#### ABSTRACT

# A STUDY OF DEVELOPMENT PREFERENCES AND SOCIOECONOMIC STRUCTURE IN THE RESOURCE CONSERVATION AND DEVELOPMENT PROGRAM: A COMPARATIVE ANALYSIS

By

David George Carvey

The Resource Conservation and Development program depends on local participation and support. Without these the program could not function. The objective of the program is to help improve economic and environmental conditions in rural areas by offering local residents the opportunity to identify problems, evaluate needs, propose remedial actions, set priorities, and initiate actions. The program's openendedness allows them to change their minds and plans. In view of the program's expansion over the years, encompassing over one-third of the counties in the U.S., and in view of the variation in program success in widely different physical, institutional, social, and economic settings across the Nation, research of program response and factors affecting decision making by local volunteer participants was undertaken. Comparative analyses were used to test the following hypotheses:

 Direct relationships exist between program response or actions and local development proposals, suggesting one indicator of program effectiveness;

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- In specifying development preferences, the behavior of local decision makers is closely associated with socioeconomic attributes of the RC&D projects in which they live;
- Relationships between development preferences of local decision makers and socioeconomic attributes of their respective project areas will differ over a range of development alternatives.

A system for classifying development proposals and actions was constructed using mutually exclusive categories based on primary development intentions. Records of 48 RC&D projects were examined. Proposals made and actions taken between 1963 and 1970 were classified. Statistically significant association was found between rankings of proposals and actions. This suggests that the RC&D program seems to be consistent in reflecting locally specified development preferences.

Factor and discriminant analysis techniques were used to examine important linkages between shifts in local development preferences, as actions were taken on proposals, and socioeconomic structure as represented by 76 socioeconomic variables. The conclusion is that man's views, as represented in his group decision making, seem to be distinctly influenced by his surroundings as defined by socioeconomic structure. Analyses also showed that the relationships between basic elements of socioeconomic structure and local development preferences varied considerably for a wide range of development activities. Major predictors of shifts in development preferences were found to be those aspects of structure concerning health and education finances, the minority aspect of other rural-farm population, banking deposits, nonresident workforce, education specialty, government debt compared to revenue, and measures of wholesale efficiency.

Results of this research suggest that consideration be given to use of the classification system developed for categorizing RC&D activities; that additional effort beyond measuring program consistency be given to developing an efficient measure of client satisfaction for evaluating program effectiveness; and that the comparative analytical approach presented in this study be considered for application to the RC&D program for use in program management, evaluation, and planning.

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# A DISSERTATION

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## CHAPTER I

#### INTRODUCTION

## Problem Setting

In recent decades, several efforts have been made to stimulate community improvement in rural areas. Several versions of communityoriented development programs have been tried which incorporated various levels and degrees of community involvement and responsibility.<sup>1</sup> Some critical questions facing administrators of those program adaptations concerned the desirability and consequences of local involvement and the strategies and policies for insuring a level of local participation consistent with program needs.<sup>2</sup> This concept of development policy based on the precept that community involvement must be contingent on program needs is one indicator of why a national policy of intervention has conceived and given birth to relatively short run programs. Federal program designers seem to have stressed community adjustment to program requirements. This is a major failing of an intervention policy. While an overall policy to intervene to change the deterioration rate of rural areas is worthy, the objective of community development requires a coordinated, functional approach including a process of

<sup>&</sup>lt;sup>1</sup>James L. Sundquist and David W. Davis, Making Federalism Work, (The Brookings Institution, N.W. Washington, D.C.: 1969), Chapter 5.

<sup>&</sup>lt;sup>2</sup>Kenneth P. Wilkinson, "Special Agency Program Accomplishment and Community Action Styles: The Case of Watershed Development," <u>Rural</u> <u>Sociology</u>, XXXIV, (March, 1969), p. 29.

comprehensive planning and action embracing a wide range of community shortcomings; mobilization of resources of many agencies, public, private, federal, state, and local; and vigorous leadership with more extensive citizen participation.<sup>1</sup> Successful programs, i.e., specific guidelines for community adjustment, involvement, and adherence, must at least allow collaboration and cooperation by the communities and program administrators. Program needs should not be weighted as heavily in development efforts as the community viewpoint. A key to effective, community-oriented, development programs is a concern for a level of local involvement consistent with community needs and objectives.

Community involvement forms the basis of a current rural development program under the auspices of the Department of Agriculture's Soil Conservation Service (SCS). The Resource Conservation and Development (RC&D) program was suggested in the Agriculture Act of 1962 and later defined and authorized in November of that year.<sup>2</sup>

An RC&D project has been defined as:

a locally initiated, sponsored, and directed project designed to carry out a program of land conservation, land utilization, accelerated economic development, and reduction of chronic unemployment in an area where these activities are needed to foster a local economy.<sup>3</sup>

Thus, local people participating in the RC&D program are described as main ingredients for successful analysis, planning, and action processes vital to a well-rounded program of community improvement.

<sup>1</sup>Sundquist and Davis, <u>op. cit</u>., p. 131.

<sup>&</sup>lt;sup>2</sup>Secretary's Memorandum Number 1515, U.S. Department of Agriculture, November 2, 1962.

<sup>&</sup>lt;sup>5</sup>U.S. Department of Agriculture, Soil Conservation Service, <u>Resource Conservation and Development Projects: RC&D Handbook</u>, Washington, D.C., 1972, Sec. 100.2b.

In searching out means for improvement of economic and environmental problems, project sponsors and other citizens voluntarily participating in the program are faced with responsibility for the decision making process. This includes identifying local problems, specifying solutions by formulating and submitting proposals for development measures, and setting local development goals and general priorities. Local citizens are also required to make final decisions as to specific priorities for seeking action on proposed development measures. A generalized view of SCS and local responsibilities is shown in Figure 1.

Each RC&D project is required to complete a project plan summarizing proposals for development actions to alleviate local problems. Development goals are established in this manner. These development proposals represent one measure of development preferences of people participating in the program. A second measure of local preferences is suggested by program response through recorded actions. Annual progress reports for each project list all development proposals for which actions have been taken, but not necessarily completed. Comparison of proposals and actions should reflect one measure of program effectiveness, i.e., consistency, in working toward the general development goals of the RC&D clientele which is the local people and their communities.

The RC&D program has been operating since 1963. Federal policy is that the program be extended where needed, given the local leadership to effectively plan and implement activities necessary to achieve the goals of the program.<sup>1</sup> While the USDA encourages local volunteer leadership to take an orderly, coordinated, natural resource-oriented

<sup>1</sup><u>Ibid</u>., Sec. 100.2c3.

Figure 1.	Primary Soil Conservation Service and Local Client Relationships in an RC&D Area.	ADMINISTRATIVE & PRELIMINARY DECISION MAKING FINAL DECISION MAKING FINAL DECISION MAKING TECHNICAL ASSISTANCE (ACTION INITIATION) DETERMINATION) Soil Conservation Service Clientele Clientele Clientele Clientele Clientele	<ul> <li>Clientele</li> <li>RC&amp;D Council (or area steering committee)</li> <li>of RC&amp;D</li> </ul>	counties & - interpret policies area - reflect problems, goals, & priorities - assimilate new information	<ul> <li>adjust to changes in infor- mation, experience, problems goals, &amp; priorities</li> </ul>	Sponsors - eligible public Final Decision for Action bodies - action measures specified	<ul> <li>Steering</li> <li>Steering</li> <li>Committees</li> <li>Iocal people</li> <li>Iocal people</li> <li>Iocal people</li> <li>Project coordinator</li> <li>epecify goals</li> <li>determine policies</li> <li>&amp; priorities</li> </ul>	
			Soil Conservation Service	State SCS Office	- Area Conservationist	- C&D Project Coordinator	Resource Committees	

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approach to improving economic and evironmental conditions, there is no provision for comprehensively judging the merits of the program in relation to its contribution toward facilitating and effecting a full range of local development preferences. There is also no way in which to judge the effects of variation in the socioeconomic makeup of RC&D projects and the influence that this variation might have on local development preferences. Finally, there are no means for evaluating the implications of structural and preference variation on the administrative and operational aspects of the RC&D program.

A basic problem underlying this research is that of a growing program to encourage development in primarily rural areas without appropriate methods of program analysis and guidelines for program growth. Appropriate information concerning development response to local preferences through the RC&D mechanism, is not readily available and that which exists is slanted toward natural resource aspects of RC&D activities. Many resource development activities being reflected in locally conceived project plans deal directly with improvements of the human condition or social well-being but are not visible in the reporting format currently in use in the RC&D program. In this situation, there is no base for properly analyzing and evaluating either the federal policy for aiding qualified rural areas or the development mechanism for implementing such a policy.

## Purpose of Study

The purpose to which this research is directed is that of formulating a systematic approach to the analysis and evaluation of the RC&D program in relation to program response to local preferences for development and also in relation to determinants of local development

preferences. Major aspects of the research problem can be specified by these questions:

- Is the RC&D program reflecting development preferences held by local citizens participating in planning and other decision making?
- 2. To what extent is variation in the socioeconomic structure of RC&D projects associated with variation in local development preferences?

Of prime concern in this research is the development of a systematic capability to consistently categorize local development preferences suggested by RC&D proposals and resultant actions. A second target concern involves examining relationships between inherent, socioeconomic attributes of RC&D projects and local patterns of development preferences specified within the context of the RC&D program. Development of empirical models to classify RC&D projects with respect to changes in development preferences is desired. A final concern deals with the interpretation of research findings for the purpose of encouraging a more comprehensive analysis and evaluation of the RC&D program. Further, it includes the identification of useful analytical approaches and tools so as to allow their consideration for future applications with regard to the RC&D program or in any feasible situation where it is useful to compare variation in socioeconomic structure to variation in some dependent variable. This research should not be construed as an attempt to evaluate RC&D effectiveness as might be accomplished by analysis of capital investment or employment efficiency stemming from development activities. The only relevant measure of effectiveness pertinent to this study involves the concept of comparing program

response to clientele preferences as revealed by development proposals and actions within the RC&D context, i.e., response consistency.

### Objectives

Meaningful analysis of RC&D activities must take into account an accurate classification of RC&D activities, their variation between projects, and their variation over time, i.e., variable preferences. The following objectives were formulated to strengthen the data base describing RC&D activities and to examine the role of socioeconomic structure in relation to these activities. The primary motive is to enhance the understanding of the program thereby facilitating improvement in overall program administration (management, analysis and evaluation, policy, and program planning) as well as in coordination of and participation in activities at the local level. These objectives are:

 To develop a consistent system for classifying local resource development preferences suggested by local proposals for development and resultant actions.

2. To determine general resource development directions (human vs. natural resource) and specific development emphases of participating local citizens and to analyze the consistency of program response to development preferences.

3. To develop an analytical approach for examining socioeconomic structure and identifying those influences which seem to determine shifts in development preferences.

4. To examine implications of findings of this study for overall program administration (including planning and evaluation), coordination, and participation at the project level.

#### Hypotheses

The following working hypotheses have been formulated to assist in the accomplishment of objectives established for this study:

 Direct relationships exist between program response and local development proposals, which suggest one measure of program effectiveness, i.e., consistency.

2. In specifying development preferences, the behavior of local decision makers is closely associated with socioeconomic attributes of the RC&D projects in which they live.

3. Relationships between development preferences of local decision makers and socioeconomic attributes of their respective areas will differ over a range of development alternatives.

## Assumptions and Limitations

Limitations of this research and resultant findings can be better understood by examining the assumptions which facilitated the analysis of certain aspects of development preferences within the RC&D program and the exploration of their linkages with socioeconomic characteristics of RC&D projects.

A primary assumption involves the propriety of using only development proposals included in project plans as baseline measures of local preferences, as opposed to looking at all proposals made throughout the operation of the project. It is assumed that the research should try to examine shifts in development preferences over time. This is achieved by comparing initial preferences (proposals) with cumulative actions over all years of project operation. This approach does not allow a periodic examination of the influence of time which could act as a dummy variable to express the effect of continued local involvement and the knowledge and experience gained by citizen volunteers in formulating new proposals and initiating actions. Although this is a serious weakness in the research the primary support for the assumption is the analysis of measures of initial and cumulative preferences. Cumulative data collection on proposals would entail a much longer data collection period involving indepth contact with all RC&D projects selected for study.

Another assumption worth noting concerns the degree of importance placed on the measurement of cumulative actions. The actions reported in progress reports for RC&D projects do not constitute completed actions but only those which were initiated. An action can be dropped from a later progress report and would not be identified as such in this research. The justification for the assumption involves a need for a measurement of cumulative action preferences at the latest cutoff date, July 1970.

In all probability there are many weaknesses in the proposed system for classifying resource development activities. There is an entire set of assumptions concerning the types of categories to be included in the system and the decisions necessary to insure consistent classifications. In support of the general assumption that such decisions can be made so as to accurately quantify development preferences at two points in time, it can be stated that some dependence on mutually exclusive categories is necessary. In essence the classification system stands as the cornerstone to this research.

Another general assumption concerns socioeconomic structure. Out of a multitude of variables which could be included in the exploration of socioeconomic structure only a relatively few are to be chosen. The

analyses which depend on and reflect the socioeconomic parameters in this study will be limited by the original variables chosen. The final selection of variables is to be based on the best current knowledge and experience available in the literature and on the judgment of the researcher.

A final set of assumptions concerns the theoretical relationships of socioeconomic structure and with what it may or may not be linked. There is a movement toward general theories of the relation of community socioeconomic structure and decision-making.<sup>1</sup> Recently, researchers have been proposing the hypothesis that socioeconomic structure can be related to specific "issue areas."<sup>2</sup> In accordance with logical positivism in social science, it is suggested that logical consequences or conclusions derived from assumptions of a theory are subject to independent, empirical verification although the general theory may not be verified. Thus, the assumption is made that linkages between different "issue areas" in resource development can be found in and empirically described by socioeconomic structure.

<sup>2</sup><u>Ibid</u>., p. 67.

<sup>&</sup>lt;sup>1</sup>Terry N. Clark, Community Structure and Decision-Making: Comparative Analyses, (San Francisco: Chandler Publishing Company, 1968).

#### CHAPTER II

### **REVIEW OF LITERATURE**

An important aspect of this analysis of local development preferences concerns the involvement of local citizens participating in a rural development program--RC&D. Local participation is not perfunctory, it is central and essential to any accomplishments forthcoming through the program. Local citizens who reside within the established or proposed multi-county RC&D projects and wish to participate in decision making must first become volunteers. After accepting this commitment, they must then assume the responsibility for identifying conditions or problems which might be improved through the program, evaluating local needs, proposing means for achieving improvement or solution to identified problems, and finally stimulating actions for implementation of their proposals. This sequence of grassroots involvement implies an ordering of local development preferences within the context of multigroup decision making. The process of social choice or decision making is therefore an integral element in the social action arena of the RC&D program.

The concept of social action or collective response, in search of an acceptable mix of resource development activities to meet locally defined needs, establishes a relevant basis for examining literature concerning the community. Although RC&D projects often include many counties, the concept of community is still very relevant, as the intent

and purpose of social actions forms the basis for "community." A community has been defined as:

a collective response to conditions of life in a given territory formed by the establishment of social action paradigms necessary to meet common needs of residence, sustenance, and other societal functions.<sup>1</sup>

In addition, the overwhelming importance of social choice or local decision making in improving conditions of life and surroundings added a second major element to the literature review--decision making, not the process itself, but the outcomes.

The third important element in this literature search stems from the RC&D program and how it has spread to embrace a wide range of types of geo-political areas characterized by variant attributes and variant resource development preferences. To gain more understanding of two variant entities, RC&D projects and development preferences, it is logical to pursue a more complete understanding of their individual variations and then search for meaningful associations between the variations. Thus, the review in its final stages turns toward literature concerning analysis of structural variation in geo-political areas and the relationship between socioeconomic variation and variation in decision outcomes.

# The Community: A Social Action Arena

There are many diverse views as to what the concept of community means. Reiss' view of community incorporates collective response in a social action territory based on common needs. A similar view is shared by Wilkinson who has outlined a definition of community which

<sup>&</sup>lt;sup>1</sup>Albert J. Reiss, Jr., "The Sociological Study of Communities," Rural Sociology, XXIV, (March, 1959), p. 118.

he suggests as an aid in the process of clarification, examination, and understanding characteristic aspects of community.

