambiguity of goals and means as well as the problem of aggregating individual goal preferences into group goal preferences. Theoretical solutions are adapted to the problem of this study, identifying citizens' goals for land use planning in Region V. Chapters IV and V present an empirical endeavor to apply and test the theoretical solutions in Region V.

CHAPTER III. DEVELOPMENT OF MULTI-GOAL
MODEL FOR LAND USE PLANNING

The previous chapters emphasize the nature of problems involved in articulating and formulating goals for land use planning. This chapter discusses relevant theoretical economic models and relates their adaption to a multi-goal model for land use planning. The first section of this chapter addresses the problem of differentiating between variables which may reasonably be considered goals of land use policy with variables that are means toward achieving those goals. This is one of the problems associated with articulation of goals. The methodology for selecting appropriate goals for this study is also detailed in the first section.

The second section of this chapter contains an overview of theoretical concepts of social welfare functions. Many problems associated with constructing a social welfare function are encountered in identifying citizens' preferences in goals for land use planning. Techniques offered as solutions to problems encountered in construction of a social welfare function are reviewed with a view to utilization in the multi-goal land use model. Two techniques adopted for this study, the certainty method and the paired-comparison model, are described in the last section of the chapter.

Economic Policy Variables Adapted
to Land Use Planning

Economic policy deals with optimization of objectives, but unlike economic theory, objectives may not be closely restricted by convention; i.e., profit or utility maximization or cost minimization. Economic policy implies broad objectives covering large groups of people with the added implication of a public body instituting or carrying out policy in the general interest.

With multiple objectives and multiple groups involved, economic policy deals not only with optimizing chosen objectives, but first choosing objectives to maximize groups' interests. As Tinbergen states, the general interest is difficult to fix since it depends not only on the individual optimizing functions but on the policy-makers' abilities to combine and weigh individuals' interests. Tinbergen delineates steps in determining optimum policy:

1. The fixation of a collective preference indicator,
 2. the deduction, from the indicator, of the targets of economic policy, generally,
 3. the choice of adequate instruments, qualitative and quantitative,
 4. the determination of the qualitative values of the instrument variables, as far as such instruments are chosen, and
 5. the formulation of the connections between
 - a) the relation between targets and quantitative values of instrument variables on the one hand and
 - b) the structure of the economy studied on the other.
- (65, pp. 2-4)

Under the above formulation, Tinbergen's model utilizes four groups of variables: 1) data, 2) target, 3) instrument, and 4) irrelevant. Data variables are the given economic information available to policy makers. Decisions are based upon data available, but data itself cannot be manipulated by policy makers. Target variables define and delineate ultimate objectives of policy makers and must be stated in quantitative measurable terms. These variables provide the "target" for which policy makers aim and, if stated in measurable terms, can be evaluated.

Instrument variables name tools available to policy makers to achieve desired target variables. Instrument variables may be ends in themselves but function primarily as means of achieving target variables. The irrelevant variables may not affect policy or, if they do, the effect is not important to the policy maker.

Target and instrument variables are of concern here. Tinbergen (65, p. 1) states that the general interest is a function of target variables and thus targets should be chosen to maximize the general interest. Examples of target variables in economic policy are real national income, volume of employment, distribution of income, and balance of payments.

Instrument variables reflect means available to implement policy or achieve desired targets and may be qualitative as well as quantitative. Examples include tax rates, rates of

exchange, and money supply. An example of a qualitative change is complete restructuring of the tax rates while a quantitative change is an increase or decrease in the tax rate. To maximize the general interest of the people, the policy maker needs to choose the correct instrument variables as well as the appropriate level of the instrument variable. Certain limitations, technical or political, place upper or lower limits on changes or levels of instruments. Technically, negative prices or tax rates may not be feasible while for political reasons, the tax rate must not be so high as to be a disincentive. Mathematically, to solve the system of equations, the number of target variables must not exceed the number of instrument variables (65, pp. 15, 27).

In another area, a great deal of work is being carried on with multi-objective or multiple goal decisions models especially in operations research and management decision-making (24; 42; 9). These models presuppose a decision maker able to determine and rate his preferences numerically. Various techniques are then utilized to derive an optimum choice among alternatives.

MacCrimmon (42, p. 19) differentiates between multiple attribute and multiple objective decision models.

Multiple attribute decision problems deal with choosing among a set of alternatives which are described in terms of their attributes.

Multiple objective decision models, . . . , recognize that attributes of alternatives are often just means to

higher ends--the decision maker's objectives. This technique, then, requires a) preference information about the decision maker's objectives and b) information about the instrumental relationship between objectives and attributes. Preferences among attributes are thus derived from the preferences among objectives and the functions relating attributes to objectives.

This latter concept could be modified to derive a multi-goal model for land use planning. Decision maker's objectives correspond to ultimate ends (Tinbergen's target variables) of land use planning. Examples of objectives include increased level of real income, greater income equity, higher level of employment, environmental quality, and conservation of resources.

Multiple attributes designate the means (Tinbergen's instrument variables) for achieving these objectives. Attributes reflect uses of land to achieve each objective and include using land for agriculture, industry, parks, or residential building as well as the degree of use for each purpose. Each attribute contributes to or detracts from achievement of one or more objectives in a varying degree. Thus, one use of land may contribute significantly to achievement of one objective, contribute slightly to another, and detract from the third.

Following MacCrimmon's and Tinbergen's models, two further items of information are needed: 1) preference information about decision maker's objectives and 2) information about the instrumental relationship between objectives and attributes.

The literature assumes a small group or one decision maker is involved whose preferences are known and can be stated numerically. In this study, the entire body of citizens is assumed to be the decision maker and a means of eliciting and ranking their preferences is needed along with the structural relationship between the attributes (means) and goals. For the structural relationship, technical or economic relationships between each means and each goal could be used. From these relationships citizens' preferences among means (these are the items of concern to land use planners) could be derived.

Briefly, the multi-goal model is as follows. Goals or ultimate ends of land use planning correspond to targets of economic policy as various uses of land (means) correspond to instrument variables. Limitations comparable to those of economic policy are imposed on land use planning, such as technical limitations on the quantity of available land or characteristics limiting land to a few selected uses. The concepts of private property and just compensation provide examples of political limitations on land use policy.

In land use planning, however, instrument variables may easily be construed as target variables and a clear demarcation becomes more difficult to achieve. The problem is reflected in many of the goals cited previously in land use projects and laws. An oft-repeated goal is "to preserve prime agricultural land for agricultural use only." The question arises, is the

ultimate end preservation of land in agricultural use or is that merely a stepping stone to achievement of a higher goal. Preserving land in agriculture as a primary goal may satisfy the aesthetic instincts of a few, but the primary reason for preservation is to guarantee a supply of food or to obtain the greatest economic return from the land; i.e., preservation of agricultural land is an instrument to achieve a higher goal.

Method for choosing land use goals for this study

The primary objective of this study is to ascertain preferences of citizens within Region V for goals of land use planning. Consequently, the first task is identification of goals among which citizens could set priorities.

If goals in land use planning are to complement Tinbergen's economic policy target variables, goals must be specified which reflect ultimate ends of land use. Two methods were used in this study to develop a list of goals representative of target, rather than, instrument variables. First, land legislation and resource project proposals were reviewed and a list of twenty explicit goals or objectives of the projects was compiled. These goals and objectives are:

1. to settle the land and place it in private ownership,
2. to raise revenue for the federal government,
3. to provide the greatest good to the largest number in the long run, not merely individual profit or advantage,
4. to improve income and living conditions by means of adjusting agricultural production to foreign and domestic demand,

5. to encourage planned and orderly land use development,
6. to provide for needs of all sectors in the future,
7. to encourage use of land in accordance with its character and adaptability,
8. to conserve soil and other resources,
9. to protect the beauty of the landscape,
10. to promote efficient and economical use of public resources,
11. to facilitate orderly and well-planned development,
12. to protect the health, welfare, safety, and quality of life of residents,
13. to preserve land for food and fiber production,
14. to provide for future recreational areas and facilities,
15. to preserve Iowa's best agricultural land for agricultural purposes and development of all classes of land for the most beneficial use for the maximum number of Iowans, identifying growth, recreational, and energy needs, and preserving forests and wilderness,
16. to promote general welfare and provide full and wise application of resources to strengthen environmental, recreational, economic, and social well-being of citizens,
17. to increase national economic development,
18. to enhance environmental quality,
19. to increase regional development, and
20. to increase social well-being.

Second, an open-ended questionnaire (see Appendix A) was sent to a selected group of citizens within Region V who were asked to name the most important purpose of land use planning as they perceived it. The group included twenty-four county

supervisors (elected decision makers) and thirty individuals identified by extension agents as interested in and informed on land use planning. From their responses, a second list of fourteen goals was compiled. The goals and objectives of this group are:

1. to conserve soil, water, and other resources,
2. to identify best agriculture for farming; conserve good agricultural land for production of food,
3. to evaluate and make provisions for future needs,
4. to evaluate land for its best (alternative) uses,
5. to protect property rights of individuals,
6. to stop unwise urban sprawl,
7. to plan for other than economic needs; i.e., health and recreation,
8. to coordinate planning of local zoning boards and other agencies,
9. to insure adequate green areas,
10. to protect areas from undesirable uses,
11. to preserve a desirable environment,
12. to develop unproductive land (for uses other than agriculture) in an orderly manner,
13. to prevent external diseconomies from affecting adjoining land, and
14. to control pollution.

The two lists were combined resulting in one list of thirty-four items, some of which are identical and others nearly identical. Other items on the list are categorized as means rather than goals and are combined with goals. By

combining and rephrasing, the thirty-four items were condensed into the following four goals of land use planning:

1. to conserve land and other natural resources,
2. to increase production and real income in the region,
3. to improve environmental quality, and
4. to increase employment and subsequently the population of the region.

Unlike Tinbergen's target variables, however, goals were not quantified at this stage since respondents were not asked to state quantities because measurements have not been developed for two of the goals, namely, to conserve land and other natural resources and to improve environmental quality. Research efforts continue in attempts to develop an overall measurement for environmental quality and to quantify social indicators (23). Partial measurements are available; i.e., environmental quality is measured by the amount of pollution in the air or silt in the streams, however, no overall measurement for environmental quality is accepted at the present. Comparable partial measurements may be found for the other goal, conservation of land. The two economic policy goals lend themselves to quantification, and measurements have been developed for them. Increased real income is measured in dollars of real GNP and increased employment is measured in percentage of employment. Because measurements have not been developed for all four goals, in this study target variables were not presented to respondents in cardinal values.

As a result of pretesting the interview schedule, the four goals were combined into three goals specified by the Water Resources Council. Goals are stated in broad terms. To mitigate the problem of diverse interpretations by respondents, explanations and examples are included with each goal. The explanations are similar to those published in the Council's administrative order which specified the goals. As presented to respondents in the final interview schedule, the goals are stated as:

- A. Increased environmental quality and conservation of resources
this could be done by
 - improving quality of air and water resources
 - prohibiting developments and practices which result in permanent loss of natural resources or irreversible damage to "critical areas"
 - preserving green areas and open spaces

- B. Increased economic development of the region
this could be done by
 - increasing total production of region through more efficiency of land in its present use
 - increasing total production of region by changing uses of land
 - increasing number of jobs
 - providing more stable economic base for the region

- C. Increased social well-being of the region
this could be done by
 - more equitable income distribution among groups
 - providing recreational, educational, and cultural opportunities
 - providing for better life, health, and safety of residents

Aggregating Individual Choices into Group Choices

Public decisions seldom result from unanimous choices by individual citizens. Therefore, diverse individual choices must be molded into an ordered social choice acceptable to affected individuals. Many options are available. Preferences of one or a few individuals could be imposed on all or choices could be drawn by lot with no regard for preferences of individuals. It seems that a more satisfactory approach would be to recognize the preferences of all individuals and adopt a methodology to combine individual choices into a group choice acceptable to a majority of citizens.

Theoretical social welfare functions

Economic theory has looked at the problem of aggregating individual choices into group choices in terms of a social welfare function. A social welfare function is defined as some ordering of preferences for alternative social states. The form is not unique and is a function of the utility levels of all individuals (30, p. 280; 17, p. 247; 1, p. 22).

Existence of a social welfare function is acknowledged. The difficulty lies in identifying elements of the function and aggregating individual preferences into society's preference.

Elements included in a social welfare function are dependent upon the values of individuals and the task of identification is left to sociologists and anthropologists (17, p. 247).

The problem of aggregating individual preferences into a social welfare function has been more closely scrutinized by economists than has the problem of identifying elements. Arrow (1) lists five conditions which a social welfare function could reasonably be expected to fulfill. He then states in his Possibility Theorem that, in general, it is impossible to construct social preferences that satisfy all five conditions. Various authors have answered the theorem by introducing qualifications and/or additional constraints. Coleman (10) states that a social welfare function is a possibility if intensity of preferences and negotiations are allowed and choice under uncertainty is recognized. If a larger number of persons are involved, a solution is more likely. Sen introduces a value-restricted preference for concerned individuals with inclusion of only those who are not indifferent. He states, "It seems that the Value-Restricted Preferences will cover a variety of practical cases. A comparatively limited measure of agreement seems to be sufficient to guarantee consistent majority decisions and to get from it to a Social Welfare Function with the other properties specified by Arrow" (53). Other authors (49; 8; 6) show that a simple majority rule under certain conditions is sufficient to show intensity of preferences, transitivity, and consistency.

Three points emerge from the literature and discussion. First, construction of a social welfare function to maximize

society's welfare is very difficult, requires very restrictive conditions, and may be impossible while still fulfilling certain conditions. Second, some type of social welfare function is a necessary component of policy decision models (75, p. 1; 24, pp. 468-9). Third, pragmatists have introduced techniques to develop and quantify social welfare functions and to aggregate individual preferences into group preferences because, as a practical matter, some indicator of social welfare is needed by decision makers. Often the first two points tend to overshadow point three but this study focuses on the latter.

Pragmatic approaches to social welfare function

Weighting of elements and aggregation of individual choices are discussed in this section with reference to some of the techniques that have been used in previous studies. Intensity of preference is discussed briefly in this section but is covered more fully in the discussion of the certainty method in the following section.

Preferences of two groups, decision makers and groups of individual citizens, may be analyzed with reference to social welfare functions. Van Eijk and Sandee (75) analyze preferences of decision makers in an attempt to formulate an explicit social welfare function. Van Eijk and Sandee conduct an "imaginary interview" of policy makers asking them to designate marginal rates of substitution between target variables in

various situations. These marginal rates of substitution and target variables become the elements of the social welfare function which is continuous and partitioned into "separable facets."

Rausser and Freebairn (50) suggest an indirect approach to weighting the elements of a social welfare function. The researcher analyzes the end result of an action, the goal achieved, and hypothesizes a mathematical form and relevant performance variables for an objective function. From the goal achieved and the hypothesis, deductions are made about the parameters of the objective or social welfare function.

MacCrimmon introduces programming and weighting techniques to be utilized in multiple-objective decision problems. A multiple-objective decision model lists several alternatives, each described in terms of multiple attributes. The problem becomes one of choosing the alternative which maximizes the objective function. A key requirement in this model is preference information about decision makers' objectives. Alternatives are specified and weighted by one of the following methods and form the elements and weights of the social welfare function:

1. The preferences of the decision makers are inferred from past choices rather than being obtained by direct query and are inputs into a general linear statistical model,
2. the preferences of the decision makers are obtained by direct questioning and are aggregated additively across all attributes,

3. the preferences of the decision makers are obtained by direct questioning and specific attributes are taken to represent the whole alternative (i.e., a zero-one aggregation). (42, p. 25)

The weighting techniques in MacCrimmon's and Rausser's models could be adapted to specification of group preferences based on individual, as opposed to decision maker, preferences.

Aggregation of individual choices into group choices while providing for intensity of preferences among individuals was examined by Dalkey (15, pp. 8-9) who describes several methods used at the RAND Corporation for arriving at group ranking of items. In one study to determine elements contributing to the quality of life, the Corporation used the Delphi technique to obtain a list of twelve clusters of items to present to respondents for their choice. In the Delphi technique, an open-ended questionnaire is sent to a selected group of experts in a field under study. Researchers analyze responses, combine them in a report, and develop a second questionnaire. The response report and second questionnaire are again presented to the group which is asked to review the responses to the first questionnaire and, on that basis, reply to the second. The process is repeated until a consensus is reached or no further agreement is noted in the responses. After the twelve clusters of items had been obtained through the Delphi technique, three groups of individuals were asked to rate the clusters in three different ways to test group reliability. One group was asked to distribute one hundred

points among the twelve clusters. The second group was asked to pick the top item and rate the other eleven with respect to the top item. The third group was asked to rate the twelve items on a percentage point ranking scale. The three groups correlated in the high nineties.

Method used for aggregating and weighting individual goal choices in this study

Combining goals of individual citizens in Region V into an ordered social choice of society's goals in land use planning involves many of the same problems discussed in reference to a social welfare function. First, citizens do not display unanimity in choice of goals of land use. Second, an ordered social choice does exist which may or may not be definable. Third, policy makers do need some indicator of society's preferences so, as a practical matter, definition of society's goals in land use should be attempted. Assuming point three, methods discussed above for weighting and aggregating individual into group choices are adaptable for deriving an ordered social choice of goals for land use planning.

Van Eijk's interview of decision makers and Rausser's indirect approach to weighting elements of an objective function do not seem appropriate for this study for two reasons. First, goals of individuals in their roles as citizens rather than the goals of decision makers are desired. Second, results from the indirect approach may not be definitive. Goals are

broad and sources other than land use contribute to their attainment. Thus, weighting of the effects of land use in past policy decisions may be difficult to assess.

Direct query seems most appropriate. However, the number of goals presented to citizens may be narrowed by a Delphi-type technique. As stated in part one of this chapter, a variation of this technique was used in this study. The defined goals constitute the elements of the social order. Weighting of the elements can be achieved by asking individuals to rank their preferences with any one of the techniques described by Dalkey (15) or some comparable method. To obtain group ranking, individual choices may be combined resulting in an interval weighting for each goal. If desired, similar methods can be employed for selecting means to be used to achieve desired goals.

After reviewing the weighting and ranking methodologies described above along with several other methods, the certainty method was chosen for one section of the study and the paired-comparison model for a second section. Both methodologies result in a weighting which allows items to be placed on an interval scale in a more than ordinal manner. In addition, the paired-comparison model forces respondents to choose between two goals which was considered imperative in this type of decision problem. A complete description of both methods follows.

Certainty method

While the principal objective of this study is determination of citizens' preferences in goals for land use planning, an auxiliary objective is determination of citizens' preferences in means to be used to achieve the desired goals. Section I of the survey schedule is designed to elicit this information. A further objective is quantification of these preferences in a more than ordinal manner. Thus, to merely ask respondents to name their first choice, second choice, etc., and assume an equal interval between the rankings is not sufficient. If respondents consider two choices as nearly equal, their responses must be elicited in a manner that measures this rating.

Social scientists have long utilized various means of measurement in their work as evidenced by the numerous scales which have been developed to measure traits and characteristics. These scales provide a measurement based upon respondents' answers to questions or judges' evaluation of subjects. It was decided to adopt a scaling technique to measure respondents' choices among means in this project.

The format and procedure used for Section I of the survey schedule is based on a method outlined by Warren, Klonglan, and Sabri (76) in a report issued in 1969 by the Department of Sociology and Anthropology at Iowa State University. This procedure, named the certainty method, ". . . incorporates a

given response framework as well as the assigning of numbers to social science stimuli" (76, p. 2).

The response framework involves a two-step procedure wherein the respondent is required to make two separate decisions: 1) a directional judgment (in this case, agree or disagree) and, 2) a certainty judgment (how strongly respondent agrees or disagrees). The response is recorded in the following format:

Agree					
	1	2	3	4	5
Disagree					

This format can be used with an eleven point continuum as well as the certainty method. The difference between the two methods revolves around assigning of numbers to responses. In the eleven point continuum method, equal intervals are assumed between each number and assigned values range from one to eleven inclusive. In the certainty method, equal intervals are not assumed between the response values. Larger values are assigned to end points of the continuum. The assumption is that there is a greater difference between those who assign a certainty of five and those who assign a four to their responses than there is between those who assign a certainty of two and those who assign a one. This results in responses of those with strong feelings being given greater weight than responses of those who do not feel as strongly. Intensity of feeling is registered since responses of persons who feel

strongly enough to indicate their certainty by a five or four have greater weight than the responses of those who really do not have much feeling and so indicate with a one or two. The certainty method allows higher scores for extreme values than would an eleven point scale.

The difference between the eleven point continuum and the certainty method is illustrated with the values assigned below (76, p. 9):

Row 1 - response	<u>D5</u>	<u>D4</u>	<u>D3</u>	<u>D2</u>	<u>D1</u>	<u>A/D</u>	<u>A1</u>	<u>A2</u>	<u>A3</u>	<u>A4</u>	<u>A5</u>
Row 2 - numerical values - 11 pt.	1	2	3	4	5	6	7	8	9	10	11
Row 3 - numerical values - CM	-8	-5	-3	-2	-1	0	1	2	3	5	8
Row 4 - transformed values - CM	0	3	5	6	7	8	9	10	11	13	16

Row three further illustrates the theoretical basis for this type of scoring in terms of normalized ranks. Warren *et al.*, explain the development and theoretical basis for the certainty method:

. . . the certainty method is an 11 point continuum and the scoring procedure indicates assigning larger values to the end points. In the certainty framework when a person chooses 1, he is indicating that he is certain that the response is much less favorable than neutral. A choice of 11 indicates that he is certain that the response is much more favorable than neutral. Transferring this to a probability framework, a response of 1 would be near .00 and a response of 11 implies 1.00. In the development of the certainty method where the 11 equal appearing intervals are used, Wolins (1963) assumed that the normal distribution is divided into eleven intervals. When a person chooses a point he is indicating the probability for the mean of the normal deviate that lies in the interval represented by the point

selected. For instance, the choice of 11 (Row 2) does not indicate the probability of 1.0, but rather the probability for the mean of the normal deviate that lies in the interval from .91 to 1.00. Thus, a transformation (Row 3) is made by referring the numbers from 1 to 11 on the 11 point equal appearing interval continuum (Row 2) to a table of normalized ranks. The use of this procedure "spreads out" the tails of the original scale and "pushes together" the middle. Thus, with the certainty method the respondent or judge responds on a certainty continuum (Row 1), these responses are then assigned numerical values (Row 3). To avoid the use of negative values, these numerical values are usually transformed to all positive numbers (Row 4). (76, pp. 9-10)

Both the response framework and the scoring of the certainty method were adopted for Section I of the survey schedule. A series of nine brief situations were developed to be read to each respondent. Situations were designed to make respondents aware of both negative and positive aspects of decisions involving land use. After the reading of each situation, respondents were shown and read a statement concerning the situation and asked if they agreed or disagreed with the statement. Then respondents were asked to indicate how strongly they agreed or disagreed by assigning a number from one to five with five indicating strong feelings and one indicating respondents did not feel strongly.

Answers were then assigned values from zero to sixteen in line with the transformed values indicated in Row 4 above.

Paired-comparison model

The principal objective of this study is identification of citizens' goals for land use planning. The methodology

chosen to weight and aggregate goals of individual citizens is the paired-comparison model.

The paired-comparison model provides an estimate of each item's numerical position on a scale in addition to an ordinal ranking of the items. An ordinal scale assumes equal intervals between each rank, but for this study it was necessary to develop a scale registering intensity of feeling because distance between each item on a scale as well as the ordinal ranking may influence people's behavior. For example, an individual's second choice might be very close to his first choice, or conversely, at the opposite extreme on the scale. The individual's feeling about the second choice varies in these two circumstances.

