A conceptual variable analysis of technological change

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UMI®
A CONCEPTUAL VARIABLE ANALYSIS OF TECHNOLOGICAL CHANGE

by

Everett Mitchell Rogers

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

Major Subject: Rural Sociology

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1957
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INTRODUCTION

One of the characteristics of our modern American society is the rapidity with which technological changes are taking place. New technology has resulted in important changes in many different fields, such as industry, medicine, education, and homemaking. One field in which technological changes have had an important effect is agriculture. New seed varieties, fertilizers, machines, livestock feeds and other new agricultural practices are constantly being developed and recommended to farmers.

Agricultural technology is novel to the extent that much of it has been developed by state and national agencies that are supported by government funds. Not only has the research and development of new agricultural technology been supported by the public but also government agencies have been set up to diffuse or spread this technology to the farmer. These agencies include the federal and state extension services, the Soil Conservation Service, the Agricultural Stabilization and Conservation Service, and high school vocational agriculture departments. One of the objectives of most of these "change agencies" is to secure the adoption of new technological practices by their constituents.

Commercial concerns also have been interested in speeding the spread of new technological discoveries. Most new practices entail the purchase of some new product or equipment.
The role of the commercial change agent in securing the diffusion and adoption of certain new farm practices such as the use of hybrid seed corn has been studied (86).

In view of the considerable effort expended by both publicly and commercially sponsored change agents, one might expect that new technological practices would be adopted rapidly. There is considerable evidence that this is not the case. For example, in the case of 2,4-D weed spray, a period of more than five years passed after the first farmers were aware of the practice until half of the farmers in one Iowa community were using it (81).

Rural sociologists in recent years have been able to provide the change agents with a theoretical framework in which to analyze the role of the change agent (71). The process by which an individual adopts a new practice and the relative importance of various information sources at each stage in this adoption process has been determined. It has also been found that all individuals do not adopt a new practice at the same point in time (8, 81). Adopters have been categorized on the basis of the time at which they adopt new practices into "innovators", "adoption leaders", and into other adoption categories. The personal characteristics of each of these adopter categories have been described (81).

One of the major purposes of this dissertation is to add to this basic framework mentioned above by suggesting sociological concepts that are related to a more rapid
adoption of agricultural technology. These sociological concepts were suggested by an application of general sociological theory and from a review of the literature dealing with past research in this area. A more detailed description of the criteria by which these sociological concepts were selected is included in a later chapter.

The method of analysis used in this dissertation is that of conceptual variable analysis. A concept is defined as an entity or a dimension stated in basic or primitive terms. A conceptual variable is a concept expressed as a continuous variable, usually by means of a scale or index. The attempt in this thesis is to predict as large a portion as possible of the variation in the dependent conceptual variable, technological change, by means of analyzing the relationships of this concept with six other independent conceptual variables.

These six conceptual variables are labeled in this thesis as (1) change orientation, (2) communication competence, (3) status achievement, (4) cohesion with the locality group, (5) family integration, and (6) cohesion with the kinship group.

Operational indexes were constructed to measure each of these six sociological concepts. These independent variables were combined in a multiple regression analysis in order to determine the degree to which each could predict technological change. The degree to which the combined effect of all six conceptual variables could account for the variation in the
dependent variable (technological change) was also determined. The interrelationships between each of these six independent variables were computed and these interrelationships were controlled by use of partial correlation techniques so as to determine the "pure" relationship between each independent variable and the dependent variable.

One of the major tasks encountered in this study was the construction of satisfactory indexes to measure each of the conceptual variables. The validity and reliability of these indexes and the items contained in each index are reported in a later chapter.

The main purposes of this dissertation are:

1. To determine the extent to which technological change might be predicted by a conceptual variable analysis of selected sociological factors.

2. To determine which conceptual variables are the best predictors of technological change when (a) analyzed singly and (b) certain other conceptual variables are controlled by statistical means.

3. To suggest other sociological concepts and improved operational measures of sociological concepts which might be utilized in future research endeavors in the general field of technological change.
REVIEW OF LITERATURE ON ADOPTION OF FARM PRACTICES

A number of studies have been centered around the analysis of personal, social, and personality characteristics as they are related to the time of adoption of a single farm practice. Included in this type of study are those of Dimit (25, pp. 68-75), Wilkening (101), Marsh and Coleman (63), Chaperro (16), Gross (36), Gross and Taves (37), and Marsh and Coleman (65).

Other studies have made use of an adoption scale with each element or item in the scale composed of the adoption or non-adoption of a single farm practice. The adoption scale was utilized as a general measure of the degree to which each farmer has adopted new technology. The usual method of analysis was to determine the degree of relationship between the adoption scores and a variety of characteristics such as: years of education, size of farm, formal participation, age, and others. Nineteen of these studies are listed in the chapter on Construction of the Operational Measures.

In terms of the objectives of these studies (which were generally not stated explicitly) they might be criticized as to their selection of factors that were analyzed as they related to the adoption of farm practices. First, little emphasis was placed upon dynamic factors, or ones that could be manipulated or changed in order to secure higher or more rapid adoption. This criticism may not be too serious in
exploratory research or when the purpose of the research study is to provide the change agent with some personal characteristics of the innovators, adoption leaders, and other adoption categories so that the change agent can identify and locate these individuals among his constituents. However, when the purpose of a study is to determine factors that the change agent may manipulate in order to secure more rapid adoption of technological changes among his constituents, the emphasis would be better placed on dynamic factors.