Wilkinson desires that community be recognized as a field of study and that it be clearly defined. His review of several sciences has provided a definition of field which he uses to define community. The attributes of Wilkinson's field or community are: a holistic, interaction nexus, i.e., internally interactional in relation to causes and consequences; unbounded but distinguishable; dynamic, i.e., continuously changing; and emergent, i.e., resulting from its own interactions.<sup>1</sup> Both Wilkinson and Reiss recognize the validity of social interaction as a basis for community definition.

Social action to achieve change is a basic tenet of the RC&D program. A crucial relationship between social action and change is reflected in Wilkinson's statement that:

. . . the eternal fact of change in human societies is to be found in the gap between what people expect and wish to happen, and what actually transpires when they behave and interact with one another!<sup>2</sup>

Local residents must band together for the purpose of making decisions which will influence the magnitude and composition of the changes preferred by these residents. Barkley and Seckler, in relating economic development to environmental decay, have testified to the significance of man's decisions or choices in effecting preferred changes. They recognize the complexity of the societies within which man must act and they suggest the consequential nature of mankind's choices as determinants of his environment and vice versa. They state:

Wilkinson, <u>op. cit.</u>, p. 31.

<sup>2</sup>Ibid., p. 32.

In sum, the environment of the human organism is a complex system of physical, biological, and social mechanisms that must continually adapt to the consequences of man's choices. While man is unique in that he can significantly determine his environment, he is similar to other organisms in that his behavior at any point in time is highly constrained by the environment he has created. Choice not only determines man's immediate welfare, it also determines the various options open to him in the future.<sup>1</sup>

The consequential relevance of mankind's choices within the context of his environment parallels the concept of consequential decision making within the context of the community.

#### Social Structure and Social Action: An Analytical Approach

The works of the aforementioned writers and researchers have been used to establish the important link between community, social action, and decision outcomes. In so doing, the process of resource development, through change based on interactions of community residents, has been reviewed. Other questions remain to be answered. Given the importance of the community and social action, i.e., decision making, what is known about their relationship? Do communities provide clues as to preferred decision outcomes? If so, do such clues exist for resource development preferences? Such questions suggest the importance of establishing a suitable framework for community-oriented research in relation to the process of development.

In proposing a framework for community oriented research, Wilkinson specified that comprehensive development and change requires coordination and social structure differentiation. Differences of values, ideas, and desires within a community must be viewed in some logical, organized manner, achieving an equitable degree of coordination. Such

<sup>&</sup>lt;sup>1</sup>Paul W. Barkley and David W. Seckler, <u>Economic Growth and Envi</u>-<u>ronmental Decay: The Solution Becomes the Problem</u>, (New York: Harcourt Brace Jovanovich, Inc., 1972), p. 6.

coordination aids in the social process of community decision making. The ideal is movement toward a final decision or set of decisions specifying a preferred resource use or allocation. This decision would perhaps yield some optimum level of social welfare or community benefits. In other words, differentiation and coordination within the context of social decision making and action facilitates desired changes within a society, i.e., community.

When community decision making is directed exogenously, the thrust of change is most likely to be through intervention. This approach says that local values and desires must be altered for the sake of the program. Endogenous choice direction is more likely to be collaborative in nature, allowing a closer coordination between local planning and choice processes. Goodenough recognizes the value of local inputs as he writes that "the best customers for community development are those with a need they are themselves aware of."<sup>1</sup> To extend this toward Wilkinson's view, the degree of community involvement in decision making is a function of the importance of the need for material and human resources to obtain community development goals. It is also a function of the need to legitimize a development program or thrust. Community involvement hinges on the need to achieve a congruence with the values of democratic society. Although Wilkinson uses resources, legitimation, and value congruence as means to justify local participation in decision making within the context of a governmental program, the very same conceptual framework would hold for any community oriented development or improvement effort.<sup>2</sup> That is, if

<sup>2</sup>Wilkinson, <u>Rural Sociology</u>, XXXIV, No. 1, <u>op. cit</u>., p. 35.

<sup>&</sup>lt;sup>1</sup>Ward Goodenough, <u>Cooperation and Change</u>, (New York: Russell Sage Foundation, 1963), p. 309.

some local project is needed, e.g., library or sewer extension, local participation in decision making through bonding or millage votes or through public meetings would lend to the probability of success for the project.

With regard to research of local participation in the local choice or decision making process Wilkinson says:

Among the many variables to be considered as a state or federal agency plans a special interest, development program within a given local society, the one which has received perhaps the least attention in research is the extent of local participation in decision making to be encouraged or permitted in the program.<sup>1</sup>

This statement should not be limited to a state or federal agency, but should include even locally oriented and initiated plans for improvement as per the examples of the library and sewer extension used above. However, while identifying the extent of local participation in the choice or decision making process as inherently important, Wilkinson fails to give recognition to the importance of community influences or attributes on community preferences.

A. J. Reiss has written that community research generally fails to apply the scientific comparative approach and techniques of multivariate analysis in their design and execution.<sup>2</sup> Furthermore, he believes that there is no systematic approach to the study of diverse community problems, community attributes of these problems, and their community variation. He calls for the characterization of communities in terms

<sup>2</sup>Albert J. Reiss, Jr., "The Sociological Study of Communities," Rural Sociology, XXLV, No. 2, (March 1959), p. 126.

<sup>&</sup>lt;sup>1</sup><u>Ibid</u>., p. 35.

of their attributes and for comparative analyses to show how such attributes affect decision making in the community.<sup>1</sup>

Peter Rossi substantially agrees with Reiss with regard to the relevance of studies of the social environment of decision makers and the decision making process. However, he contends that it is also relevant to examine the characteristics of the decision makers themselves and their relation to decision outcomes.<sup>2</sup> He supports Reiss' comparative analysis position and argues that understanding of particular decisions should receive less emphasis than the understanding of tendencies within classes or types of decisions. He suggests comparative research of: decision makers of different types; different community and institutional settings; and a range of issues.<sup>3</sup> The comparative, community research approach is also supported by Summers, Clark, and Seiler who recognize that we know a great deal about communities, but what we know does not add up to a coherent, systematic body of propositions, concepts, and explanations which can be recognized as a sociological theory of community.<sup>4</sup> Comparative analysis seems to be a reasonable approach to understanding the community and inherent influences on social choice.

<sup>1</sup><u>Ibid., p. 129.</u>

<sup>2</sup>Peter H. Rossi, " Community Decision Making," <u>Administrative</u> <u>Science Quarterly</u>, I, No. 4, (March 1957), p. 415.

<sup>3</sup><u>Ibid</u>., pp. 438-39.

<sup>4</sup>Gene F. Summers, John P. Clark, and Lauren H. Seiler, "The Renewal of Community Sociology," <u>Rural Sociology</u>, XXXV, No. 2, (June 1970), p. 218.

#### Research Methods

Given a feasible framework for comparative research on community attributes and issues the question remaining is, what is relevant to know? Relevance, in this case, is anything that will aid the understanding of the influence of community attributes on the choices, decisions, or tradeoffs communities must make to satisfy their demands for improvement through change.

In response to the need for a scientific comparative approach and the use of more meaningful multivariate analytical techniques, the advent of the 1960's brought a flurry of comparative, structural studies directed toward multi-county, geo-political areas. These comparative studies facilitated the identification of attributes which seemed to be most relevant to area differentiation. The basis of this new comparative thrust can be traced back to 1941 work by Hagood, Danilevsky, and Beum.<sup>1</sup> In this work, factor analysis, a relatively new analytical technique in sociology, was used to group geo-political areas. Factor analysis was seen to be a valuable tool for exploring socioeconomic structure by reducing exceedingly complex relationships within a set of variables to more understandable proportions. This was similar to its role in psychology.

Daniel Price recognized the value of factor analysis for comparative structural studies and in 1942 he published results of factor analysis of characteristics of 93 American cities with populations of

<sup>&</sup>lt;sup>L</sup>Margaret J. Hagood, Nadia Danilevsky, and Merlin O. Beum, "An Examination of the Use of Factor Analysis in the Problem of Subregional Delineation," <u>Rural Sociology</u>, 6. (September 1941), pp. 216-233.

100,000 as of 1930.<sup>1</sup> One purpose of his writing was to further expose the academic world of sociology to the concept and value of factor analysis. Although he used static measures of metropolitan population and area characteristics, he recommended the use of measurements of changes in such characteristics. He suggested that such an approach would be meaningful in explaining and predicting social change.

Although factor analysis continued to be used in comparative studies in education and psychology in the next two decades, little progress was made in advancing comparative community studies. Then in 1961, Johassen and Peres published factor analytic research which sought to simplify the complex structure of communities. Eighty-two census measurements (1950 data) for 88 Ohio counties were analyzed and reduced to seven basic elements characterizing differences between counties.<sup>2</sup>

Also in the early 1960's, Hadden and Borgatta published their parallel factor analyses of census measurements on 644 American cities. These cities, with populations of 25,000 or more as of 1960, were grouped into eight combinations: all cities; four sets of cities grouped according to size; and three sets of cities grouped according to a location rule.<sup>3</sup> Sixty-five census measurements were reduced to fourteen basic factors or elements of urban structure. The eight parallel factor analyses allowed comparisons of structural differences.

<sup>1</sup>Daniel O. Price, "Factor Analysis in the Study of Metropolitan Centers," <u>Social Forces</u>, XX, No. 4, (May 1942), pp. 449-455.

<sup>2</sup>Christen T. Jonassen, "Functional Unities in Eighty-eight Community Systems," <u>American Sociological Review</u>, XXVI, No. 3., (June 1961), pp. 399-407.

<sup>3</sup>Jeffrey K. Hadden and Edgar F. Borgatta, "The Factor Analytic Structure of American Cities," <u>American Cities: Their Social Charac-</u> teristics, (Chicago: Rand McNally and Co., 1965).

In a follow-up to the Jonassen and Peres work, Munson, in 1965, presented the results of a second factor analytic study of 88 Ohio counties, using 113 1960 census measurements.<sup>1</sup> Munson, as did Jonassen and Peres, found seven basic elements of community structure, four closely paralleling the earlier findings: urbanism, socioeconomic level, population growth, and governmental expenditures. Munson tentatively suggested these may represent the most fundamental elements or dimensions of the community.

In the late 1960's Bonjean, Browning, and Carter responded to the well documented need for comparative community research with their factor analytic study of all counties in the 48 contiguous states.<sup>2</sup> They chose 79 census measures, 46 of which were identical or similar to those used by Hadden and Borgatta. They searched for refinements in the lists of variables forming the basic dimensions or elements of community structure. In their analysis, they found considerable parallelism with results of Hadden and Borgatta and Jonassen and Peres. They found 15 basic community dimensions, twelve of which compared similarly to those in the other studies.

The thrust and progress in comparative research in community structure in the decade of the 1960's set the stage for a melding of two concepts--community structure and what it can say about community action. Green and Mayo, in their research of actions of community groups in the early 1950's, recognized that structural studies were

<sup>&</sup>lt;sup>1</sup>Byron E. Munson, "Structural Analysis of the Community," <u>Rural</u> <u>Sociology</u>, XXXLLL, No. 4, (December 1968), pp. 450-459.

<sup>&</sup>lt;sup>2</sup>Charles M. Bonjean, Harley L. Browning, and Lewis F. Carter, "Toward Comparative Community Research: A Factor Analysis of United States Counties," <u>Sociological Quarterly</u>, X, No. 2, (Spring, 1969), pp. 157-176.

fundamentally important but generally had not been very fruitful for predicting actions of organized social groups.<sup>1</sup> Although predictive structural analysis was found useful in classifying individual behavior and its determinants very early in psychology; only in the late 1960's was comparative community research through factor analysis recognized as an integral aspect of predictive studies of social choice.

In 1968, Kevin Cox published research relating the geography of political party preference and participation to various characteristics of the population of metropolitan London.<sup>2</sup> Factor analysis was used to define socioeconomic dimensions used in the development of causal models of political affiliation and participation. Cox's work is particularly relevant because voter behavior is an essential element of policy formation.

The advances in comparative research at the geo-political or community level urged political scientists into proposing new hypotheses concerning public policies and political system characteristics. Traditional variables in widely different political systems, e.g., electoral and institutional circumstances, did not explain much of the variation in public policy. In 1969, Sharkansky and Hofferbert published comparative research on the dimensions of state politics, economics, and public policy using factor analysis. They provided a basic statement upon which much current research is founded. They stated:

<sup>&</sup>lt;sup>1</sup>James W. Green and Selz C. Mayo, "A Framework for Research in the Actions of Community Groups," <u>Social Forces</u>, XXXI, No. 4, (May, 1953), p. 320.

<sup>&</sup>lt;sup>2</sup>Kevin R. Cox, "Suburbia and Voting Behavior in the London Metropolitan Area," <u>Annals</u>, Association of American Geographers, LXIII, (March, 1968), pp. 111-127.

. . . our findings show that different social and economic characteristics have different relevance for policies, and their relevance varies between substantive areas of policy.<sup>1</sup>

This position recalls the Rossi position of the late 1950's that the understanding of tendencies within types or classes of decisions may be the key to understanding social action.<sup>2</sup> Adelman and Morris' work in the mid-1960's preceeded the Sharkansky and Hofferbert research.<sup>3</sup> It dealt with social, political, and economic relationships. They sought to understand developmental processes in under-developed nations by means of a factor analytic, comparative approach. Although their main objective concerned dimensions of economic development, they added encouragement for further, important, comparative research at the are level.

In 1967, P. T. Cox published comparative research findings from a study of small watershed developments in Oklahoma.<sup>4</sup> This consisted of the usual exploration of a large socioeconomic data set and its reduction to a small number of dimensions accounting for most of the variance in the original set. Cox, however, pushed further with his comparative studies, breaching the gap between techniques in community studies and psychological and educational techniques. He employed the results of factor analysis in the classification of watersheds by discriminant analysis. The combination of the two techniques,

<sup>&</sup>lt;sup>1</sup>Ira Sharkansky and Richard I. Hofferbert, "Dimensions of State Politics, Economics, and Public Policy," <u>American Political Science</u> <u>Review</u>, LXIII, No. 3, (September, 1969), p. 867.

<sup>&</sup>lt;sup>2</sup>Rossi, <u>op. cit.</u>, p. 415.

<sup>&</sup>lt;sup>3</sup>Irma Adelman and C. T. Morris, <u>Society, Politics and Economic Deve</u>lopment: <u>A Quantitative Approach</u>, (Baltimore: John Hopkins Press, 1967).

<sup>&</sup>lt;sup>4</sup>P. Thomas Cox, "A Sociological Analysis of Upstream Watershed Development in Oklahoma," (unpublished Ph.D. dissertation, Graduate College, Oklahoma State University, 1967), 141 pages.

factor and discriminant analyses, allowed the derivation of models which would predict classification probabilities for small watershed development based on socioeconomic data.

In the late 1960's another Rossi position gained some support. Rossi firmly believed that the comparative research approach should not be limited to community characteristics. He asked that the decision makers, the members of social action groups, be examined in light of their decisions.<sup>1</sup> In 1968, Kivlin and Fliegel published comparative research of Pennsylvania farmers suggesting that the way in which a farmer relates to his business may be at least as important as perceptions and stimuli in accounting for their behavior in the adoption of agricultural technology.<sup>2</sup> This work represents a part of the breakthrough into comparative research on decision makers.

Then in 1972, Smith and Martin analyzed the association between socioeconomic attributes and the behavior of cattle ranchers.<sup>3</sup> As in P. T. Cox's work, they applied factor and discriminant techniques. Findings included classification probabilities showing the degree of accuracy of the classification of ranchers based on their socioeconomic characteristics and views.

<sup>2</sup>Joseph E. Kivlin and Frederick C. Fliegel, "Orientations to Agriculture: A Factor Analysis of Farmers' Perceptions of New Practices," <u>Rural Sociology</u>, XXXIII, No. 2, (June, 1968) pp. 127-140.

<sup>3</sup>Arthur H. Smith and William E. Martin, "Socioeconomic Behavior of Cattle Ranchers, with Implications for Rural Community Development in the West," <u>American Journal of Agricultural Economics</u>, LIV, No. 2, (May, 1972), pp. 217-225.