If items are conducive to measurement in physical terms such as length, weight, or size, a judge may rank a set of items on a scale from shortest to longest or lightest to heaviest by measuring each item with an appropriate measuring device and then arranging the items in order. It is possible with physical measurement to go beyond ordinal ranking of items and assign each a cardinal weight. However, not all items to be scaled are amenable to physical measurement. If individuals are asked to make judgments about items which involve values, preferences, or ideas, no physical measuring device exists with which to assign weights and to place these items on an interval scale. Ordering of items on the basis of

judgments is accomplished on a psychological continuum which cannot be measured as precisely as a physical continuum.

Several methods have been developed for measuring and ranking values, judgments, and preferences, but the method described here is the method of paired comparisons based on work by Thurstone and Clave (60), Kendall (39), and Edwards (21). Harman et al., (28) employed the paired-comparison format in a study conducted at Oklahoma State University to evaluate the hierarchy of goals of a group of farmers in Texas, Oklahoma, Kansas, and Colorado. Several studies at Iowa State University (41; 56) have utilized variations of the technique.

The paired-comparison model is based on the postulation that given a set of stimuli, each possesses a different but unknown degree of some attribute of interest to the researcher. The problem involves ordering this set of stimuli on a psychological continuum if a continuum can be found for this attribute. Stimuli may contain more than one attribute which would involve more than one continua, or no psychological continuum may be found for the attribute of interest.

Edwards (21) outlines some of the assumptions of the paired-comparison model. First, the law of comparative judgment formulated by Thurstone and Clave (60) ". . . assumes that for a given Stimuli i there is associated a most frequently aroused or modal discriminial process on a psychological continuum." This theoretical concept represents the reaction

of an individual when confronted with Stimuli i and asked to make a judgment about an attribute. Reactions other than the modal discriminial process may be aroused along a psychological continuum.

The second assumption is that the distribution of these processes is normal for each of the items to be judged. Since in a normal distribution the mean, median, and mode have the same value, the mean is the same as the modal discriminial process and is taken as the scale value for each stimuli. The mean or scale value for each stimuli may differ but the standard deviations are assumed to be equal.

Another assumption is that correlations between the intensity of reactions to one stimuli and the intensity of reaction to every other stimuli are equal.

Two further assumptions are needed in utilizing this method. First, it is assumed that a subject can place the intensity of his reaction to a stimuli on a psychological continuum in such a manner that no two stimuli occupy the same spot. He may not be able to assign a numerical value to the reaction to each stimuli, but given a group of items in which each item is paired with each of the others, he can state a preference for one item over another. Further, the assumption of additivity of the scale separations is made which implies that the distance between items one and three on a scale is equal to the distance between items one and two plus the

distance between items two and three where $3 > 2 > 1$.

Using these assumptions, the following procedure for deriving scale values for the goals (items) in this study was followed. The procedure parallels that found in Edwards (21) or Harman et al., (28).

The development of the interview schedule is crucial to the success of this methodology. A range of possible items must be included. On the other hand, if the list becomes too long, respondents may tire, lose interest, and become confused and inconsistent. Items must be constructed to avoid ambiguity and to be easily understood by all respondents.

The first step in the procedure is development of a list of items following the above guidelines. The procedure used in this study to identify goals for land use planning is detailed in the first part of this chapter. These goals are then paired in all possible combinations. The number of possible combinations is given by the formula ${}_n C_2 = \frac{n(n-1)}{2}$, where n is the number of items being ranked. For three goals, the maximum number of pairs is three. Each pair is printed on a card. Order of placement of items on the card and of presentation to the respondent is determined randomly, but once this order is established, it remains the same for every respondent to remove any bias arising from placement of items on the cards or presentation to respondents.

The next step is the actual interview. Cards are presented one at a time to respondents who are asked to make a choice between the two items on each card. If a respondent refuses to make a choice, both items are checked by the interviewer who records the answers on a schedule.

The analysis of the responses involves several steps and is a rather complex procedure. Chapter V contains a step-by-step illustration of the analysis using the actual data obtained from the survey conducted as part of this study. Briefly, a frequency matrix is developed showing the number of times one item is chosen over each other item. The frequency matrix is transformed to a proportion matrix and then a Z matrix. From the Z matrix, scale separations between items are developed. The scale values are arbitrary. It is the distance between them that is important so the absolute value of the most negative number is added to each scale value to establish an origin of zero. These scale values are then normalized to achieve a zero to one common scale.

The paired-comparison analysis results in an ordinal ranking of the goals plus a weighting for each goal on a zero to one scale. Equal intervals between each goal are not assumed.

A goodness-of-fit test is then applied to check agreement between a fitted model and the model developed from the data. The null hypothesis to be tested is that the paired-comparison

model is valid; i.e., the assumptions outlined previously are tenable. Harman et al., (28) list three ways in which assumptions of the model may be violated resulting in rejection of the null hypothesis:

1. lack of normality
2. lack of additivity among the scale separations, and
3. failure of the n populations to have equal standard deviations.

If the null hypothesis is not rejected, tests for differences among subgroups can be made. Harman et al., (28) illustrate a procedure that may be used to test for differences among groups even if some of the assumptions do not hold. The test and procedure are covered in the analysis presented in Chapter V.

Test for consistency of individual response The problem of inconsistent choice arises in using the method of paired-comparison. Inconsistencies may indicate that the respondent is making random choices which casts doubt upon the validity of the technique. One assumption implicit in the model is that respondents make consistent, rational choices in choosing goals. An inconsistency occurs if, when judging three goals A, B, and C, a respondent chooses A over B, B over C, and C over A. This choice results in what is termed a circular triad. To be consistent the respondent who chooses A over B and B over C, should choose A over C.

Edwards (21, p. 67) lists several reasons why inconsistencies may occur: 1) the respondent may be disinterested in the problem at hand and careless, 2) some of the goals may fall so close on the psychological continuum that choices are difficult to make, 3) goals may not fall along a single continuum, 4) attributes other than the one we are measuring may interfere with or influence the making of a choice, or 5) inconsistency may be a general character trait which shows up in any choices the respondent is asked to make.

This section presents a detailed description of the technique used to test for consistency of individual response.

Each respondent is asked to make choices between goals presented to him in three pairs of statements. Two responses are possible for each pair.

Pair 1 -- A is chosen over C or
C is chosen over A

Pair 2 -- B is chosen over C or
C is chosen over B

Pair 3 -- A is chosen over B or
B is chosen over A

A frequency matrix similar to Table 3-1 is developed for each individual. The interpretation of the matrix is that the column goal is preferred over the row goal. For instance, if in Pair 1, A is chosen over C, a (1) is recorded in column 1, row 3. If the choice is C over A, a (1) is recorded in column 3, row 1. If a respondent is unable to choose between goals, a 0.5 is recorded in each cell.

Table 3-1. Frequency matrix

		Columns		
		1	2	3
Rows	Goals	A	B	C
1	A			
2	B	1		
3	C	1	1	
4	a	2	1	
5	a ²	4	1	

Next, a summation "a" is made over each column and recorded in line 4; then "a" is squared and recorded in line 5.

To determine if a respondent has committed a circular triad, a "d" statistic (39, p. 148) is computed where

$$d = \frac{1}{12} (n) (n-1) (2n-1) - \frac{1}{2} \sum_{i=1}^n a^2$$

where n = number of items to be ranked.

Inserting the appropriate numbers in the formula when n = 3 and $\sum a^2 = 5$,

$$d = (1/12) (3) (2) (5) - (1/2) (5) = 0$$

indicating no circular triads are committed by this respondent.

An example of inconsistency occurs if a respondent chooses C over A, B over C, and A over B. Now a² equals 3 and inserting appropriate numbers in the formula

$$d = (1/12) (3) (2) (5) - (1/2) (3) = 1$$

indicating one circular triad has been committed.

Kendall (39, p. 146) develops a formula for the maximum number of circular triads which may be committed for each number of items to be ranked. If n is even, $(1/24) (n^3 - 4n)$ is used to determine the maximum number while if n is odd, $(1/24) (n^3 - n)$ is the formula. In this case with $n = 3$,

$$(1/24) (3^3 - 3) = 1$$

is the maximum number of triads which may be committed.

A test may be conducted to check if a respondent made his choices on a purely random basis. The null hypothesis would be formulated as the individual's choices are random. The alternative hypothesis would be that the choices were consciously and deliberately made with some single attribute in mind.

It follows that a person committing few circular triads would lend support to the alternative hypothesis. The usual procedure would be to establish a significance level, determine the probability of observing the number of triads that are committed, and if that probability is less than the significance level, reject the null hypothesis.

Kendall's (39, p. 190) table, "Paired Comparisons Frequency (f) of Values of d and Probability (P) that values will be Attained or Exceeded," lists the probability of observing d or more circular triads if the choices are made purely at random. To adapt the table to the problem of testing

for d or less circular triads, subtract the probability as given in the table from one. If $1 - P$ is less than or equal to the established level of significance, reject the null hypothesis.

Difficulties arise, however, in using this table for n as small as three. The maximum number of circular triads with $n = 3$ is one. A person may then commit one or zero circular triads. The probability as listed in the table for committing zero or more circular triads if choices are random is 1.00; for one or more, $P = 0.25$. To convert this into the framework of d or less, use the probability in the $d + 1$ row and subtract from one. Thus, the probability of committing zero or less triads is $1 - 0.25 = 0.75$. The null hypothesis could be rejected only with a significance level of 0.75. This procedure cannot be utilized to determine the probability of one or less circular triads. All one could state is that the probability of attaining one circular triad if choices are made purely at random is 0.25. Establishing a significance level of, for example, $\alpha = 0.05$ and testing against this significance by use of Kendall's table would be meaningless.

In this chapter a model is developed following the means-end continuum in which goals constitute the ends or targets of land use planning. Various uses of land, such as residential, agricultural, recreational, or industrial, constitute means of achieving desired goals. Methods of weighting both individual

and group choices and aggregating individual choices into group choices are also examined. The certainty method and the paired-comparison model are chosen for this study.

The following chapter includes a description of Region V followed by exposition of the procedures used in applying and testing the model developed in this chapter.

CHAPTER IV. APPLICATION OF MODEL TO REGION V IN IOWA

This chapter describes Region V and the procedure followed in applying the model as developed in the previous chapter to land use planning in the region. The first section of the chapter contains background information on land characteristics, population, and the economy of the region since all contribute to land use decisions. Needs and problems of land use specific to Region V are included in the next two sections.

The fourth section of the chapter presents construction of the schedule used in the regional survey as needed to obtain the data for applying the model. Personal and land ownership characteristics of the sample population are presented in section five. Comparison between characteristics of the sample population and the population of the region is also included.

Regional Data

The state of Iowa has been divided into sixteen planning regions. Region V, site of this study, comprises six counties in North Central Iowa; Calhoun, Hamilton, Humboldt, Pocahontas, Webster, and Wright. Figure 4-1 locates Region V within the state of Iowa. Location of the sixty-one cities and towns within the region is shown in Figure 4-2.

Figure 4-1. Location of Region V within the state of Iowa

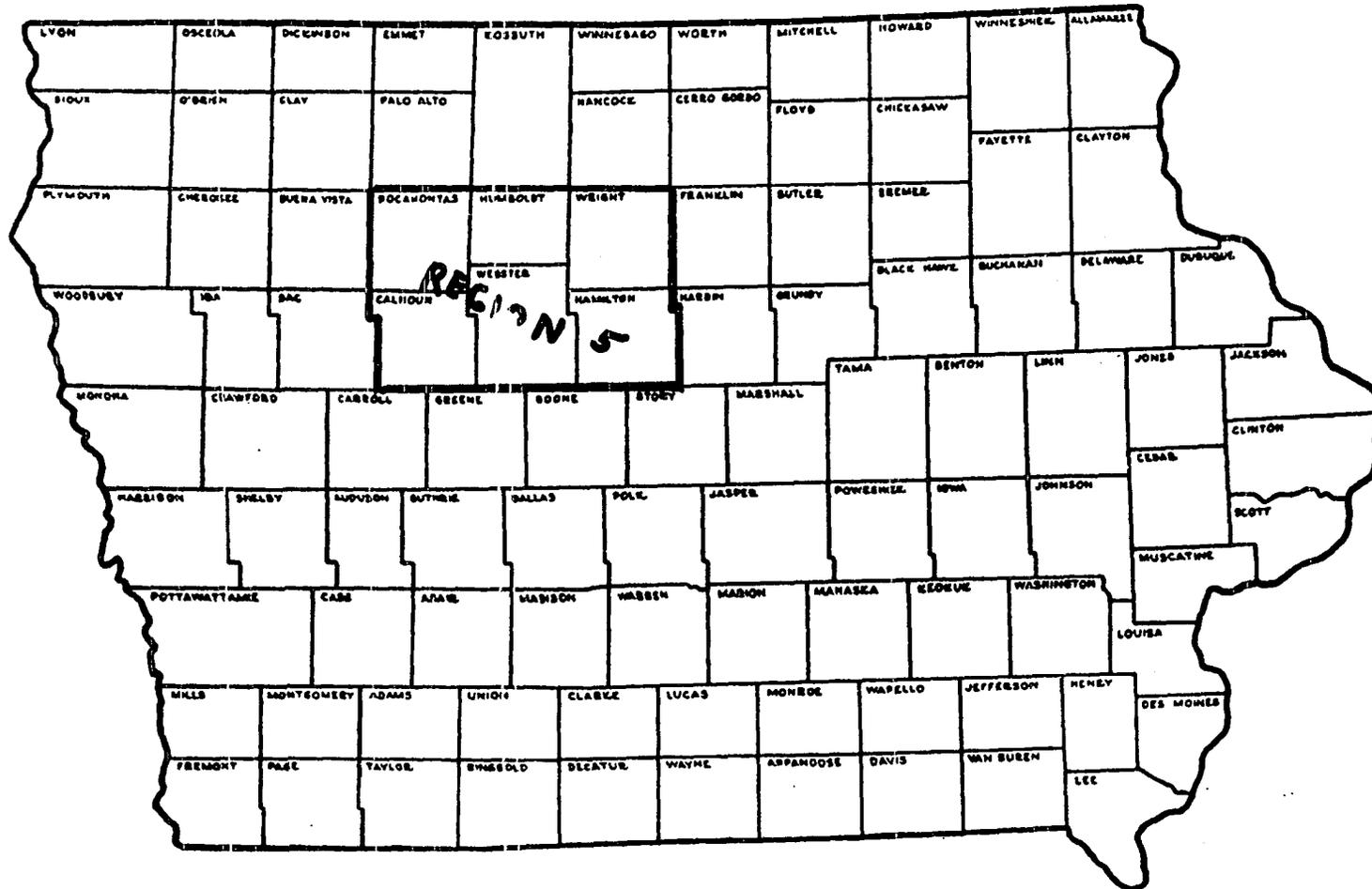
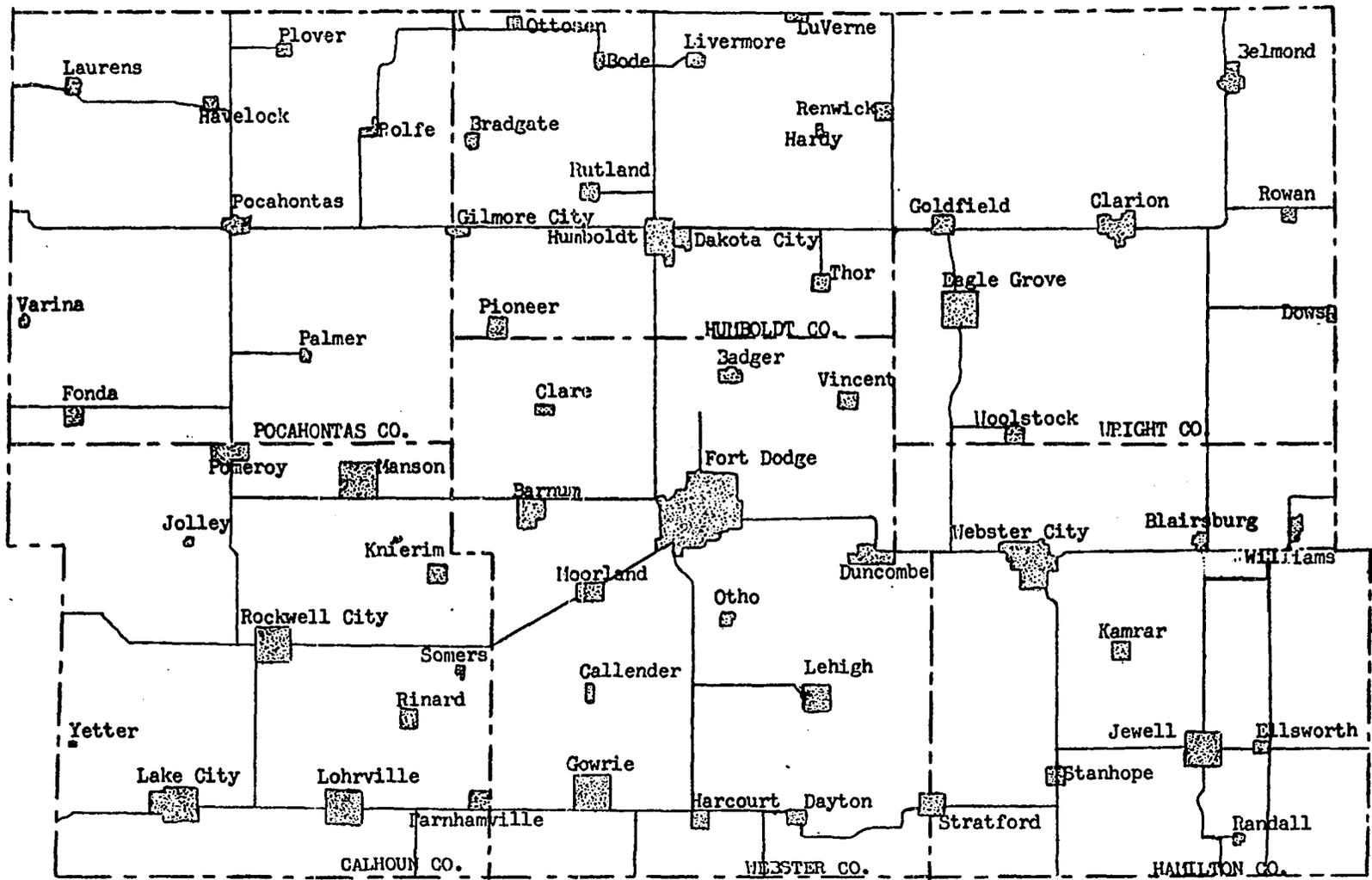


Figure 4-2. Location of communities within Region V (Reproduced from Demographic and Economic Base Survey and Analysis, p. 3, Published by MIDAS Regional Planning Commission)



Ninety-six and eight-tenths percent of the land area is classified prime agricultural land with the remaining 3.2 percent of the land requiring conservation practices (44). A survey conducted as part of the larger land use study in the region reveals that in 1970, 94.8 percent of the land was used for agricultural purposes with about three-fourths of that in cropland (25). Corn and soybeans are major crops. A small percentage of land is in permanent pasture. The Census of Agriculture states that farm land comprises 100 percent of two counties in the region, Humboldt and Wright (69; 70). In the region, highways and roads account for the next highest use of land, 2.8 percent, while urban use with 1.3 percent is third (25).

The population of Region V in 1970 was 123,603, a decrease of 5.3 percent from 1960. Studies anticipate a continuing decline in regional population in the next twenty-five years. Forty-two percent of the population is located in urban areas with the remaining 58 percent rural. Following a state-wide pattern, population in the under-five years of age category decreased in the past ten years while the over-seventy years of age category increased. These changes were slightly more pronounced in Region V (44).

Economically, the region is dependent upon agriculture. In all counties except Webster, farm earnings account for one-quarter to one-third of total personal income (73). Neverthe-

less, total employment in agriculture declined 34.9 percent in the decade from 1960 to 1970, while employment in other sectors increased 8.9 percent. Retailing, manufacturing, mining, and service industries account for the bulk of the nonagricultural employment (44). In 1972, per capita income in the counties of the region ranged from \$3,999 to \$5,012 with a regional average of \$4,444, while the United States average was \$4,480 (73).

Need for Land Use Planning in Region V

General needs for land use planning cited in Chapter I prevail in Region V. In addition there exist needs and problems peculiar to the state and region including possible enactment of land use legislation in the State of Iowa, changes in land use occurring within the region, and problems voiced spontaneously by respondents in the land use survey taken in the region.

Bills to provide for a state land use policy have been introduced into the Iowa General Assembly for the past several sessions. To date none have passed. However, House Bill 505 introduced in the 1974 session was passed by the House on April 11, 1975 and is currently awaiting action in the Senate Natural Resources Committee. Among items included in this bill is one authorizing the state commission to apportion funds among county land use commissions to fund development and

enforcement of land use plans (55, p. 9). The bill also includes provisions for the state commission to establish rules to review and approve comprehensive plans for cities, counties, and special districts and, if necessary, resolve conflicts among the plans (55, p. 10). Section 10 of the bill requires that application for development projects in state permit areas shall be sent to the affected county land use policy commission for their review and recommendation (55, p. 15). Finally, House Bill 505 provides that a county land use policy commission shall be appointed for each county and a comprehensive plan for land use shall be prepared and adopted for each city and county. The comprehensive plan shall include at least the following (55, p. 21):

- a) coordinated systems of solid waste disposal, sewage collection and treatment, and water supply and distribution
- b) the siting and development of industrial, commercial, educational, cultural, residential, and recreational facilities and areas
- c) the designation, development, or use of local critical areas
- d) a coordinated countywide transportation system which shall include elements of a statewide transportation system
- e) the designation, siting, and development of confined feedlot operations which are not designated as state permit areas.

Although this specific bill may not pass, enactment of land use bills at either the national or state level or both appears probable. If so, to fulfill the above or similar provisions that might be included in land use bills, land use planning for the counties or region would be needed.

Agriculture, which accounts for 94.8 percent of land use in the region, has experienced the following changes between 1960 and 1970: farm size has increased 28 percent; the number of farms has decreased 22 percent; the total number of people employed in agriculture has decreased 30 percent; the percentage of the total population employed in agriculture has decreased 8 percent (69; 70). These developments indicate probable changes in farming practices affecting land usage. The developments also indicate possible changes in economic conditions of the region necessitating more off-the-farm employment opportunities with accompanying changes in use of land.

The Mid Iowa Development Association Regional Planning Commission (44) has outlined changes in physical characteristics of land, transportation, urban use, commercial use, industrial use, and waste disposal which may contribute to land use problems in the future. Physical characteristics of the region include four major rivers and many small streams, some of which are subject to flooding. Potential for recreation exists along the rivers and streams but may conflict with other uses such as agriculture or residential construction. Pollution and conservation are two other problems to be considered. Limestone, sandstone, gypsum, and some coal are found in the region. Mining of these resources leads to conflicts in uses of land and contributes to pollution and conservation problems.

Transportation decisions profoundly affect usage of adjacent land but most of these decisions were made years ago for Region V. Nevertheless, completion of Expressway 520 is expected through the region by the 1980's. Unused country roads and abandoned railways could be used for agriculture and recreation.

Although the total amount of land involved, is small, incorporated areas have not been fully utilized for urban use. Incorporated areas comprise 1.2 percent of total land area with but 41 percent of the incorporated land urbanized. Present corporate boundaries include much prime agricultural land. New subdivisions have leapfrogged beyond existing developments leaving pockets of undeveloped areas within city boundaries. Providing public facilities to these outlying developments is more expensive while at the same time subdivisions exert pressure to withdraw the encircled agricultural land from farming.