Secondly, few past studies have made an explicit attempt to utilize sociological theory in deriving hypotheses or in giving fuller meaning to the findings. The factors included in most of these past studies were not at a "general" level of abstraction. An advantage of operating at a more abstract or general level is that the research findings can usually be applied to a wider range of situations.

These shortcomings of past research studies are listed for the purpose of pointing out the reason for attempting to utilize a different approach to the problem in this dissertation.

A variable analysis including more abstract or general measures of sociological concepts has been attempted in two recently published studies. A thesis (33) and a professional meeting paper (34) by Fliegel report the results of a multiple correlation analysis involving a measure of the adoption of farm practices and six independent variables. These six inde-
dependent variables were general measures rather than the specific factors such as age, size of farm, years of education, and others used in previous studies. The six variables used by Fliegel were: a size of farming operations index, an authority in decisions on farm matters index, a familism index, a sources of information on farm matters index, a level of living index, and an attitude toward new farm practices index. He found that the first two of the six independent variables were not significantly related to the adoption scores. When each of the six independent variables was tested for its degree of relationship with the adoption scores while controlling on the effect of the other five independent variables, the first two of the six independent variables were again found to be not significantly related to the adoption variable. Fliegel reported a multiple correlation of .57 between the six independent variables and the adoption of farm practices.

A professional meeting paper (20) and a bulletin (22) by Copp reported the results of a study of the adoption of new farm practices by Kansas cattlemen. He found that scores on each of three general measures, a professional farming scale, a rigidity-flexibility personality scale, and a size of unit index, were highly associated with the adoption of farm practices. When these three "general" variables plus the more specific factors of formal education, age, social participation, and gross farm income were included in a multiple
regression analysis, it was concluded that three of the four single factors were of no significant additional value in accounting for adoption when the three general measures and gross farm income were taken into consideration. A coefficient of multiple correlation of .69 was found.

Second multiple regression analysis was completed by Copp including measures of professionalism, mental flexibility and gross farm income and also the number of acres operated and the number of cattle owned. A coefficient of multiple correlation of .70 was found and the increment of explained variance explained by acres operated and beef cattle was barely significant.

Both the variable analyses by Copp and by Fliegel were attempts to utilize more general or abstract measures of concepts. Neither attempted to use general sociological theory in developing their hypotheses although Copp stated that he felt the field theory approach (of Lewin) might be appropriate. Copp suggested that the behavioral tendency to adopt recommended farm practices might be regarded as the result of the field of forces impinging on the individual farm operator. However, Copp did not explicitly use the field theory approach in his study.

References to the studies cited above will be made in further detail in appropriate later chapters of this dissertation. With the exception of the two studies that have been reviewed in this chapter, the general procedure in this thesis
will be to integrate citations of past research findings and methodology into the appropriate sections. It is the author's opinion that these references will be more functional if handled in this way. It is hoped that this distribution of citations to past research studies throughout this dissertation will demonstrate that a thorough review of the literature was made.
METHOD AND PROCEDURE

How the Study Was Done

The data that are used in this dissertation are a part of the data collected as Iowa Agricultural Experiment Station Project 1236, "Patterns of Social Relationships and Lines of Communication in Rural Iowa Communities". The objectives of this larger study are reported by Beal (?) as:

1. Determine the patterns of formal and informal social relationships, leader-follower relations and lines and patterns of communication in an Iowa rural community.

2. Determine if and how the above data can be used by professional leaders and lay people to broaden and increase the depth and speed of dissemination of ideas and practices to community leaders.

3. Develop research techniques to rapidly gather and analyze such data from both the point of view of (a) the basic research worker and (b) the professional worker who of necessity will have to have a quicker, less complex method to obtain the significant data.

The rural community of Collins, Iowa, was selected as the locale for this study. The community is geographically located in a position relative to Iowa State College so that field interviewing expenses were low. Although representa-
tiveness was not a major consideration in selecting the community, Iowa Extension Service supervisory and county workers ranked the community as a fairly typical central Iowa community when they used the criteria of success with educational programs and general level of agricultural practices adopted. In no case did they rank the community in the lower or upper 20 percent of communities in the county. The Collins community was found to have no outstandingly unique characteristics, such as ethnic or religious groupings.

The Story County Extension Director was asked to delineate the boundaries of the Collins community. Specifically, he was asked, "If you were going to carry on Extension educational work in Story County on a community basis, where would you delineate the boundaries of the Collins community?" The community boundary was obtained in this manner.

Description of the Community

The Collins community boundary is roughly similar to Collins Township in the southeastern corner of Story County. The agriculture is typical of the highly commercialized corn-hog area of central Iowa. The level of living index for farm operator families (39) in Collins Township was 186 in 1950 while the average for the state was 178 and for the United States was 122.

The majority of the members of the Collins community live within the Story County boundary but several members live just
inside the boundaries of Marshall and Jasper Counties. U. S. Highway 65 bisects the community from north to south, passing through the village center. Iowa Highway 64 passes through the southeastern corner of the community.