<sup>&</sup>lt;sup>1</sup>Rossi, <u>op. cit</u>., p. 415.

#### Literature Review Conclusions

Over time, the value of comparative research in community and group structure has been borne out. The technique of factor analysis, developed for description and classification in psychology, has proved invaluable in the study of structure in the community as well as group context. The comparative research possible with factor analysis, when combined with the classification capabilities of discriminant analysis overcomes many of the problems of deriving empirical models for explaining the behavior of social groups.

Given this review, one conclusion is that comparative structural research should be performed on socioeconomic attributes of selected RC&D projects. Factor analysis should be used to reduce a large socioeconomic data set to a set of basic dimensions summarizing or accounting for most of the variance in the original data. This would identify similarities and differences between projects. A second conclusion is that empirical models should be derived which depict relationships between shifts in resource development preferences, i.e., decision maker behavior, and socioeconomic structure of RC&D projects. This can be done by discriminant analysis. The procedure is to group the RC&D projects according to their known shifts in resource development preferences and use this as a dependent variable in conjunction with each projects' measurements on elements of socioeconomic structure to find those equations which best reproduce the actual, known groupings. Resultant equations will depict relevant functional relationships between structure and various classes or categories of development emphasis. Such equations can be used to predict shifts in development preferences in new or proposed RC&D projects.

#### CHAPTER III

## **RESEARCH PROCEDURES**

This chapter presents an overview of data requirements and statistical techniques necessary to carry out a comparative analysis of community socioeconomic structure and the identification of linkages between structure and tendencies for development preference shifts within certain types or classes of development decisions.

In the review of literature, it was noted that concerted social action or collective response by representatives of a particular geopolitical area defines that area as a community. Thus by definition a community is an arena for social action. The RC&D program with its emphasis of local, collective decision making fits well this definition of community. The literature review also followed the development of a comparative analytical procedure for examining socioeconomic structure of geo-political areas, i.e., communities, and suggested the need for this type of research in view of an apparent lack of solid theory of community. <sup>1</sup>

The review discussed many examples of comparative analyses and emphasized the relevance of factor analysis for exploring and defining important aspects of community structure. Relevant findings concerning the relation of variation in community structure to variation in substantive areas of policy, (see Sharkansky and Hofferbert, et. al.),

<sup>1</sup>Summers, Clark, and Seiler, <u>op. cit</u>., p. 218.

issue areas (see Clark), and tendencies within classes of decisions (see Rossi) are presented. Another statistical technique, discriminant analysis, was identified as a key to pinpointing the linkages between structure and development preference shifts in classes of decisions or issue areas.

Two necessary types of data are essential to the comparative research proposed for this study. First, a set of data which clearly defines substantive issue areas or classes of decisions occuring within the RC&D program is needed. This set of data is developed by review of records of RC&D development preferences. Numbers and types of development proposals are categorized and counted. The same is done for actions initiated. The second set of data consists of an array of socioeconomic measurements of community structure. Selection of variables to include in this set is based on the review of literature.

#### Data Requirements

To realistically evaluate program response to community needs as indicated by development preferences and to specify important relationships between socioeconomic structure and shifts in preferences, a consistent classification system is needed with which to categorize these preferences. The development classification scheme used by the Soil Conservation Service, USDA, in the RC&D program does not allow for clear, concise consideration of a wide range of community preferences, thus making the evaluative process uncertain. Activities covered by the SCS system are closely aligned with the natural resource-oriented program offerings. In addition, many development proposals offered and actions desired by local citizens do not fit into mutually exclusive categories and thus cannot be considered for analysis and evaluation

in terms of initial development preferences versus resultant program actions. Meeting the objectives of this research requires two basic types of data. First, data describing local resource development preferences across 48 RC&D projects are necessary. Secondly, data describing the structure or socioeconomic makeup of these project areas must be examined.

#### Development Preference Data

Local development preferences were obtained by reviewing project plans which specify development proposals and progress reports which specify resultant actions. Preferences determined in a context of local decision making have been found to embrace a wide range of activities including such things as further detailed studies of various proposals, requests for assistance from various agencies, planning and technical assistance, and cost sharing. It is assumed that an accounting of development proposals and resultant actions can provide enough data to evaluate the consistency with which the RC&D program responds to locally determined needs.

Quantification of local development preferences requires a classification system for consistently categorizing proposals and actions. Review of the SCS system revealed several major weaknesses which hindered attempts to adequately evaluate RC&D response in view of the implied comprehensive rural development mission of the program. The system used by SCS for classifying RC&D activities is shown below:

Accelerated resource developments Agricultural water management developments Recreation developments Wildlife developments Watershed projects (under Public Law 566) Water developments other than P.L. 566

Land and critical area stabilization Special resource studies and inventories Highways, scenic highways, trails, and roads Range improvement groups and associations Agricultural and wood using processing and marketing industries Other industries Public service facilities (hospitals, schools, sewage systems, etc.) Industrial parks Rural water lines Rural sewer systems Beautification Education measures Other measures not classified Accelerated soil surveys Accelerated conservation planning Accelerated land treatment Accelerated land conversion: cropland to grass and woodland

One major problem presented by this type of framework is that some categories overlap. Examples are Accelerated land treatment and Land and critical area stabilization. Both deal with land and its treatment. Secondly, some categories are too general as exemplified by Accelerated resource developments and Special resource studies and inventories. Measures grouped by these categories would have no unity of intent. A third problem is that some categories are too specific. Rural water lines and Rural sewer systems are good examples. These types of problems present serious dilemmas for program analysis which requires unity of intent in each category entering into the analysis. One attempt to achieve unity of intent through mutually exclusive categories is discussed below.

A major study of 48 RC&D work plans was undertaken in recognition of the serious problems in the SCS classification system. The objective was to build a framework that would serve as a reliable classification instrument for any type of development proposal. To solve the problem of ensuring mutually exclusive categories, the basic intent or concern of each proposal was used as the primary decision criterion for classification purposes.
Study of the work plans revealed two major areas of concern. Proposals which were directed toward improvement of the human condition were grouped together as human resource measures. Those proposals primarily directed toward improvement in the natural condition were grouped as natural resource measures. These two major groups are defined to represent resource development directions. Further categorizations were made within the human and natural resource groupings using mutual exclusiveness and basic intent as the decision rule. The end result was seven categories in each of the two major groupings. Together these 14 categories provide the basis for evaluation of program effectiveness and for examining the relationships between socioeconomic structure and shifts in development preferences. The entire classification system is presented in Table 1. A listing of basic concerns is provided for each category. These acted as the criteria for classifying proposals and actions.

In summary, the 14 category classification system is designed for use in quantifying local development preferences as indicated by basic intent of proposals and as reflected by actions occurring within the RC&D context. In classifying a proposal or action, two questions were asked. Is this an attempt to improve a human or natural condition? Assuming a satisfactory decision on this, what is the basic intent of the proposal? This final decision serves to properly classify the proposal or action.

## Socioeconomic Structure Data

Meaningful analysis and evaluation of the RC&D program will have to take into account variation between RC&D projects with regard to preferences and program response. One means of so doing is to relate

## TABLE 1

## Classification System for Categorizing Development Activities

### Human Resource Related

- 1. Education
   elementary and secondary
   college
   adult
   vocational
- Health and Medical Services medical personnel medical facilities medical programs
- Industry lack of management personnel lack of development
- 4. Employment low wages lack of job training seasonal work lack of industry and business
- 5. Transportation highways and roads harbors and channels rail facilities air facilities
- 6. Housing shortage dilapidation presence of vacation housing housing development controls
- 7. Community Facilities and Services water supply and distribution systems police and fire service urban improvements business services historical and cultural improvements sewage and treatment and disposal systems

## Natural Resource Related

- Environment air pollution loss of natural beauty changing land use
- 2. Land erosion lack of soils data land development
- 3. Water pollution flooding drainage
- Agriculture management farm size and ownership land use and treatment marketing
- 5. Forestry management timber quality and species marketing land ownership
- 6. Recreation management land and water use conflicts public access underdevelopment overdevelopment financing
- 7. Planning and Development comprehensive planning land use planning development controls or guidelines

Source: Developed for this study from a review of 48 RC&D project plans.

variation in the makeup of RC&D projects to variation in shifts in local development preferences. Area analysis is implied. Insight into patterns of development which reflect local needs requires research of the involved areas. Some researchers stress the need for examination of variation in community attributes which affect human behavior and decision making while others call for indepth research into the characteristics of decision makers, their social environment, and the decision process itself.<sup>1</sup> Most researchers, however, recognize the importance of relevant community attributes. This study focuses on such attributes and their association with resource development preferences within the context of the RC&D program.

Review of literature pertaining to voter preferences, community and regional structure, and decision making suggested a wide range of variables that could be valuable in examining the association between development preferences and socioeconomic structure. In all, 76 variables were chosen for the structural analysis of the 48 RC&D projects in the study. All are displayed in Table 2. These county-level census measurements were collected for all of the 297 counties included in the selected RC&D projects. All variables were transformed to represent multi-county attributes in accordance with project boundaries. Percentages, rates, and averages were used whenever possible to partial out any dramatic influences of size of raw data figures. This procedure was followed as past studies have shown that the amount of variance of a variable may be a direct function of its size. While rates and averages may have little or no relationship to size, they are useful

<sup>&</sup>lt;sup>1</sup>Reiss, <u>op. cit.</u>, p. 119. Also see Peter H. Rossi, "Community Decision-Making," <u>Administrative Science Quarterly</u>, I, No. 4 (March, 1957).

# TABLE 2.

# Socioeconomic Variables Selected for Structural Analysis

Number	Description	Data Type
1.	total population in 1960	population
2.	% population change 1950 to 1960	•••
3.	% population change due to migration, 1950 to 1960	**
4.	% population change due to natural increase 1950 to 1960	
5.	population density, 1964	11
6.	% change in number of families, 1950 to 1960	**
7.	% population voted in 1960	**
8.	% urban population, 1960	resident type
9.	% population rural-farm, 1960	"
10.	% population rural-farm white, 1960	
11.	% population rural-farm negro, 1960	11
12.	% population rural-farm other, 1960	11
13.	% population in group quarters, 1959	**
14.	% population minority, 1960	ethnicity
15.	% population foreign born, 1960	11
16.	% population foreign stock, 1960	11
17.	% population under 5 years, 1960	age
18.	% population over 65 years, 1960	"
19.	% population 21-65 years, 1960	**
20.	median age of population, 1960	11
21.	change in median age, 1950 to 1960	11
22.	% population of voting age, 1960	"
23.	per capita income, 1959	income
24.	median family income, 1959	**
25.	% change in family income, 1949 to 1959	11
26.	% family incomes of \$3,000 or less, 1959	**
27.	% family incomes of \$10,000 or more, 1959	**
28.	number of cars per capita, 1960	11
29.	<pre>% population 5-34 years old in elementary school,</pre>	
	1960	education
30.	<pre>% population 5-34 years old in high school, 1960</pre>	11
31.	% population 5-34 years old in college, 1960	**
32.	<pre>% population completed 5 grades or less, 1960</pre>	11
33.	<pre>% population 25 years old or more completed high</pre>	
	school, 1960	17
34.	median years of education, 1960	11
35.	<pre>% population 21-65 years old in labor force, 1960</pre>	labor force
36.	% civilian labor force male, 1960	**
37.	% civilian labor force female, 1960	**
38.	% labor force white collar, 1960	**
39.	<b>% of employed working outside home county,</b> 1960	**
40.	% employed 13 weeks or less, 1959	11
41.	% labor force employed in agriculture, 1960	**
42.	% labor force employed in manufacturing, 1960	**
43.	% labor force employed in construction, 1960	**

# TABLE 2.

# (continued)

Number	Description	Data Type
44.	% labor force employed in retail and wholesale trade,	
	1960 * Johan former employed in finance incurrence and	labor force
43.	real estate 1960	
46.	<sup>%</sup> labor force employed in educational services, 1960	11
47.	% labor force employed in public administration.	
	1960	**
48.	property tax per capita, 1962	revenue and
		expenditures
49.	general expenditure per capita excluding capital	
	outlay, 1962	**
50.	% general expenditures for education, 1962	11
51.	% general expenditures for highways, 1962	
52.	% general expenditures for public health and hospitals	5,
50		
53.	% debt of government revenue, 1962	
54.	7 revenue for education, 1962	
)). 54	% revenue for highways, 1962	
JO. 57	& revenue for public nealth and nospitals, 1962	
50	wholegale calce per employee, 1963	productivity
50.	wholesale sales per employee, 1905	
J <b>J</b> .	ing 1063	"
60	retail cales per employee 1063	**
61.	selected services sales per employee 1963	
62.	Z occupied houses with washer 1960	housing
63.	% occupied houses with freezer, 1960	"
64.	<b>%</b> occupied houses with air conditioning, 1960	
65.	% occupied houses with television. 1960	**
66.	% occupied houses with telephone, 1960	**
67.	% occupied houses with car, 1960	11
68.	% commercial farms with sales of \$10,000 or more,	
	1964	agriculture
69.	% parttime farms of commercial farms, 1964	"
70.	% farm tenancy, 1964	11
71.	% change in farm size, 1959-1964	11
72.	% farm operator households with non-farm income,	
	1964	11
73.	farm family living index, 1959	11
74.	% time deposits of total deposits, 1964	banking
75.	% demand deposits of total deposits, 1964	**
76.	% change in bank deposits, 1960-1964	14

in that they may measure somewhat less obvious but perhaps more relevant portions of differences.<sup>1</sup>

### Statistical Methods

Development Preference Consistency

The product of resource development decision making is viewed at two points in time. First, development proposals were classified and counted. The same was done for development actions resulting from the proposals. In order to evaluate the effectiveness of the RC&D program relative to program response to local proposals, comparisons of proposals and actions were made. For each project, a set of rankings was established for proposals and another for actions. These rankings were based on a 14 unit scale corresponding to the 14 development categories of the classification system. The association between proposal rankings and action rankings was tested by Spearman's rank correlation statistic.<sup>2</sup> With this statistic, the degree of association of rankings is represented by the magnitude of the correlation coefficient. The direction of the relationship between rankings is indicated by the sign of the coefficient.

Socioeconomic Structure and Development Preferences

In the past, many studies have focused on the social and economic structures of various types of geo-political areas. Numerous studies of characteristics of decision makers and their decisions have also been completed. However, little research has been directed toward deriving

<sup>1</sup>Hadden and Borgatta, op. cit., p. 34.

<sup>&</sup>lt;sup>2</sup>Sidney Seigel, <u>Nonparametric Statistics for the Behavioral</u> <u>Sciences</u>, McGraw Hill Series in Psychology, (New York: McGraw-Hill Book Company, 1956).

models which may aid our understanding of the influences and importance of socioeconomic structure in the outcome of local resource development decision making. A basic question is, what are the primary elements of socioeconomic structure of these essentially rural RC&D projects? Another is, to what degree do various elements of socioeconomic structure seem to be associated with shifts in various resource development preferences?

The literature review has identified one analytical method which has proved fruitful in examining socioeconomic structure of geopolitical areas--factor analysis.<sup>1</sup> Factor analysis is the generic name for a variety of procedures developed for analysis of intercorrelations within a set of variables, and for facilitating the discovery of regularity, order, and patterns of variation present in many observations on many variables. Principal component analysis is a useful factor technique for determining the minimum number of linear, independent dimensions (factors) needed to account for most of the variance in the original set of observations and is used in this study. This particular technique not only reveals how several measures (socioeconomic variables) can be combined to produce maximum differentiation among cases along a single socioeconomic factor, but also often reveals that several independent factors are required to adequately define the domain or socioeconomic structure under investigation.

Factor analysis can be used and has been in this research, to: untangle linear relationships into separate patterns with each pattern appearing as a factor delineating a distinct cluster of interrelated data; reduce a mass of information to its essential meaning; discover

<sup>&</sup>lt;sup>1</sup>R. J. Rummel, <u>Applied Factor Analysis</u>, (Evanston: Northwestern University Press, 1970).

the basic structure of a given domain; develop an empirical typology for classification or description; transform data to meet the assumptions of other analytical techniques; and explore.<sup>1</sup>

The literature also suggested a technique for analyzing linear relationships between discovered elements of socioeconomic structure of RC&D projects and shifts in local development preferences-discriminant analysis.<sup>2</sup> This technique is used to find linear combinations of variables that maximize the ratio of among-groups to within-group variability. It produces an optimum discriminant function for a two-group situation that includes a linear combination of variables capable of discriminating between two groups better than any other linear combination.<sup>3</sup> The probabilities of each case having come from each group are computed and used for evaluating the classification of an area in a given group. Multi-group discrimination is possible but was not feasible for this research.