Major commercial sites are located in business districts within cities, however, commercial areas also stretch along main highways near city limits. Most of these areas have grown without conscious prior planning and have contributed to overall urban sprawl.

Many types of industry are located in Region V but to provide more job opportunities to maintain the present population level, additional industry may be needed. MIDAS (44) states that presently the region lacks planned industrial parks.

Air and water pollution and conflicts between industrial and other uses of land are but two of the problems to be considered in siting new industry.

Sewer systems, septic systems, and solid waste disposal are facets of land use which benefit from a regional approach.

In addition to these factors outlined by MIDAS, individual citizens mentioned conditions which were of concern to them in the land use goals survey taken in the region by Iowa State University as part of this study. Location of a sanitary landfill nearby prompted comments from several respondents. Failure to improve existing or to provide additional recreational facilities was noted by others. Lack of adequate railway service elicited most comments.

Impending state land use legislation, changes in land use within the region, conflicts among uses, plus problems in other areas associated with land use point up the need for land use planning in the region.

Need for Citizen Participation in Region V

Planning implies choosing among alternatives which may conflict with each other. If so, the alternative chosen should be the "best," and some rule or procedure is needed to determine the "best." It seems reasonable that the citizens affected by the plans should be involved in choosing the best alternative or in specifying the rules for determining the best.

General reasons for citizen involvement are found in Chapter I. Specific reasons for citizen involvement in Region V are derived from the legislative processes of the state and its subdivisions.

MIDAS recognizes the role of member governing bodies in the statement, "MIDAS has only the power invested in it by member municipalities and counties. At the instruction of the member communities, MIDAS develops studies and reports which can be adopted, revised, or rejected by member governments" (44, p. 39).

The land use bill introduced into the Iowa General Assembly in 1974 provides that at least one public hearing shall be held before adopting county land use policy guidelines. Public notice shall also be given before any modifications are made in existing plans (55, p. 21).

Whether attained through public meetings or by other means, wider citizen participation in development may result in more effective fulfillment of plans.

Procedures Used in Region V

Citizens may participate in governmental decision making through several means, e.g., voting in elections, participating in public meetings, or responding to surveys. In voting for candidates, citizens have a direct voice in determining who represents them but seldom (except for referendums) have a

direct vote on specific issues. Candidates usually represent several issues so a vote for a candidate seldom translates into a vote for or against one specific issue. Public meetings constitute a forum for specific issues but, though people indicate their preferences through this forum, results are not binding on decision makers. In addition, perhaps only citizens with strong feelings for or against an issue may attend meetings. All segments of the population are not represented. Surveys allow representation of all strata of the populace but results are not binding on decision makers. Nevertheless, evidence exists that elected officials look to results of polls to assess public opinion. Moreover, some states use public opinion polls to obtain citizen input. The land use planning bill of Vermont requires citizen participation in land use decisions with part of citizen input derived through opinion polls. In the state of Washington, citizens were given the opportunity to vote on Alternatives for Washington through a series of polls (14, pp. 17-19).

Fulfillment of the primary objective of this study, identification of citizens' goals for land use planning, requires direct participation by residents of Region V. As stated in Chapter III, direct query was judged the most feasible means to obtain citizen preferences, and a survey of the population of the region was deemed the most appropriate method of directly questioning the citizens of Region V.

Because of resource limitations, a survey of the entire population could not be conducted. If properly chosen, results of a random sample are representative of the population. The choice of personal interview versus mail questionnaire or telephone survey is determined by complexity of the survey instrument and amount of probing necessary to obtain answers. The questions in this study were relatively complex, covering issues which may have been unfamiliar to at least some interviewees so a personal interview was deemed necessary to obtain valid responses. Mail questionnaires have the additional disadvantage of low and incomplete returns. Initial survey expenses increase with personal interviews, but the percentage rate of completed returns is higher. Interviewers encountering refusals can continue with substitutions until a satisfactory number of interviews are completed. Distribution of sample characteristics probably remain truer to population characteristics in a personal interview study than in a mail questionnaire study if the sample is properly chosen. In view of the above considerations, personal interviews of a randomly selected sample of the households of Region V were chosen as the means of eliciting citizens' preferences in goals of land use planning. The following procedures are based upon that decision.

Sample selection

Location, size, and composition of sample were questions to be decided. With the number of interviews limited by budget constraints, the decision was made to conduct one interview per household. Preferences of all individuals, regardless of position in the household, were desired in this study so any member of a household eighteen years of age or older was eligible for interview. To ensure representation from both sexes, interviewers randomly selected a respondent from each household. With only one member in a household, that member was interviewed. With more than one member in a household, members were listed numerically following prespecified rules and a random number sheet used to select the member to be interviewed.

The individual interviewed was instructed to answer the questions in light of his (her) own preferences, not what he (she) thought the community preferences would be.

The¹ universe for this study consisted of all households in a 6-county area of North Central Iowa; specifically, the counties were Calhoun, Hamilton, Humboldt, Pocahontas, Webster, and Wright. From this universe a stratified area sample of housing units was selected which was expected to yield

¹The following five paragraphs were prepared by Harold Baker, Statistical Laboratory, Iowa State University Ames, Iowa, December, 1975.

approximately 350 completed interviews. The over-all sampling rate was 1 out of 105.5.

Six strata were defined by grouping the incorporated towns and cities into six size classes based on 1970 Census population data. These size classes were:

10,000 or more (Ft. Dodge only, included in sample with certainty)

5,000 to 9,999 (Webster City only, included in sample with certainty)

2,500 to 4,999 (3 communities, 2 selected in sample)

1,000 to 2,499 (8 communities, 4 selected in sample)

500 to 999 (13 communities, 4 selected in sample)

less than 500 (35 communities, 5 selected in sample).

The number of communities selected in a stratum was determined somewhat arbitrarily taking into account the total number of communities in the stratum and the total sample size allocated to the stratum. It was desirable to select a fairly large number of communities in order to adequately reflect the diversity in the population; however, the more communities selected, the higher would be the costs both of sampling and of interviewing. Within a stratum, the communities were selected with probabilities proportional to their sizes in terms of 1970 Census housing units. The sampling rate within a selected town was determined such that the over-all sampling rate, which is obtained by multiplying the sample rate within the town by the probability of having selected the town, was

maintained at the desired 1 out of 105.5. Within a sample town, so-called area segments were selected at the appropriate within-town rate. These area segments consisted of small pieces of land expected to contain on the average about 3 households each (in this particular study). In Ft. Dodge and Webster City, city directories were used to define and delineate the area segments; in the remaining towns, aerial photographs were used. Once the boundaries of a segment were established, every housing unit actually found within the boundaries was to be included in the sample regardless of whether or not it appeared in the city directory (or on the aerial photograph). Since every unit of land in a sample town had a known nonzero probability of being selected in the sample, every housing unit, by virtue of being associated with a unit of land, also had a known nonzero probability of being selected in the sample. This probability was, in fact, the same for all housing units in the universe -- 1 out of 105.5

All area outside the incorporated towns and cities was grouped to form a seventh stratum. Sampling in this stratum was carried out in a manner similar to that in the other strata using sampling materials specifically constructed for that purpose. The over-all sampling rate of 1 out of 105.5 was applied directly to these sampling materials in a single sampling stage. The area segments were defined on county highway maps.

Altogether, 399 occupied housing units were found in the sample. Interviews were obtained from 338 of them for a response rate of 84.7 percent.

The distribution of the sample among the counties is shown below:

Table 4-1. Distribution of sample among counties

County	Housing units in county	Estimated size of sample in each county	Interviews completed
Calhoun	5,312	43	51
Hamilton	6,596	53	46
Humboldt	4,316	35	28
Pocahontas	4,455	36	34
Webster	16,305	132	128
Wright	<u>6,296</u>	<u>51</u>	<u>51</u>
Total	43,280	350	338

A larger sample would always be preferable, but size was limited by financial constraints. It was felt that a sample of 350 distributed as it was would provide a sufficient number in various strata and categories to analyze statistically and still remain within budget.

After the three basic questions were decided, the sample was drawn by the Statistical Laboratory at Iowa State University. The entire survey was carried out with a high degree of cooperation from various personnel at the Laboratory; planning the survey, drawing the sample, preparing the survey schedule, conducting interviews, coding schedules, keypunching

data cards, and analyzing results. Concurrently with sample selection, the schedule to be used in the survey was constructed.

Construction of the survey schedule

The schedule used in the personal interview is the single means of contact with the individual citizen in this survey hence questions had to be developed to obtain desired information in a form amenable to statistical needs of the researcher. This study is part of a larger land use research project which in turn is part of a coordinated program of research, education, and development in Region V. It was felt that this survey could also serve as a vehicle for obtaining information useful in other facets of this program. Enlarging the schedule used in this survey was more economical than conducting a second survey. Development of the schedule involved input from the project leader, Iowa State University Agricultural and Home Economics Experiment Station and University Extension personnel, and Statistical Laboratory personnel.

The schedule is comprised of six sections each of which is described more fully in the following sections of this chapter. The writers dealt with the problem of length and possibility of respondent fatigue. To avoid monotony, diverse methods of presenting various sections are used. Visual aids in the form of cards and graphs are used to draw respondents' attention to the questions. For many respondents, sections of

the schedule could be omitted which shortened the length of the interview considerably.

Before beginning the actual interview, interviewers selected respondents from eligible household members by asking the first contact at each household the names and ages of all members and listing them in order. Educational level of all members over eighteen years of age was also obtained. The respondent was selected from members listed and the interview conducted with the selected member.

The final schedule used in this survey is found in Appendix B.

Situation-statement section

Section I includes nine situations read to respondents. The scenarios present several aspects, both positive and negative, of situations involving land use. A statement follows each situation. The certainty method, described more fully in Chapter III, is used to elicit responses. In this methodology, the respondent is asked to make two decisions: directional (agreement or disagreement with the statement) and certainty (strength of the response) about each statement.

Placing the situation-statement section at the beginning of the schedule serves two purposes. First, the situations serves as a device to educate respondents on the meaning of land use planning for the remainder of the schedule. The meaning of land use planning differs widely among individuals

and, in Section I, land use is related to specific situations with which the respondent may be familiar so he (she) is introduced to the meaning of land use planning in terms of this survey. An interesting sidelight to the educational aspect is that the scenarios served to show respondents they really were familiar with land use. Beginning the interview, many respondents protested they were uninformed about land use with no opinions on the subject. When going through the scenarios in Section I, however, respondents often stated that they felt strongly about a particular issue but had not thought of it in terms of land use. Second, the statements encompass the "means" designated in the model; respondents are queried about their preferences in various uses of land such as residential, recreational, agricultural, or industrial as well as preferences on conservation and environmental quality.

Section I of the schedule grew out of discussions with university personnel engaged in land use research and extension as well as those specializing in polling public opinion. Approximately twenty-four questions on land use in Iowa were identified in preliminary discussions with members of this group. Several questions involve degrees of the same issue so eventually twenty-four questions were combined into nine separate issues. Most of the issues were complex and respondents would need a great deal of information to make rational decisions involving the issues. The issues are not unique to Region V so all citizens (even relative newcomers to Region V)

were expected to be cognizant of the general situations but not familiar with details nor all aspects of issues. Knowledge of potential respondents was expected to range from very little to a great deal.

Rather than request citizens to respond under these conditions, the writers decided to present a modicum of information to all respondents so each would possess at least the same threshold of knowledge. To fully explain each issue and include all data which should be considered is far beyond the limits of this survey. The length would have become prohibitive both in terms of financial resources and in maintaining respondent interest and comprehension.

To counter objections to length and still present sufficient information to respondents, situations were composed which included two or three negative and positive points about each issue. Situations were kept reasonable in terms of length and number of facts respondents were expected to comprehend and retain. Those familiar with public opinion polls suggested that issues be developed in terms of conditions prevailing in Region V. Reactions would more closely approximate true feelings if situations were relevant to the respondent's own situation rather than couched in abstract terms. To avoid bias, pros and cons of each issue were balanced. Excess negativism could lead to a negative response and vice versa. Personnel at the Statistical Laboratory aided

in revising and rewriting situations to avoid bias, to employ terminology familiar to respondents, and to eliminate unnecessary detail.

In the original schedule, eleven statements followed nine situations. Pretesting revealed confusion over two statements which were reworded and combined into one statement.

A strength of the certainty method is the weighting of statements in a more than ordinal manner. Respondents are allowed to register intensity of feeling through a range of choices available to them. A respondent who might hesitate to endorse a statement unequivocally has the opportunity of indicating limited agreement. Respondents' choices are not interpersonally comparable; i.e., an Agree 3 does not indicate the same intensity of feeling by two persons but rather indicates relative intrapersonal feeling. Nevertheless, responses of all individuals can be averaged to obtain a weighted mean for each statement. A comparative ranking of statements is obtained which does not assume equal intervals between each rank.

A weakness of the method might be the tendency for a respondent to feel making a certainty judgment is too difficult and simply repeat the same answer to each question; i.e., a three if inclined to the mean or a five to indicate strong feelings. When constructing Section I, the writers did not feel that a respondent would necessarily agree with every statement nor disagree with every statement since statements

are phrased in both positive and negative terms. In the completed schedules, responses cover the entire range for each of the aggregated statements and, for most individual respondents, choices are not confined to one number for each statement.

In general, in this study, the strength of the Certainty Method appears to be exploited while the weakness is avoided.

Goal preference section

Section II, or the goal preference section, is designed to elicit respondents' preferences among the three goals which have been outlined previously in Chapter III.

Resolution of two basic questions, which goals to include and how to present them to interviewees, involved much time and many meetings. The first question, what goals to include, is covered in the first part of Chapter III. As stated, an open-ended questionnaire was sent to a selected sample of the population in which citizens were asked to identify their goals of land use planning. Objectives of previous resource projects were also explored and listed. Items from these two sources were combined and grouped into four goals and eventually, after pretesting, into three goals.

The method for presenting these three goals to the interviewees involved long and careful consideration. The goals as stated could involve as many interpretations as there are respondents. To aggregate responses, respondents must have

similar interpretations of the question; if not, aggregation is really over dissimilar questions. A second major problem involves ranking of goals. Each goal is desirable, so respondents, if asked to rate each individually on a scale, would certainly rate it highly. For purposes of this study, respondents must be forced to make choices.

Several methods were utilized to achieve similar interpretations. First, an explanation is included with each goal. The explanations parallel those included with the Water Resources Council administrative order. With assistance from personnel at the Statistical Laboratory, explanations were clarified and presented in terminology familiar to the layman. Placement of goals in Section II of the survey schedule was the second measure employed. Respondents are introduced to specific examples of land use planning in Section I which serve to illustrate the meaning of land use planning, point up the mutual exclusiveness of decisions in this area, and explain achievements which could be expected to result from land uses, all of which aid interpretation of goals.

The problem of ranking goals was solved by employing a weighting methodology. A simple ordinal ranking of goals is insufficient for the purposes of the model developed in Chapter III. If respondents were asked to weight each goal individually on a scale, such as the certainty method, individual rankings would doubtless result in a high weight for each goal since all

are desirable. Often goals are mutually exclusive; for example, it may be necessary to choose between a cleaner environment or increased production of goods and services. The writers wished to force respondents to choose between situations that may be mutually exclusive. The paired-comparison format allows this type of choice and results in a weighted ranking of goals; therefore this format was utilized in presenting goals to respondents.

A detailed description of the paired-comparison technique may be found in the last section of Chapter III. Briefly, respondents are confronted with a pair of goals and asked to choose between them. Each pair of goals is presented only once, but all possible combinations of pairs are included. The number of possible combinations when there are n goals is given by the formula:

$${}_n C_2 = \frac{n(n-1)}{2}$$

With only three goals, there are only three pairs of statements in Section II:

$${}_3 C_2 = \frac{3(3-1)}{2} = 3$$

Each pair of goals is printed on a separate card and presented one at a time to respondents who are asked to choose between the two goals on each card. The order of goals on cards and the order in which cards are presented to respondents are determined by random choice to prevent biasing the

respondents by placement of items. Once that order is established, however, the pairs are presented to each respondent in the same order.

It was hoped that this method of presenting goals would alleviate problems of interpretation and ranking. From the completed schedules, choices of all respondents are aggregated and analyzed resulting in a weighted ranking of goals. When tested, the model is statistically valid for the goals section of the schedule.

Approaches to land use planning

Section III is designed to learn the approach to implementation of land use planning preferred by citizens of Region V. Four approaches covering the range from no control to control by legal force are outlined. Along with explanations or examples of each, approaches are presented to respondents in a paired-comparison format identical to that employed in the previous section for goals. Analysis similar to that used for the goals is carried out. A ranking is obtained but, when tested, is not statistically valid.

Land use preferences of citizens of Region V

Section IV was developed in cooperation with another researcher at Iowa State University to determine citizens' desires in future uses of land in Region V. Earlier in the year, a study of Region V was completed and the number of acres presently in each of eight uses was computed. The uses are

airports, mining, private recreation, railroads, public recreation, urban use, highways and roads, and agriculture. Acreages which would be found in each of these uses in 1990 if present trends continue were projected. The objective of this section of the schedule is to provide a basis for comparison with uses projected on trends. If projected uses based on trends coincide with those uses desired by citizens as shown by the survey, no problem exists. If not, some means of adjusting projected to desired projected uses might be found.

This section proved difficult both for the writers and the interviewers. As with previous sections, the questions require at least a minimal amount of knowledge on the part of respondents if valid answers are to be expected. Questions of how much information to present to respondents and form of presentation arose. Should respondents be asked to look at present use or projected uses? There are over two million acres of land in Region V. If choices were presented in acres, could respondents conceptualize the acres in each uses and respond validly? Would responses be more valid if respondents were asked to judge percentages of land in each use?

The original schedule contained present uses in percentages. It was felt using both present and projected uses in the same schedule might bias the respondents. Projections are not facts, just projections, but present uses involve known data. The pretest revealed two major problems. It was often difficult to ascertain if respondents when indicating a change,

meant the change should be a specified percentage or whether the total amount of land in a particular use should be the specified percentage (percentages of land in some uses are very small in Region V). The second problem involved respondents' beliefs that, if considering the present, certain uses cannot be changed so even believing too much land is in a particular use, respondents nevertheless indicate no change. For example, respondents may suggest highway and road acres should be decreased but since the land is already in that use, highways cannot be eliminated and respondents' final answer was no change.

Section IV was rewritten several times between the pre-test and actual interviews. Several measures were taken to alleviate problems encountered in the pretest. To counter the attitude that land is "fixed" in any use, in the final schedule respondents are asked to indicate how they would like to see their land used in fifteen years. This span of time is short enough to be within the time frame of reference of most respondents and long enough to allow for changes in use. Most major land developments could be completed in fifteen years. Finally, in the earlier study of land use in Region V projections were completed for this period.

To counter ambiguity in answers, interviewer instructions were rewritten for clarification. In the final version both acres and percentages presently in each use are printed on a

card shown to respondents who are asked to respond in acres. The question is phrased in terms of more, less, or no change in each use in fifteen years. If no change is indicated for a use, the interviewer is instructed to proceed to the next use. If a change is indicated, the interviewer asks how many acres more or less after reminding respondents that the region contains a fixed number of acres so more acres in one use necessitates less acres in another. After proceeding through all eight uses in this manner, the interviewer is instructed to add the acres in the more and less columns. If the columns do not balance, she is instructed to point this out to respondents and attempt to reconcile the number of acres in each column. Most respondents indicate a preference for more or less, but many find it impossible to conceptualize acres and refuse to make a judgment on the number of acres in each use. To avoid antagonizing respondents who may then refuse to complete the interview, interviewers are instructed to record more or less but not insist upon a number of acres if respondents refuse to state a figure.

Clarifying interviewer instructions and phrasing the questions in terms of desired land use in fifteen years serve to obviate many of the problems encountered in the pretest of the survey schedule.

Land ownership information

Section V is devoted to land ownership information on respondents. Ownership of land and experience with regulations on land are two factors which may affect choices of goals in land use planning. The researcher hypothesized that land owners, especially those who had experienced difficulty with regulations on their land, would be more opposed to strict controls on land than nonlandowners. Responses to approaches in Section III and some of the situation-statements in Section I of the survey schedule may reflect these differences. Ranking of goals may also differ between landowners and nonlandowners. Responses to questions in Section V are compared to responses from the first three sections of the schedule.

Questions in this section include location, size of holding, current use, regulations covering land as well as any problems encountered with regulations for each piece of land owned by respondents including residential lots in cities, farms in open country, beach lots, or any other location. If respondents own no land, most of the section is omitted. All respondents, however, are queried about experience with and attitude on land use planning and the level of government which should be responsible for land use planning.

Information obtained in this section will be available to other researchers for their segments of the project.

Demographic information

In Section VI of the survey schedule, the interview is eased to a conclusion with relatively easy demographic questions. Up to this point, respondents have been requested to make rather difficult choices and decisions. Easy, factual questions at the end conclude the interview on a lighter note. Respondents may resent questions on their income so that question is placed at the end of the interview.

Occupation, tenure in community, and income are factors which may affect attitudes on land use goals; questions on these items are included. Responses to Section VI are compared to responses of the first three sections to determine any relationship between these factors and the means, goals, and approaches preferred by respondents. The personal characteristic information of this section provides the basis for dividing the sample population into groups for analysis later.

Finally, respondents are given an opportunity to volunteer any comments or views on land use which have not been covered in the schedule.

A complete copy of the schedule may be found in Appendix B.

Characteristics of the Sample Population

The first four sections of this chapter include background information on Region V and land use problems unique to that region as well as a description of the development of the

survey schedule. This section presents characteristics of the sample population that was interviewed in Region V.

The first part of this section summarizes personal characteristics of the sample population. Part two summarizes land ownership of the sample population as well as respondents' experiences with regulations and their attitudes toward land use.

Personal characteristics of the sample population

Information on personal characteristics of the sample provides a basis for comparison with characteristics of the population of the region to determine if the sample is representative of the population. Characteristics compared are age, number of members in the household, sex, occupation, and income.

In Chapter V, the sample population is grouped by use of the personal characteristics developed in this section of Chapter IV. Each group is analyzed by use of the paired-comparison model to check for differences in weighting of goals by the various groups.

Personal information was obtained on each respondent, on the head of the household if different than the respondent, and on each household. The schedule specifies that the individual respondent state his (her) preference on each question, but it was felt that occupation and education of the head of the household and family income would influence the respondent thus

questions on family and head of the household are included in the schedule.

There were 338 completed interviews distributed among the six counties of Region V in proportion to census population in each. Table 4-2 lists the number and percentage of interviews completed by county. In addition, the sample was divided into place of residence to ensure representation from rural areas as well as various sizes of towns or cities. The number and percent in each category are found in Table 4-3. Thirty-two percent of all responses are from rural residents, 29 percent from residents of towns with a population below 2,500 persons, about 14 percent from residents of towns with a population of 2,500 to 10,000, and the remaining 25 percent from residents of Fort Dodge, the only city with a population greater than 10,000.

The respondent is head of the household in 61.5 percent of the interviews. Of total respondents, 48.2 percent are female. Ages of respondents range from eighteen to eighty-nine years with a mean of 46.7 years. Table 4-4 breaks down ages of respondents into six categories. Education of respondent and of head of household are grouped in six categories in Tables 4-5 and 4-6. Mean years of education of respondents is 11.88 while that of the head is 11.84.