The shape of the community approaches a square with the exception of the northeastern corner where the farm operators were considered members of the Rhodes community.

The village center is located approximately in the center of the community area. The business life of the village center reflects its dependence on the agriculture of the surrounding area. Implement agencies, grain elevators, feed stores, grocery stores, garages, gas stations, hardware stores, restaurants, a real estate office, a telephone office, a railroad depot, several churches, and a school constitute the primary services offered in the village center.

There are three churches and 11 church affiliated organizations in the village center. Among the many formal organizations are the Masonic Lodge, Eastern Star, Boy and Girl Scouts, Boys' and Girls' 4-H Clubs, F.F.A., Lions, American Legion, Legion Auxiliary, Farm Bureau, Saddle Club, Square Dance Club, and several card clubs.

The population of the incorporated village center was 432 in 1950. Approximately 160 households are maintained in the village center. About 148 farm operator households and 19 non-farm households are located in the rural area of the commu-
A wide variety of possible contacts with sources of information about new farm practices are available to the farm operators residing in the Collins community. Veterans' on-the-farm training, vocational agriculture, adult evening classes for farmers, Soil Conservation Service, Agricultural Stabilization and Conservation Service, Iowa Extension Service and other agricultural agencies operate programs in the community. The offices of some of these plus additional agencies are located in the county seat town, 18 miles away. Some farmers go directly to the state agricultural college, located about 30 miles away, to secure agricultural information.

Eighty-three percent of the farm operators in the community listen regularly to at least one farm radio show. Only two farmers do not possess radios. Ninety-one percent of the farm operators have television sets and eighty-six percent regularly watch at least one farm television broadcast. Ninety-seven percent subscribe to at least one farm magazine. The average farm operator subscribes to 4.4 farm magazines.

Field Interviewing

Since one of the purposes of the Agricultural Experiment Station study was to determine the patterns of social relationships and lines of communication in the community, it was necessary to gather data from all of the farm operators resid-
ing in the delineated community area. One hundred forty-eight personal interviews were completed with the farm operators during a two weeks' period in June and July of 1955. Farm operators were included if they farmed 20 acres or more and had a part in making the farming decisions on their farm. Interviews were also completed with the wives of the farm operators and with the female heads of the households located in the village center as a part of the larger study. Data used in this dissertation are taken mainly from the farm operator interviews although responses to a limited number of questions are taken from the farm wives' interview schedules.

Many of the ideas used in the study were developed in a graduate seminar in sociology in which the author was enrolled. However, the actual interview schedule was developed primarily by the research project leader, Dr. George M. Beal. Some questions were taken from interview schedules used by other research workers. The interview schedule was pretested on farm operators in Story County by the author. Interviewers were trained by the project leader and the author. The interviewers were advanced undergraduate students in sociology and professional interviewers from the Iowa State College Statistical Laboratory. The interviewing was jointly administered and directed by the project staff and the Iowa State College Statistical Laboratory. The author completed more than one-fifth of the interviews with the farm operators and their wives. Each interview lasted about one and one-half hours.
Methods of Analysis

Data from each schedule were coded and transferred to IBM cards. Indexes to measure each of the six independent variables and the dependent variable in this study were constructed. The chapter on Construction of the Operational Measures includes a description of how these indexes were constructed.

One of the major purposes of this dissertation, as stated in the Introduction, was to determine which sociological concepts are the best predictors of technological change. The interrelationships between each of the six sociological variables and the adoption of technology variable were determined by means of the statistical method of multiple regression. The formulas used in this multiple regression analysis are included in the chapter concerned with the analysis of the data. Much of the actual computational work that was required for the multiple regression analysis was done by the Iowa State College Statistical Laboratory.

One of the assumptions underlying the use of a multiple regression analysis for tests of significance is that the data were obtained by a random sample from a larger population. In this study, interviews were taken with all of the 148 farm operators in one rural community. The decision to interview the total population of farm operators in one community was made necessary by the nature of the larger Agricul-
tural Experiment Station project of which the present study was one part.

In order to justify the utilization of statistical tests of significance it may be assumed that the 148 farm operators are a random sample of farmers in time and space. The relative strength of the assumption that the 148 respondents are a random sample in time and space from a larger population obviously limits the definite application of the findings of this study.

The necessity of assuming a random sample rather than a complete population does not affect the problem of estimation encountered in this dissertation. For example, in later chapters of this thesis an attempt will be made to estimate the regression equation by means of which the dependent conceptual variable of technological change may be predicted.

Two different types of tests of significance will be made in the Analysis of Data. Each of the intercorrelations between the seven variables will be tested to determine whether they are significantly different from zero. Each of the six fifth-order partial correlations between the dependent variable and each of the six independent variables will be tested for significance to determine which of the six independent variables may be dropped from the prediction equation. In these two types of tests of significance it must be remembered that the real error term involved in the tests of significance will probably be larger than the error term actually
used. The real error term is unknown. The author decided that it was better to use statistical tests of significance even though their use cannot be entirely justified.* The findings must be regarded as tentative until the findings of other research workers either support or fail to support them. The reader should keep this caution in mind when reading the findings of the present study.