Discriminant analysis has the general capability to: test for significant differences among average score profiles of two or more a priori defined groups, assuming multi-normal distributions and equal dispersions; determine which variables account for most of the intergroup differences in average profiles; find linear combinations of variables which allow the representation of groups by maximizing amonggroups relative to within-group separation; and establish models for

<sup>1</sup><u>Ibid</u>, p. 449.

<sup>2</sup>Maurice M. Tatsuoka, <u>Multivariate Analysis</u>: <u>Techniques for</u> <u>Educational and Psychological Research</u>, (New York: Wiley, 1971).

<sup>3</sup> and David V. Tiedeman, "Discriminant Analysis," <u>Review</u> of Educational Research, XXIV, No. 5, (December, 1954), p. 402.

assigning new individuals whose profiles, but not group identity, are assumed to be from one of the a priori defined groups.<sup>1</sup>

For each RC&D project development proposals and resultant actions were compared for each of the 14 development categories. For any given category, if a project's percentage share of development actions was found to be greater than the corresponding share of proposals, that project was said to have emphasized that particular type of development. Thus, for each development category it is possible to obtain two groups of projects--one group that has emphasized and one that has not.

Discriminant analysis uses measurements on each socioeconomic factor discovered through factor analysis to discriminate between the two groups of projects for each development category. The result is a best, linear equation for the group emphasizing the activity and a corresponding equation for that group not emphasizing the given activity. These equations are derived for each specific development activity. They are also derived for the two group situation formed by grouping the projects with respect to their emphasis of human versus natural resource development. As in the 14 categories, the term "emphasis" is used to indicate a percentage share increase in actions as compared to the corresponding share of proposals. The overall concept behind the discriminant analyses in this research is the discovery of the magnitude and direction of relationships between socioeconomic structure and shifts in development preferences quantified by the use of the 14 category system for classifying resource development activities.

<sup>&</sup>lt;sup>1</sup>Paul Green and Donald Tull, <u>Research for Marketing Decisions</u>, 2nd ed., (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1970), p. 368.

In summary, two analytical techniques, factor and discriminant analysis, are combined to produce equations which serve to identify seemingly functional relationships between socioeconomic structure and development preferences as measured by changes in emphases of development activities in RC&D projects across the Nation. A major advantage these techniques offer is the capability of assessing and predicting qualitative dependent variates, i.e., Yes or No emphasis groupings representing tendencies toward development preference changes, from a set of quantitative independent variates representing socioeconomic structure of geo-political areas.

#### CHAPTER IV

#### COMPARATIVE ANALYSIS

### Resource Development Preferences

Examination of local resource development preferences began with the review and analysis of development proposals and actions. Proposals are presented by the local people in the major planning documents of their respective RC&D projects and resultant actions are recorded in corresponding cumulative progress reports. Forty-eight RC&D projects across the Nation were selected for study. These were operational for a period of years between 1963, when the first ten RC&D projects were authorized, and 1970, the cutoff date for the analyses in this study. The projects selected for study are shown in Table 3.

## Resource Development Directions

Study of 48 RC&D planning documents resulted in the classification of 8,341 development proposals. Corresponding progress reports contained records of 6,590 measures acted on through the intiiative of local participants and their respective project coordinators. These data revealed a strong, natural resource preference in development. Overall, two-thirds of all proposals and actions were classified in natural resource-related categories. In each of the projects studied, natural resource-related proposals and actions outnumbered those primarily concerned with human resource conditions. However, when the percentage shares of human and natural resource proposals and actions of each

## TABLE 3.

	RC&D Areas	<u>State</u>	Included Counties
_			-Number-
1.	East Connecticut	Connecticut	3
2.	St. John - Aroostook	Maine	2
3.	North Country	New Hampshire	3
4.	East Central Vermont	Vermont	4
5.	South Central New York	New York	7
6.	Seneca Trail	New York	3
7.	Penn Soil	Pennsylvania	4
8.	Endless Mountains	Pennsylvania	5
9.	Shawnee	Illinois	14
10.	Lincoln Hills	Indiana	4
11.	Northwest Michigan	Michigan	13
12.	Buckeye Hills	Ohio	5
13.	Pri Ru Ta	Wisconsin	10
14.	Lumberjack	Wisconsin	9
15.	Sunflower	Kansas	7
16.	Top of the Ozarks	Missouri	5
17.	South West Missouri	Missouri	10
18.	West Central Minnesota	Minnesota	5
19.	Onanegozie	Minnesota	4
20.	Randall	South Dakota	3
21.	Black Hills	South Dakota - Wyoming	9
22.	North Central Piedmont	North Carolina	6
23.	Low Country	South Carolina	6
24.	Crossroads	South Carolina	6
25.	Little Kanawa	West Virginia	5
26.	Mountain Dominion	West Virginia - Virginia	5
27.	Coosa Valley	Alabama	7
28.	Wiregrass	Alabama	9
29.	Tradewater River	Kentucky	9
30.	Southeast Delta	Mississippi	7
31.	Northeast Mississippi	Mississippi	20
32.	Hull - York Lakeland	Tennessee	11
33.	Arkansas River Valley	Arkansas	10
34.	Ozark Foothills	Arkansas	5
35.	Trail Blazer	Louisiana	4
36.	Cherokee Hills	Oklahoma	3
37.	Southeast Texas	Texas	11
38.	Eastern Hill Country	Texas	3
39.	Western Wyoming	Wyoming - Idaho	4
40.	Box Elder	Utah - Idaho	3
41.	North Idaho	Idaho - Washington	5
42.	Upper Willamette	Oregon	4
43.	Northern Rio-Grande	New Mexico	8
44.	South West New Mexico	New Mexico	3
45.	Central Nevada	Nevada	5
46.	North California	<b>Nevada - Cal</b> ifornia	5
47.	Sangre De Cristo	Colorado	5
48.	Bitter Root	Montana	2

Resource Conservation and Development Projects Selected for Study

project were considered, directional shifts toward human resource preferences were found in twenty-seven or 56 percent of the projects.

### Resource Development Emphases

Overall development emphases were determined by comparing percentage share of all proposals for each development category with the corresponding share of actions. These percentages are shown in Table 4. Increased shares, indicating slight shifts in development preferences, were found for Education, Industry, Housing, Land, Agriculture, and Recreation. In the process of converting proposals into actions, over half the studied areas were found to have increased their emphasis in five development categories: Education, Housing, Environment, Land, and Recreation. The distribution of RC&D projects' emphasis shifts is provided in Table 5.

#### A Measure of Program Effectiveness

One measure of the effectiveness of a rural development program such as RC&D is the identification and quantification of measurable economic impacts of development-related activities, i.e., capital investment and job creation. This is the traditional type of measure used to judge program success. This approach is beyond the scope of this study.

This research is directed toward the local context. The measure of effectiveness chosen concerns the degree to which program response through initiated actions corresponds to local development proposals drawn up in accordance with locally identified problems and needs. The assumption has been made that the intense process of problem and need specification provides one rather accurate picture of local development preferences. A second, time-lapse picture of such preferences is

Development Emphases :	Percenta			
Human Resource	Proposals	ge Share Actions	Ranki Proposals	ngs Actions
Human Resource :				
Human Resource :				
Education :	2.4	2.7	11	6
Health and Medical Services :	1.5	1.3	12	13
Industry :	4.6	5.4	9	Ś
Employment :	0.5	0.2	14	14
Transportation :	6.2	5.1	2	9
Housing :	1.2	1.9	13	12
Community Facilities and Services :	19.1	17.5	e	m
••				
••				
Natural Resource :				
Environment :	2.4	2.1	10	11
Land :	6.4	10.1	4	4
Water :	22.6	18.5	г	7
Agriculture :	3.7	4.2	8	7
Forest :	4.3	4.1	7	ø
Recreation :	22.5	24.3	2	Ч
Planning and Development	2.6	2.6	6	10

TABLE 4.

Overall Development Preferences by Percentage and Rank

TABLE 5.

.

Distribution of RC&D Area Development Emphases

		Development 1	Emphasis		
Categories	: Incr	ease	: Deci	rease	
	: Number of : Areas	: : Percent :	: Number of : Areas	: : Percent	ا ب ا
Human Resource	• •				
Education	30	63	18	37	
Health & Medical Services	20	42	28	58	
Industry	19	40	29	60	
Employment		10	43	60	
Transportation	23	48	25	52	
Housing	25	52	23	48	
Community Facilities & Services	22	97	26	54	
	•••				
Natural Resource					
Environment	26	54	22	97	
Land	. 38	79	10	21	
Water	20	42	28	58	
Agriculture	. 18	38	30	62	
Forestry	. 17	35	31	65	
Recreation	. 29	60	19	40	
Planning & Development	. 19	40	29	60	
	••				

provided by final decisions by local people to seek action on proposals and actually have them initiated. These two pictures provide the only measurement of the consistency with which local development preferences are adhered to through program response.

This approach to evaluation is justified by the argument that improvements in human and natural conditions cannot always be realistically or accurately measured in terms of dollars or jobs. Local viewpoints, attitudes, leadership, and cohesiveness may all be important considerations. Furthermore, the type of developments or improvements desired may not require significant investment, employment, or resource reallocations and therefore resultant effects would not be identified.

For the purpose of evaluating program consistency, development categories have been given overall ranks according to their shares of total proposals and actions. In the two resulting rankings shown in Table 4, the lower rankings indicate larger shares. The null hypothesis is that there is no difference between the set of rankings. A Spearman rank correlation statistic of .96, statistically significant at alpha = .05, was found, indicating close agreement between rankings of proposals and actions. The same test procedure was used for each RC&D area. The hypothesis of no difference between rankings for proposals and actions was rejected for only three projects. Correlation coefficients are shown in Table 6.

Local participants in the RC&D program have an open-ended opportunity for identifying problems, evaluating needs, proposing remedial courses of action, setting priorities for actions, initiating actions, and changing their views. Given the findings above, the only possible conclusion is that program response seems to be effectively mirroring

## TABLE 6.

## Rank Correlations for Proposals and Actions Within RC&D Projects

Project	Correlation Coefficient	Project	Correlation Coefficient
1	.7165	25	.5308*
2	.8473	26	.4737*
3	.8435	27	.5253*
4	.6770	28	.5594
5	.8506	29	.8077
6	.7913	30	.7429
7	.7825	31	.8935
8	.8770	32	.7737
9	.7638	33	.7869
10	.9066	34	.5429
11	.7011	35	.8924
12	.8649	36	.9055
13	.9451	37	.8594
14	.6990	38	.7110
15	.8440	39	.7539
16	.8847	40	.8957
17	.9462	41	.7913
18	.9055	42	.6385
19	.6292	43	.7506
20	.7935	44	.7044
21	.8624	45	.8242
22	.8044	46	.7374
23	.7605	47	.8880
24	.7759	48	.6935

\* Not significant at alpha = .05

development preferences of local participants. The degree to which local people are satisfied with program response can only be measured through survey techniques beyond the scope of this study.

### Project Analysis

Thus far, comparative analysis has provided measures of locally specified preferences for improvements in human and natural conditions in rural areas and measures of the consistency with which the RC&D program has responded to these choices. In keeping with the objectives of this study, comparative analysis of RC&D projects was undertaken for the purpose of identifying basic elements of their collective socioeconomic structure.

This process began with the selection and collection of 76 countylevel census measurements descriptive of socioeconomic structure for each of the 297 counties comprising the selected projects. The 76 variables were transformed such that measurements on 297 counties would represent the socioeconomic structure of the 48 RC&D projects. The first data matrix of 76 x 297 was reduced to 76 x 48 in this manner. Application of factor analysis to this matrix further reduced it to 20 x 48 by gathering highly intercorrelated variables together in 20 groups, i.e., factors, which explained 94 percent of the variation in the 76 x 48 matrix. These factors represent the basic elements of socioeconomic structure of the studied project areas as limited by the 76 original variables selected for study. Factors derived in this manner are important in that they lend themselves to indepth interpretation of socioeconomic relationships within areas. Factors also allow for the computation of weighted scores for each project on each factor. Such scores allow for structural comparisons between projects

and also serve as the basis for analyses identifying relationships between socioeconomic structure and development preferences.

Relationships between variables and the factors in which they have primary importance are used in factor interpretation and definition. In factor definition, major component variable loadings are considered as are their signs which indicate positive or negative association with the factor. Generally, the higher a variable's loading is, the greater is its association with the factor and the more descriptive the variable is concerning relationships within the factor. Major factors discovered in this analysis are shown in Table 7.

#### Structural Elements

The largest factor found was Socioeconomic Status. This factor represents strong, positive influences of income levels and distribution, population change, residence, education, age, labor force, and employment.

Minority Population was the second element found. A strong minority aspect in this factor is signified by strong, positive minority component loadings. It is reinforced by contrasting, strong, negative loadings on the white rural-farm population component and on level-ofliving and political participation variables. These variable loadings are often associated with minority circumstances.

In the Health and Education Finances factor, a distinct bipolar relationship exists between education and health revenue and expenditures components. Highly negative loadings on public health and hospitals components suggest low levels of revenue and expenditures for health systems are important in explaining variation in structural make-up of rural areas. The education components are inversely related

7.	
TABLE	

Listing of Socioeconomic Factors, Major Components, and Loadings

i.

Components	Loadings
per capita income, 1959 familv income \$10.000 or more. 1959	9464. 9406.
median family income, 1959	.9302
% family incomes \$3,000 or less, 1959	8932
% population change due to migration, 1950-1960	.8867
median school years, 1960	.8677
% population 25 years old completed high school, 1960	.8666
% population change, 1950-1960	.8663
change in median age, 1950-1960	.8358
% change in number of families, 1950-1960	.8340
% labor force employed in insurance, finance, and real	
estate, 1960	.7462
% occupied houses with telephone, 1960	.7355
% labor force white collar, 1960	.6879
number of cars per capita, 1960	.6723
% population completed 5 grades or less, 1960	6554
% commercial farms with sales of \$10,000 or more, 1964	.6520
% urban population, 1960	.6434
% occupied houses with car, 1960	.6395
property tax per capita, 1962	.6134
% occupied houses with television, 1960	.6028
general expenditure per capita excluding capital	
outlay, 1962	.5898
% population rural-farm, 1960	5851
% population 21-65 years old in labor force, 1960	.5719
<pre>% population 21-65 years old, 1960</pre>	.5590
<pre>manufacturing productivity per employee, 1963 % 1 c for for for for for for for for for for</pre>	.5400
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<b>TABLE 7.</b>

	Minority Population	<pre>% rural population rural-farm white, 1960 % rural population rural-farm negro, 1960 % population minority, 1960 % occupied houses with washer, 1960 % population voted in 1960 % males in civilian labor force, 1960 % females in civilian labor force, 1960 % occupied houses with air conditioning, 1960 selected services sales per employee, 1963 % change in farm size, 1959-1964</pre>	8897 .8835 .8618 .8618 7954 7350 7350 7350 6552 .6552 .6341 .5712 .5712
°.	Health and Education Finances	<pre>% revenue for public health and hospitals, 1962 % general expenditures for public health and hospitals, 1962 % general expenditures for education, 1962 % revenue for education, 1962</pre>	9626 9615 .6700
4.	Other Rural-farm Population	<pre>% population rural-farm other, 1960 % labor force employed in construction, 1960 % labor force employed in public administration, 1960</pre>	.8327 .7533 .6003
°.	Age	<pre>% population of voting age, 1960 median age of population, 1960 % population under 5 years old, 1960 % population change due to natural increase, 1950-1960 % population over 65 years old, 1960</pre>	9284 .9106 .9058 .8864 7928
6.	Highway Finances	<pre>% revenue for highways, 1962 % general expenditures for highways, 1962 % occupied houses with freezer, 1960</pre>	.9242 .9116 .4768
7.	Banking	<pre>% demand deposits of total deposits, 1964 % time deposits of total deposits, 1964 % population foreign born, 1960 % population in group quarters, 1960 % population foreign stock, 1960</pre>	.8199 8194 5913 5388 5313

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°.	Non-resident Workforce	% of employed working outside home county, 1960	.8763
.6	Education Specialty	<pre>% population 5-34 years old in college, 1960 % labor force employed in educational services, 1960 % employed 13 weeks or less, 1959</pre>	9087 8843 5172
10.	Manufacturing Investment Efficiency	<pre>% capital expenditure of value added in manufacturing, 1963 % part-time farms of commercial farms, 1964</pre>	7985 5129
11.	Retail-Wholesale Trade	% labor force employed in retail and wholesale trade, 1960 retail sales per employee, 1963	.8310 5198
12.	Government Debt/Revenue	% debt of government revenue, 1962	8622
13.	Farm Family Living Index	farm family living index, 1959	6949
14.	Non-farm Income	<pre>% farm operator households with non-farm income, 1964 % farm tenancy, 1964</pre>	.9042 5722
15.	Commercial Agriculture	% commerical farms with sales of $$10,000$ or more, 1964	.4414
16.	Education Structure	<pre>% population 5-34 years old in elementary school, 1960 % population 5-34 years old in high school, 1960</pre>	7106 4110
17.	Family Income Change	% change in family income, 1949-1959	6947
18.	Banking Deposits Change	% change in bank deposits, 1960–1964	.4363
19.	Wholesale Efficiency	wholesale sales per employee, 1963	7685
20.	Population Level and Density	total population, 1960 population density, 1960 % labor force employed in manufacturing, 1960	.7984 .7441 .5227

to the health components but somewhat less important in accounting for structural variation.