Information was obtained on the primary occupation, secondary occupation, if any, and present status of employment

Table 4-2. Interviews completed by county. Iowa Land Use Study, Region V, 1975

County	Absolute frequency	Percent of total
Calhoun	51	15.1
Hamilton	46	13.6
Humboldt	28	8.3
Pocahontas	34	10.1
Webster	128	37.9
Wright	51	15.1
Total	338	100.0

Table 4-3. Interviews completed by place of residence. Iowa Land Use Study, Region V, 1975

Place of residence	Absolute frequency	Percent of total
Rural	108	32.0
Towns < 2,500	98	29.0
Towns 2,500 to 10,000	47	13.9
Cities > 10,000	85	25.1
Total	338	100.0

Table 4-4. Age of respondent in land use goals survey. Iowa Land Use Study, Region V, 1975

Age category in years	Absolute frequency	Percent of total
18-29	76	22.5
30-39	66	19.5
40-49	49	14.5
50-59	48	14.1
60-69	49	14.5
70-89	47	13.9
Missing	3	1.0
Total	338	100.0
Mean	=	46.75
Standard deviation	=	18.55
Median	=	45.375

of both the respondent and head of the household and is presented in Tables 4-7 through 4-14. Occupations are coded into ten categories corresponding to census classifications. Status of occupation includes full-time, part-time, or retired. For respondents, housewife is the largest primary occupation with 28.7 percent. The second largest group, 18.3 percent is

Table 4-5. Education of respondent in land use goals survey.
Iowa Land Use Study, Region V, 1975

Years of schooling	Absolute frequency	Percent of total
3-8	50	14.8
9-11	40	11.8
12	142	42.0
13-15	70	20.7
16	20	5.9
17 and over	9	2.7
Missing	7	2.1
Total	338	100.0
Mean	11.879	
Standard deviation	= 2.472	
Median	= 12.032	

farm or farm manager. For status of primary occupation, 196 respondents reported full-time employment, 12 part-time employment, 32 retirement, and 1 was unemployed at the time of interview. Only those employed for wages were asked status of employment; housewives are not coded to status of employment although they constitute the largest single category of

Table 4-6. Education of head of household in land use goals survey. Iowa Land Use Study, Region V, 1975

Years of schooling	Absolute frequency	Percent of total
3-8	57	16.9
9-11	45	13.3
12	138	40.9
13-15	57	16.9
16	18	5.3
17 and over	18	5.3
Missing	5	1.5
Total	338	100.0
Mean	11.841	
Standard deviation	= 2.656	
Median	= 11.976	

respondents. Farm or farm manager is the largest primary occupation category for heads of household with 28.1 percent. Since 32 percent of the interviews were conducted in the rural area, logically farming would be the largest occupation category for heads of household. Two hundred and sixty-five heads of households are employed full-time, 4 are employed

Table 4-7. Primary occupation of respondent in land use goals survey. Iowa Land Use Study, Region V, 1975

Nature of occupation	Absolute frequency	Percent of total
Professional (includes students)	35	10.4
Farm, farm manager	62	18.3
Manager, owner	17	5.0
Clerical	26	7.7
Sales	9	2.7
Craftsman	28	8.3
Operative	22	6.5
Service worker	24	7.1
Laborer (includes farm laborer)	17	5.0
Housewife	97	28.7
Unemployed	1	0.3
Total	338	100.0

Table 4-8. Primary occupation of head of household in land use goals survey. Iowa Land Use Study, Region V, 1975

Nature of occupation	Absolute frequency	Percent of total
Professional (includes students)	34	10.1
Farmer, farm manager	95	28.1
Manager, owner	32	9.5
Clerical	15	4.4
Sales	15	4.4
Craftsman	38	11.2
Operative	32	9.5
Service worker	24	7.1
Laborer (includes farm laborer)	32	9.5
Housewife	21	6.2
Total	338	100.0

Table 4-9. Status of employment in primary occupation for respondent in land use goals survey. Iowa Land Use Study, Region V, 1975

Status	Absolute frequency	Percent of total
Unemployed	1	0.3
Full-time	196	58.0
Part-time	12	3.6
Retired	32	9.5
Housewife (not included in other categories)	97	28.7
Total	338	100.0

Table 4-10. Status of employment in primary occupation for head of household in land use goals survey. Iowa Land Use Study, Region V, 1975

Status	Absolute frequency	Percent of total
Unemployed	1	0.3
Full-time	266	78.4
Part-time	4	1.2
Retired	47	13.9
Housewife (not included in other categories)	21	6.2
Total	338	100.0

Table 4-11. Secondary occupation of respondent in land use goals survey. Iowa Land Use Study, Region V, 1975

Nature of occupation	Absolute frequency	Percent of total
Professional (includes students)	4	1.2
Farmer, farm manager	7	2.1
Manager, owner	4	1.2
Clerical	4	1.2
Sales	8	2.4
Craftsman	7	2.1
Operative	5	1.5
Service worker	15	4.4
Laborer (includes farm laborer)	8	2.4
Housewife	1	0.3
No secondary occupation	275	81.4
Total	338	100.0

Table 4-12. Secondary occupation of head of household in land use goals survey. Iowa Land Use Study, Region V, 1975

Nature of occupation	Absolute frequency	Percent of total
Professional (includes students)	2	0.6
Farm, farm manager	4	1.2
Craftsman	5	1.5
Operative	3	0.9
Service worker	3	0.9
Laborer (includes farm laborer)	3	0.9
No secondary occupation	318	94.1
Total	338	100.0

Table 4-13. Status of employment in secondary occupation for respondent in land use goals survey. Iowa Land Use Study, Region V, 1975

Status	Absolute frequency	Percent of total
Full-time	2	0.6
Part-time	54	16.0
Retired	6	1.8
Housewife (not included in other categories)	1	0.3
No secondary occupation	275	81.4
Total	338	100.0

Table 4-14. Status of employment in secondary occupation for head of household in land use goals survey. Iowa Land Use Study, Region V, 1975

Status	Absolute frequency	Percent of total
Full-time	2	0.6
Part-time	18	5.3
No secondary occupation	318	94.1
Total	338	100.0

part-time, 47 are retired, 1 is unemployed; 21 heads of households list their occupation as housewives and are not coded to status of employment. Sixty-three respondents report secondary occupations with two employed full-time in their secondary occupation. Twenty heads of households are employed in secondary occupations, two full-time.

Respondents' affinity with their community and state may be reflected through choice of goals or other opinions on land use, thus questions on residence in the community were included in the schedule. Definition of community is left to individual respondents with no sharp delineation of community set down in the schedule. Thirty-four percent of the respondents had lived in the community their entire life, length of residence ranging from one year to eighty-seven years with a mean of 28.48 years. Table 4-15 lists number and percent of respondents in each of five categories of years. Respondents who have resided in the community one year or less are coded one year. The second category includes those who have had a greater opportunity to become familiar with the community by residing there from two to five years. Six to ten year residents are included in the third group, while the fourth group encompasses residents from eleven to twenty years. Individuals who have lived more than twenty years in the community are included in the fifth category. Researchers felt that all residents of twenty or more years would identify

Table 4-15. Years of residence in community. Iowa Land Use Study, Region V, 1975

Years	Absolute frequency	Percent of total
1	20	5.9
2-5	37	10.9
6-10	37	10.9
11-20	50	14.8
> 20	192	56.8
No response	2	0.6
Total	338	100.0
Mean	28.48	
Standard deviation	= 21.93	
Median	= 24.93	

closely with the community even if they had not lived there for their entire lives.

Those who have moved into the community are asked their last place of residence. The replies are coded into four groups: 1) somewhere in Region V, 2) any other place in Iowa, 3) one of the border states surrounding Iowa, or 4) any other place in the United States or a foreign country. The largest

percentage, 42.6, have moved into their community from somewhere else in Iowa. Table 4-16 presents the above categories and number and percentage in each. One further measure of identification with the community is if respondents expect to remain there. When asked if they expected to be living in the community in ten years, 52 replied no, 261 replied yes, and 25 did not know, which indicates that about 77 percent consider their present community their permanent residence.

Gross household income is listed in seven categories in Table 4-17. Nine respondents refused to answer the income question. The mean income of those who respond is approximately \$14,609. The number of members in the household ranges from one to eight with a mean of 3.08 members. Approximately one-third of the households consist of two members. Table 4-18 lists members in each household by number and percentage.

Personal characteristics of the survey sample were compared with the personal characteristics of the population of Region V as shown in the 1970 Census. Because of length of time involved, 1970 for the census and 1975 for the survey, perfect fit could not be expected and was not found. No major discrepancies arise, however. Percentages in each age category in the survey compare favorably with census categories generally. The largest discrepancy is a 3 percent difference in one five-year span. The mean number of members in each household in the census is 3.01 compared with 3.08 in the

Table 4-16. Location moved from. Iowa Land Use Study, Region V, 1975

Location	Absolute frequency	Percent of total
Somewhere in Region V	88	39.5
Any other place in Iowa	95	42.6
Minnesota, South Dakota, Nebraska, Missouri, Illinois, or Wisconsin	20	9.0
Any other place in the United States or a foreign country	20	9.0
Total	223	100.0

survey. Percentages in each sex are reversed in the census and survey. The census lists population of Region V as 48.3 percent male and 51.6 percent female; reverse percentages appear in the survey sample. Census figures include the entire population while the survey sample only includes the population eighteen years of age and older. Occupations in the survey are coded to match those of the census. Percentages in some occupational categories in the survey are similar to those of the census; other categories vary a great deal. Part of the discrepancy may be attributed to misinterpretation in coding the survey schedule. Because of length of time involved

Table 4-17. Gross household income in land use goals survey.
Iowa Land Use Study, Region V, 1975

Income groupings	Class mean (assumed)	Absolute frequency	Percent of total
< than \$3,000	\$1,500	22	6.5
\$3,000-5,999	\$4,500	36	10.7
\$6,000-8,999	\$7,500	37	10.9
\$9,000-11,999	\$10,500	49	14.5
\$12,000-14,999	\$13,500	67	19.8
\$15,000-24,999	\$20,000	81	24.0
\$25,000 or over	\$35,000	37	10.9
No response		9	2.7
Total		338	100.0
	Mean	14,609	
	Standard deviation =	9,200	
	Median =	13,500	

and inflationary forces, comparison of household income between the sample and the 1970 Census is meaningless. More recent income information is available in a news story in the Sunday, November 2, 1975 issue of the Des Moines Sunday Register. The Department of Housing and Urban Development reports mean Iowa

Table 4-18. Number of members in household in land use goals survey. Iowa Land Use Study, Region V, 1975

Number of members	Absolute frequency	Percent of total
1	54	16.0
2	109	32.2
3	45	13.3
4	66	19.5
5	30	8.9
6	18	5.3
7	10	3.0
8	5	1.5
No response	1	0.3
Total	338	100.0
Mean	=	3.08
Standard deviation	=	1.68
Median	=	2.62

family income as approximately \$14,000 which is very comparable to the average of the survey sample population (16).

Land ownership characteristics of the sample population

The concept of land as private property pervades much of the discussion on land use bills on both the state and national level. Land ownership may affect an individual's attitude toward goals of land use planning. Section V of the survey schedule provides information on ownership of land by respondents. Landowners are grouped by location of land owned. Each group is analyzed by use of the paired-comparison technique in Chapter V to check for differences in weighting of goals by the groups.

Information on location of land owned, size of holding, and use of the land was obtained from all landowners. Of total respondents, 236 own land in at least one location, 47 own land in two locations, 7 own land in three locations, while 4 respondents own land in four locations. The 236 landowners account for 309 separate plots of land. Figures 4-3 to 4-5 show the number of respondents who own more than one plot of land and the location of the plots. The number of respondents who own land in each of the locations is presented in Table 4-19.

Average size holdings in the city and in the open country were calculated. The number of lots held by each owner in city locations ranges from one to ten with a mean of 1.6 lots. The

(n = 47)

Locations coded:

- 1- Incorporated City
- 2- Unincorporated Place
- 3- Edge of city
- 4- Open country
- 5- Other

Location Plot 2

Count				
Percent	1	3	4	5
Location Plot 1				
1	10 0.2127	3 0.0638	22 0.4681	1 0.0213
2	0 0.0	0 0.0	1 0.0213	0 0.0
3		1 0.0213	2 0.0425	0 0.0
4			7 0.1489	0 0.0

Figure 4-3. Respondents owning two plots of land. Iowa Land Use Study, Region V, 1975

(n = 7)

Locations coded as before

First plot is always incorporated city (1)

Location Plot 3

Count	
Percent	4
Location Plot 2	
1	4 0.5714
3	1 0.1429
4	2 0.2857

Figure 4-4. Respondents owning three plots of land. Iowa Land Use Study, Region V, 1975

(n = 4)

Locations coded as before

First two plots always incorporated city (1)

Location Plot 4

Count		1	3	4
Percent				
Location Plot 3				
1		1	1	1
		0.25	0.25	0.25
3			0	1
			0.0	0.25

Figure 4-5. Respondents owning four plots of land. Iowa Land Use Study, Region V, 1975

number of acres in each holding in the open country ranges from one acre to one thousand acres with a mean of 165.6 acres.

Owners were questioned about uses of each piece of land. All uses are recorded. For example, if an owner farms an acreage on which he resides, both farming and residential use are recorded. Two hundred and eleven plots of land, or 68.3 percent of the total, are used for the residence of the owner. Farming, second largest use, is recorded a total of 103 times in either first or second use. All owners of farm land were asked who farmed the land, the owner or a tenant. Responses are divided almost equally between the two categories. Tables 4-20 and 4-21 present uses of land as well as tenure of farm land.

Experience with regulations on land use may affect an individual's attitude toward land use in general, toward the approaches to be used in implementing land use plans, and toward the means (uses of land) of the model developed in Chapter III.

With this in view, information was obtained from the landowners on public regulations that may be applicable to their land, any problems experienced because of regulations, and the effect of their experience with regulations on their attitudes toward land use in general. Nonlandowners were also asked the last two questions. It may be as important for decision makers to know if a respondent is unaware that his land is subject to

Table 4-19. Location of land owned by respondents in land use goals survey. Iowa Land Use Study, Region V, 1975

Location	Absolute frequency	Percent of total respondents (n = 338)
Within the incorporated limits of a city or town	170	50.3
Within an unincorporated place	2	0.6
On the edge of a town or city (outside city limits)	12	3.6
In the open country	91	26.9
Other (includes lake cottages, beach lots, etc.)	3	0.9

a regulation, as if the answer is yes or no because this indicates that educational programs may be needed.

Table 4-22 presents the number and percentages of separate pieces of land subject to each regulation. Over 60 percent of the parcels of land are subject to some type of health and safety regulations. Almost 50 percent of the land is subject to building codes, pollution controls, or zoning regulations. Generally, respondents are aware of the regulations covering their land. Nevertheless, approximately one-fourth of the respondents do not know if their land is subject to subdivision

Table 4-20. Uses of land. Iowa Land Use Study, Region V, 1975

Use	First use		Second use		Third use	
	Absolute frequency	Percent of total	Absolute frequency	Percent of total	Absolute frequency	Percent of total
Own residence	211	68.3	2	3.0	--	--
Residential, but not own	26	8.4	4	6.0	1	25.0
Commercial or industrial	8	2.6	1	2.0	1	25.0
Farming	48	15.5	55	87.0	--	--
Vacant	11	3.6	--	--	--	--
Other	4	1.3	1	2.0	2	50.0
No response	1	0.3	--	--	--	--
Total	309	100.0	63	100.0	4	100.0

Table 4-21. Tenure of farm land. Iowa Land Use Study, Region V, 1975

Tenure	Absolute frequency	Percent of total
Farmed by owner	50	48.0
All land rented to tenant	47	45.0
Partially farmed by owner and partially rented out	3	3.0
Other	4	4.0
Total	104	100.0

regulations or conservation laws.

Ninety three percent of the landowners replied regulations on land had caused no problems which is reflected in responses to the question on the effect of regulations on attitude toward land use. Only 12 of the 102 nonlandowners had experience with public regulations on land use. Only 18 (all landowners) of the total 338 respondents, or 5 percent, reported that their attitude had become more opposed to land use in general as a result of their experience with regulations. Tables 4-23 to 4-25 present the number and percent of landowners who encountered problems with regulations and nonland-

Table 4-22. Public regulations on land. Iowa Land Use Study, Region V, 1975

Regulation	No		Yes	
	Absolute frequency	% of total plots of land	Absolute frequency	% of total plots of land
Zoning regulations	132	42.7	136	44.0
Subdivision regulations	184	59.5	47	15.2
Building codes	133	43.0	143	46.3
Health & safety regulations	87	28.2	190	61.5
Conservation laws	142	46.0	91	29.4
Pollution controls	118	38.2	150	48.5
Other	193	62.5	12	3.9

<u>Don't know</u>		<u>No response</u>		Row total
<u>Absolute frequency</u>	<u>% of total plots of land</u>	<u>Absolute frequency</u>	<u>% of total plots of land</u>	
38	12.3	3	1.0	309 100.0
75	24.3	3	1.0	309 100.0
30	9.7	3	1.0	309 100.0
29	9.4	3	1.0	309 100.0
70	22.7	6	1.9	309 100.0
37	12.0	4	1.3	309 100.0
21	6.8	83	26.9	309

Table 4-23. Public regulations on land caused problems.
Iowa Land Use Study, Region V, 1975

Regulations caused problems	Absolute frequency	Percent of total sample population	Percent of total landowners
No	217	64.2	92.3
Yes	18	5.3	7.7
Not applicable ^a	102	30.2	--
No response	1	0.3	--
Total	338	100.0	100.0

^aNonlandowners who were not questioned.

Table 4-24. Experience with land use regulations. Iowa Land Use Study, Region V, 1975

Had experience with regulations	Absolute frequency	Percent of total sample population	Percent of total non-landowners
No	84	24.9	87.5
Yes	12	3.6	12.5
Not applicable ^a	236	69.8	--
No response	6	1.8	--
Total	338	100.0	100.0

^aLandowners who were not questioned.

Table 4-25. Effect of attitude on land use in general as a result of experience with regulations. Iowa Land Use Study, Region V, 1975

Attitude	Absolute frequency	Percent of total sample population	Percent of respondents to question
More favorable	102	30.2	41.3
More opposed	18	5.3	7.3
No effect	127	37.6	51.4
Not applicable ^a	84	24.9	--
No response	7	2.1	--
Total	338	100.0	100.0

^aIncludes those nonlandowners who had no experience with regulations.

owners who had experience with regulations along with the effect on attitudes toward land use regulations in general.

Problems with public regulations on land may effect attitude toward land use. A chi-square test for independence (Table 4-26) results in an $\alpha = 0.05$ level of significance indicating the two items are not independent.

Replies to this section of the survey schedule should not be construed to mean this is the attitude of the respondents toward land use regulations. The question is phrased in terms of the effect on attitudes toward land use in general.

Table 4-26. Crosstabulation between problems caused by public regulations on land and the effect on attitude toward land use regulation in general. Iowa Land Use Study, Region V, 1975

	<u>Attitude</u>			Row total
	More favorable	More opposed	No effect	
Regulations caused no problems	118	15	153	286
Regulations caused problems	11	3	6	20
Column total	129	18	159	306
Raw chi-square with 2 degrees of freedom = 5.847				
Significance = 0.0537				

A final question in this section of the survey schedule involves the level of government with primary responsibility for developing and enforcing land use planning. Forty-two percent of the respondents select county government as their first choice. Three of the counties in Region V have county zoning regulations with which respondents may have already been familiar. There are nine "other" or no responses. Three of the "other" list federal government as their choice (federal government is not included in the choices presented to the respondents), while a few do not believe any level of

government should be involved. Table 4-27 lists the number of respondents who chose each level of government as first and second choice to be responsible for land use planning development and enforcement.

Again, this question does not involve an endorsement or acceptance of land use planning by the respondents. The question is phrased in terms of, "If a land use plan were required, which level of government would you prefer"

Chapter IV provides information on population characteristics of residents of Region V and of the sample population that was surveyed. This information serves as a background for understanding and explaining citizens' preferences in goals for land use planning which are articulated in the following chapter. In Chapter V results of the survey conducted in Region V are analyzed and presented.

Table 4-27. Level of government responsible for developing and enforcing land use plans. Iowa Land Use Study, Region V, 1975

Level of government	First choice		Second choice	
	Absolute frequency	Percent of total	Absolute frequency	Percent of total
Local municipal government	104	30.8	41	12.1
County government	142	42.0	123	36.4
Regional council of governments	33	9.8	90	28.1
State of Iowa	51	15.1	67	19.8
Nor response or "other"	8	2.4	12	3.6
Total	338	100.0	338	100.0

CHAPTER V. ARTICULATED LAND USE GOALS IN REGION V
RESULTING FROM APPLICATION OF MULTI-GOAL MODEL

Chapter V presents results of application of the multi-goal model to Region V. The first section analyzes the situation statements (means) by use of the certainty method and by crosstabulating individual responses to means and goals.

In section two of this chapter, responses to Section III (goals section) of the survey schedule are analyzed by the paired-comparison technique. Results of this analysis for the entire sample population as well as groups within the sample are presented and compared. A similar analysis of the approaches section of the schedule for the entire sample population is included.

Weighting of Situation Statements

An analysis of the situation statements (means) found in Section I of the survey schedule is presented in this section. In terms of the land use model developed in Chapter III, some of the statements encompass means which may be employed to achieve desired goals. Numerical values of all responses are averaged to obtain a group weighting for each statement resulting in a relative ranking of agreement by respondents with various means.

Relationships between selected means statements and goals and approaches are explored. Relationships can be either

positive or negative; i.e., a respondent who agrees strongly with one means statement can be expected to rank Goal A first if the relationship is positive or last if negative. Results of crosstabulations to determine if such relationships exist are found in the second part of this section.

Weights discussed in the following analysis are based on the certainty method in which respondents are shown statements and the following scale printed on a card:

Agree						
	1	2	3	4	5	
Disagree						

For purposes of analysis, responses are recorded to the following numerical scale:

Response	D5	D4	D3	D2	D1	A/D	A1	A2	A3	A4	A5
Numerical values	0	3	5	6	7	8	9	10	11	13	16

(D = Disagree, A = Agree, and A/D = Indifference or unable to make a choice)

The highest possible mean value is sixteen indicating strongest possible agreement by all respondents. A mean value of eight indicates neither agreement nor disagreement while anything less indicates disagreement with the statement.

Table 5-1 summarizes results of the certainty method analysis of the ten statements in Section I of the survey schedule. A brief phrase in the table indicates the subject matter of each statement, however, precise wording of each statement is included in the analysis that follows. Responses

Table 5-1. Summary of situation statement responses in land use goals survey. Iowa Land Use Study, Region V, 1975

Statement number	Statement reference	Mean	Standard deviation	Median
1	Environmental quality	9.878	4.331	10.718
2	Recreational areas	6.938	5.501	6.167
3	Conservation	11.071	3.970	11.138
4	Preserve suitable land in agriculture	9.145	5.945	10.188
5	Nonfarm rural residences	8.379	5.019	9.462
6	Roads and airports	11.777	4.401	12.746
7	Urban sprawl	10.284	4.388	10.833
8	Mining	8.036	5.219	9.000
9	Industrial development	10.759	4.552	11.076
10	Restrict industry to industrial parks	12.917	3.853	13.407

Mode	% agree	% agree 5	% agree 4	% disagree 4	% disagree 5	% disagree
11.000	70.7	15.7	12.4	3.6	7.1	22.9
0.0	38.5	13.9	8.0	11.2	24.0	55.3
16.000	78.1	22.8	18.9	3.0	3.3	16.6
16.000	55.4	29.6	10.7	6.2	18.0	41.0
11.000	57.4	12.4	12.1	8.6	14.2	39.1
16.000	80.8	36.7	17.5	3.0	4.4	13.9
11.000	72.2	19.8	14.2	3.6	6.2	22.0
0.0	51.9	12.7	10.4	7.4	18.0	41.5
16.000	74.6	25.7	16.6	4.1	6.2	19.2
16.000	88.1	48.2	17.5	1.2	2.7	8.7

range from zero to sixteen for each statement, indicating a wide diversity of opinion. Strong opinion at either extreme of the spectrum is indicated by a mode of zero for Statements 2 and 8 and sixteen for Statements 3, 4, 6, 9, and 10. On the average, respondents disagree with only one statement, 2, which has a mean of 6.938.