A caution also needs to be mentioned regarding one other aspect of this study. As Ostle (73, p. 118) has pointed out in his discussion of analysis of regression, simply because some functional relation among certain variables is found, a causal relation cannot be assumed. For example, a coefficient of correlation of .50 is found between scores measuring the adoption of farm practices and scores measuring the degree of readership of farm magazines. It cannot be assumed on the basis of the statistical findings that readership of farm magazines causes the adoption of farm practices.

However, one of the purposes of sociological theory is to suggest causal relationships. One of the advantages in utilizing sociological theory in the derivation of the hypotheses tested in this study is that a cause and effect relationship can be tentatively inferred. However, the causal relationships cannot be assumed on the basis of the statistical tech-

*It should also be pointed out that the necessity of assuming a random sample for the purpose of making statistical tests of significance is not uncommon in both the physical and the social sciences.
It was stated in an earlier section that the method used in this dissertation is that of conceptual variable analysis. The essential steps in a conceptual variable analysis may be described briefly as follows.

The first step is to express all concepts as variables. A concept is defined as an entity or dimension stated in its basic or simplest ("primitive") terms. A conceptual variable is a concept expressed as a continuous variable. A conceptual variable to be used in this thesis, for example, is technological change. Technological change is defined as the degree to which individuals accept new technological practices. A concept ideally should be general or abstract enough so that it may be applied to many specific types of situations. For example, technological change could be studied in industry, education, homemaking, or in other applications.

The next step in variable analysis is to develop operational scales or indexes to measure each conceptual variable. An operation is defined as the empirical referrent of a concept. For example, the adoption of farm practices scale will be described as the operational measure of the concept of technological change. The degree to which the operation is a valid measure of the concept is an important consideration. This linkage between concept and operation is called an epistemic correlation.

The postulated relationship between two conceptual vari-
ables is called a general hypothesis. For example, a general hypothesis may be postulated between the concept of technological change and the concept of status achievement. The general hypothesis will be stated: the degree of technological change varies directly with the degree of status achievement. A general hypothesis is tested by means of testing an empirical hypothesis. An empirical hypothesis is the postulated relationship between two operational measures. For example, an empirical hypothesis will be stated in a following section of this thesis: the adoption of farm practices scale varies directly with the status achievement index. An empirical hypothesis is usually accepted or rejected on the basis of statistical tests of significance. As variables are usually involved, statistical methods of correlation or regression are commonly utilized. A general hypothesis is supported or not supported on the basis of the testing of the corresponding empirical hypothesis. Confirmation is added to a general hypothesis by similar findings from other studies involving the relationship between the two conceptual variables in a variety of situations.

As additional confirmation is added to a general hypothesis by findings from later studies, greater confidence may be placed in the relationship between the concepts. The relationships between each of these two concepts and other concepts may also be studied and as findings of this nature are gradually accumulated, a body of general sociological theory
is developed. In this fashion, it can be seen that the theoretical findings are accumulated in a consistent manner. The eventual goal is the development of a body of general sociological theory composed of the interrelationships among a number of concepts.
THEORY AND HYPOTHESES

In this chapter the dependent variable and each of the six independent variables will be discussed from a theoretical standpoint. First, however, some more general considerations of sociological theory will be mentioned.

General Considerations

The approach to the theoretical analysis of technological change used in this study is that of conceptual variable analysis. The procedure of this type of analysis has been described in the previous chapter. However, before this method of analysis is utilized, some of the shortcomings of variable analysis should be mentioned.

Blumer (10, p. 683) has referred to variable analysis as the scheme of sociological analysis which seeks to reduce human group life to variables and their relations. He has criticized variable analysis on three shortcomings: (1) the lack of criteria for the selection of conceptual variables; (2) the lack of truly generic variables in sociology; and (3) the tendency for interpretive processes to be ignored by the analysis. Nevertheless, Blumer (10, p. 689) feels there are many appropriate uses for variable analysis where the interpretive process is not directly involved.

The process by means of which an individual adopts a new farm practice is definitely an interpretive process. The
farmer interprets various communication stimuli in terms of his past experiences in deciding to adopt or not to adopt a new technological change.

To the extent that Blumer's criticism of variable analysis is sound, the method of this dissertation is weak. However, it might be pointed out that variable analysis has been used in a variety of situations where the interpretive process was definitely involved. For instance, both Copp (20 and 22) and Fleigel (33 and 34) essentially utilized variable analysis in their studies of the adoption of farm practices. Perhaps the use of variable analysis might be partially justified in this dissertation on the basis that the study is exploratory and that later research endeavors can then attempt to more precisely take into account the interpretive process of the human mind.

Another problem involved in the use of conceptual variable analysis in this study is that it was designed to include only social system variables. A social system is defined as a population of individuals functionally differentiated and engaged in collective problem solving behavior.

Variable analysis was developed with the main purpose of analyzing social systems. The individuals involved in this study of technological change are not engaged in collective problem solving behavior. They might be described most aptly as belonging only to a "mass audience" situation. A mass audience is defined as a population of individuals who
are the object of some informational or propaganda action. The individuals in a mass audience, unlike those in a social system, are not necessarily engaged in collective problem solving behavior. The 148 farm operators included in this study are objects of a campaign (by certain change agencies) designed to secure their adoption of technological changes, but are not necessarily engaged in collective problem solving behavior. Certainly, however, some of the 148 farmers are included together in social systems, but all of the 148 individuals are not included in any single social system. For example, some of the farmers in the study are grouped together into family social systems. Not all of the farmers are included in any one family, however. The question is, then, whether social system variable analysis may be applied to this mass audience situation.