Other Rural-farm Population, as a factor, suggests another minority aspect of socioeconomic structure of rural areas. It is based on a component of the same name and is directly associated with construction and public administration labor force components although they are somewhat weaker.

The Age factor suggests that a strong, positive influence is exerted on rural struture by components describing the very young population and population change due to natural increase. Strongly negative loadings on components describing older population segments measure the contrasting aspects of age.

Highway Finances is a factor based on two strongly positive revenue and expenditure components. This indicates that highway considerations represent a characteristic element of rural structure.

In the Banking factor, a strong positive influence of demand deposits is contrasted with strongly negative time deposits and weaker negative components measuring a foreign origins influence.

Non-resident Workforce is based on one major component variable of the same name. The loading is strongly positive, indicating that commuting across county lines for employment is an important element of rural structure.

Education Specialty seems to represent the aspect of higher education facilities in rural areas. It contains strong negative loadings on major components measuring college population and educational service employment. The factor suggests that an absence of educational centers for higher learning is an indicator of variation in socioeconomic structure. High factor scores would indicate an absence of such centers.

Manufacturing Investment Efficiency is another negative factor. It has a strong negative loading on the proportion of capital expenditure compared to value added in manufacturing. The negative loading in this case signifies relatively efficient manufacturing as rural areas are generally characterized by low levels of capital expenditure compared to value added. The factor is negatively associated with the component representing part-time farms as a percent of commercial farms, suggesting that where efficient manufacturing exists at high levels, part-time farming may exist only at low levels.

The Retail-Wholesale Trade factor's major component represents the share of the labor force employed in retail and wholesale businesses. The loading is strongly positive. In contrast, another component measures retail efficiency or productivity in sales per employee. The moderately negative loading suggests that retail productivity is not very high in rural areas.

Government Debt/Revenue Index is a strongly negative factor defined by a single major component of the same name. The loading suggests low levels of debt compared to revenue in rural areas. However, it is only one measure of the financial condition of rural governments.

Farm Family Living Index is also represented by a single major component of the same name. It is a fairly strong negative component indicating lower levels of living in the rural areas studied.

Non-farm Income is comprised of two oppositely signed components. A strong positive loading indicates non-farm incomes are important in the structure of rural areas. A farm tenancy component, in contrast, was found to be negative and moderately strong suggesting that tenancy is not a predominent state in the structure of the rural areas studied.

Commercial Agriculture is a factor characterized by one positive, moderately strong component--percent of commercial farms with sales of 10,000 dollars or more. This is indicative of moderate influence in the rural structures examined.

Education Structure is a negative factor represented by a strongly negative component measuring elementary school population and another, negative but somewhat weaker, measuring high school population. The conclusion is that relatively low levels of these populations characterize rural structure.

Family Income Change is based on a single, major component of the same name. The loading is negative and fairly strong suggesting low levels of family income change are characteristic of rural structure.

The weakest factor found was Banking Deposits Change. It consists of a similarly named major component. The positive loading indicates that moderate deposit changes form a characteristic element of socioeconomic structure.

Wholesale Efficiency is represented by a single, strongly negative component measuring wholesale sales per employee. The loading implies that efficiency in rural area wholesale businesses is not high as was the case with retail efficiency.

The last basic structural element found was Population Level and Density consisting of three major components. Total population and density components were found to have strongly positive associations with the factor while labor force in manufacturing is somewhat weaker and less important in defining the structure of rural areas.

The 20 factors identified above represent structural elements of the socioeconomic makeup of those RC&D projects studied. Their primary

limitations, in terms of defining socioeconomic structure, stem from the original 76 variables chosen for the analysis.

Given 20 measurements of rural socioeconomic structure, comparative analysis of socioeconomic structure can be achieved by comparing each RC&D projects' score on each of the 20 factors. For each factor, a score for an area is calculated by multiplying the area measurement on each variable by the factor loading for that variable and summing the results. These weighted scores represent the measurement for a given factor on a given project. Factor scores vary around zero with the sign indicative of a strong (positive) or weak (negative) measurement. The degree of strength or weakness is indicated by the magnitude of the score. All factor scores for each project were computed and used in the development of empirical equations through discriminant analysis.

## Development Preference Analysis

Thus far, different aspects of this comparative analysis have provided information defining local development preferences as measured by proposals and program response, i.e., actions, measures of the effectiveness of program response in relation to local preferences, and basic structural elements of socioeconomic conditions of rural RC&D projects. The primary remaining task in completing the comparative analysis is to attempt to clarify some of the relationships between socioeconomic structure and development preferences as Rossi has suggested.<sup>1</sup> This task is accomplished by means of discriminant analysis. This technique facilitates the comprehension of differences in development preferences across projects with different socioeconomic

<sup>&</sup>lt;sup>1</sup>Rossi, <u>op. cit.</u>, p. 415.

structures by defining the influence each factor has in explaining resource development preferences, i.e., emphases.

In the derivation of development preference models, RC&D projects were grouped according to preference shifts defined by comparing proportional shares of proposals and actions. Fifteen discriminant analyses were performed. One involved shifts between human and natural resource development preferences. Projects with increased shares of human resource-related actions, as compared to proposals, formed one group. The second group was formed by projects tending toward increased natural resource-related activities. Similar groupings, defined by increases or decreases in emphases, were formed for each of the 14 development categories. Factor scores were entered into the analysis and used for the purpose of discriminating differences in emphases for each of the 15 sets of project groupings. All 20 factors were entered into each discriminant problem.

Each discriminant analysis resulted in the derivation of an equation, for each separate group of projects, describing a discriminant value (dependent variable), a constant, and coefficients for all structural elements or factors (independent variables) which were instrumental in determining or reproducing the most accurate groupings of projects. Reproduced groupings were compared to known, actual groupings. The discriminant values were then used to compute each project's posterior probabilities of membership in each of the two groups for each analysis. These probabilities clearly indicate the degree to which a project is correctly or incorrectly classified by socioeconomic structure (factors). The general model of classification equations derived in these analyses is presented in an appendix. However, for each separate group in a given analysis the model takes the general form:

$$F = z_1 c_1 + z_2 c_2 + ... + z_n c_n + c_0$$

where F = a discriminant function value

- c = classification function coefficient for the i<sup>th</sup>
   term

and 
$$c_0 =$$
 the constant for this equation

Equations of the form shown above specify functional relationships between socioeconomic factors and shifts in development preferences. The magnitude of the classification function coefficients indicates the relative strengths and weaknesses of those factors helping to determine or reproduce accurate classification of projects.

A two step process is used in reviewing the results of this final aspect of the overall comaprative analysis and discussing the implications thereof. First, primary determinants of emphasis-group classification are identified and some general conclusions are drawn. These determinants and their functional relationships with development preferences can be interpreted as hypothesized, causal influences or forces present in local areas which act to influence the views and decisions of local RC&D decision makers. Appendix tables show factorpreference relations as described by discriminant coefficients. Next, major determinants are summarized and reviewed for clues as to the complexity of structural inter-relationships and relationships between socioeconomic structure and shifts in local development preferences.

#### Primary Determinants of Development Emphasis

Given the wide range of alternative choices and development activities possible in today's modern society, it is important as Rossi said, to attempt to gain insight into influences of local development preferences or tendencies. Following is a discussion of major determinants for each of the 15 classification problems--human versus natural resource development and each of the 14 development categories.

A particular RC&D project may have either a strong (positive) score on a given factor or a weak (negative) one. A strong score suggests that the factor is very characteristic of the project in terms of the components as represented in the factor. A weak score suggests the opposite. The size of a factor score indicates the degree of strength or weakness of the factor in terms of describing socioeconomic conditions of a project. These considerations are used in identifying the influence or effect of major determinants (factors) on emphasis classification (development preferences). All conclusions drawn are subject to limitations imposed by the variables initially chosen for study.

Primary determinants of development emphases are shown in Table 8, along with the 15 development classifications for which equations were derived. Only seven factors describing the structure of RC&D projects were found to be primary determinants of changes in development emphases. What follows is an attempt to interpret some of the implications of these primary determinants in relation to changes in local development preferences.

<u>Health and Education Finances</u>. Strong scores on this factor were indicative of Human Resource, Environment, and Recreation emphases (preference increases). Projects strongly characterized by low public health as opposed to education revenue and expenditures seemed likely to emphasize these types of activities. The conclusion is that projects

TABLE 8.

Primary Development Determinants and Classification Accuracy

Primary Development Determinants

Development Categories	ID		Factor Scores	Primary Classifi- cation Accuracy %	Total No. of Factors in Final Equation	Final Classifi- cation Accuracy %
: Human vs. Natural Resource :	ς Γ	Health and Education Finances	strong (+)	60	10	85
Human Resource						
Education :	12	Government Debt/Revenue Index	weak (-)	73	11	85
Health & Medical Services:	ø	Non-resident Work Force	weak (-)	67	12	85
Industry :	œ	Non-resident Work Force	strong (+)	63	13	96
Employment :	7	Banking	weak (-)	63	10	98
Transportation :	6	Education Specialty	strong (+)	68	19	90
Housing :	19	Wholesale Efficiency	strong (+)	63	14	06
Community Facilities & :			•			
Services :	80	Non-resident Work Force	weak (-)	58	12	81
Natural Resource :						
Environment :	m	Health and Education Finances	strong (+)	63	19	81
Land :	4	Other Rural-Farm Population	weak (-)	79	6	100
Water :	m	Health and Education Finances	weak (-)	64	10	79
Agriculture :	e	Health and Education Finances	weak (-)	60	19	89
Forestry :	œ	Non-resident Work Force	strong (+)	63	16	87
Recreation :	m	Health and Education Finances	strong (+)	71	9	85
Planning & Development :	4	Other Rural-Farm Population	weak (-)	64	17	87

with higher revenue and expenditures for health and education systems would be inclined toward a strong concern for people and therefore their activities and environment.

Projects with weak scores on this primary factor tended to emphasize Water and Agriculture activities. The conclusion is that projects where this factor is not descriptive are likely to be less people oriented and inclined toward concerns of agricultural production which often involves water-related development activities.

Other Rural-farm Population. Projects with weak scores on this factor were inclined to emphasize Land and Planning and Development activities. The implication is that these activities are associated with projects not characterized by high levels of other rural-farm population, or by high levels of construction and public administration components of the labor force.

<u>Banking</u>. This factor acted as a primary determinant of increased emphasis of Employment activities when projects had weak scores. The implication is that strong demand deposits and weak time deposits situations are not conducive to increased concern for improved Employment activities. Strong demand deposit situations suggest that a regular, adequate income is generally available to enough workers in an area that the need for improved employment conditions is limited.

<u>Non-resident Workforce</u>. This element of socioeconomic structure was particularly relevant for discriminating differences in projects in regard to four separate emphasis increases. Weak scores were crucial in identifying projects with increased emphasis in Health and Medical Services and Community Facilities and Services activities. The

implication is that the lack (weak scores) of commuting out-of-county by the labor force of a project area is directly associated with a concern for local health systems and local community services as opposed to extra-local.

Strong scores on this factor were important in correctly classifying projects in relation to their increased emphasis of Industry and Forestry activities. The fact that the labor force of an area is characterized by a willingness to commute out-of-county, may suggest that an area's population places higher values on the implications of industry-related development activities for that area. A non-resident workforce seems to enhance a local concern for the more extensive, areawide type of resource development activities that Forestry entails.

1

Education Specialty. Scores on this factor were instrumental in discriminating differences in projects in relation to their increased emphasis of Transportation activities. Strong scores imply that projects not characterized by a center for advanced education as indicated by low levels of college population and educational service employees, were inclined toward increased emphasis in transportation-related activities.

<u>Government Debt/Revenue Index</u>. Projects emphasizing Education activities were found to have weak scores on this factor. Such areas are not characterized by low levels of debt as compared to revenue. This may be indicative of a greater willingness for local communities and governments to borrow to pay for acceptable levels of educational services.

<u>Wholesale Efficiency</u>. Scores on this factor were crucial in discriminating differences in emphasis of Housing activities. Strong scores

were associated with increased emphasis. The implication is that low levels of wholesale sales per employee may manifest itself in a strong local concern for the welfare of its population, especially in regard to housing conditions.

An Overview of Structure and Preferences

Results of the 15 discriminant analyses suggest that there are many complex interrelationships in socioeconomic structure and that the relevance of such relationships varies considerably between substantive areas of policy or decision making as Sharkansky and Hofferbert argued in their studies in political science.<sup>1</sup> Indeed, a different mix of structural elements (factors) was relevant for each of the development emphasis problems analyzed.

The preceding section concerned only interpretation of primary socioeconomic determinants of development emphases. This belies the complexity of relationships between structure and preferences. Table 8 shows the number of factors used to achieve maximum discrimination accuracy for each of 15 problems analyzed. The structure-emphasis relationships become quite complex beyond the primary factor, with each added factor tending to contribute less to the overall accuracy of a given discrimination problem.

To summarize the relative importance of each factor in terms of each of the 14 development categories, simple ranks were calculated for each factor. These were based on the number of times the factor was relevant in the 14 classification problems and the degree of importance it held each time it was relevant. Table 9 shows these ranks and those of the 10 factors in the human versus natural resource development problem.

<sup>&</sup>lt;sup>1</sup>Sharkansky and Hofferbert, <u>op. cit.</u>, p. 867.

Determinants and Their Rankings	Resource Development	
Development Classification		

TABLE 9.

	-			•		
	Factors	Direction	••	Emph	hasis	
		Human vs. Natural	: Human	: Natu	ural	 <b>Overall</b>
			Ţ	F		7.6
-	Socioeconomic status	I	11	T	0	T 4
2.	Minority population	5	ۍ <b>.</b> ۲	20	0	12
÷.	Health & education finances	Ч	Ч	0	2.5	ч
4.	Other rural farm population	I	4	-	П	2.5
5.	Age	I	7	10	0	6.5
6.	Highways revenue & expenditure	ſ	8	5	6	6.5
7.	Banking	1	6	11	П	œ
<b>œ</b>	Non-resident work force	7	2.5	N	2.5	2.5
9.	Education specialty	80	13	ω	80	6
10.	Manufacturing investment efficiency	1	16	15	2	16.5
11.	Retail-wholesale trade specialty	7	13	18	8	16.5
12.	Governmental debt-revenue index	I	5.5		2	Ś
13.	Farm family living index	ı	17	17	7	20
14.	Non-farm incomes	6	13	19	6	18
15.	Commercial agriculture	I	15	EL.	<del>ر</del>	15
16.	Education structure	1	20	Ð	9	13
17.	Family income change	6	19	14	4	19
18.	Banking deposits change	1	10	12	5	10.5
19.	Wholesale efficiency	4	18	7	4	10.5
20.	Population level & density	10	2.5	01	2	4
	•••					

In the latter case, the factor rank is the same as the degree of importance in the problem.