Statement 10 evokes greatest agreement, "New industries in your community should be restricted to areas set aside for industrial use only (for example, in industrial parks)." The mean is 12.917, very closely equivalent to an Agree 4 with 88 percent of the respondents agreeing with the statement.

Statement 6, "If a new road or airport is built in your county, it should be built on land least suited to agriculture," has the next highest mean, 11.777, with 81 percent of respondents agreeing with the statement.

Both of the above statements indicate agreement with strict limitations on uses of land, at least for the uses cited in the statements.

Conservation is important to citizens of Region V as evinced by the mean of 11.071 for Statement 3, "Soil resources should be conserved for the future even if this means fewer jobs or more expensive goods now." Nevertheless, Statement 9, "Taking all of these things into consideration, new industry should be encouraged to locate in your community," which could be interpreted as the opposite of Statement 3, has the next

highest mean of 10.759. Approximately 75 percent of the respondents agree with both statements. These responses point up one of the weaknesses of the certainty method. Respondents may agree with each of two statements that are at least partially mutually exclusive; respondents are not forced to make choices as may be the case in real world situations.

Another statement with a restrictive connotation found considerable agreement among residents of Region V. Statement 7, "A land use plan for your county should specify the type of residential construction allowed in each tract, possibly limiting the number of units," follows a scenario discussing urban sprawl and population density, neither of which appear to be serious problems in Region V. Over 70 percent of the respondents agree with the statement for a mean of 10.284.

Statement 1, "I would be willing to pay more for the goods I purchase if that was necessary to enhance the quality of the environment," emphasizes added costs that may be needed to achieve a cleaner environment. Realizing that it may be costly, over 70 percent of the respondents nevertheless agree with the statement for a mean of 9.878. Interviewers were instructed to record any voluntary comments of respondents and Statement 1 evoked considerable comment. One group of comments focuses on the additional amount respondents would be willing to pay. A second group of respondents question the necessity of increasing costs to clean up the environment; they feel

environmental quality can be enhanced without increasing prices.

One of the stated objectives of many Iowa resource projects and proposed laws is preservation of prime agricultural land for farming only. If this is to be accomplished, agricultural land cannot be sold for other purposes. Thus, Statement 4 presents this problem, "Farmers should not be allowed to sell or use the best agricultural land for any purpose other than farming." Only slightly over one-half of the respondents agree with the statement, but 30 percent of the responses are Agree 5. The mean of the statement is 9.145.

Respondents are nearly indifferent to Statement 5, "Non-farmers should be permitted to build residences on 2-3 acre plots in rural areas even though these potential problems exist," and Statement 8, "Taking all of these things into consideration, mining should be permitted on agricultural land." Scenarios preceding these statements list several positive and negative aspects of each situation.

Increasing park and recreational areas arouses slight disagreement, a mean of 6.938, among citizens of Region V. Statement 2 reads, "Public areas used for parks, recreation, and wildlife should be increased even if it means less land for residential or agricultural use."

In summary, residents of Region V agree quite strongly with restricting various activities involving land use to

specific locations. Statements which involve controlling land use receive a high weight (degree of agreement). In most statements, the necessity of control to achieve the desired end is clearly stated, not merely implied. Thus, respondents are informed about controls. Improvement of environmental quality and conservation of resources are strongly endorsed.

Statements which deal with specific uses of land, or means to achieve desired goals in terms of the model presented in Chapter III, serve to rank the means preferred by respondents. Industrial use, mean 10.759, is most preferred; however, strict controls on location accompany endorsement of industry. Agricultural use, second choice with mean 9.145, fits into the character of the region which contains some of the most highly productive farm land in the nation. Residential use is difficult to judge. Two statements capture different aspects of residential use. Fairly strong agreement, mean 10.284, is shown for restricting number and type of residential construction especially on the urban fringe. With a mean of 8.379, respondents display almost complete neutrality to building residences on plots of agricultural land in the open country. From responses to these two statements, the conclusion may be that citizens do not want agricultural land used for nonfarm residences. No specific statement on residential use within city limits is included in the survey since this is primarily a zoning question rather than a general land use question. Mining

mean 8.036, evokes neither strong agreement nor disagreement; the region contains some mineral resources but mining as a source of income is relatively unimportant. Respondents generally disagree, mean 6.938, with an increase in the land use for public parks, recreation areas, or wildlife preferring that land be used for agricultural or residential purposes.

Comparison of responses to means statements with ranking of goals

This section compares the relationship between each individual's weighting of selected statements as scored by the certainty method with the goal ranked first by each person. For example, the hypothesis is that an individual who ranks Goal A first will agree strongly with certain statements, disagree strongly with others, and perhaps have ambivalent feelings about a third group. Another type of relationship might exist between Goals B and C and selected statements. These relationships are explored by crosstabulating responses to selected statements with the ranking for each goal by each individual. Responses to means statements are analyzed and reported only for respondents who chose each goal first.

In Table 5-2, responses of persons who rank Goal A first are broken down into five categories for each of seven statements. Goal A is stated as increased environmental quality and conservation of resources. Statement 1 also deals with enhancement of environmental quality so the hypothesis is that

Table 5-2. Analysis of weighting of selected means statements by respondents ranking Goal A first. Iowa Land Use Study, Region V, 1975

Statement	Disagree 4 & 5		Disagree 3, 2, & 1		Agree/ disagree		Agree 1, 2, & 3		Agree 4 & 5	
	No.	%	No.	%	No.	%	No.	%	No.	%
1 (n=176)	14	7.9	19	10.8	13	7.4	77	43.8	53	30.1
3 (n=177)	10	5.6	22	12.4	4	2.3	60	33.9	81	45.8
5 (n=177)	43	24.2	31	17.5	5	2.8	54	30.5	44	24.8
7 (n=177)	19	10.7	22	12.4	10	5.6	68	38.4	58	32.7
8 (n=177)	48	27.1	24	13.6	17	9.6	52	29.4	36	20.3
9 (n=177)	21	11.9	16	9.0	12	6.8	56	31.6	72	40.7
10 (n=176)	8	4.5	5	2.8	5	2.8	38	21.5	120	67.8

individuals who rank Goal A first should agree strongly with Statement 1. Almost three-quarters of respondents in this group agree with Statement 1; 30 percent agree strongly. Statement 3 dealing with conservation also finds strong agreement within the group with 46 percent in the agree strongly category and 80 percent of respondents agreeing with the statement.

It is hypothesized that respondents who rank Goal A first will also agree with Statements 7 and 10 and disagree with Statements 5, 8, and 9. As shown by Table 5-2, Statements 7 and 10 receive substantial agreement with 71 and 89 percent of respondents agreeing with each statement respectively. Statements 5 and 8 show no clear delineation, however, many respondents agree strongly with Statement 9 which contradicts the hypothesis.

Goal B is stated as increased economic development of the region. The hypothesis formulated is that Statements 2, 3, and 4 are phrased to detract from economic development and, therefore, respondents who rank Goal B first will not agree with these statements. Since agreement with Statements 6, 7, 8, and 9 indicates approval of economic development, respondents who rank Goal B first should agree with these statements. Table 5-3 presents agreement with means statements by respondents who rank Goal B first. Less than one-half, 33.8 percent, of the respondents in this group agree with Statement 2. Only

Table 5-3. Analysis of weighting of selected means statements by respondents ranking Goal B first. Iowa Land Use Study, Region V, 1975

Statement	Disagree 4 & 5		Disagree 3, 2, & 1		Agree/ disagree		Agree 1, 2, & 3		Agree 4 & 5	
	No.	%	No.	%	No.	%	No.	%	No.	%
2 (n=89)	38	42.7	17	19.1	3	3.4	12	13.5	19	21.3
3 (n=89)	7	7.9	10	11.2	9	10.1	33	37.0	30	33.7
4 (n=89)	23	25.8	15	16.8	4	4.5	12	13.5	35	39.3
6 (n=89)	6	6.8	6	6.8	5	5.7	25	28.4	46	52.3
7 (n=89)	10	11.2	9	10.1	6	6.7	35	39.3	29	33.0
8 (n=89)	17	19.1	16	18.0	4	4.5	29	32.6	23	25.8
9 (n=87)	6	6.8	6	6.8	2	2.3	26	29.9	47	54.0

slightly over 50 percent of the group agree with Statement 4. For the remainder of the statements, agreement ranges from 61 to 82 percent.

Because it was felt that respondents who rank Goal C first will agree with Statements 2, 5, and 10, these variables are crosstabulated and results summarized in Table 5-4. A majority of respondents disagree with Statement 2, 63 percent agree with Statement 3 while 90 percent agree with Statement 10.

Three statements are crosstabulated with Approaches C and D (Section III of the survey schedule). Approach C is stated as the use of government expenditures and taxation power to implement land use so crosstabulations are made to learn if respondents who choose Approach C as their first means of implementing land use are interested in increasing publicly owned land areas (using government expenditures) as indicated in Statement 2. However, of those who rank Approach C first, 63 percent disagree with Statement 2 while only 37 percent agree.

Approach D involves using legal force to implement land use plans. Statements 4 and 7 involve restricting individual use of land. The hypothesis formulated is that persons who prefer legal use to enforce land use plans will agree with restrictions on individual use of land. Sixty-three percent of the respondents in the group do agree with Statement 4 while 91 percent agree with Statement 7 which tends to support

Table 5-4. Analysis of weighting of selected means statements by respondents ranking Goal C first. Iowa Land Use Study, Region V, 1975

Statement	Disagree 4 & 5		Disagree 3, 2, & 1		Agree/ disagree		Agree 1, 2, & 3		Agree 4 & 5	
	No.	%	No.	%	No.	%	No.	%	No.	%
2 (n=49)	15	30.6	14	28.6	3	6.1	7	14.3	10	20.4
5 (n=49)	5	10.2	9	18.3	4	8.2	18	36.7	13	26.5
10 (n=49)	1	2.0	1	2.0	3	6.1	7	14.2	37	75.5

the hypothesis. Table 5-5 presents the results of the cross-tabulation of approaches and statements.

As noted previously, the certainty method does not force the respondent to rank his choices. Therefore, a respondent forced by methodology to rank the goals can make a less precise determination in the means statements which may explain part of the discrepancy between ranking of goals and agreement or disagreement with various statements.

Analysis of Goals of Land Use Planning

This segment of Chapter V presents the analysis of Section II of the survey schedule constructed to determine ranking of goals by citizens of Region V.

Several methods of obtaining an aggregated ranking of goals were considered for this project. A simple ordinal ranking of goals by respondents was considered feasible since the number of choices is small, but this method provides but an ordinal ranking which assumes equal intervals between goals. The certainty method was considered since it provides a weighting for the goals. However, if each goal is weighted by itself and not in relation to other goals, each goal is likely to elicit a high ranking since all goals are desirable. In real-life situations, attainment of all goals is seldom possible so choices must be made between goals. The method of paired-comparison was chosen because it not only provides an interval

Table 5-5. Analysis of weighting of selected means statements by respondents ranking Approaches C and D first. Iowa Land Use Study, Region V, 1975

Statement	Disagree 4 & 5		Disagree 3, 2, & 1		Agree/ disagree		Agree 1, 2, & 3		Agree 4 & 5	
	No.	%	No.	%	No.	%	No.	%	No.	%
<u>Approach C</u>										
2 (n=35)	12	34.3	10	28.6	0	0	3	8.6	10	28.6
<u>Approach D</u>										
4 (n=32)	5	15.6	5	15.6	2	6.3	6	18.8	14	43.8
7 (n=32)	2	6.3	1	3.1	0	0	11	34.4	18	56.3

scaling of the goals, but concurrently forces respondents to choose between goals.

A two-step procedure is employed for the analysis. First, choices of each respondent are computed individually to check for ordinal ranking of goals by each respondent and for consistency of choice. Second, aggregated responses of all respondents and of groups of respondents are analyzed by means of the paired-comparison technique.

Ordinal ranking of goals

To compute individual ordinal ranking of the three goals, the first step of the paired-comparison technique is carried out for each respondent. That is, a matrix is constructed to record individual choices and the number of times a respondent chooses one goal over another is recorded in the matrix. Three choices are possible so the goal chosen over each of the other two goals is ranked first for that individual; a goal chosen over one other goal is ranked second; a goal not chosen over another is ranked last. If a respondent chooses each goal over another once, the set of choices is recorded as no clear-cut decision.

Table 5-6 summarizes the results of the above analysis. A majority of the respondents, 52.4 percent, rank Goal A first. An even higher percentage, 54.4 rank Goal C last. No majority emerges for second choice, but 43.2 percent of the respondents choose Goal B second. Twenty-three respondents have no clear

Table 5-6. Ranking of goals by individual respondents in land use goals survey.
Iowa Land Use Study, Region V, 1975

Goal	Goal A		Goal B		Goal C	
	Increased environmental quality and conservation of resources		Increased economic development of region		Increased social well-being of the region	
Rank	No.	%	No.	%	No.	%
First choice	117	52.4	89	26.3	49	14.5
Second choice	86	25.4	146	43.2	82	24.3
Third choice	53	15.7	79	23.4	184	54.4
No clear choice	22	6.5	24	7.1	23	6.8
Total	338	100.0	338	100.0	338	100.0

ranking of goals.

With only three goals, a majority for first and third effectively ranks all three, so on this basis the ranking of goals by citizens of Region V in order from most to least preferred is Goal A, Goal B and Goal C.

Individual consistency of choice

Assumptions of the model may be violated if respondents are inconsistent in choosing between pairs of goals. Several possible reasons for inconsistencies are enumerated in Section 5 of Chapter III. An inconsistency occurs when an individual judging three goals prefers A over B, B over C, and C over A resulting in what is termed a circular triad. To be consistent the respondent should choose A over C.

Using the matrix developed in the previous section, responses of each individual are tested for consistency of judgment. The number of circular triads committed by each respondent is determined using Kendall's (39, p. 148) formula for the "d" statistic. With only three choices, the maximum number of circular triads (referred to as "d") for each respondent is one. For such a small number of items, it is not possible to test for consistency of individual choice at an acceptable level of significance. Nevertheless, it is possible to look at the number of respondents who commit zero or one circular triad. This data is presented in Table 5-7.

Table 5-7. Number of circular triads committed by respondents in selecting goals

No. of circular triads	Respondents	
	No.	%
0	309	91.4
1	29	8.6
Total	338	100.0

Only 29 or 8.6 percent of the respondents commit one circular triad. This figure would be reduced if the number of persons who could not or would not make a choice are eliminated from the study. When a respondent does not choose between two goals, 0.5 is assigned to each of the choices in the pair rather than a one or zero as would be the case if a choice is made. Nonchoices result in a circular triad for that individual and a higher number of circular triads for the study.

The small number of items from which to choose, may have contributed the small number of inconsistencies. With but three choices, respondents may be able to sort out, remember only three goals, and make a conscious effort at consistency. This may not be possible when confronted with a larger number of goals and the resulting larger number of choices.

Ninety-one percent of the respondents were completely consistent in their judgments. One interpretation may be that respondents did not make random choices and, therefore, one of the assumptions of the paired-comparison model is upheld.

Interval scaling of goals by paired-comparison technique

The objective of this study is articulation of citizens' preferences in goals for land use planning in Region V. Interval scaling by use of the paired-comparison analysis results in an ordered social choice of goals which fulfills the above objective.

The responses of all individuals (n=338) are analyzed to arrive at a common scale for the region. As shown in Table 5-8, respondents rank Goal A first, Goal B second, and Goal C third which is the order arrived at by use of the ordinal method developed earlier in this chapter. Now the assumption of an equal interval between A and B as well as between B and C no longer holds. As shown in the table, on an interval scale of zero to one, Goal A is weighted 1.0, Goal B equals .561, and Goal C equals 0.0. After developing the common scale values, the next step is to test the null hypothesis that the paired-comparison model is valid. A theoretical fitted model is constructed and tested with a chi-square goodness-of-fit statistic. The tabular χ^2 value with one degree of freedom at the $\alpha = .05$ level of significance is 3.841. The computed χ^2 value for the aggregate model is 1.04 so the null hypothesis is

Table 5-8. Common scalar values and rank order of goals for all respondents and for selected subgroups of population in land use goals survey. Iowa Land Use Study, Region V, 1975

Group characteristic	Subgroup characteristic	No. of respondents	Goal A	Goal B	Goal C	Computed χ^2 value ^a	Probability of a larger χ^2 value
All respondents	-----	338	1.000 (1)	.561 (2)	0 (3)	1.04	.30
Age	18-29	76	1.000 (1)	.402 (2)	0 (3)	.305	.60
	30-39	66	1.000 (1)	.304 (2)	0 (3)	.094	.77
	40-49	49	1.000 (1)	.771 (2)	0 (3)	2.51	.12
	50-59	48	1.000 (1)	.658 (2)	0 (3)	.085	.78
	60-69	49	1.000 (1)	.950 (2)	0 (3)	.0002	.99
	> 70	47	1.000 (1)	.622 (2)	0 (3)	.119	.74
Education	3-8 grades	50	.930 (2)	1.000 (1)	0 (3)	.267	.63
	9-11 grades	40	1.000 (1)	.500 (2)	0 (3)	.952	.34
	completed high school	142	1.000 (1)	.638 (2)	0 (3)	1.498	.23
	1-3 yrs. of college	70	1.000 (1)	.307 (2)	0 (3)	.135	.72
	completed college	20	1.000 (1)	.500 (2)	0 (3)	.163	.69
	> 4 yrs. college	9	1.000 (1)	0 (3)	.970 (2)	2.38	.13

Years lived in community	< 1	20	1.000 (1)	.222 (2)	0 (3)	.013	.91
	2-5	37	1.000 (1)	.351 (2)	0 (3)	.004	.95
	6-10	37	1.000 (1)	.740 (2)	0 (3)	.202	.67
	11-20	50	1.000 (1)	.519 (2)	0 (3)	.015	.90
	> 20	192	1.000 (1)	.638 (2)	0 (3)	.830	.38
Sex	male	175	1.000 (1)	.414 (2)	0 (3)	.033	.87
	female	163	1.000 (1)	.743 (2)	0 (3)	1.916	.17
Location of residence	rural	108	1.000 (1)	.557 (2)	0 (3)	.099	.76
	towns < 2,500	98	1.000 (1)	.673 (2)	0 (3)	.499	.49
	towns 2,500-10,000	47	1.000 (1)	.339 (2)	0 (3)	.694	.43
	cities > 10,000	85	1.000 (1)	.565 (2)	0 (3)	2.17	.15
Income	< \$3,000	22	.912 (2)	1.000 (1)	0 (3)	.776	.40
	\$3,000-5,999	36	1.000 (1)	.632 (2)	0 (3)	.221	.65

^aThe critical value of $\alpha = .05$ was selected for this study. The χ^2 value at $\alpha = .05$ for one degree of freedom is 3.841, for $\alpha = .01$ is 6.635. The null hypothesis that the assumptions of the model are valid is rejected if computed χ^2 is greater than 3.841.

Table 5-8 (Continued)

Group characteristic	Subgroup characteristic	No. of respondents	Goal A	Goal B	Goal C	Computed χ^2 value	Probability of a larger χ^2 value
Income (Cont.)	\$6,000-8,999	37	1.000 (1)	.698 (2)	0 (3)	.400	.54
	\$9,000-11,999	49	1.000 (1)	.532 (2)	0 (3)	.079	.77
	\$12,000-14,999	67	1.000 (1)	.379 (2)	0 (3)	.556	.47
	\$15,000-24,999	81	1.000 (1)	.700 (2)	0 (3)	.0006	.98
	\$25,000 or over	37	1.000 (1)	.248 (2)	0 (3)	.063	.80
Occupation	professional	35	1.000 (1)	0 (3)	.019 (2)	2.54	.115
	farmer	62	1.000 (1)	.668 (2)	0 (3)	.366	.56
	manager	17	1.000 (1)	.628 (2)	0 (3)	.155	.69
	clerical	26	1.000 (1)	.707 (2)	0 (3)	1.076	.30
	sales	9	1.000 (1)	.500 (2)	0 (3)	.195	.67
	craftsmen	28	1.000 (1)	.413 (2)	0 (3)	.464	.51
	operative	22	1.000 (1)	.238 (2)	0 (3)	1.002	.32
	service	24	1.000 (1)	.329 (2)	0 (3)	.969	.34

	laborer	17	1.000 (1)	.673 (2)	0 (3)	3.886	.0491
	housewife	97	1.000 (1)	.818 (2)	0 (3)	1.095	.29
Land within city limits	owners	170	1.000 (1)	.656 (2)	0 (3)	.353	.57
	nonowners	168	1.000 (1)	.477 (2)	0 (3)	.822	.38
Land in unin- corporated places	owners ^b	2					
	nonowners	336	1.000 (1)	.559 (2)	0 (3)	.944	.34
Land on edge of city	owners	12	1.000 (1)	.304 (2)	0 (3)	.00067	.98
	nonowners	326	1.000 (1)	.578 (2)	0 (3)	.997	.33
Land in open country	owners	91	1.000 (1)	.587 (2)	0 (3)	.090	.77
	nonowners	247	1.000 (1)	.551 (2)	0 (3)	1.053	.30

^bThere were too few observations in these subgroups to provide usable data for analysis.

Table 5-8 (Continued)

Group characteristic	Subgroup characteristic	No. of respondents	Goal A	Goal B	Goal C	Computed χ^2 value	Probability of a larger χ^2 value
Land in other places	owners ^b	3					
	nonowners	335	1.000 (1)	.558 (2)	0 (3)	.899	.36
Landowner	yes	236	1.000 (1)	.651 (2)	0 (3)	.641	.44
	no	102	1.000 (1)	.365 (2)	0 (3)	.412	.53

not rejected; i.e., the paired-comparison model is assumed valid. The computed χ^2 and the probability of larger χ^2 may be found in Table 5-8. An explanation of the paired-comparison technique illustrating the method for developing the weights follows. The aggregated responses from the sample population are used for this illustration.

Three possible goals of land use planning are isolated and paired with each other for a total of $\frac{n(n-1)}{2} = 3$ pairs of goal statements. Each respondent is asked to select the one goal statement from each pair which he prefers over the other. In cases where respondents refuse or are incapable of making choices between the goals, 0.5 is assigned to each goal in the pair.

A frequency matrix is developed showing the number of times one goal is chosen over another. Goals are listed in order, A, B, and C, on the lefthand side of the matrix and across the top. The matrix can be interpreted to show the number of respondents who prefer the goal listed across the columns to the goal listed in the rows. The diagonals indicate how often a goal is preferred to itself so consist of zeroes. Table 5-9 illustrates the results of the survey conducted in Region V. For example, by reading down Column 1, it can be observed that 213.5 of the respondents prefer Goal A over Goal B while 248.5 prefer Goal A over Goal C. Column 2 lists the number of respondents who prefer Goal B over Goals A and C

while Column 3 lists the number of respondents who prefer Goal C to Goals A and B. The row totals indicate the number of respondents who prefer the other two goals over the goal listed in the row. The column totals indicate the number of times respondents prefer the goal listed in the column heading over both of the other goals. The simple ordinal rank of the goals is shown in the last line of Table 5-9.