There is some reason to think that even though the method of variable analysis was developed for the purpose of analyzing a social system, it might also be used in a mass audience situation. However, the degree to which the findings from social system analyses (which will be cited in later chapters) may be applied to the present hypotheses is open to question.

It already has been stated that the attempt in this dissertation is to utilize sociological concepts that are at a general level. Merton (68, pp. 93-94) has suggested five characteristics which sociological theory at this general
level should possess:

1. Sociological theory should be conceptualized in abstractions of a higher degree in order to obtain a wider scope of application.

2. Theoretical findings should be cumulative. A major function of systematic sociological theory is for later findings to add confirmation to the set of propositions from which they were derived.

3. Theory should provide for an increased fruitfulness of research by successive exploration of implications in remotely related fields.

4. Theory should provide a grounds for prediction.

5. Sociological theory should be precise enough to be testable.

These considerations were kept in mind while developing the hypotheses utilized in this dissertation. One of Blumer's criticisms of variable analysis (10, pp. 683-685) was that there was a lack of criteria available for the selection of conceptual variables. In this dissertation, Merton's five criteria listed just previously were considered as a basis in setting down criteria by means of which to select the six concepts that were studied as they related to technological change.

These criteria were:

1. Each concept must be dynamic or manipulatable.

Beal has labeled certain factors in his participation
research as dynamic if they could be altered or changed by the change agent.* If they cannot be changed they are labeled as static factors and tend to be of less value to the change agent in achieving change in his constituents. As an example, a general finding of past research dealing with the adoption of farm practices is that farmers of an older age tend to be more resistant to technological change in agriculture. Because a change agent can do nothing to change a farmer's age, and by so doing change his adoption of farm practices, this factor of age is labeled as static. Both Copp (21) and Bauder (4) have recently made a plea for an emphasis on dynamic rather than static concepts in adoption research.

2. Each concept must be expected to be highly related to the dependent conceptual variable, the degree of technological change. As the amount of computational effort limited the analysis to only six independent variables, the task was actually one of selecting the six conceptual variables that were expected to be most highly related. The degree to which these concepts might be expected to be related was suggested both by general sociological theory and by a

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*For the original discussion of this dichotomy of static versus dynamic factors, see Beal (6). For later uses of this distinction between static and dynamic factors in participation research, see Rogers (76, 77, 79, and 80), Voland (96), and Harp (43).
review of the literature dealing with past adoption research.

3. Each concept must be sociological rather than economic, psychological or biological. A criticism of past research, that some of the concepts were not sociological, has been made by Bauder (4). Although it is a matter of degree, the attempt in this study was made to choose conceptual variables that were sociological.

4. Each concept should be fairly general in nature. This higher level of abstraction is in part necessitated by the use of general sociological theory in the formulating of hypotheses and is a marked change from most past research studies in this area with the exceptions of Fliege (33 and 34), Copp (20 and 22), and Wilkening (103, p. 7). The attempt was made to select concepts that could be measured by an index at a "middle" level of abstraction,* so that general sociological theory could be utilized, but not so highly abstract that the findings would

*This "middle range" level of abstraction was described by Merton (68, p. 5) as:

... intermediate to the minor working hypotheses evolved in abundance during the day-by-day routines of research, and the all-inclusive speculations comprising a master conceptual scheme from which it is hoped to derive a very large number of empirically observed uniformities of social behavior.
not be of use to the change agent.

5. Another limitation in selection of these independent variables was that the information was secured from the respondents before the operational indexes were constructed. Hence, a variable could not be selected for inclusion in this dissertation if the data to measure it were not already secured. This is obviously a major limitation of this dissertation.

On the basis of these criteria, six conceptual variables were selected as possessing the desired characteristics. In the following sections of this chapter, each of these six conceptual variables will be considered. For each concept, the following data will be listed: (1) past research of a similar nature; (2) a definition of the concept; (3) reasoning or logic as to why the concept would be expected to be related to technological change; (4) a statement of the general hypothesis postulating the relationship between the concept and technological change; and (5) a statement of the empirical hypothesis derived from the general hypothesis.

A Situational Analysis

Perhaps one of the best means of conceptualizing the expected relationships between each of the six selected conceptual variables and technological change is to describe a hypothetical situation in which technological change is taking place.
Even at the most basic and elementary level of conceptualization, this situational analysis would require at least the following components* to be present:

1. An actor which in this case is a farm operator.
2. A technological change which in this specific example is a new farm practice.
3. Communication devices whereby the actor may learn of the new technological change.
4. Various mental attitudes that the actor already possesses as a product of his past experience.
5. Various group situations of which the actor is a part and which may influence his behavior.

The specific behavior under analysis is the adoption of the new technological change by the actor. The actor does not perform the behavior (adoption) until communication takes place and he learns of the existence of the new technological practice. Communication as a component of the adoption situation is analyzed in this study as it is related to technological change. The conceptual variable of communication competence is described more fully in a later section of this chapter.