The human and natural resource development rankings were statistically tested to determine the degree to which they are similar. The resulting rank correlation coefficient of .41 is significant at alpha = .05. This finding implies that there is a significant association between the values of a factor in the classification of either human or natural resource development emphases. Although for some factors there are wide differences in ranks for human and natural resource-related emphases, notably Minority Population, Education Structure, and Wholesale Efficiency, each of the 20 factors was found to have been one of the top five determinants of classification for one or more development categories. Table 10 shows, as previously indicated, that only seven different factors acted as primary determinants of increased development tendencies. Only these and four more ever acted as secondary determinants; these eleven and three different factors ever acted as tertiary determinants; etc. The overall importance of each factor as a determinant of development emphasis is shown by the overall ranking of Table 9. The most important factor in the 14 classification problems concerning specific development emphases was Health and Education Finances while the least important was Farm Family Living Index.

### Comparative Analysis in Retrospect

The RC&D program offers project areas and included communities an open-ended opportunity to identify problems, evaluate needs, propose remedial courses of actions, set priorities for action, initiate actions when possible, and perhaps most importantly, local participants are allowed to change their minds relative to problems, needs, priorities, and preferences for action. This research represents an attempt to quantify local

TABLE 10.

First Entry of Each Socioeconomic Factor in a Discriminant Problem

	5 2 2 2 2				Level	of Fi	lrst E	Cutry			
	ractor	1	••	2	••	3	••	4	••	5	
۲.	Socioeconomic status					Х					
2.	Minority population							Х			
m	Health & education revenue & expenditure	X									
4.	Other rural farm population	X									
ۍ.	Age			X							
6.	Highways revenue & expenditure							Х			
7.	Banking	X									
<b>∞</b>	Non-resident work force	X									
<b>.</b> 6	Education specialty	X									
10.	Manufacturing investment efficiency			Х							
11.	Retail-wholesale trade specialty					X					
12.	Governmental debt-revenue index	X									
13.	Farm family living index							Х			
14.	Non-farm incomes					Х					
15.	Commercial agriculture			Х							
16.	Education structure							X			
17.	Family income change									X	
18.	Banking deposits change									Х	
19.	Wholesale efficiency	X									
20.	Population level & density			X							

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development preferences by the analysis of proposals for action and of program response represented by initiated actions. An attempt was also made to analyze and define the socioeconomic structure of selected RC&D areas. A third analysis attempted to pinpoint major elements of socioeconomic structure which seem to act to direct the views of decisions, i.e., preferences, of RC&D decision makers. Each of these analyses was part of an overall comparative analysis of the type suggested by Reiss, Rossi, and Sharkansky and Hofferbert which encompasses the application of multivariate analysis techniques in a scientific approach to investigating community tendencies within types or classes of decisions.

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The major conclusion of the comparative analysis is that it was successful. Delineation of socioeconomic structure was accomplished by means of factor analysis. Major elements of rural structure were then identified through discriminant analysis which provided functional relationships between structure and shifts in development preferences. Classification accuracy was 89 percent overall. For each discriminant problem considered, a single factor was able to detect project differences corresponding to differences in development emphases for a majority of the 48 RC&D projects. Only seven different primary determinants of emphasis were found. Several had primary discriminating power for more than one type of development activity. Other factors entering the discriminant problems after the primary or first factor had much less discriminating power.

The complexity of structure-preference relationships is suggested by the wide range of factors needed to achieve maximum accuracy of discrimination--from 6 for Recreation to 19 for Transportation, Environment, and Agriculture. Complex relationships are also indicated by the finding that each of the 20 factors of socioeconomic structure used in this study was found to have acted as one of the top five determinants of emphasis for one or more development activities.

# CHAPTER V

## SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

### Summary

This research is intended to examine some of the factors affecting local decisions relating to resource development occurring in the RC&D program. This report involves research on 48 RC&D projects across the Nation. The overall research purposes are to examine and improve the data describing the RC&D program response to local development preferences and to explore the relationship between program response and the socioeconomic structure of rural areas. It is hoped this research will facilitate and improve planning, management, operation, and evaluation of the RC&D program. Several research objectives have been formulated to help fulfill the research purposes. The objectives are:

 To develop a system for consistently classifying local resource development preferences as suggested by RC&D proposals for development and resultant actions.

2. To determine general resource development directions and specific development emphases of local citizens participating in RC&D projects.

3. To develop an analytical approach for examining socioeconomic structure of RC&D projects and for identifying those influences which seem to determine changes in development preferences.

4. To examine implications of study findings relative to the planning, management, operation, and evaluation of the RC&D program.

Projects selected for study were in operation between 1963 and 1970. Each of these projects had a completed project plan, a planning document outlining desired development proposals, and each had a history of initiated actions recorded in progress reports. Indepth study of the 48 project plans led to the formulation of a system for classifying resource development activities occurring in the RC&D program. These activities are divided into two broad groups or directions, human vs. natural resource development. Each broad group is subdivided into seven categories and a total of 53 development objectives are used to classify any given development proposal. Development actions recorded in progress reports are classified by the same process.

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The development classification system was used to classify over 8,300 proposals for action and over 6,500 actions in the 48 projects. Two-thirds of all proposals and all actions were oriented toward natural resource development. Activities related to Water, Recreation, and Community Facilities and Services, in this order, were found to be the most popular activities. They accounted for nearly two-thirds of all proposals and actions. Fifty-six percent of the 48 projects had shifts toward increased human resource development activities as proposals were translated into actions. In only three projects, correlation coefficients describing the association between proposals and actions were found to be statistically insignificant at the 95 percent confidence level.

Shifts in local development preferences were analyzed at the RC&D project level. Proportional changes in development emphases were explained in terms of variation in socioeconomic structure. Factor analysis was used to reduce 76 measurements of socioeconomic structure for 48 projects to 20 dimensions (factors). Discriminant analyses were completed using project factor scores on all 20 factors. The resulting discriminant equations attained an overall accuracy of 89 percent in reproducing known groupings of projects based on changes in development preferences. Different combinations of determinants were associated with different types of development categories. Equations were found to contain from six to 19 factors. Only seven of the 20 factors were found to be primary determinants. These include indicators of financial aspects of public health and education, other rural farm population, bank deposits, non-resident workforce, education centers, government debt and revenue, and efficiency in wholesale trade.

### Conclusions

The following study conclusions are presented in accordance with defined study objectives.

1. The system, consisting of two broad categories and 14 subcategories, developed for the classification of RC&D proposals and actions stands up well under two tests. The high degree of consistency found between proposals and actions in the RC&D program attests to the reasonableness of classifying proposals according to basic intent. Secondly, the high degree of accuracy attained in reproducing groups of known composition strictly on the basis of project socioeconomic structure supports the contention that the groups were properly formed in the first place--

prior to discriminant analysis. However, the fact that as many as 19 factors are necessary to achieve a highest classification accuracy for a few types of development activities may suggest that further definitional improvements could be made in the interpretation of basic development intent for certain types of development and that additional measurements of socioeconomic structure may improve results.

2. The identification and examination of general development directions and emphases has been successfully accomplished by means of the resource development classification system. Resulting data provide a more definitive view of what occurred in the RC&D program up to 1970. The importance of being able to view RC&D activities over time from the vantage point of several well defined (see conclusion 1) development categories should not be discounted. Development tendencies and shifts can be observed at the program and project levels.

3. The analytical approach using factor analysis to explore and identify many dimensions of socioeconomic structure and discriminant analysis to identify determinants of changes in development emphases is valuable and useful at the project level. It pinpoints variation in socioeconomic structure and, in conjunction with the classification system, it relates this variation to shifts in development preferences. It specifies classification equations showing the mix of socioeconomic factors needed to predict changes in development preferences and the relative importance of each determinant.

### Implications

The implications of study findings focus on their usefulness and value at three major levels of the RC&D program; administration, coordination, and local participation. For purposes of this discussion, administration specifically includes program management, evaluation, policy making, program planning and generally everything above the individual RC&D project level effort. Coordination refers only to the efforts to achieve actions in individual RC&D projects in accordance with proposals and priorities of local decision makers. Participation includes the volunteer involvement of local citizens in decisionmaking in accordance with their views regarding resource development problems and needs in their communities.

### RC&D Classification System

The classification system formulated in this study embraces a wide range of development aspects. The system allows the categorization of RC&D proposals and resultant actions and could also serve to classify citizen identified problems and priorities for action within the RC&D program. Mutually exclusive categories provide a firm basis for quantification of RC&D related input of local citizen participators responsible for planning and determining priorities for action. Additionally, the quantification of RC&D related actions provides a measure of program response in achieving progress in designated priority areas of local concern.

An accounting of proposals and actions allows the analysis of major resource development directions and specific development emphases. It can be used to identify trends in planning and action and to check consistency of planning and action at program and project levels.

Profiles for projects or the nation can easily be constructed by displaying percentage distributions of plans and actions in simple bar chart form (see Figure 2). Finally, it could also be considered for use as an aid to problem identification in old, new, or proposed RC&D projects and as a guide to evaluation of applications for accordance with the total development concept of the RC&D program.

# **Project Analysis**

The analysis of project socioeconomic structure is accomplished by factor analysis of secondary data. This method yields socioeconomic factors which can provide substantial clues to the makeup or nature of any given project as well as pinpoint differences between projects. Profiles can be built by displaying factor scores in simple chart form showing deviations from a zero line (Figure 3). This type of analysis reveals many aspects of socioeconomic structure which vary with one another, either directly or inversely, and perhaps just as importantly identifies those aspects which do not vary together.

The value of this analysis lies primarily at the administrative level with this defined to include management and evaluation responsibilities. As concerns over success versus non-success arise over time, factor profiles for less successful projects could be compared with those of successful ones. Local citizens could also use factor profiles to further their understanding of their communities. Such glimpses into community systems, perhaps on a regular basis could do much to educate and inform involved citizens and professionals as to the complexity of community structure. Over time a series of project profiles could show changes in the structure of factors and in the relative importance of





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Proposals exceed actions, proportionally

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- Actions exceed proposals, proportionally



Figure 3. Factor Score Profiles for Selected RC&D Projects

given variables in these factors, thus providing clues for program adjustments in given projects.

Determinants of Development Directions and Emphases

The relevance of analysis of socioeconomic factors is supported by the derivation of the empirical models used to successfully classify projects in terms of shifts in development preferences. The modeling approach to understanding factors affecting decision making can be extended for purposes of predicting likely development directions and emphases for any proposed RC&D project for which appropriate secondary data have been collected.

Another interesting extension of this approach consists of the derivation of empirical models based on the classification of existing RC&D projects in accordance with their ranking of proposals and actions. Such rankings could be determined by the proportions of measures in each development category or by survey methods. Different classification models, again based on scores on socioeconomic factors, would then classify projects according to priorities in planning or action. This sort of analysis could also be used for predicting proposals and actions for potential RC&D projects, given the appropriate secondary data. This method would define relative relationships between different types of development whereas the models derived in this research define only the direction of changing preferences within a given category of development. The use of both methods would present more detailed inputs for the evaluation of program planning and response. Such inputs could serve as additional criteria for RC&D project selection and could be important at the RC&D administrative level. Improvement in policy formulation, program planning, management, and evaluation require a continual quest

for improvement of indicators of program success or progress. Increased intelligence concerning socioeconomic influences and their relationship to various aspects of the RC&D effort might improve the possibility of discovering other perhaps more meaningful empirical models which could serve well in various aspects of program administration.

### Recommendations

RC&D Classification System

The classification system developed and used in this study embraces a wide range of development activities and intentions. It provides an additional data base for quantifying RC&D planning and progress. Consideration should be given to the use of this system to monitor local resource development preferences indicated by project proposals and resultant actions. This would facilitate analysis of planning and action trends on project and national levels. It should also be considered for use as a guide to problem identification and formulation of planning proposals in existing and potential RC&D projects as well as for evalution of applications with respect to the total development concept of the RC&D program.

# Analysis of Socioeconomic Structure

The exploration of socioeconomic structure of projects is useful for defining elements of considerable variation in their makeup. Profiles can be built which pinpoint socioeconomic differences and similarities in projects. Along with providing insight into the makeup of RC&D projects, the analyses provide the data input (factor scores) necessary for relating structural variation to changing development preferences. Determinants of Changes in Development Preferences

Improvement in policy formulation, program planning, management, and evaluation require improvement in indicators of program activities and response. The success of the empirical socioeconomic models in classifying projects according to shifts in resource development preferences points out the relevance and importance of analyzing socioeconomic data as a means of gaining insight into what factors influence decision-making in the RC&D program. Consideration should be given to extending the modeling approach to include the prediction of likely development tendencies for proposed RC&D projects for which appropriate data can be collected. This approach could also be extended to the prediction of priorities in planning and action given some additional data concerning local rankings of priorities. Such analyses could help in establishing firm guidelines for planning and action in proposed RC&D projects.

# Further Research

Additional research is needed to insure that resource development programs deal effectively with problems of people while assuring socially acceptable impacts on the resources involved. As the RC&D program grows and as other programs related to resource development grow, care must be given to the task of developing improved approaches to effective resource development. Careful identification and consideration of development preferences in conjunction with scientific analysis and evaluation of results of development activities can help achieve this objective. To this end, consideration should be given to encouraging the type of comparative analysis suggested by this study.

### Summary of Recommendations

1. The development classification system, consisting of 14 development categories and 53 development purposes, should be considered as a basis for monitoring, analyzing, and evaluating the broad range of development possible within the concept of the RC&D program.

2. Consideration should be given to the search for relevant socioeconomic dimensions or factors characterizing project similarities and differences (including those RC&D projects still in the application stage).

3. Further effort should be directed toward the development and use of empirical models specifying functional relationships between socioeconomic influences and shifts in development directions and emphases and priorities for all RC&D projects (including those in the application stage).

4. Consideration should be given to the concepts and techniques employed in this research project in terms of their potential value and usefulness in RC&D and other development programs where additional knowledge of geo-political areas and development tendencies is important and where some level of citizen decisionmaking is required to insure socially acceptable resource development and use.

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APPENDIX A

METHODS

# APPENDIX A

# METHODS

Factor analysis is the generic term for a variety of procedures developed for analysis of intercorrelations within a set of variables. Such techniques facilitate the discovery of regularity, order, and patterns within sets of observations on many variables. Principal component analysis (component factor analysis) is a useful factor technique for determining the minimum number of independent dimensions needed to account for most of the variance in the original set of variables. It not only reveals how several measures of a given domain can be combined to produce maximum discrimination among cases along a single dimension, but also often reveals that several independent dimensions are required to adequately define the domain under investigation. This technique is described below.

The generalized linear factor model is:

 $z_{ji} = a_{j1}F_{1i} + a_{j2}F_{2i} + \cdots + a_{jp}F_{pi} + a_{ju}U_{ju}$ where  $z_{ji}$  = a standard score on test j for individual i, j = 1, 2, ... m measurements, i = 1, 2, ... n cases, p = 1, 2, ... p common factors

<sup>&</sup>lt;sup>1</sup>R.J. Rummel ., <u>Applied Factor Analysis</u>, (Evanston, Northwestern University Press, 1970), pp. 107-108. Also see pp. 101-155.

a<sub>jp</sub> = factor loading for the p<sup>th</sup> factor on the j<sup>th</sup> variable, F<sub>pi</sub> = the factor score for area i on the p<sup>th</sup> factor and a<sub>ju</sub>U<sub>ju</sub> = a unique term (including the coefficient a<sub>ju</sub> and the factor score U<sub>ju</sub>) describing the specific and random error variance in i measurements on the j<sup>th</sup> variable.