Table 5-9. Frequency matrix

Goal	(1) A	(2) B	(3) C	Total
A		124.5	89.5	214
B	213.5		114	327.5
C	248.5	224		472.5
Total	462	348.5	203.5	1014
Rank order	1	2	3	

The next step is rearrangement of the matrix with the least preferred goal in Column 1 and the most preferred in Column 3. The rows must also be rearranged following the same procedure. Table 5-10 illustrates the second step.

Table 5-10. Rearranged frequency matrix

Goal	C	B	A
C		224	248.5
B	114		213.5
A	89.5	124.5	
Total	203.5	348.5	462
Rank order	3	2	1

Table 5-10 is converted to a proportion matrix by dividing the entry in each cell (the number of times each goal is chosen over another or f_{ij}) by the number of times the goal could have been chosen (the total number of respondents). In this illustration each entry is divided by 338 to arrive at the matrix shown in Table 5-11. If N = the number of respondents, the proportion, p_{ij} , may be found as $p_{ij} = \frac{f_{ij}}{N}$ with p_{ij} as the proportion of times i is chosen over j .

Table 5-11. Observed proportion matrix

Goal	C	B	A
C		.663	.735
B	.337		.632
A	.265	.368	

The proportion matrix may be interpreted as follows. If a large number of respondents are asked to judge two goals (i.e., A and B) and .5 choose A over B and .5 choose B over A, then it may be hypothesized that both goals have the same modal discriminial process or scale value. However, if more than .5 choose A over B, then it might be said that A has a higher modal discriminial process than B. It might be well to note at this point that the proportion values are not independent. Once the proportion of those choosing A over B (p_{AB}) is determined, p_{BA} may be obtained by

$$1.00 - p_{AB} = p_{BA}$$

Thus, the corresponding values above and below the diagonal elements must sum to one.

The proportion matrix is transformed to a Z matrix by converting the p_{ij} values into z_{ij} values by use of a conversion table. In this project the "Table of Normal Deviates Z Corresponding to Proportions P of a Dichotomized Unit Normal Distribution" (21, p. 246) is used. z_{ij} is the value of the standardized normal random variable Z such that the $\Pr(Z < z_{ij}) = p_{ij}$. For example, if $p_{ij} = 0.5$, $z_{ij} = 0$, and if $p_{ij} < 0.5$, there is a negative z_{ij} value while for $p_{ij} > 0.5$, the z_{ij} value is positive. Table 5-12 illustrates the Z matrix corresponding to the data of this project and is the conversion of Table 5-11. Again, the z_{ij} values are not independent. The corresponding values above and below the diagonals are the same with opposite signs.

Table 5-12. Z matrix

Goal	C	B	A
1 C		.421	.628
2 B	-.421		.337
3 A	-.628	-.337	
4 Sums	-1.049	.084	.965
5 Means	-.351	.028	.322
6 Scalar values	0	.379	.673
7 Common scale	0	.561	1.000

Using the assumptions listed previously, Edwards (21, p. 28) derives the formula $z_{ij} = \bar{S}_i - \bar{S}_j$ where

\bar{S}_i = scale value of Stimulus i,

\bar{S}_j = scale value of Stimulus J and

z_{ij} = difference between the two scale values.

Thus, each cell entry in Table 5-12 is the separation between the scale values of two goals.

To obtain the scale value assigned to each goal, sum over the entries in each column and divide by the number of entries to obtain the mean. For example, the entries in Column 1 all represent differences between the scale value of Goal C and the

other two goals so that

$$z_{11} = \bar{S}_C - \bar{S}_C$$

$$z_{12} = \bar{S}_C - \bar{S}_B$$

$$z_{13} = \bar{S}_C - \bar{S}_A$$

When the entries in Column 1 are summed, \bar{S}_C is a constant and

$$\sum_{j=1}^3 z_{1j} = 3\bar{S}_C - \sum_{j=1}^3 \bar{S}_j$$

where $\sum_{j=1}^3 z_{1j}$ means Column 1 is held constant with summation over rows.

To obtain an average divide both sides of the formula by three since $3\bar{S}_C$ is three times the scale value of Goal C and

$\sum_{j=1}^3 \bar{S}_j$ is the sum of all scale values. In formula form, $z_{1.} =$

$\bar{S}_C - \bar{S}$ where

$\bar{z}_{1.}$ = arithmetic mean of the entries in Column 1
of the Z matrix

\bar{S}_C = scale value of Goal C

\bar{S} = arithmetic mean of the three scale values.

The mean of the z values in Column 1 of Table 5-12 is the scale value of Goal C in terms of its deviation from the mean of all scale values. Similar reasoning is followed for each column. The sum of the deviations in scale values must equal zero.

Goals with negative scale values are considered less favorable and those with positive scale values more favorable.

Since the choice of origin on the continuum is arbitrary, a constant may be added to each scale value so all values are positive and thus easier to use if manipulations are required. The distance between the values will remain the same. A convenient number to add is the absolute value of the largest negative average scale value which, from Table 5-12, is .351. By adding .351 to each mean value, scale values for each goal are developed as shown on line 6, Table 5-12.

One further refinement of the scalar values will permit comparison between various groups or strata. The scalar values may be normalized by dividing each of the scalar values by the largest value thereby adjusting the scale to a zero-one basis. The normalized values are on the last line of Table 5-12 and are the values assigned and used in the goal model.

Internal consistency check

After obtaining the scalar values, an internal consistency check is developed by reversing the procedure. A fitted theoretical proportion model is then compared with the observed

proportion model to check for agreement between the models. The null hypothesis to be tested is that the model is valid. The alternative hypothesis is that the model is not valid. A chi-square statistic has been developed to test this hypothesis.

The procedure utilized in this study closely follows that of Harman et al., (28, pp. 11-14). The first step is construction of a theoretical z matrix by developing the theoretical scale separations in the form of z values which is accomplished by setting up a matrix bounded on the top and left by the scalar values, line 6, Table 5-12. Each entry on the left is subtracted from each entry on the top in order and entered in the cells below the diagonal in the matrix. Table 5-13 illustrates this step.

Table 5-13. Theoretical z matrix (z'_{ij})

Goal		C	B	A
	Scale value	.00	.379	.673
C	.00	.00		
B	.379	-.379	.00	
A	.673	-.673	-.294	

For example, the entry in z'_{12} is obtained by subtracting .379 from .00 while for z'_{22} , .379 is subtracted from .379.

The theoretical z values of Table 5-13 (z'_{ij}) are converted to theoretical proportions (p'_{ij}) by again referring to the "Table of Normal Deviates Z Corresponding to Proportions P of a Dichotomized Unit Normal Distribution" (36, p. 246) and locating the proportions corresponding to each z'_{ij} . Theoretical proportion values for the data of this study are shown in Table 5-14.

Table 5-14. Theoretical proportion matrix (p'_{ij})

Goal	C	B	A
C			
B	.353		
A	.251	.384	

The distribution of probabilities for the population of possible observed proportions for each cell is unknown so an approximation using the inverse size transformation developed by R. A. Fisher is outlined by Harman et al., (28, pp. 11-14) based on the concept that a distribution for proportions may be approximated using the arcsin of p . Following their thoughts, "If a proportion p is observed from a binomial sample of size R from a population with a true proportion of success p^* , then $\theta = \arcsin \sqrt{p}$ is approximately normally distributed with mean $\theta^* = \arcsin \sqrt{p^*}$ and variance $\frac{821}{R}$ where θ and θ^* are measured in

degrees."

For this model, define

$$\theta_{ij} = \arcsin \sqrt{p_{ij}}$$

and

$$\theta'_{ij} = \arcsin \sqrt{p'_{ij}}$$

with p_{ij} the observed proportions in Table 5-11 and p'_{ij} , the theoretical proportions from Table 5-14. Under the null hypothesis that the paired-comparison model is valid, the true proportion of success for each cell in the fitted model is p'_{ij} .

The statistic

$$\chi^2 = R \sum_{i=2}^n \sum_{j=1}^{i-1} \frac{(\theta_{ij} - \theta'_{ij})^2}{821}$$

which has approximately a chi-square distribution with $\frac{(n-1)(n-2)}{2}$ degrees of freedom is used to test the null hypothesis. If the calculated χ^2 exceeds the tabular chi-square associated with the appropriate degrees of freedom, the null hypothesis is rejected.

From the above, it follows that the proportion matrices must be changed to θ matrices. This step is accomplished by first changing the entry in each cell below the diagonal in the proportion matrices to a percentage by multiplying by 100. This percentage is then converted to angles by use of an appropriate table. For this study a "Table of the Angular Transformation of Percentages to Degrees" (21, p. 248) is used.

For example cell 12 of Table 5-11 lists a proportion of .337 which is 33.7 percent which converts to 35.49 degrees by use of the aforementioned table. The same procedure is followed for all cell entries below the diagonal in both the observed and theoretical proportion matrices, Tables 5-11 and 5-14. These transformations are shown in Table 5-15 for the observed proportions and Table 5-16 for theoretical proportions.

Table 5-15. θ transformations based on p_{ij}

Goal	C	B	A
C			
B	35.49		
A	30.92	37.35	

Table 5-16. θ' transformations based on p'_{ij}

Goal	C	B	A
C			
B	36.45		
A	30.07	38.29	

A table is then constructed to show the deviations $\theta - \theta'$, by subtracting the entry in each cell of Table 5-16 from the entry in the corresponding cell in Table 5-15. For example, $\theta_{12} = 35.49$, $\theta'_{12} = 36.45$, and the difference is $-.96$. The differences for each pair of cells are recorded in Table 5-17.

Table 5-17. $\theta - \theta'$ deviations

Goal	C	B	A
C			
B	-.96		
A	.85	-.94	

Each deviation is squared and the sum of the squares inserted in the test statistic. In our study, R equals 338. The χ^2 value is calculated and compared to the tabular χ^2 for one degree of freedom which is 3.841 with $\alpha = .05$ level of significance.

Since the calculated χ^2 value of 1.04 is less than the tabular value, the null hypothesis that the paired comparison model is valid is not rejected.

Differences within groups

To test the hypothesis that personal characteristics of respondents affect responses, the sample population is divided into groups by age, level of education, sex, income, occupation,

location of residence, and years lived in the community. Respondents are also grouped by landowners and nonlandowners as well as by the location of land owned. The survey provides information on each of these groups.

Each group is divided into subgroups and a common scale developed for each subgroup. A test of the null hypothesis that the paired-comparison model is valid is made for each subgroup. A summary of the common scale values, a ranking for each goal, the computed χ^2 value, and the probability of a larger χ^2 value for each subgroup is shown in Table 5-8. The null hypothesis is rejected for only one subgroup, occupation of laborer.

With but four exceptions, ranking of goals by each subgroup follows that of all respondents with first choice as Goal A, second choice Goal B, and third choice Goal C. Two subgroups, respondents who completed eight or less years of education and respondents with incomes of less than \$3,000, ranked Goal B first and Goal A second. Two subgroups, respondents who completed more than four years of college and those with professional occupations, ranked Goal C second with Goal B third. In these four subgroups, two goals are very close on the interval scale; Goal B (first choice) weighted 1.0 and Goal A (second choice) weighted .930 in the first subgroup; Goal B (first choice) weighted 1.0 and Goal A (second choice) weighted .912 in the subgroup with less than \$3,000 income; Goal A

(first choice) weighted 1.0 and Goal C (second choice) weighted .970 in the subgroup with more than four years of college; and Goal C (second choice) weighted .019 with Goal B (third choice) weighted 0 in the professional subgroup.

The four subgroups which did not follow the usual ranking order likely encompass two groups at either end of a spectrum. Two subgroups, respondents with eight years or less of education and those with incomes of less than \$3,000 may be comprised of essentially the same individuals. With incomes of less than \$3,000, economic development logically would be of greatest importance to this group. The other two subgroups, more than four years of college and professional occupations, probably contain the same individuals in each subgroup and thus ranking of goals by each subgroup would be similar.

Utilizing this technique with only three choices mandates that the first choice is weighted 1.0 and third choice 0.0 in every subgroup; however, the common scale value for the second choice can and did vary greatly from .019, indicating a wide interval between the first and second choices, to .970, indicating a very narrow interval between first and second choices.

To test the hypothesis that differences exist in rankings between subgroups, groups are tested utilizing a procedure presented in Harman et al., (28, p. 21). The null hypothesis formulated is that response probabilities for each pair of

choices are equal for all subgroups; i.e., there is no difference in the ranking of goals among various subgroups. The test statistic is of the form:

$$\chi_{ijm}^2 = \sum_{\substack{i,j=1 \\ i>j}}^n \sum_{k=1}^m \frac{N_{ijk} (p_{ijk} - p_{ij.})^2}{p_{ij.} (1 - p_{ij.})}$$

with $\left[\binom{n}{2} - 1 \right]$ (m-1) degrees of freedom, where

N_{ijk} = total number of respondents in the k^{th} group preferring the i^{th} to the j^{th} choice

p_{ijk} = the observed proportion of the respondents in the k^{th} group preferring the i^{th} to the j^{th} choice

$p_{ij.}$ = N_{ijk}/N ; i.e., total number of respondents preferring i to j divided by the total number of respondents.

Table 5-18 presents results of the test for differences between rankings by groups. Groups are judged to be significantly different in their ranking of goals when the probability of a larger χ^2 is less than or equal to 0.05. Age, education, years lived in the community, land owned on edge of city, landowner, sex, location of residence, income, and occupation are characteristics which show highly significant differences in ranking.

Table 5-18. Probabilities of significantly different hierarchies of goals between subgroups in land use goals survey. Iowa Land Use Study, Region V, 1975

Group characteristic	Number of subgroups	Calculated χ^2 value	Degrees of freedom	Probability of a larger χ^2 value
Age	6	158.78	10	<<.01
Education	6	636.06	10	<<.01
Years lived in community	5	101.58	8	<<.01
Land owned within city limits	2	3.62	2	.17
Land owned on edge of city	2	116.406	2	<<.01
Land owned in open country	2	2.75	2	.26
Landowner	2	8.81	2	.012
Sex	2	11.84	2	.01
Location of residence	4	53.69	6	<<.01
Income	7	158.49	12	<<.01
Occupation	10	325.63	18	<<.01

One caution should be noted. Groups were not stratified and then sampled randomly; rather samples were post-stratified; therefore some bias may have entered the sample. Nevertheless, most subgroups number at least twenty persons so changes that may occur if different sampling procedures are followed should not significantly alter the conclusions.

Analysis of Approaches to Land Use Planning

This segment of Chapter V presents the analysis of Section III of the survey schedule which was constructed to learn approaches to land use planning and implementation preferred by citizens of Region V.

The procedure in constructing Section III of the survey schedule and analyzing responses is identical to that used in the goals section of the survey schedule and has been explained in the previous section of this chapter and in Chapter III. Only results of the approaches analysis are presented here.

Ordinal ranking of approaches

The ordinal ranking of approaches by individuals as shown in Table 5-19 is discussed in this section. As shown in the table, a majority of respondents, 53.3 percent, select Approach B, developing a plan and encouraging people to follow the plan through education and information, as their first choice. A majority does not emerge for any other choice; 33 percent of the respondents choose Approach C, developing a plan and

Table 5-19. Ordinal ranking approaches by individual respondents in land use goals survey. Iowa Land Use Study, Region V, 1975

Approach	<u>Approach A</u>		<u>Approach B</u>		<u>Approach C</u>		<u>Approach D</u>	
	No restriction on use of land		Education and information		Taxation and government expenditures		Legal means	
Rank	No.	%	No.	%	No.	%	No.	%
First choice	73	21.6	180	53.3	35	10.4	32	9.5
Second choice	59	17.5	91	26.9	112	33.1	40	11.8
Third choice	72	21.3	32	9.5	118	34.9	61	18.0
Fourth choice	99	29.3	9	2.7	31	9.2	163	48.2
No clear choice	35	10.4	26	7.7	42	12.4	42	12.4
Total	338	100.0	338	100.0	338	100.0	338	100.0

encouraging people to follow it through taxation and government expenditures, second. Approach C also receives the largest percentage, 35, for third choice. While not a majority, a substantial number, 48 percent, select Approach D, developing a plan and forcing people to follow it through legal means, as their last choice. A considerable number of individuals do not make selections between some pairs of approaches resulting in approximately 10 percent of the respondents showing no clear choice in the rankings. If the no-choices are eliminated, 55 percent of the remaining respondents choose Approach D last, but still no majority emerges for second and third places.

Individual consistency of choice

Responses of each individual were tested for consistency of judgment. Table 5-20 shows the number and percentage of respondents committing zero, one, or two circular triads. With $n = 4$ (four items from which to choose), the maximum possible number of circular triads is two.

Table 5-20. Number of circular triads committed by respondents in selecting approaches

Number of circular triads	Respondents	
	Number	Percent
0	272	80.5
1	59	17.5
2	7	2.1
Total	338	100.0

Only 7, or 2.1 percent, of the respondents commit the maximum of two circular triads and 59, or 17.5 percent, commit one circular triad. Respondents not making choices between some pairs of goals are included; these nonchoices result in a circular triad for that individual. The number of circular triads would be much smaller if only persons making a choice between each pair of approaches are included.

As with the goal analysis, the number of items is too small to test with an acceptable level of significance using Kendall's "d" statistic table. Nevertheless, from Kendall's table (39, p. 190), the probability of a respondent committing zero circular triads if choices are purely random is 0.375; yet 80 percent of the respondents committed zero circular triads which would tend to suggest that respondents are fairly consistent in their choices.

Interval scaling of approaches

The paired-comparison analysis of approaches results in ranking Approach B first and Approach D last which is similar to that resulting from the ordinal method of ranking developed earlier in this section, however, now a ranking for second and third choices emerges. Approaches C and A are very close on the interval scale, but Approach C ranks second by this method. Table 5-21 presents the common scale values for each approach on a zero to one scale.

Table 5-21. Common scale values for approaches

Approach	Common scale value
B	1.000
C	.398
A	.330
D	.000

A test of the null hypothesis that the paired-comparison model is valid results in a computed χ^2 value of 33.59. The tabular χ^2 value at $\alpha = .05$ level of significance with three degrees of freedom is 7.815, thus the null hypothesis is rejected. Assumptions which may be violated resulting in an invalid model are discussed in section five of Chapter III. In addition, respondents refuse to select a choice from a pair of approaches sixty-seven times which may indicate that respondents feel approaches are not located on a single uni-dimensional continuum.

The preference of respondents among approaches is interesting. All approaches are now being utilized, thus respondents should be familiar with at least some of them. Approach B, encouraging individuals to follow a plan through education and information, is a likely candidate for first choice. Approach B is relatively neutral satisfying those who

believe planning is essential and, at the same time, not requiring any coercion on the part of decision makers. Approach C falls considerably below Approach B on the interval scale. Rather close to Approach C on the scale is Approach A which calls for no restriction on an individual's use of land. This approach coincides with the concept of land as private property given as one of the objections to land use planning in general. Approach D, forcing people to follow a plan through legal means, is fourth choice and the approach with which people should be most familiar. Many legal means such as zoning and pollution control laws are now widely utilized to restrict land use. The word force may have biased some respondents who are opposed to the concept of force rather than the legal means which may be employed.

Analysis of the information obtained from the personal survey conducted in Region V is presented in this chapter. Citizens' preferences in means are developed by use of the certainty method and compared with individual's responses to questions on goals and approaches. Preferences in goals and approaches are analyzed and presented in both an ordinal ranking and on an interval scale by use of the paired-comparison model.

CHAPTER VI. SUMMARY, RECOMMENDATIONS,
AND CONCLUSIONS

A multi-goal model developed for land use planning is applied in Region V of North Central Iowa. The study is assessed in this chapter in terms of results, recommendations, and qualifications of results viewed in light of the study objectives.

Summary

The problem of identifying citizens' goals for land use planning in Region V is approached by direct query of the residents of the region. A model is developed which utilizes goals as the ultimate ends of land use planning and uses of land as means to achieve the goals. A personal survey of a random sample of residents of Region V is developed and conducted to identify the goals and means preferred by citizens of the region. The survey provides a ranking and weighting of goals and means. Results of this survey and analysis are presented as answers to one study objective as stated in the initial chapter of this report.

Need for land use planning

In this study land is viewed in the spatial context as a territory marked out on the earth's surface with subsurface and supersurface dimensions included. Space identifies parcels of

land and locates resources of land which have the capacity of satisfying man's wants. Both concepts are essential in land use planning because these characteristics of land provide the basis for conflicts among uses and users of land. As population grows, individuals vie for the limited space and resources available. The market place along with the limited exercise of the public rights of taxation, public domain, and police power retained by government have served to allocate land and alleviate conflicts throughout most of this nation's history. However, increasing conflicts between public and private interests and among various users of land are becoming evident, and land use planning has been suggested as a complement to the market place for protecting society's interests and in alleviating conflicts and confusions arising from shifts in land use.

Hearings and discussions on land use bills introduced at both the national and state level suggest reasons for the increasing conflicts among uses and users of land and the need for land use planning. Some of the reasons noted are recent crises in environmental issues and energy use, rapid and continued growth of the nation's population, expanding urban development, proliferating transportation systems, and large-scale industrial and economic growth. Environmental management decisions and energy issues are inextricably interwoven with land use decisions. A land use policy is needed to identify

trade-offs and compare alternative proposals and demands these proposals make upon land (72, p. 1).

While the need has been recognized, land use planning has not received universal approval, perhaps, because of the problems associated with its introduction. Two problems are discussed in this study: the lack of citizen participation and lack of explicitly stated goals in land use proposals and legislation. Land use decisions affect most people in some form. Active citizen participation in selecting goals and formulating plans may encourage support for policies and for implementation of plans.

Land use plan formulation and evaluation is impeded because, in at least some of the projects and legislation, goals are not stated explicitly because 1) goals are confused with means for achieving the goals and 2) goals are stated in vague and ambiguous terminology. Clearly stated goals may also permit closer cooperation between the various levels of government and private groups involved in land use planning.

Problem to which study is directed

General needs for and problems associated with land use planning cited above prevail in Region V of Iowa. In addition, there are needs and problems unique to the region including the possible enactment of land use legislation in Iowa requiring county land use plans, changes in land use occurring within the region, and problems voiced by citizens of the region. Citizen

participation is necessary because the planning role of MIDAS must be supplemented by citizen input and, if land use legislation is enacted, the law will probably require citizen participation.

With the above in view, this study focuses on identifying the goals for land use planning preferred by the citizens of Region V in North Central Iowa.

Three objectives are formulated to guide and evaluate the study. Each objective is now examined and summarized in terms of achievement.

Achievement of study objectives

The first objective of this study is to develop a methodology for obtaining, ordering, and reconciling citizens' preferences for goals of land use planning. Two major sub-objectives emerge from objective one: 1) articulating goals appropriate to land use planning for presentation to potential respondents and 2) developing a methodology for presenting goals to citizens and for aggregating individual preferences among goals into a group preference in a manner acceptable to involved citizens and at the same time satisfying criteria of group decision theory.

The first sub-objective is approached by developing a model which defines the role of goals, establishes criteria for goal identification, and differentiates between goals and means. Goals which fit into a land use planning model are

identified and articulated. The theoretical approach to subjective one involves reviewing economic policy models and adapting these models to land use planning. Models by Tinbergen, MacCrimmon, and Timmons (65; 42; 63) which incorporate target and instrument variables or a means-end continuum provide the basis for a model in which goals constitute targets or ultimate ends of land use policy. Uses of land for residence, industry, agriculture, recreation, mining, or public facilities constitute means for achieving these goals. Two items of information are needed to utilize the model:

1) technical relationships between goals and means and 2) goal preferences of decision makers or citizens. Goal preferences of citizens of Region V are derived as part of objective two.