*This situational analysis makes use of component patterns essentially similar to those described by Carr (14, pp. 3-4). He listed two main types of component patterns: background patterns including primary groups (such as the family and rural neighborhood), community, orientation and communication groups, and status groups; and foreground patterns such as past experience and attitudes.
change, toward the communication device from which he learns of the new practice, toward the original source of the technological information, and toward certain other phenomena will affect his adoption behavior. The first of these attitudes mentioned above will be one of the conceptual variables included in this dissertation. Empirical measures of the other attitudes were not available so that they could be studied.

An attitude is a mental tendency to act under certain conditions in a certain way. An attitude is developed through the individual's past experience. This attitude would be expected to influence his behavior when he receives the communication stimulus about the new technological practice.

Even when the adoption situation is described in its simplest form, it is impossible to neglect the influence of various groups upon the individual's adoption behavior. A farmer's neighbors, kinfolk, and immediate family might be expected to affect his decisions regarding the adoption of technological changes. These groups build up role expectations for the actor which they expect him to fulfill. If he does not fulfill these expectations, negative sanctions such as ridicule are leveled against him. If the roles are fulfilled, such positive sanctions as rewards are accorded the actor. Three different group influences upon the actor's adoption behavior will be included in this thesis as conceptual variables.

An individual's status is probably a product of his
interaction with a number of groups. The influence of this status upon the actor's role might have an effect upon his adoption of technological changes. For example, if it is known that higher relative status is accorded to the individual who adopts new technological practices, those individuals who already possessed a relatively high status would feel they were expected to adopt new technological practices.

Other group influences such as those from landlords, bankers, formal organizations, and county agents could have been analyzed. However, the data by which to measure them were not available.

The purpose of this situational analysis was to describe some of the forces that are impinging upon the actor in the adoption situation for the purpose of providing an overview for the following sections of this chapter.

Technological Change

Many research studies in the general area of adoption of farm practices have either implied or stated that the dependent variable involved was a measure of a concept similar to technological change. A number of titles have been used for this concept by various authors. Some of these titles have been used for the concept of acceptance of technological change and others for the concept of resistance to change.

For example, Hoffer (46) used the concept of "cultural change", as did Pederson (75). Gittler (35, p. 260) labeled
this concept as "the degree of social change". Using the opposite concept were Ryan (85) with "technical conservatism" and Stern (91, p. 59) with "resistance to technological advance". The concept of "resistance to change" was used by Ogburn (72, p. 180), Stern (90, p. 7), Kelley and Volkart (52), and Coch and French (18, p. 260).

Wilkening (99, p. 353, 104, and 106) has utilized the concept of "technological change" to refer specifically to the acceptance of new agricultural practices. Lionberger (60, p. 13) used the concept of "technological competence" and suggests that the concept be measured by the number of new farm practices actually put to use (adopted). Wilkening (105) used the concept of "change in farm technology".

The dependent conceptual variable of this dissertation is in the general area of cultural change. Brown and Barnett (12) have pointed out that this phenomena is more appropriately labeled as cultural rather than social change as social change might also include changes in the structure of society. Of course, cultural changes may cause indirect social changes in the structure of society.

Technological change might be viewed as even a more appropriate label than cultural change for the purposes of this dissertation as the term has a more limited meaning and does not include many kinds of cultural changes. Technological change is defined as the degree to which an individual accepts or adopts new technological ideas or prac-
tices. An individual with a high degree of technological change would have accepted or adopted many new practices. The term "acceptance" is used synonymously with the term "adoption" in this dissertation. Adoption is defined as satisfaction with the new practice and intention to make continued use of the practice in the next decision making period. The length of the decision making period would vary specifically with the nature of the practice. For instance, in the case of a new variety of seed, the length of the decision making period is the crop year.

The definition of technological change used in this thesis is basically the same as that reported earlier by Wilkening (99, 104, and 106), the acceptance of new agricultural practices. Certain of the five criteria that were listed in an earlier section of this chapter as a means of selecting the independent conceptual variables may also be used in evaluating the concept of technological change. The concept is dynamic, it is at a fairly general level of abstraction, and the data required to construct an operational measure of technological change were secured in the field study. A question might be raised as to whether technological change is a sociological concept. If viewed in the light of the situational analysis presented in an earlier section of this chapter, technological change might be considered as partly the product of group influences upon the individual.

In this sense, the concept of technological change has certain
sociological aspects.

Technological change is a concept that is similar in some respects to Hamblin's (42) concept of "suggestibility", which is defined as the degree to which individuals indicate a readiness to accept problem relevant ideas. However, the concept of technological change is more limited in scope in that it would only include the acceptance of new technological ideas. There are also some similarities to Merton's concept (69, p. 134) of innovation which is defined as the acceptance of culturally approved ends or goals but rejection of culturally accepted means of attaining those goals and use of culturally unacceptable means. The individual who is one of the first to adopt a new practice is often referred to as an "innovator", a term which is appropriate to the extent that the farmer accepts the cultural goal of technological production but may use a culturally unacceptable means (new practices) of attaining that goal.

It seemed logical that an operational measure of the degree of technological change might be constructed on the basis of the degree of adoption of a number of new farm practices. The construction of this index is described in detail in the next chapter.