The following model displays the factor model for the elements of vector  $z_i$  for n cases:

 $z_{1j} = a_{j1}f_{11} + a_{j2}f_{12} + \dots + a_{jp}f_{1p} + a_{ju}f_{1u}$   $z_{2j} = a_{j1}f_{21} + a_{j2}f_{22} + \dots + a_{jp}f_{2p} + a_{ju}f_{2u}$   $\vdots$   $z_{nj} = a_{j1}f_{n1} + a_{j2}f_{n2} + \dots + a_{jp}f_{np} + a_{ju}f_{nu}$ 

where f<sub>lp</sub> = p<sup>th</sup> factor score for the first case on the j<sup>th</sup> variable and a<sub>jp</sub> = p<sup>th</sup> factor loading for the first case on the j<sup>th</sup> variable. When all factors (common and unique) are considered the sum of the squared factor loadings for a given row is equal to one:

$$\begin{array}{c} \mathbf{u} & \mathbf{2} \\ \boldsymbol{\Sigma} & \mathbf{a} \\ \mathbf{k}=1 \end{array} = 1.00$$

where k = any factor. In the case of principal component analysis, no differentiation is made for unique variance representing both specific and random error variance in measurements on variables. The unique terms are not included in the generalized linear factor model or in the  $z_j$  vector model presented above. The correlation matrix would be factored with unities in the diagonal yielding p common factors explaining most of the variance in the data. Thus in principal component analysis, the sum of the squared factor loadings for a given row (variable) is equal to:

$$h_{j}^{2} = 1.00 - (\text{specific + error variance})$$
  
or, 
$$h_{j}^{2} = a_{j1}^{2} + a_{j2}^{2} + \dots + a_{jp}^{2}$$
  
where  $h_{j}^{2}$  = the observed communality of variable j when p factors are  
used,  
$$a_{jp}^{2}$$
 = the proportion of a variable's total variance accounted for

The communality  $h_j$  represents the proportion of a variable's total variance accounted for by all p factors. The proportion of total variance in all variables explained by factor p is:

where the trace = sum of diagonal elements or m.

The following definitions are offered for purposes of review and clarification. A <u>factor loading</u> is a weight for each factor dimension measuring the variance contribution the factor makes to the data vector. Each variable has a loading on every factor. Loadings can be interpreted generally like correlation coefficients, that is their values vary from -1.00 to +1.00 with the signs indicating that the variable varies inversely or directly with the factor. Loadings are crucial as they form the basis for factor interpretation.

For a given variable, the sum of the squared loadings on each factor equals its <u>communality</u>, or the proportion of a variable's total variation that is included in the factors.

Use of the closed factor model, factoring with unities in the diagonal of the correlation matrix, allows computation of <u>factor scores</u> according to:

 $F_{1i} = a_{11}z_{1i} + a_{21}z_{2i} + \cdots + a_{p1}z_{pi}$ where  $F_{1i}$  = score on factor 1 for case i,

 $a_{11}$  = loading on factor 1 for case 1,

z<sub>1i</sub> = standard data score on test 1 for case i.

Each variable is weighted proportionally to its involvement in a pattern or factor; the more involved, the higher the weight. To determine a factor score,  $F_1$ , for a case on a pattern, the case's data,  $z_{ji}$ , on each variable is multiplied by the pattern weight,  $a_{ji}$ , for that variable. The sum of the weight-times-data products for all variables for a given case equals the factor score for that case on that factor.

Multiple factor analysis involves two basic steps. First a technique, principal components analysis for example, is used to derive an initial set of reference dimensions. Then a rotational technique is used to convert the reference or principal factor pattern to a pattern of simple structure. <u>Rotation</u> causes a shift from factors maximizing total variance to factors delineating separate groups of highly intercorrelated variables.

The basic requirements that simple structure should satisfy are:

- Each variable should have at least one zero loading in the factor matrix.
- For a factor matrix of p factors, each column of factor loadings should have at least p variables with zero loadings.
- 3. For each pair of columns of loadings (factors), several variables should have zero loadings in one column but not in the other.

<sup>&</sup>lt;sup>1</sup><u>Ibid., p. 380.</u>

- 4. For each pair of columns of loadings (factors), a large proportion of the variables should have zero loadings in both columns.
- 5. For each pair of columns of loadings (factors), only a small proportion of variables should have non-zero loadings in both columns.

In this study, rotation was restricted to orthogonality, meaning that the resulting factors are mutually orthogonal. Orthogonality ensures that factors will delineate statistically independent variation and are amenable to subsequent mathematical manipulation and analysis. One primary characteristic of interest is that factor scores obtained from orthogonal factors are linearly independent and uncorrelated. Such factor scores were derived and used in a discriminant analysis technique.

The Varimax criterion was used to obtain an orthogonal rotation. This procedure maximizes the sum of the variances of squared factor loadings in the columns of the factor loading matrix. The <u>Varimax</u> <u>criterion</u> is defined as:

$$V = m \sum_{i=1}^{n} \sum_{j=1}^{m} \left[\frac{a_{ji}}{h_j}\right]^4 - \sum_{i=1}^{n} \left[\sum_{j=1}^{m} \frac{a_{ji}}{2}\right]^2 = \max_{j=1}^{n} \sum_{j=1}^{n} \sum_$$

where V = variance of normalized factors,

a\_ji = factor loading of variable x<sub>j</sub> on factor F<sub>p</sub>, h<sub>j</sub><sup>2</sup> = communality of variable x<sub>j</sub> and j = 1, 2, . . . m variables i = 1, 2, . . . n cases

Discriminant Analysis

Discriminant analysis is a technique used to find linear combinations of variables that maximize the ratio of among-groups to within-group

variability. The optimum discriminant function for the two-group situation is that function yielding a linear combination of variables which would discriminate between two groups better than any other linear combination.<sup>1</sup> This optimum function, Fisher's, is described by the following matrix equation:

$$Wv = dk$$

- where W = square matrix whose elements are the sums-of-squares and the sums-of-cross products within the two groups, of the p ori- ginal variables;
  - d = column vector of the differences between the group-means on the p variables;

k = arbitrary constant; and

v = column vector of weights which satisfy the equation and yield an optimum linear combination.

The two-group discriminant criterion can be defined as:<sup>2</sup>

$$\frac{SS_{b}(Y)}{SS_{w}(Y)} = \frac{v'Bv}{v'Wv}$$

where  $SS_{h}$  (Y) = between groups sums-of-squares of Y;

SS\_ (Y) = within groups sums-of-squares of Y; and

B = between groups SSCP matrix, and

W = within groups SSCP matrix.

<sup>&</sup>lt;sup>L</sup>Maurice M. Tatsuoka and David V. Tiedeman, "Discriminant Analysis," <u>Review of Educational Research</u>, XXIV, No. 5, (December, 1954), p. 402.

<sup>&</sup>lt;sup>2</sup>Maurice M. Tatsuoka, <u>Multivariate Analysis: Techniques for</u> <u>Educational and Psychological Research</u>, (New York: Wiley, 1971), p. 159.

Mahalanobis' D<sup>2</sup> statistic is used to measure the "distance" between two groups assuming the populations are multivariate normal with equal dispersions (variances and covariances). Upon failure to reject the hypothesis of no difference between groups, the discriminating functions are calculated according to:<sup>1</sup>

$$F_{LMK} = \sum z_{mkj} c_{mj} + c_{mc}$$

where F<sub>LMK</sub> = m<sup>th</sup> discriminant value for case K in group L; z<sub>mkj</sub> = observation (factor score) for each variable (factor); c<sub>mj</sub> = m<sup>th</sup> classification function coefficient for variable j; c<sub>mo</sub> = m<sup>th</sup> constant; L, M = two groups k = 1, 2, . . . t for each L; and j = 1, 2, . . . p factors (variables).

Next, the posterior probability of case k in group L having come from group m is computed according to:<sup>2</sup>

$$P_{LMK} = Exp \frac{(F_{LMK})}{g}_{i=1}^{\Sigma} Exp(F_{Li})$$

where  $i = 1, 2, \ldots g$  functions.

Basically, group differences are determined by means of the Mahalanobis  $D^2$  statistic and discriminant function values and posterior probabilities are computed and used to classify cases into groups.

<sup>&</sup>lt;sup>1</sup>W.J. Dixon, (ed.), <u>Biomedical Computer Programs</u>, Berkeley, University of California Press, 1970, p. 214k.

Analytical Objectives

The main advantage of factor and discriminant analyses is the capability of assessing and predicting a qualitative dependent variate from a set of quantitative independent variates.

Factor analysis techniques may be used to: (1) untangle linear relationships into separate patterns with each pattern appearing as a factor delineating a distinct cluster of interrelated data, (2) reduce a mass of information to its essential meaning, (3) discover the basic structure of a given domain, (4) develop an empirical typology for classification or description; (5) transform data to meet the assumptions of other analytical techniques and (6) explore.<sup>1</sup> At various stages of this research, most of these capabilities were used advantageously.

Discriminant analysis has the capability to (1) test for significant differences among average score profiles of two or more a priori defined groups, assuming multinormal distributions and equal dispersions, (2) determine which variables account most for such intergroup differences in average profiles, (3) find linear combinations of variables which allow the representation of groups by maximizing among-group relative to within-group separation, and (4) establish models for assigning new individuals whose profiles, but not group identity, are assumed to be from one of the a priori defined groups.<sup>2</sup>

<sup>&</sup>lt;sup>1</sup>R.J. Rummel, "Understanding Factor Analysis," <u>Journal of Conflict</u> <u>Resolution</u>, XI, No. 4, (December, 1967), pp. 449-451.

<sup>&</sup>lt;sup>2</sup>Paul Green and Donald Tull, <u>Research for Marketing Decisions</u>, 2nd ed., (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1970), p. 368.

APPENDIX B

TABLES

	Factors	•• ••	Function Coeff	ficients
IUUR	ber Description	Hum	an Resource	Natural Resource
	Socioeconomic status	••	1	8
2.	Minority population	••	21	.27
÷.	Health & education revenue & expenditure	••	.52	67
4.	Other rural farm population	••	8	8
ς.	Age	••	1	
6.	Highways revenue & expenditure	••	34	77.
7.	Banking	••	8	8
œ.	Non-resident work force	••	45	.59
<b>.</b>	Education specialty	••	15	.20
10.	Manufacturing investment efficiency	••	1	
11.	Retail-wholesale trade specialty	••	.17	22
12.	Governmental debt/revenue index	••	1	ł
13.	Farm family living index	••	1	
14.	Non-farm incomes	••	14	.18
15.	Commerical agriculture	••	8	1
16.	Education structure	••	1	
17.	Family income change	••	20	.26
18.	Banking deposits change	••	1	ł
19.	Wholesale efficiency	••	.27	35
20.	Population level & density	••	08	.11
		••		
	Constant	••	25	42
		••		

Discriminant Function Coefficients Showing Relationships Between General

TABLE 11.

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# Discriminant Function Coefficients Showing Relationships Between Human Resource Preferences and Socioeconomic Structure

				Hume	in Resource	e Orients	ition		
	ractors	Educ	cation	: Health,	Medical	Indus	stry	: Emplo	yment
	er uescription	Yes	No	: Yes	: No	Yes	No	: Yes	No
	Socioeconomic status	.11	19	1	1	08	.05	1	;
2.	Minority population	.17	29	.38	.27	60	.39	99	.11
т.	Health & education revenue &								
	expenditure :	ł	1	90	.64	ł	1	1.56	18
4.	Other rural farm population :	52	. 88	22	.15	-1.03	.68	-1.65	.19
ۍ.	Age	ł	ł	17	.12	-1.02	.67	73	.08
6.	Highways revenue & expenditure ;	1		13	60.	58	.38	.45	05
7.	Banking	ł	1	ł	1		ł	-1.94	.22
<b>∞</b>	Non-resident work force :	.34	58	1.08	77	1.33	87	1	
<b>.</b> 6	Education specialty	1	1	.25	18	ł	i		ł
10.	Manufacturing investment								
	efficiency .	1	1	1	1		1	1.36	16
11.	Retail-wholesale trade specialty :	48	. 80	1	ł	69	.45	1	
12.	Governmental debt/revenue index :	.78	-1.30	.46	33	.55	36	1	
13.	Farm family living index	ł	I	.50	36		1	1	ł
14.	Non-farm incomes	.27	45	54	.39	51	.33	!	
15.	Commerical agriculture	.26	44	1	1	ł	!	1.29	15
16.	Education structure	ł	ł	ł	ł	40	.26	1	
17.	Family income change	ł	1	ł	1	35	.25	23	.02
18.	Banking deposits change	29	. 48	25	.18	61	.40	;	1
19.	Wholesale efficiency	30	.51	!	ł	1	1		!
20.	Population level & density	.22	37	.44	32	.53	34	1.73	20
									l
	Constant	39	-1.09	76	<b>-</b> . 38	-1.46	63	-4.15	05

See footnote at end of table

Continued

		Hu	man kesoui	ce urtental	tion	
ractors	Tran	sportation	H H	ousing	Community	y Facilities
nmper nescription	Yes	. No	Tes	No	Yes	No
1. Socioeconomic status	54	.50	.24	26	15	.12
2. Minority population	51	47	!	1	.32	27
3. Health & education revenue &						
expenditure	. 68	62	31	.33	30	.26
4. Other rural farm population	;	ł	60	.66	1	1
i. Age	:35	.32	.15	16	54	.46
5. Highways revenue & expenditures	. 49	45	.59	64	1	ł
7. Banking	. 30	28	21	.23	.34	28
3. Non-resident work force	21	20	1	ł	.81	69
). Education specialty	82	75	ł	ł	.38	32
). Manufacturing investment efficiency:	.10	09	68	.74	.27	22
l. Retail-wholesale trade specialty :	.12	11	.07	.07	26	.22
2. Governmental debt/revenue index :	.23	21	16	.17	.42	35
3. Farm family living index	. 35	32	.30	33	ł	1
4. Non-farm incomes	.17	16	!	ł	20	.17
5. Commercial agriculture	. 38	35	.17	18	1	ł
5. Education structure :	. 38	35		1	1	!
7. Family income change	41	.38	1		1	1
3. Banking deposits change	28	.26	.16	17	ł	1
). Wholesale efficiency	18	.16	75	.81	!	!
). Population level & density :	29	.26	.19	20	.10	08
Constant	76	64	54	64	42	30

TABLE 12. (continued)

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# Discriminant Function Coefficients Showing Relationships Between Natural Resource Development Preferences and Socioeconomic Structure

				Natu	al Resou	ce Orien	tation		
	Factor	Envi	ronment		nd	: Wa	ter	Agric	lture
Nume	oer Description	Yes	: No	: Yes	: No	: Yes	No	Yes	No
	Socioeconomic status	20	24		1	1	1	26	.15
2.	Minority population	:17	.20	ł	ł	!	ł	32	.19
ъ.	Health & education revenue &								
	expenditure	:51	.60	1	1	.59	42	1.12	67
4.	Other rural farm population	:50	.59	81	3.10	1	1	75	.45
ъ.	Age	:41	.48	1	1	1	!	59	.35
6.	Highways revenue & expenditure	10	12	39	1.51	29	.21	39	.23
7.	Banking	: .13	16	22	.84		;	65	.39
8.	Non-resident work force	: .42	50	ł	ł	ł	;	.60	36
9.	Education specialty	:40	.47	1	ł	10	.07	.41	25
10.	Manufacturing investment effi-								
	ciency	: .22	26		1			.44	26
11.	Retail-wholesale trade specialty	18	.21	1	1		1	26	.15
12.	Governmental debt/revenue index	:27	.32	.49	-1.87	.20	14	.10	06
13.	Farm family living index	18	.22	ł	ł	.27	19	17	.10
14.	Non-farm incomes	08	.10	1		19	.14	!	
15.	Commercial agriculture	: .26	31	1	1	48	.34	31	.18
16.	Education structure	:41	.49	.36	-1.37	.43	30	.04	.02
17.	Family income change	:	:	37	1.42	ł	ł	.38	23
18.	Banking deposits change	09	.10	34	1.29	23	.16	34	.20
19.	Wholesale efficiency	. 30	36	.33	-1.26	.42	30	.48	29
20.	Population level & density	. 30	36	.50	-1.91	• 44	31	.36	21
	Constant	- 34	- 48	- 37	-5,37	- 38	19	63	23
		•	•			•		)	)   