After formulation of the model, general goals of land use policy are identified by reviewing past land legislation, resource projects, and administrative orders and compiling a list of goals from these sources. A review of early United States public land policies reveals two major goals: 1) to raise revenue to retire the Revolutionary War debts and provide operating expenses for the newly formed government and 2) to settle the vast Western lands in the hands of emigres. Threads of these two goals are woven through all land legislation enacted for nearly three-quarters of a century. Multifarious means have been employed to dispose of public lands to achieve those goals but the end result has been very little revenue for

the United States and settlement of the West which has often been acrimonious and wasteful of resources.

Legislation has been enacted for specific types of land (timber, mining, arid) or specific groups (veterans, soldiers, Indians) which includes goals unique to each situation. In each specific enactment, the primary goal has been to alleviate a particular problem with land providing one means to achieve a solution. For example, if more soldiers have been needed to fight a war, free land has been used to induce men to enlist in the army.

Since the early 1900's, legislation has shifted from public to private land with the focus on agricultural land and conservation. The trend in recent legislation is to include all categories of land use. Goals of recently enacted or introduced state land use bills are stated in broad but ambiguous terms such as, "to facilitate orderly and well-planned development," terms amenable to many interpretations of meaning but not amenable to measurement and evaluation. National legislation, proposed but not enacted, includes a broad statement of purpose and specific sub-goals but no criteria for evaluation of achievement.

While no major land use bills have been enacted by either the Iowa General Assembly or by the United States Congress, several agencies guide and control various facets of land use on both the state and national level. The objective of the Soil

Conservation Service, both state and federal, is promotion of soil and water conservation practices which prevent soil erosion and waste of resources (54; 36). In the State of Iowa, the Department of Natural Resources is empowered to establish and enforce a state-wide plan for the control, utilization, and protection of water resources of the state (35). The objective of the law establishing the Department of Environmental Quality is stated as the abatement, control and prevention of air and water pollution in the state (33).

On the national level, policies for irrigated land are guided by the Reclamation Act of 1902. The objective of active land management was promulgated in the Taylor Grazing Act of 1934 which still controls grazing land policy (57). Through the National Environmental Policy, Congress has authorized all agencies of the government to ensure that decisions consider the environmental impact of projects and plans (46).

The Water Resources Council (74) has established national objectives for land and water resources planning. Two major goals are national economic development and enhanced environmental quality with secondary goals of regional development and social well-being. In addition, the Council order includes criteria for evaluation and measurement of achievement of goals. From all of the above sources a list of goals is compiled.

The second step in identifying and articulating goals involves sending an open-ended questionnaire to a group of

citizens of Region V who are asked to name the purpose of land use planning as they perceive it. From the responses, a second list of goals is compiled. The two lists are combined and condensed into four goals included in the pretest schedule. As a result of the pretest, two goals are combined, and the following three goals are identified and presented to citizens in the final survey: 1) increased environmental quality and conservation of resources, 2) increased economic development of the region, and 3) increased social well-being of the region.

The second major sub-objective of objective one is development of a methodology for presenting the identified goals to citizens for their choice and aggregating individual preferences into group preferences. Part two of Chapter III is devoted to a review of theoretical problems associated with construction of a social welfare function and possible solutions. Arrow (1) lists five conditions which a social welfare function should fulfill and then states, in general, it is impossible to construct a function which will fulfill all conditions. Several authors (10; 53) introduce functions with restrictions or qualifications which allow the functions to satisfy Arrows conditions. Despite conflicts over the possibility of constructing a social welfare function, many economic policy models are based on such a function or group preferences so, for practical applications, some type of group preference

ordering is needed. With application in view, this researcher inspects methods and techniques for presenting alternatives to potential respondents and for aggregating and weighting individual choices into group preferences and two methods, the certainty method and the paired-comparison model, are chosen for use in this study. Both methodologies result in a weighting which allows items to be placed on an interval scale in a more than ordinal manner.

The certainty method is used for Section I of the survey schedule which contains ten situation-statements. In the certainty method, the respondent is presented with a statement and asked to make two separate decisions: 1) a directional judgment (agree or disagree) and 2) a certainty judgment (how strongly respondent agrees or disagrees). Respondents have a range of choices from five indicating very strong agreement to one indicating very weak agreement. All responses for each statement are summed and averaged to obtain a weight for that statement. Statements are then ranked by weight.

The paired-comparison model, chosen for Section II (goals section) of the survey schedule, provides an estimate of each goal's numerical position on a scale in addition to an ordinal ranking of the goals. In this methodology, goals are paired in all possible combinations. Respondents are asked to select a choice from each pair of goals. The aggregated responses are analyzed and a common scale value developed for each goal.

A personal interview of the citizens of Region V is deemed the most appropriate method to secure citizens' preferences in goals.

In summary, the methodology developed as part of objective one consists of developing a multi-goal model, identifying goals which satisfy the criteria of the model, presenting the identified goals to citizens for their choice, and aggregating individual preferences among goals into group preferences.

The methodology developed in objective one is used in objective two of this study, to apply the procedure in Region V to obtain and analyze citizens' preferences for land use planning goals. An interview schedule is constructed incorporating methodology as developed and 338 personal interviews conducted of a random sample of the population of Region V. Individual choices in goals and approaches are aggregated into group choices by means of the paired-comparison technique, resulting in a weighted order of goal preferences.

Empirical results of the survey reveal that increased environmental quality and conservation of resources is first choice of the sample population; second choice is economic development of the region and increased social well-being is third choice. The sample is divided into groups based upon personal and certain land ownership characteristics, and in all groups but two, first choice is similar to that of the entire sample population. In two subgroups, individuals with eight

years or less of education and individuals with income of less than \$3,000, the first choice is increased economic development of the region. Second choice in most groups is increased economic development with increased social well-being as third choice. However, two subgroups, respondents who completed more than four years of college and those with professional occupations, rank increased social well-being second and increased economic development third.

The paired-comparison analysis results in a weighting for each goal. For the entire sample, on a zero to one scale, first choice is weighted 1.00, second choice .561, and third choice 0.0. Because there are only three goals, first choice is always weighted one and third choice zero, but the weighting for second choice varies a great deal ranging from .019 to .970 for different groups indicating that, for some groups, two goals are almost equally preferred.

The hypothesis that differences exist in ranking of goals by sub-groups is tested. Age, education, years lived in the community, land owned on edge of city, landowner, sex, location of residence, income, and occupation are characteristics which show highly significant differences in ranking.

Approaches to implementing land use planning (Section III of the survey schedule) are analyzed by use of the paired-comparison technique for the sample population. The first choice of respondents in approaches to implementing land use

planning, weighted 1.00, is to develop a plan and encourage people to follow the plan through education and information. Second and third choices are very close on the interval scale with weightings of .398 and .330 respectively. Second choice is to develop a plan and encourage people to follow the plan through taxation and government expenditures while third choice is for individual landowners to use land as they wish. The last choice for implementing land use planning is to develop a plan and force people to follow the plan through legal means.

Approaches to land use planning reflect methods for directing land into the uses (means) which achieve the goals desired by citizens of Region V.

As a corollary to objective two, individual choices in means are weighted by use of the certainty method, summed over all individuals, and averaged, resulting in an average weight for each means statement. Statements producing strong agreement are those restricting industry to specified locations, restricting roads and airports to land least suited to agriculture, and conserving soil resources. Uses of land, in order of preference, are industry, agriculture, mining, and recreation; however, respondents were not asked to rank uses but merely indicate strength of agreement or disagreement with each use.

Crosstabulations are made between weighting of responses to selected means statement and ranking of the goals to test

relationships existing between the goals and various statements.

Objective three is to suggest further research needs in both methodology and identification of land use planning goals. During the conduct of this study, needs were discovered which are included as part of the recommendations in the third section of this chapter. Basic needs center around quantification of goal variables of environmental quality and social well-being as well as technical relationships involving these goals and various uses of land. Recommendations for changes in survey design to incorporate the quantifications of goals are discussed. Other changes recommended for the survey include a combination of television-mail survey to reach a larger population for educational as well as interview purposes.

A model incorporating multiple-objective goal programming is discussed. Patterns of land use based on citizens' preferences could be developed through a multiple-objective goal program and presented to decision makers for use in making policy.

Limitations of Study

Design, conduct, and analysis of the survey indicates several limitations of the study which are summarized below:

1. The survey area is relatively homogeneous in terms of land use with approximately 95 percent of the land in

agriculture. Each of the other uses accounts for a small percentage of total land area. Existing land patterns tend to limit changes respondents might indicate since most feel drastic changes in land use are not possible.

2. Two problems of land use in Iowa, conversion of forest land to agricultural use and of agricultural land to urban use, are almost nonexistent in Region V at this time. If the survey were conducted in an area in which these problems are more pronounced, results may be more widely applicable.

3. In one means statement, persons are asked if they would pay more for goods and services, if necessary, to improve environmental quality. No costs, either in dollars or percentages, are mentioned. Perhaps respondents would have found the question easier to answer if limits had been mentioned; for example, a 10 percent increase in prices.

4. At least some respondents, asked to indicate desired changes in land use in acres, are unable to conceptualize acres and experience great difficulty in stating desired changes in terms of acres. Two categories present particular difficulty. Respondents, unaware of the acreage required for an airport, find it difficult to approximate acreages when a need for additional air service is felt. In the second category, respondents feel additional land should be mined if resources are available but are unaware of the amount of potential mineral resources in existence.

5. The use of the word "force" in Approach D may have biased respondents by focusing attention on that word rather than the approach discussed. Many respondents refuse to choose between pairs of goals which included Approach D.

6. Goals are so broad that, even with the explanations included, respondents may have been unable to visualize goals in terms of land use.

7. Citizen preferences in trade-offs between various uses of land would be helpful but the question is not included for two reasons. Technical relationships and resulting feasible trade-offs are not precisely formulated for presentation to respondents. Second, the "free-loader" problem would likely arise if respondents were asked to make estimates of trade-offs but not called upon to make the actual payment in either dollars or in changed uses of land.

8. All agricultural uses are combined into one category. Some agricultural uses are quite diverse and, if afforded the opportunity, respondents perhaps would differentiate among the agricultural uses such as livestock feeding and crop production.

Recommendations for Further Research

During the course of developing a methodology for identifying citizens' goals for land use planning and of applying and testing the methodology in Region V, further research needs appeared both in methodology and in its

application. Experiences encountered during this study suggest further research needs, particularly quantification of variables, technical relationships between goals and means, and further model development.

Two of the goal variables included in the survey, environmental quality and social well-being, lack an overall measure of quantification. Presently, both can only be measured by measuring components of each. Measurable components of environmental quality include air, water, and noise pollution, silt in streams, green spaces, and preservation of critical areas. Components of social well-being include income equity; educational, recreational, and cultural opportunities; and health and safety of citizens. While each component of environmental quality and social well-being is measurable, summation of components is hardly a valid measure of the whole variable since interaction exists among components.

An overall quantification similar to gross national product or the unemployment rate aids in judging the state of environmental quality and of social well-being. Economic measures are not without their critics but, imprecise as the measures may be, if computed in the same manner over a period of time, result in a useful indication of the direction of the economy. A similar quantification of environmental quality and social well-being would be valuable in general use.

With quantification of variables, a questionnaire can include more precise alternatives for respondents' choice. Rather than stating increased environmental quality, a range of values may be presented to respondents who can be asked to state trade-offs acceptable to them. In the present study respondents indicated if choices were stated numerically, responses would have been easier to make.

As conducted, the present study results in weightings for each goal indicating relative importance of each goal to respondents. With quantification of goals, similar weightings can be developed but, in addition, targets for each variable can be stated quantitatively following Tinbergen's model.

A survey of citizens appears essential if citizens' goals in land use planning are to be identified. A personal survey has been used in this study because questions are complex and explanations are necessary, but the procedure is expensive and reaches but a small segment of the population. Adaptations are possible. A combination television-mail questionnaire technique has been employed in other states and might be investigated. A state-wide television program provides needed background and explanations. Viewers fill out and return a questionnaire either mailed to each household or printed in local newspapers. A television-mail procedure is also expensive, but serves as an educational device and reaches a larger audience.

The geographical area of the present study does not include some of the more pressing problems surrounding land use today such as an increasing population in metropolitan areas accompanied by urban sprawl. A larger combined television-mail survey would encompass heterogeneous areas of the state and should provide additional information. Surveys provide one item of information needed for model implementation, goal preferences of decision makers or citizens.

The second item of information needed is the technical relationships between means and goals of the model. Goals and appropriate weightings for each are obtained through the survey. Uses of land for agriculture, residence, industry, recreation, mining, or public facilities constitute means for achieving designated goals. Information on the contribution of each means to each goal is necessary. For example, an acre of land used for industry may contribute in varying degrees to achieving environmental quality, economic development, or social well-being. An acre of land in recreation also contributes toward achievement of each goal but in degrees that differ from that of an acre of land in industry.

Information on some of the technical relationships is available for use at the present time, but is nonexistent or sparse for other relationships. Economic relationships are easier to obtain than those involving environmental quality or social well-being. Difficulties similar to quantifying

environmental quality and social well-being arise in establishing technical relationships involving these same variables, and time is needed to solve the difficulties. Nevertheless, even if exact relationships are not available at the present time, an estimate of the relative contribution of each land use to achievement of each goal would be helpful. Technical relationships should be developed in coefficient form for use in computer programs.

With the above coefficients and the weighting of goals obtained through a survey, a multiple-objective goal program can be developed to construct a pattern of land use to conform to goal preferences of citizens. Acres of land serve as resources of the model; restrictions consist of total acres of land available plus minimum acres needed in each use; weights obtained in the survey provide the weighting for each goal. Technical coefficients for land uses may vary from area to area and can be changed as needed in the original model for use in all areas.

Patterns of land use developed through these programs have several uses, only two of which are discussed here. First, goal weights may be varied to produce a series of patterns of land use for presentation to citizens for selection in a survey-type situation. Respondents apprised of weighting of goals for the various patterns can make choices on that basis.

More importantly, the programmed patterns provide a basis for comparison with patterns of land use projected on trends. A researcher in the Department of Economics at Iowa State University has used several techniques to project future land uses in Region V. One technique involves a time series regression of changes in acres of land in each use for the past several years. Another technique makes allowance for trends in population changes. Urban and airport uses are projected utilizing both methodologies. Population trends are not used for projecting mining and recreation; projections are based solely on trends in these uses. Iowa State Highway Commission projections are used for highways and roads, while railroad projections are based on trends in deactivization of railroads.

A comparison of the pattern of land use programmed to correspond to citizens' preferences in goals and the pattern projected on trends can be presented to decision makers. If the two patterns coincide indicating land uses will fall into the patterns preferred by citizens, no action may be needed. However, if patterns projected on trends do not coincide with that preferred by citizens, decision makers will be aware of the difference and may consider moves to change current trends of land uses to follow the desired uses.

This section discusses recommendations and needs which surfaced as a result of the study of goals of land use planning. Major needs center around methods for quantifying goals and technical relationships involving goals. Recommendations for

survey design and model implementation are also discussed.

Conclusions

This study is one segment of a three-part land use project conducted in Region V of North Central Iowa with the general purposes of obtaining data on land use and processes, goals of land use planning, and tools to channel land into uses to achieve preferred goals, as well as developing methodologies applicable for land use research in other regions. This segment focuses on identifying goals of land use planning preferred by citizens of Region V. The study utilizes the framework of a means-end continuum with goals of land use planning constituting the ends and land uses, the means.

Conclusions of this study follow. The first conclusion is that the model as developed is applicable to land use planning. Economic policy models developed by several theoreticians are combined and adapted to land use planning. Variously called target variables, ends, or policy objectives in economic policy models, variables in the land use model termed goals are ultimate objectives of land use policy. Means, in economic policy models called instrument variables or attributes, in the land use model consist of land uses such as agricultural, industrial, residential, mining, recreational use, each of which contributes in varying degrees to achievement of goals. Theoretically, the model is sufficient as outlined but for application to specific

situations, researchers need coefficients expressing the contribution of each land use toward each goal. It is assumed these coefficients vary with locations studied because of differing soil characteristics, climatic conditions, and size of community. Coefficients would be developed for each study site.

The second conclusion of the study is that the methodology is applicable to determination of goal preferences of citizens, the second piece of information necessary to implement the model. The method utilized in this study is to identify goals, design a survey incorporating these goals into a schedule, and personally interview a random sample of the population of Region V. Initially, persons involved in land use planning had expressed reservations on citizens' ability to make choices among goals and among various situations involving land use. Citizens may not be aware of technical relationships involved in some aspects of land use, but land use is a direct or indirect component of many jobs, recreational opportunities, and everyday living situations; and individuals have general knowledge about land use, have formed opinions on many issues, and are willing to share their views.

The empirical study in Region V results in the following conclusions on citizens' preferences in goals for land use planning. Citizens decisively choose environmental quality and conservation of resources as their first goal of land use planning. The second choice, economic development of the region, is rather further down the scale. Social well-being

ranks third. Since the term, social well-being, is difficult to define precisely, third place ranking is understandable. The choice of environmental quality over economic development is more difficult to analyze. Generally, decision makers have assumed economic development paramount in regional development planning. Results of the survey indicate that more weight should be given to environmental quality and conservation. Increased awareness and growing concern have developed in the past few years over the effects of pollution and the decreasing supply of resources. This may partially explain the choice of environmental quality as the first goal. Environmental quality is weighted strongest by individuals under forty years of age. In addition, the economy of the region has been relatively viable and healthy for some time and economic development may not be of prime concern at the present time.

The study also concludes respondents generally agree with limitations or restrictions on several uses of land as evidenced by responses to the situation statements. Two statements involving restrictions on location of industry, roads, and airports receive strongest agreement. Conservation and environmental quality again receive strong endorsement in this section of the schedule. Use of land for industry or agriculture is preferred over recreational use.

When choosing approaches to implementing land use planning, respondents indicate a preference for planning but relatively

mild approaches to enforcement. Legal means of enforcement are least preferred but no restrictions on land use is second least preferred. Respondents prefer that people conform to land use plans through information and education.

Most of the landowner respondents have encountered one or more public regulations on land but regulations generally have not adversely affected individual's attitude toward land use. About 5 percent of the respondents are more opposed to land use planning as a result of their experience with regulations.

A final conclusion concerns the relationship between this study and land use planning in Region V. This study is not conceived nor intended as a plan for land use in the region. However, the study can serve as a helpful guide to planners by identifying goals desired by citizens of Region V; goals toward which planning should be directed.

Results of this study indicate that planning can no longer be single-purpose. Multiple goals must be considered when constructing land use plans with the implication that planning should not be directed toward maximizing one goal but rather determining an optimum level of achievement of several goals. While environmental quality and conservation of resources is the goal preferred by the majority of respondents in this study, preferences for the other two goals, economic development and social well-being are indicated by some.

Needs for citizen participation in land use planning are indicated in Chapter I. Among reasons cited is that active participation by citizens may motivate them to execute the plans. While citizens may not be able to participate in the technical aspects of land use planning, articulation of their goals is one means for citizens to participate in land use planning. If citizens realize that technicians are directing land use planning toward goals preferred by themselves, citizens may be motivated to execute the plans.

BIBLIOGRAPHY

1. Arrow, Kenneth J. *Social Choice and Individual Values*. 2nd ed. New York: John M Wiley & Sons, Inc., 1964.
2. Associated Engineering, Inc. *Zoning and Subdivision Regulations for Webster County Iowa*. Fort Dodge, Iowa: Author, n.d.
3. Barlowe, Raleigh. *Land Resource Economics*. Englewood Cliffs, N.J.: Prentice Hall, 1958.
4. Baumol, W. J. *Welfare Economics and the Theory of the State*. 2nd ed. Cambridge, Mass.: Harvard University Press, 1967.
5. Bining, Arthur C., and Cochran, Thomas C. *The Rise of American Economic Life*. New York: Charles Scribner's Sons, 1964.
6. Blin, J. *Intransitive Social Ordering and the Probability of the Condorcet Effect*. *Kyklos* 26 (Fasc. I 1973): 25-35.
7. *Bureau of Land Management Act*. U.S. Code, vol. 10 (1970).
8. Campbell, D. E. *Social Choice and Intensity of Preference*. *Journal of Political Economy* 81 (January-February 1973): 211-18.
9. Candler, Wilfred, and Boehlje, Michael. *Use of Linear Programming in Capital Budgeting with Multiple Goals*. *American Journal of Agricultural Economics* 53 (May 1971): 325-30.
10. Coleman, J. S. *The Possibility of a Social Welfare Function*. *The American Economic Review* 56 (December 1966): 1105-22.
11. Colorado. *Revised Statutes*. Chapter 106, sec. 1, art. 4, 1963.
12. Coombs, Clyde. *A Theory of Data*. New York: John M. Wiley & Sons, 1964.
13. Coombs, C. H. *Social Choice and Strength of Preference*. In *Decision Processes*. Edited by R. M. Thrall, C. H. Coombs, and R. L. Davis. New York: John M. Wiley & Sons, 1954.

14. Council of State Governments. Land Use Policy and Program Analysis No. 6. Lexington, Ky.: Author, 1975.
15. Dalkey, Norman. Studies in the Quality of Life. Paper presented at Institute of Government and Public Affairs Seminar at UCLA, 12 February 1970.
16. Des Moines Sunday Register, 2 November 1975, sec. A, p. 7.
17. Dewey, Donald. The Analysis of Prices and Markets. New York: Oxford University Press, 1975.
18. Dillon, John L. An Expository Review of Bernoullian Decision Theory in Agriculture: Is Utility Futility? Review of Marketing and Agricultural Economics 39 (March 1971): 3-80.
19. Easton, Allan. One-of-a-Kind Decisions Involving Weighted Multiple Objectives and Disparate Alternatives. In Multiple Criteria Decision Making, pp. 657-67. Edited by James L. Cochrane and Milan Zeleny. Columbia, S.C.: University of South Carolina Press, 1973.
20. Edgmon, Pamela J. Measurement and Analysis of Social Preferences for Land Use Alternatives. Report No. 16. Regional Analysis and Management of Environmental Systems. Fort Collins, Colo.: Colorado State University, August 1974.
21. Edwards, Allen L. Techniques of Attitude Scale Construction. New York: Appleton-Century-Crofts, Inc., 1957.
22. Florida. The Florida Environmental Land and Water Management Act of 1972. Statutes (1972), C. 72-317, sec. 2, 1972.
23. Fox, Karl A. Combining Economic and Non-economic Objectives in Development Planning. Iowa State University 211-d Grant Program, Occasional paper no. 1, November 1973.
24. Fox, Karl A.; Sengupta, Jati K.; and Thorbecke, Erik. The Theory of Quantitative Economic Policy. Chicago: Rand McNally & Co., 1966.
25. Gibson, James. Land Use Survey Conducted in Iowa in 1974. Department of Economics, Ames, Iowa, 1974. (Mimeographed.)