Change Orientation

Past research findings

The attitude which an individual holds toward techno-
logical change might be expected to be highly related to the actual degree of technological change. As Wilkening (102, p. 51) stated, "The acceptance of improved farm practices is affected by the ideas and attitudes of farmers with respect to the practices themselves."

Attempts have been made by research workers to measure this concept of attitude toward change. Wilkening (102, pp. 40-50) constructed an index of attitudes to measure farmer attitudes toward nine new farm practices. The attitude toward each practice was categorized as either "favorable" or "unfavorable". The index of attitudes for each farmer was the percentage of the nine practices toward which he exhibited a favorable attitude. The coefficient of correlation between the index of attitudes and an adoption score was reported to be +.44. This relationship might be expected to be rather high because essentially the same practices were included in both the adoption scale and the index of attitudes. An individual might be expected to be favorable toward a farm practice that he had adopted.

In order to avoid this problem, Fliegel (33, p. 15) constructed an index of attitudes towards seven practices that were different from the 11 practices included in his adoption scale. He found a relationship of +.42 between attitude and adoption. He also reported a coefficient of correlation of +.61 between the index of attitudes and an adoption scale composed of the same seven farm practices.
Lionberger (60, pp. 15-16) utilized a similar concept which he called "receptivity to new farming ideas". His measure of this concept, which he maintained was somewhat independent of actual adoption, was obtained by a five point interviewer rating scale. The highly receptive farmers were more likely to be named as sources of information by their neighbors (60, pp. 29-30).

**Definition of the concept**

The concept that was labeled as "attitude toward new practices" by Wilkening and Fliegel will be referred to as change orientation in the present study. The concept of **change orientation** is defined as the degree to which an individual possesses a favorable attitude toward technological changes. An attitude was defined in an earlier section of this chapter as a mental tendency to act under certain conditions in a certain way. This definition is in essential agreement with Linton (55, pp. 111-112) who defined an attitude as the covert response evoked by a value.

**Evaluation of the concept**

Results from past research studies suggest that the favorableness of an individual's attitude toward new technological practices might be expected to be positively related to his actual adoption of technological practices. The concept of change orientation might have been defined at a more
general level of abstraction as the degree to which an individual possesses a favorable attitude toward new developments, not only in technology, but in other fields as well. This more general orientation toward the "new" was not used in this dissertation because operational measures were not available.

In considering the other five criteria by which the conceptual variables were selected, it might be stated that the concept of change orientation is dynamic. It would seem reasonable that a change agent might be able to change his constituents' change orientation in the direction that he desired.

Change orientation might be regarded as a sociological concept in that attitudes are largely developed as a product of group influence. Change orientation is not directly sociological in nature, but might be viewed as an indirect product of group behavior and past experience.

General and empirical hypotheses

The general hypothesis is suggested: The degree of technological change varies directly with the degree of change orientation. The adoption of farm practices scale is a measure of the degree of technological change and the change orientation index is a measure of the concept of change orientation. The change orientation index constructed for use in this study was not composed of items which indicated the degree of favorableness toward specific new technological
practices. Rather, an attempt was made to select items for inclusion in the index that measured more general attitudes toward new practices and change. More detail on the construction of the change orientation index is given in the following chapter.

The empirical hypothesis is formulated that a positive relationship is expected between the change orientation index and the adoption of farm practices scale.

Communication Competence

Definition of the concept

For a farmer to adopt new technological changes he must first obtain information about the new practices. The role of the communication of technical information in the process by which farmers adopt new practices has been emphasized in a number of research publications.

There are many available methods by which the farmer may obtain information about new technology. One categorization of these sources of information has been made by research workers (71) on the basis of mass media (farm magazines, farm TV and radio programs, bulletins, etc.), agricultural agencies (Extension Service, Vocational Agriculture, S.C.S., etc.), commercial sources (salesmen, dealers, commercial publications, etc.), and informal sources (friends, neighbors, and relatives). Some of these sources would be expected to be more
effective early in the time period over which adoption of a new practice takes place. The general finding from past research (71) is that mass media, agricultural agencies, and perhaps commercial sources of information are more effective than informal sources in transmitting information about new technological practices to the farmer at an earlier point in time. Past studies have shown that friends, relatives, and neighbors are utilized to a greater extent by later adopters.

It has already been stated that certain sources communicate information about new practices at a relatively earlier time. These sources are said to be more "competent" in performing the role of communicating information about new practices to adopters at the earliest relative point in time. A communication that was more competent might also be expected to be more technically accurate. Due to the "filter down" process through word of mouth by which information about new practices reaches farmers from informal sources of communication, the communicated message might be expected to be less accurate and more likely to be garbled or distorted.

On the contrary, county extension directors and other change agents receive their information more directly from the state agricultural college and hence would themselves be expected to be a more competent source of information to farmers. Mass media sources of information such as farm magazines, farm radio and TV shows, and farm papers are usually more competent than informal sources because they
obtain the information more directly from the source. In fact, the radio and TV station listened to most frequently by the farm operators in the Collins community is operated by Iowa State College. Commercial sources also would be expected to be more technically accurate than informal sources of communication. It is also probably true that those communication sources that tend to communicate more technically accurate information also tend to do so at an earlier relative point in time.