See footnote at end of table

Continued

				Natura.	l Resource	e Orienta	tion		
	ractors	Fore	estry	••••	Recre	ation	Planning,	Develo	opment
	ier Description	Yes	: No		Yes	. No	: : Yes		No
;-	Socioeconomic status	31	.17		1	1	.26		.17
2.	Minority population	ł	ł		ł	;	25		.16
°.	Health & education revenue &	31	- 17		17 -	80 L	ł		ł
4.	Other rural farm population	27	.14		25	.38	85		.55
<u>ہ</u> .	Age	60	.33		1		:		ł
6.	Highways revenue & expenditure	ł	1		!		37		.24
7.	Banking	37	.20		ł	1	22		.14
<b>œ</b>	Non-resident work force	.89	48		.51	78	.71	•	46
9.	Education specialty	.55	30		ł		21		.14
10.	Manufacturing investment efficiency	.24	13		.35	54	1		ł
11.	Retail-wholesale trade specialty	.19	10		ł	1	31		.20
12.	Governmental debt/revenue index	.29	16		ł		.65	•	43
13.	Farm family living index	.23	13		1	1	.26		17
14.	Non-farm incomes	1	1				34		.22
15.	Commerical agriculture	1	i		1	1	36		.23
16.	Education structure	.30	16		35	.53	.16	•	.10
17.	Family income change	07	.04		1	1	.20	·	.13
18.	Banking deposits change	26	.14		1	;	27		.17
19.	Wholesale efficiency	.33	18		45	.69	.26	•	.17
20.	Population level & density :	.21	11		ł	;	.79	•	52
	Constant :	65	19		29	68	69	•	29
were form	<sup>1</sup> No, yes indicates whether or not a converted into actions. Each pair o s the basis for a predictive model for	given measu f columns 1 r each meas	ire type represen sure typ	receiv ts resu e.	ved increa ilts of se	ased atte	ntion when iscriminant	propose runs a	11s nd

TABLE 13. (continued)

TABLE 14. Project Factor Score Matrix

	Factor Number and Name	н 	7	3 RC	&D Are 4	ea Ider 5	itifica 6	tion N 7	lumbers 8	۲. 6	10	11
<b>i</b> .	Socioeconomic Status	7.21	0.12	-1.55	-0.81	4.91	-0.65	2.16	5.54	-2.15	-0.12	-4.84
2.	Minority Population	:-3.05	-2.93	-2.33	-0.90	-2.27	-1.97	-0.71	-0.22	0.90	-1.42	-1.58
ъ.	Health & Education Finances	-0.12	-0.00	-1.89	-0.16	-0.27	-1.51	0.32	1.11	-1.58	-0.00	-0.66
4.	Other Rural Farm Population	: 1.01	-1.24	-0.51	-0.21	0.93	0.03	-0.07	-0.14	0.46	0.41	0.03
5.	Age	-4.15	-0.45	-3.04	-1.40	-1.44	-1.22	-0.71	-1.05	-0.44	0.69	-0.45
6.	Highways Finances	:-1.84	-0.06	-0.03	0.49	-0.42	-0.03	-1.42	-0.46	-0.84	1.18	1.52
7.	Banking	-0.19	-0.31	-1.69	-0.79	-0.89	-1.01	1.98	<b>-0.</b> 04	-1.89	-0.78	0.45
8.	Nonresident Workforce	: 0.41	-1.52	-0.45	-0.40	-0.17	-0.42	-0.91	0.62	0.60	1.92	-0.00
9.	Education Specialty	: 0.41	1.02	-2.18	-0.60	2.02	1.01	1.70	0.80	-1.86	0.26	-0.02
10.	Manufacturing Investment Efficiency	: 2.82	0.69	-1.16	0.05	1.50	0.40	0.93	1.57	-0.92	-0.40	-0.33
11.	Retail-Wholesale Trade Specialty	0.03	1.62	0.53	-0.18	-0.45	-0.13	0.02	-2.38	1.33	-1.76	0.10
12.	Government Debt/Revenue Index	:-0.11	0.77	2.19	1.31	-0.05	0.58	-0.04	-0.07	-0.02	0.72	1.65
13.	Farm Family Living Index	0.98	-0.03	2.87	1.13	0.55	0.09	-0.82	-0.82	-0.11	0.08	0.67
14.	Non-Farm Income	: 0.17	0.17	1.20	0.90	1.19	1.56	2.80	1.02	0.77	0.29	2.19
15.	Commercial Agriculture	1.00	2.73	0.73	0.45	-0.06	-0.63	-0.81	0.66	-0.29	-0.87	-0.72
16.	Education Structure	: 0.92	2.16	-0.33	-0.53	-1.06	-0.55	-0.46	-1.32	-0.66	0.32	0.78
17.	Family Income Change	0.53	-0.51	-0.28	-0.74	-0.52	-0.02	-0.10	-1.12	-0.28	-1.12	-0.33
18.	Banking Deposits Change	: 1.39	-0.90	0.05	-0.84	-0.42	-0.27	-0.32	-0.59	-0.80	1.28	0.53
19.	Wholesale Efficiency	-2.86	-0.81	-0.48	0.02	-0.06	0.18	-1.12	0.03	0.28	0.60	0.52
20.	Population Level & Density	: 1.02	0.39	0.74	0.64	1.98	1.92	2.67	-2.11	1.51	-0.69	1.22

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TABLE 14. (continued)

	Factor Number and Name	12	13	RC&D 14	Area 15	Identi 16	ficatio 17	on Num 18	bers <sup>1</sup> 19	20	21
1.	Socioeconomic Status	-0.85	-12.49	-9.84	2.48	-2.93	-0.36	-8.55	-8.51	-13.43	10.97
2.	Minority Population	-0.96	-2.45	-2.19	0.84	1.52	1.80	-1.95	-3.08	-0.34	-2.12
ъ.	Health & Education Finances	-1.01	-2.53	-1.01	-0.62	1.38	0.23 -	-1.47	-2.19	-0.13	1.53
4.	Other Rural Farm Population	0.09	-0.30	-0.12	-0.66	-0.16	-0.14	-1.11	-0.46	-1.93	-0.01
5.	Age	-0.00	-0.21	0.79	-0.76	-0.33	-1.40 .	-0.50	-0.73	0.84	-1.58
.9	Highway Finances	-0.13	0.76	0.95	0.40	-0.25	-0.39	0.10	-0.56	2.78	0.45
7.	Banking	-0.40	0.66	0.84	0.34	1.53	1.73	-0.04	0.27	1.68	-0.40
<b>∞</b>	Nonresident Workforce	2.09	-0.52	0.07	1.21	-0.88	0.03	-1.74	-1.47	-1.12	-0.61
9.	Education Specialty	0.42	-0.85	0.43	0.87	-2.16	-0.57	0.17	-0.07	-2.78	3.64
10.	Manufacturing Investment Efficiency :	-1.32	-1.48	-0.52	-0.08	-0.52	0.32 -	-1.07	-1.00	-3.61	0.84
11.	Retail-Wholesale Trade Specialty	0.83	-0.19	-1.02	0.91	-1.06	0.79	-1.54	-3.22	-4.10	1.27
12.	Government Debt/Revenue Index :	0.22	1.53	1.45	0.36	1.37	1.37	0.01	0.30	2.14	0.45
13.	Farm Family Living Index	-0.15	-0.13	-0.16	-0.55	0.20	-0.53 .	-1.01	-0.79	0.30	1.54
14.	Non-farm Income	1.75	0.84	1.39	-0.99	-0.05	1.15 -	-2.93	-0.04	-6.41	-3.04
15.	Commercial Agriculture	-1.17	-2.40	-1.19	0.62	-0.35	-0.78 -	-1.43	-0.61	0.17	0.21
16.	Education Structure	0.54	-0.15	0.11	-1.11	-1.02	-0.82	-0.27	-0.21	-0.17	0.14
17.	Family Income Change	0.55	1.29	1.06	-0.40	-1.77	-0.90	1.07	0.56	2.36	-0.73
18.	Banking Deposits Change	-1.35	-1.15	-0.42	-2.46	0.14	-0.77	0.86	1.41	0.36	0.06
19.	Wholesale Efficiency	-0.26	-3.00	-0.97	0.44	-0.09	-0.16	-0.07	-0.19	-0.63	0.40
20.	Population Level & Density	1.40	3.78	2.88	-0.99	-1.38	0.48	0.29	0.23	0.98	-2.70

98

	Factor Number and Name	22	23	RC&D 24	Area I 25	dentif 26	icatio 27	n Numb 28	ers <sup>1</sup> 29	30	31
i.	Socioeconomic Status	6.18	2.98	-0.81	4.45	-2.82	2.86	-5.06	3.80	-12.72	-7.83
2.	Minority Population	2.43	4.21	4.15	0.01	1.91	1.34	3.55	2.28	5.67	5.07
÷.	Health & Education Finances	0.33	0.88	0.15	-0.49	0.74	0.26	0.80	1.12	0.13	0.22
4.	Other Rural Farm Population :	0.03	0.10	-1.20	0.27	-1.12	0.40	-0.34	0.12	-1.47	-0.17
5.	Age	0.09	0.62	3.31	0.82	3.33	2.50	2.40	-0.48	4.14	2.54
6.	Highway Finances	-0.22	-1.34	-1.11	-1.96	-1.05	-0.33	1.31	-1.51	0.52	1.73
7.	Banking	0.13	-0.36	0.51	-1.07	-0.09	-1.24	-0.16	-0.99	-1.14	-0.12
<b>œ</b>	Nonresident Workforce	0.64	0.32	1.14	1.14	2.47	1.04	0.25	-0.02	0.46	-0.13
9.	Education Specialty	1.46	0.48	-0.29	2.56	0.13	1.26	-3.21	-0.79	-5.66	-4.44
10.	Manufacturing Investment Efficiency :	2.13	0.85	0.73	-1.64	-0.45	0.07	0.66	1.44	-0.95	-0.14
11.	Retail-Wholesale Trade Specialty	0,40	1.42	-1.54	0.15	2.11	0.18	0.02	1.91	-0.82	-0.55
12.	Government Debt/Revenue Index :	-1.04	1.03	1.01	-1.43	0.02	-2.40	-1.40	-1.18	-0.73	-1.70
13.	Farm Family Living Index	-0-34	-1.66	-1.33	1.78	0.24	-0.76	-0.81	-1.51	-1.48	-1.39
14.	Non-Farm Income	-0.14	-0.86	0.87	1.61	0.53	0.62	-1.62	-1.04	-4.30	-2.67
15.	Commercial Agriculture	-1.55	0.88	0.54	-1.07	0.11	-0.52	0.12	0.60	2.78	0.27
16.	Education Structure	2.24	1.40	1.69	-0.16	0.69	1.02	0.68	1.96	0.19	-0.16
17.	Family Income Change	0.26	-0.46	1.46	-0.74	1.92	0.14	-0.15	-0.56	-0.73	-0.44
18.	Banking Deposits Change	-0.01	1.45	-0.24	0.93	-0.43	-2.29	-1.44	0.06	0.84	-0.53
19.	Wholesale Efficiency	0.42	1.33	2.69	2.06	-0.41	1.79	1.74	-0.35	-1.68	1.69
20.	Population Level & Density	1.36	-1.22	0.11	-1.17	0.15	0.38	0.52	-1.45	1.92	1.64

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	Factor Number and Name :	32	33	RC&D 34	Area I 35	dentif 36	icatio 37	n Numb 38	ers <sup>1</sup> 39	40	41
<b>i</b> .	Socioeconomic Status	-7.17	-2.80	-8.37	2.06	-5.14	6.59	1.14	8.52	4.19	4.66
2.	Minority Population :	2.12	2.59	1.66	4.23	0.14	0.76	0.38	-3.01	-1.58	-1.59
э.	Health & Education Finances	0.82	0.82	-0.15	0.57	-0.04	0.78	1.15	1.37	-0.28	0.62
4.	Other Rural Farm Population :	-0.23	-0.18	-0.83	-0.15	3.22	0.94	-0.34	-0.89	0.23	-0.26
5.	Age	2.40	0.60	2.58	1.18	-1.03	0.30	-2.09	0.73	-0.48	-1.75
6.	Highways Finances	1.76	0.32	-1.55	0.63	2.71	-1.24	2.58	0.88	1.85	-0.09
7.	Banking	-0.26	1.69	0.46	-0.46	-1.42	0.83	1.69	1.67	-1.56	1.06
8.	Nonresident Workforce :	0.48	0.36	-0.70	1.72	1.80	0.27	-1.81	0.46	0.72	-1.49
9.	Education Specialty	-5.02	-2.28	-3.34	-1.27	-6.27	3.05	-1.64	5.87	-0.09	2.73
10.	Manufacturing Investment Efficiency :	-0.81	-0.06	-0.84	0.77	-0.27	-1.59	-0.24	1.80	0.33	0.06
11.	Retail-Wholesale Trade Specialty	-1.55	1.40	-1.22	0.70	1.04	0.14	0.85	0.15	-0.33	2.15
12.	Government Debt/Revenue Index :	-1.70	0.09	-0.65	-2.06	1.86	-3.54	0.30	0.23	-1.45	0.50
13.	Farm Family Living Index	0.86	0.33	-0.57	-1.97	-0.36	0.69	0.35	0.86	-1.14	1.14
14.	Non-Farm Income	-2.31	0.43	-1.39	-0.61	-0.73	1.01	-0.99	0.02	-1.45	1.36
15.	Commerical Agriculture	0.19	0.71	2.52	0.62	1.12	1.75	-1.27	0.32	-2.24	-1.35
16.	Education Structure	1.91	-1.14	0.15	-0.95	-0.51	-1.29	-1.28	0.35	-0.84	-0.07
17.	Family Income Change	0.80	-0.25	-0.29	1.86	0.66	0.09	0.52	-0.97	-2.08	-0.85
18.	Banking Deposits Change	-0.14	-0.61	-0.39	0.68	2.76	1.42	1.44	1.15	-0.42	-0.32
19.	Wholesale Efficiency	0.77	1.88	0.95	0.03	0.33	0.56	1.37	-0.97	0.52	-2.21
20.	Population Level & Density	0.50	0.09	-0.16	-2.08	-0.46	2.02	-2.24	-2.58	-4.50	1.56

(continued)	
14.	
TARLE	

	Factor Number and Name	42	RC& 43	D Area Id 44	entificat 45	ion Numbe 46	rs <sup>1</sup> 47	48
i	Socioeconomic Status	2.10	7.29	-1.54	12.88	14.76	2.92	-0.15
2.	Minority Population	-1.26	-0.99	-0.66	-1.61	-2.58	-2.26	-1.53
	Health & Education Finances	0.76	2.24	-0.42	0.68	0.20	-1.95	-0.78
4.	Other Rural Farm Population	-0.36	2.71	-0.99	3.83	1.34	0.27	-0.81
5.	Age	-0.43	2.23	3.07	-4.24	-3.07	0.04	-1.68
6.	Highways Finances	1.29	-0.95	-1.19	-1.04	-0.98	-2.95	1.04
7.	Banking	0.97	0.02	2.19	-1.63	-0.42	-1.57	0.23
<b>∞</b>	Nonresident Workforce	-0.44	0.47	-1.27	-1.48	-0.92	-0.75	-1.48
9.	Education Specialty	1.73	0.42	0.90	3.14	5.12	3.76	-0.02
10.	Manufacturing Investment Efficiency	-1.19	0.30	0.85	-0.71	3.65	1.50	-2.95
11.	Retail-Wholesale Trade Specialty	-0.24	0.71	-0.55	-1.01	0.87	1.78	0.46
12.	Government Debt/Revenue Index	-0.49	0.53	0.20	0.29	-2.52	-0.27	0.32
13.	Farm Family Living Index	0.49	1.69	-0.52	-0.18	4.65	-0.55	0.32
14.	Non-Farm Income	2.09	-1.54	1.54	1.64	1.64	1.45	0.83
15.	Commercial Agriculture	-0.42	-0.34	1.66	1.02	-0.39	0.66	-2.00
16.	Education Structure	0.11	-3.60	-0.22	1.04	0.15	0.41	0.96
17.	Family Income Change	-0.00	-0.84	2.71	0.05	0.73	0.15	-1.44
18.	Banking Deposits Change	1.95	-0.43	-1.73	-1.92	0.60	1.05	0.78
19.	Wholesale Efficiency	-1.48	0.44	-0.41	-1.61	-1.96	1.58	-0.88
20.	Population Level & Density	-1.03	-1.97	-0.60	-1.34	3.09	-0.23	-0.45

<sup>1</sup>See RC&D project identification in Table 3.