26. Harl, Neil. Land Use Legislation: Status and Implementation. Paper presented at annual meeting of Agricultural Research Institute, Denver, Colo., 15 October 1974.
27. Harl, Neil. Economic and Legal Development and Analysis to Guide Land Use Planning and Control. In Land Use Planning Seminar: Focus on Iowa, pp. 323-333. Edited by Larry Whiting. Ames, Iowa: Center for Agricultural and Rural Development, 1973.
28. Harman, Wyatte L.; Hatch, Roy E.; Eidman, Vernon R.; and Claypool, P. L. An Evaluation of Factors Affecting the Hierarchy of Multiple Goals. Oklahoma Agricultural Experiment Station and USDA Technical Bulletin T-134, June 1972.
29. Harris, Marshall. Origin of the Land Tenure System in the United States. Ames, Iowa: Iowa State University Press, 1953.
30. Henderson, James M., and Quandt, Richard E. Microeconomic Theory. 2nd ed. New York: McGraw-Hill, Inc., 1971.
31. Herfindahl, Orris, and Kneese, Allan. Economic Theory of Natural Resources. Columbus, Ohio: Charles E. Merrill Publishing Co., 1974.
32. Hibbard, Benjamin Horace. A History of the Public Land Policies. New York: Macmillan Co., 1924.
33. Iowa. Department of Environmental Quality Act. Code of Iowa (1975), vol. 2.
34. Iowa. Fruit-tree and Forest Reservations Act. Code of Iowa (1975), vol. 1.
35. Iowa. Iowa Natural Resources Council Act. Code of Iowa (1975), vol. 2.
36. Iowa. Soil Conservation Districts Law. Code of Iowa (1975), vol. 2.
37. Iowa State Planning Board. Land Utilization, Project no. 1030, July 1934.
38. Jones, Jean-Lloyd, and Waterman, Nan. Natural Resources: Final Report to the Governor's Conference on Iowa in the Year 2000. Governor's office, Des Moines, Iowa, 14 June 1974. (Mimeographed.)

39. Kendall, M. G. Rank Correlation Methods. 2nd ed. London: Charles Griffin & Co. Ltd., 1955.
40. Lokken, Roscoe L. Iowa: Public Land Disposal. Iowa City, Iowa: Athens Press, 1942.
41. McCabe, Bernard. The Objectives of the Manager and Board of Directors of Local Cooperatives and their Impact on the Behavior of the Firm. M.S. thesis, Iowa State University, 1966.
42. MacCrimmon, Kenneth R. An Overview of Multiple Objective Decision Making. In Multiple Criteria Decision Making, pp. 18-44. Edited by James L. Cochrane and Milan Zeleny. Columbia, S.C.: University of South Carolina Press, 1973.
43. Marwill, Inc. Zoning Pocahontas Iowa. Report No. 4 Community Development Plan. Des Moines, Ia.: Author, March 1972.
44. Midas Regional Planning Commission. Region 5 Development Guide. Monograph. Fort Dodge, Ia.: Author, September 1973.
45. Miller, J. R., III. Professional Decision Making. New York: Praeger, 1970.
46. National Environmental Policy Act. U.S. Code, vol. 9 (1970).
47. National Forests Act. U.S. Code, vol. 4 (1970).
48. Natural Resources Board. Certain Aspects of Land Problems and Government Land Policies. Report of the Land Planning Committee. Washington, D.C.: U.S. Government Printing Office, 1935.
49. Rao, S. N. On a Sufficient Condition for Transitivity of Majority Decisions. American Economist 16 (Fall 1972): 90-92.
50. Rausser, Gordon C., and Freebairn, J. W. Estimation of Policy Preference Functions: An Application to U.S. Beef Import Quotas. The Review of Economics and Statistics 56 (November 1974): 437-49.
51. Reclamation Act. U.S. Code, vol. 10 (1970).

52. Scoville, Anthony; Patterson, Brenda; and Baldwin, Andrea. Public Opinion and Survey Design. A Comparison of Three Opinion Surveys on Land Use Planning in Vermont. Montpelier, Vt.: Environmental Planning Information Center, July 1973. (Mimeographed.)
53. Sen, A. K. A Possibility Theorem on Majority Decisions. *Econometrica* 34 (April 1966): 491-99.
54. Soil Conservation Act. U.S. Code, vol. 4 (1970).
55. State of Iowa. House File 505. Bill introduced into General Assembly of the State of Iowa in 1974, amended and passed by the House April 11, 1975. (Mimeographed.)
56. Strauss, Jonathan G. Measuring Development: An Application to Two Rural Iowa Communities. Ph.D. dissertation, Iowa State University, 1975.
57. Taylor Grazing Act. U.S. Code, vol. 10 (1970).
58. Theil, H. Linear Aggregation of Economic Relations. Amsterdam: North-Holland Publishing Co., 1954.
59. Theil, H. On the Symmetry Approach to the Committee Decision Making Problem. *Management Science* (April 1963): 380-93.
60. Thurstone, L. L., and Clave, E. J. The Measurement of Attitude. Chicago: University of Chicago Press, 1929.
61. Timmons, John F. Issues in Land Use Planning and Control. In *Land Use Planning Seminar: Focus on Iowa*, pp. 9-30. Edited by Larry Whiting. Ames, Iowa: Center for Agricultural and Rural Development, 1973.
62. Timmons, John F. Public Land Use Policy: Needs, Objectives, and Guidelines. *Iowa State Agricultural and Home Economics Experiment Station Journal Paper* no. J-7325, 1972.
63. Timmons, John F. Professor of Agricultural Economics. Iowa State University, Ames, Iowa. Econ 682 Class notes. April 1973.
64. Timmons, John F., and Murray, Wm. G., eds. *Land Problems and Policies*. Ames, Iowa: Iowa State University Press, 1950.

65. Tinbergen, J. On the Theory of Economic Policy. 2nd ed. Amsterdam: North-Holland Publishing Co., 1955.
66. Turner, Frederick Jackson. The Frontier in American History. New York: Henry Holt & Co., 1920.
67. Turner, Frederick Jackson. Rise of the New West 1819-1829. 3rd ed. New York: Collier Books, 1968.
68. Turner, Frederick Jackson. The United States 1830-1850. New York: W. W. Norton & Co., Inc., 1965.
69. U.S. Bureau of the Census. Census of Agriculture, 1969. Vol. 1. Area Reports Part 16, Iowa. Sec. 1. County Data, Adair Co.-Jackson Co. Washington, D.C.: U.S. Government Printing Office, 1972.
70. U.S. Bureau of the Census. Census of Agriculture, 1969. Vol. 1. Area Reports Part 16, Iowa. Sec. 2. County Data, Jasper Co.-Wright Co. Washington, D.C.: U.S. Government Printing Office, 1972.
71. U.S. Congress. Senate. Committee on Interior and Insular Affairs. 1972 National Land Use Policy. S. Rpt. 92nd Cong., 2d sess., 1972.
72. U.S. Congress. Senate. Committee on Interior and Insular Affairs. Hearing on National Land Use Policy. 92nd Cong., 1st sess., 1971.
73. U.S. Department of Commerce. Social and Economic Statistics Administration/Bureau of Economic Analysis. Survey of Current Business. Vol. 54. No. 5, Part II. Washington, D.C.: U.S. Government Printing Office, 1974.
74. U.S. Water Resources Council. Establishment of Principles and Standards for Planning. Federal Register 38, No. 174: 5-20, 10 September 1973.
75. Van Eijk, C. J., and Sandee, J. Quantitative Determination of an Optimum Economic Policy. Econometrica 27 (January 1959): 1-13.
76. Warren, Richard D.; Klonglan, Gerald E.; and Sabri, Medhat M. The Certainty Method: Its Application and Usefulness in Developing Empirical Measures in Social Sciences. Iowa State University, Rural Sociology Report No. 82, 1969.

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APPENDIX A: PRELIMINARY QUESTIONNAIRE

APPENDIX B: THE SURVEY SCHEDULE

IOWA STATE UNIVERSITY
Department of Economics
and
Statistical Laboratory

Research Study of Land Use

Seg. No. _____ H.H. No. _____

Name of respondent _____

Interviewer _____

Address _____
(street or R.R.)

Date

Time

1st call _____

City _____

2nd call _____

Telephone No. _____
(area code)

3rd call _____

Starting time _____

Hello. My name is _____. I am working for Iowa State University at Ames. The Department of Economics at Iowa State is conducting this research project to learn the preference of the residents of north central Iowa with respect to some aspects of land use planning. We will really appreciate your help in this important project.

Your residence was selected at random and, in addition, we have been asked to select which member of the household to interview. Could we begin with your giving me the names of the members of this household, starting with the head, please?
[Enter in Col. a.]

- (b) [Record sex of each member.]
- (c) How old was he/she on his/her last birthday?
- (d) [For each person 18 and over, ask] What is the highest grade of schooling completed?
- (e) [Check all household members 18 years of age and over.]
- (f) [Use random number sheet to select person to be interviewed.]

	(a)	(b)	(c)	(d)	(e)	(f)
No.	Person	Sex	Age	Highest grade	Eligible (Check if 18 or over)	Person to be interviewed
1	Head					
2	Spouse					
3						
4						
5						
6						
7						
8						
9						
10						

In this household then, I have selected _____ . Is _____
home today?

We are talking with urban and rural residents of a six county area about their opinions on some of the aspects of land use planning. Land use planning is a question of concern to most Iowans. Today's decisions on land use will determine the population level, the income of Iowans, as well as many other aspects of the quality of life in the future. The information obtained in this survey will be useful in aiding public officials to better understand the wants and needs of the people when making decisions on land use. Your answers will be summarized along with those of the other participants in this research project and no individual respondent will be identified in any way.

We are especially interested in what you, as an individual, think about land use planning. Consequently, when you answer the questions please tell us what you prefer, not what you think the community would prefer. The questions we will ask do not have a right or wrong answer. What we want is your opinion. We appreciate your assistance and will try to answer any questions that you may have as we go along.

SECTION 1 -- Situations Involving Land Use

1. Had you ever heard of the term "land use planning" before I talked with you?

_____ No -----> Go to Ques. 2

_____ Yes -----> (a) Would you tell me please, what the term "land use planning" means to you?

2. Following are some situations which might occur in your community and would require decisions on how the land should be used. I will describe a situation, read a statement to you concerning this situation, and then will you tell me whether you agree or disagree with the statement, please. This is the first situation.

Situation 1.

The uses made of land could result in changes in environmental quality. Industrial growth and certain farming practices, such as usage of fertilizer and pesticides, may cause increased silt or chemical runoff into streams or dust particles in the air. Feedlots may cause odor or noise pollution. Land use regulations could forbid runoff into streams or air pollution and impose distance requirements which would eliminate some of the pollution. These requirements may result in higher costs for the producer which could in turn (1) cause higher prices for the consumer or (2) force the producer out of business.

INTERVIEWER: Hand R the YELLOW CARD with the statements and the scale.

Looking at this card, the first statement refers to the situation we have just discussed. Let's read it together Now, would you tell me if you agree or disagree with this statement? (Circle R's response.) Referring again to the card, you will notice a scale of 1 to 5. One indicates that you do not feel very strongly about your response and 5 indicates you feel very strongly about it (with degrees of 2, 3, and 4 between). Which number best represents your feelings? (Circle appropriate number.)

INTERVIEWER: If R is indifferent or refuses to answer, circle both Agree and Disagree. No number is necessary in this case.

STATEMENT 1: I would be willing to pay more for the goods I purchase if that was necessary to enhance the quality of the environment.

Agree					
	1	2	3	4	5
Disagree					

INTERVIEWER: Follow same sequence (Situation, statement, agree-disagree, scale) for each of the decision areas.

Situation 2.

People seem to have more free time, and so recreational and green areas are gaining in importance. In some instances, land can be used for recreation as well as another use, while other times, two uses may be incompatible. Scenic land may provide choice residential lots, but when this land is designated for park areas, homes cannot be built there, or dams could be constructed to provide more recreational lakes, but this would flood agricultural land and take it from production.

STATEMENT 2: Public areas used for parks, recreation, and wildlife should be increased even if it means less land for residential or agricultural use.

Agree
 1 2 3 4 5
 Disagree

Situation 3.

Certain uses of land and some farming practices cause greater soil loss and erosion than other uses. These practices could be changed or stopped entirely which might result in higher costs for the farmer, home builder, or construction people, as well as loss of some jobs.

STATEMENT 3: Soil resources should be conserved for the future even if this means fewer jobs or more expensive goods now.

Agree
 1 2 3 4 5
 Disagree

Situation 4.

As I mentioned earlier, we are working in a six-county area known as Region V. This region consists of Calhoun, Hamilton, Humboldt, Pocahontas, Webster, and Wright counties. These counties contain much of the best agricultural land in the state. This cropland is very productive and a vital source of food. However, this land could also be used for other purposes, i.e., it is often less expensive to build homes, factories, or roads on this type of land than on more rugged land. In addition, the profit per acre might be greater in uses other than agriculture.

STATEMENT 4: Farmers should not be allowed to sell or use the best agricultural land for any purpose other than farming.

Agree
 1 2 3 4 5
 Disagree

Situation 5.

Some persons, tho not actively engaged in farming, prefer to live on two to three acre plots in rural areas. This may provide a more satisfying life style than living on a smaller plot yet this removes land from agricultural production while often increasing the cost of providing public services and the potential for pollution because of sewage runoff, waste disposal problems, etc.

STATEMENT 5: Nonfarmers should be permitted to build residences on 2-3 acre plots in rural areas even though these potential problems exist.

Agree	1	2	3	4	5
Disagree					

Situation 6.

Building new public roads and airports accounts for the removal of many acres of prime land from agricultural use each year. This may result in lower crop production. On the other hand, if road building was restricted to less productive or more rugged land, it could mean that more miles of road would need to be built at a greater cost. The costs of airports would probably increase also if located on more rugged land.

STATEMENT 6: If a new road or airport is built in your county, it should be built on land least suited to agriculture.

Agree	1	2	3	4	5
Disagree					

Situation 7.

As towns increase in population, agricultural land tends to be shifted to urban use and thus lost to agriculture. One means of controlling this could be to specify that only farm operator and owner residences be built on the agricultural land adjoining a city. To provide housing for the increased population without increasing land area, the number and type of residential units built within the city could be specified (for example, restricting certain blocks to multiple family dwellings). Another alternative is the annexation of farmland into the city.

STATEMENT 7: A land use plan for your county should specify the type of residential construction allowed in each tract, possibly limiting the number of units.

Agree	1	2	3	4	5
Disagree					

Situation 8.

Underground resources are found in various areas of Iowa, including Region V. Mining of these resources could increase the income of the area and provide added jobs. However, in some cases this would remove land from cultivation and cause unsightly damage to the countryside. Some of this land might be reclaimed.

STATEMENT 8: Taking all of these things into consideration, mining should be permitted on agricultural land.

Agree					
	1	2	3	4	5
Disagree					

Here is the last situation.

Situation 9.

In order to increase economic development, new industries may be encouraged to locate in your region since this means added jobs for the labor force which, in turn, causes additional income to be spread throughout the region. The addition of these new industries, however, may result in a deterioration of the environment as more dust and smoke are expelled into the air or more polluting substances into the streams. Also, location of new industries may remove some land from agriculture and thereby reduce the production of food.

STATEMENT 9: Taking all of these things into consideration, new industry should be encouraged to locate in your community.

Agree					
	1	2	3	4	5
Disagree					

STATEMENT 10: New industries in your community should be restricted to areas set aside for industrial use only (for example, in industrial parks).

Agree					
	1	2	3	4	5
Disagree					

SECTION III -- APPROACHES TO LAND USE PLANNING

4. There are two basic ways in which your community can approach the problems of land use. In the first way, the community would make no attempt to develop a plan -- the uses of land would be determined solely by those who own it. In the second way, the community would develop a plan which would set aside areas of land to be used only for recreation or industry or agriculture or residential construction or roads and other public facilities. Once this plan is developed, there are several methods of persuading people to follow the plan. (Hand R GREEN CARD.) This card lists and explains four alternative approaches to land use planning. I would like to have you read them over with me. (Read approaches and explanations -- allow R to retain card while answering next set of questions.)

- A. Individual land owners use land as they wish
-- no restrictions put on uses of land
- B. Develop plan -- encourage people to follow plan through education and information
this could be done through
 - mass media, i.e., radio, TV, newspapers
 - extension service or other education media
- C. Develop plan -- encourage people to follow plan through taxation and government expenditures
this could be done through
 - different rates of taxation for various types of land use
 - government spending for conservation purposes or roads or other public facilities
- D. Develop plan -- force people to follow plan through legal means
this could be done through
 - zoning laws or building codes
 - laws regulating subdivisions or developments
 - laws imposing environmental quality standards
 - laws requiring permits to change uses of land

I am going to hand you a card which lists two of the alternatives we have just read. If you were to choose between the two alternatives on this card, please indicate to me which one you would prefer. Again, the order of choices listed does not reflect importance. Each pair of statements is included only once so you need not worry about contradicting yourself. (Continue with the cards until R has completed all choices in this group.)

Would you prefer?

1. a. Develop plan -- encourage people to follow plan through education and information
or
 b. Individual land owners use land as they wish
2. a. Develop plan -- encourage people to follow plan through education and information
or
 b. Develop plan -- encourage people to follow plan through taxation and government expenditures
3. a. Develop plan -- encourage people to follow plan through education and information
or
 b. Develop plan -- force people to follow plan through legal means
4. a. Develop plan -- encourage people to follow plan through taxation and government expenditures
or
 b. Individual land owners use land as they wish
5. a. Develop plan -- encourage people to follow plan through taxation and government expenditures
or
 b. Develop plan -- force people to follow plan through legal means
6. a. Individual land owners use land as they wish
or
 b. Develop plan -- force people to follow plan through legal means

SECTION IV. PRESENT AND PROJECTED LAND USES

5. A research study has been made in the six counties of Region V to find out how the land is now being used. (Hand R ORANGE card.) This chart shows how the land is presently divided among the eight uses listed in Column 1. Column 2 shows the percentage while Column 3 lists the acres in each use. For example _____% or _____ acres are in urban use. You may also note the percentage and acreages in each of the other uses.

We are primarily interested, however, in how you would like to see our land divided in the future - if there are any changes you would like to see made. Looking ahead fifteen years to 1990, would you like to see more, less or no change in _____? (use)

INTERVIEWER: Check appropriate Column (4) and continue with all 8 uses in the same manner. Only for those uses for which R prefers a change, ask:

Realizing there is a fixed number of acres of land in Region V, how many (more) (less) acres would you like to see in _____? (use)

INTERVIEWER: Record acres in proper column. Repeat for each additional use checked "more" or "less." Total acres in "more" and "less" columns. If the totals are equal, continue with question 6. If they are not the same, make an attempt to reconcile the number of acres.

(1) Use	(2) % in use	(3) Acres presently in use	(4) Change		(5) No change	(6) (Don't know)
			More	Acres Less Acres		
(a) Airports	.1	1,373				
(b) Mining	.1	1,980				
(c) Private recreation areas (golf course, drive-in theatres, private parks and campgrounds, and summer cottages)	.1	3,138				
(d) Railroads	.4	8,503				
(e) Public recreation areas	.4	8,945				
(f) Urban (includes all land inside incorporated places and urban uses outside)	1.3	29,298				
(g) Highways and roads (outside incorporated areas)	2.8	62,666				
(h) Agriculture	94.8	2,101,825				
Total	100%	2,217,728 acres	XX		XX	XXX XXX

SECTION V -- LAND OWNERSHIP INFORMATION

6. Do you (and your spouse) own any land? (Include land not paid for or land in which you own only an interest)

_____ No -----> Go to Question 8

_____ Yes -----> Continue with Question 7

7. (a) Is any of this land located (Check all applicable on opposite table.)
 (b) How much land do you own in (Record amount in each location.)
 (c) How is this property being used at the present time? (Record all applicable code numbers.)

- 1 - your own private residence
 2 - residential, but not your home
 3 - commercial or industrial property
 4 - farming
 5 - vacant
 6 - other (specify) _____

(If "4" is recorded (farming), ask:) If not, skip to part (e).

- (d) How is this land farmed? Do you (Record code)

- 1 - farm it yourself?
 2 - rent it all out?
 3 - farm part of it and rent out part of it?
 4 - other (specify) _____

- (e) Is any of your property subject to one or more of the following public regulations (Read each regulation and enter code.)

- 0 = No
 1 = Yes
 2 = (Don't know)

- 1 - zoning regulations
 2 - subdivision regulations
 3 - building codes
 4 - health and safety regulations (i.e., septic tank laws, waste disposal, etc)
 5 - conservation laws
 6 - pollution controls
 7 - other (explain) _____

- (f) Have these regulations or controls presented problems for you?

If yes: which regulations and how? _____

- (g) Has your experience with land use regulations made you more favorable or more opposed to land use regulation in general?

INTERVIEWER: Skip to Question 9

No.	Location	a		b		c	d	e							f		g		
		Land owned		Amount owned				Use? (Record code)	How farmed? (code)	Public regulations							Caused problems		Attitude
		Yes	No	Acres	Lots	1	2			3	4	5	6	7	Yes	No	Fav.	Opp.	No eff.
1)	...inside the incorporated limits of a town or city?																		
2)	...inside an <u>un</u> incorporated place?																		
3)	...on the edge of a town or city (outside city limits)? ...																		
4)	...in the open country?																		
5)	...other? (describe)																		
)	_____																		1
)	_____																		240
)	_____																		
)	_____																		
)	_____																		
)	_____																		
)	_____																		
)	_____																		
)	_____																		

8. Have you had any experience with land use regulations?

_____ No -----> Go to Question 9

_____ Yes -----> (a) Has this experience made you more favorable or more opposed to land use regulation in general?

_____ more favorable

_____ more opposed

_____ no effect

9. There is considerable debate over which level of government should have the primary responsibility for developing and enforcing land use planning. If a land use plan were required for the area in which you live, which level of government do you think should have primary responsibility? Which level would be your next choice? (1 = primary, 2 = next choice)

- _____ a. Local municipal government
- _____ b. County government
- _____ c. Regional council of governments
- _____ d. State of Iowa

SECTION VI -- DEMOGRAPHIC INFORMATION

10. In closing, could we talk a little about you and your household?

(a) What is (was) your primary occupation? _____
 (If employed for compensation, ask:)

(Do) (Did) you work: _____ full time
 _____ part time, or are you
 _____ retired from that occupation?

(b) Do you have a secondary occupation?

_____ No -----> Skip to Part (c)

_____ Yes -----> What is it? _____

Do you work: _____ full time
 _____ part time, or are you
 _____ retired from that occupation

INTERVIEWER: If R is head of household, skip to Question 11. If R is not the head of household, ask:

(c) What is the primary occupation of the head of the household? _____
 (If he/she is employed for compensation, ask:)

Does he/she work: _____ full time?
 _____ part time?
 _____ retired from that occupation?

Does he/she have a secondary occupation?

_____ No -----> Skip to Question 11

_____ Yes -----> What is it?

Does he/she work: _____ full time
 _____ part time or
 _____ retired from that occupation

11. How many years have you lived in this community?

_____ All my life

_____ years -----> (a) Where did you live before moving to this community?

_____ State

_____ Town

12. Do you think you will be living in this community ten years from now?

_____ No _____ (don't know)
 _____ Yes

Hand R the PINK CARD

13. On this card we have listed seven broad income categories. Would you look at this card and tell me which letter most closely represents the total income of the members of this household for the year 1974? Please include all the income of every member, including wages, interest, dividends, public assistance, unemployment compensation, net income from business or farming, etc., before taxes.

_____ A - Less than \$3,000	_____ E - \$12,000 - \$14,999
_____ B - \$3,000 - \$5,999	_____ F - \$15,000 - \$24,999
_____ C - \$6,000 - \$8,999	_____ G - \$25,000 and over
_____ D - \$9,000 - \$11,999	

14. Are there any other views, opinions or problems in connection with land use planning that you would like to comment on? _____

15. Would you like a copy of the report on this project? _____ Yes _____ No

Ending time _____