A word of caution needs to be mentioned regarding the use of the term "competence". A communication source could be more competent in the sense that it reaches more listeners. It could also be regarded as more competent if it did a better job of communicating the desired message. A communication source could be regarded as competent in other senses as well. However, the use of the term competence is limited in this dissertation to mean only the communication of more technically accurate information at an earlier relative time.

The concept of communication competence is defined as the degree to which an individual regards as credible the more technically accurate sources of information. It has already been pointed out that certain sources of information are more competent than others.

Hovland and others (47, p. 21) defined communication credibility in terms of both (1) the extent to which a communicator is perceived to be a source of valid assertions...
(expertness) and (2) the degree of confidence or trustworthiness in the communicator's intent to communicate the assertions considered most valid.

It will be assumed that all of the farmers in this study had equal opportunity to utilize the different communication sources. Reasoning would seem to follow that use of a certain source of communication would also be an indication of the credibility placed in it. For example, the farmer who regularly listens to a farm radio show would tend to place credence in its message. Otherwise, it would be expected that the farmer would not tune in the farm radio show.

Hovland and others (47, p. 36) suggested that:

In accounting for the different amounts of opinion change produced by communications of high versus low credibility, one obvious possibility would be that people tend not to expose themselves to communications from sources toward whom they have negative attitudes.

Attentiveness or use of communicating agencies is suggested as a measure of credibility.

This degree of use might be reflected in the amount of effort that is required to obtain the communicated information. Copp (22, p. 12) found that the degree of technological change was associated with the use of communicating media which required more effort to receive. Sherif and Cantril (87, p. 130) have pointed out that the degree of ego-involvement (which might be partially measured by effort or use) in a communication affects how much
and what will be learned.

A communication competence index was constructed to measure the concept of communication competence. This index measures an individual's use of ten different competent communication sources and the credibility placed in these sources in three hypothetical situations. The communication competence index will be described in more detail in the next chapter.

Some other authors have implied a concept of competence and certain others have used a concept of credibility. The concept of communication competence is defined in the present study as the degree to which an individual places credibility in competent sources of information. The concept is operationalized as the degree to which an individual makes use of the more competent communication sources.

Evaluation of the concept

The concept of communication competence is at a fairly general level of abstraction. Communication competence could be studied in a wide range of situations involving human behavior. The concept is dynamic to the extent that it may be changed by the change agent. The data necessary to construct the communication competence index were secured in the field study as they were in a number of past studies.

The concept is sociological to the extent that information may be secured from group sources and that the attitudes determining an individual's perception of the relative credi-
bility of certain information sources are probably learned through group experience.

Past research findings

Past research studies have generally reported a positive relationship between various measures similar to the items in the communications competence index and the adoption of farm practices. Fliegel (33, p. 77) reported a positive correlation of .414 between his measure of technological change and his contacts for information index. This index contained eight items each measuring the degree of contact with a relatively more competent means of communication.

Copp (22, p. 12) found a correlation of .50 between his measure of technological change and an index measuring degree of contact with the county agent. Another index, measuring the favorableness of the farmer's evaluation of the state agricultural college and the Extension Service, was correlated .50 with the adoption of farm practices. Copp (22, pp. 26-27) also constructed a scale which was purported to measure the degree to which an individual accepted scientific values in farming. This index was composed of a number of items measuring contact with technical sources of information. This index was correlated .60 with the adoption of farm practices.

Wilkening (103, pp. 20-21) reported that those individuals who had adopted more farm practices made greater use of agency and mass media sources of information and less use
of commercial and informal sources.

Lionberger (60, p. 15) reported similar findings in his study. Farmers with higher adoption scores made greater use of the county agent and other agency sources of information.

Marsh and Coleman (66, p. 592) found that farmers living in neighborhoods with a higher rate of technological change (adoption of new farm practices) were more likely to utilize all other sources of information than neighbors and friends.

In a laboratory experiment, Swanson (93) found that his concept of suggestibility (somewhat similar to technological change) varied with the volume of communication.

General and empirical hypotheses

On the basis of the findings cited above, the general hypothesis is suggested: The degree of technological change varies directly with the degree of communication competence. The operational measure of technological change is the adoption of farm practices scale and the operational measure of communication competence is the communication competence index. The empirical hypothesis is formulated that a positive relationship is expected between the communication competence index and the adoption scale.

Status Achievement

Definition of the concept

Many sociological writings have been concerned with the
relationships between status and role. An individual's expected role is to a certain extent prescribed by his status in the group and in turn his status will be raised or lowered by his role behavior.

A general finding of past studies has been that individuals of higher status tend to adopt more technological changes. It is difficult to say whether the higher status causes the higher adoption or whether the higher adoption causes the higher status. The latter might be expected to be the case if the adoption of practices carries high prestige value. On the contrary, many of the factors usually considered as according social status to farmers, such as education, income, formal participation, and size of farm, would be expected to result in higher adoption. For instance, a farmer with a larger acreage could adopt certain practices that might not be economically feasible in a smaller operation. Status and role behavior (adoption of practices) are probably closely interrelated.

Most past studies have found a positive relationship among separate factors indicating social status and adoption. These separate factors include level of living indexes, size of farm, income, tenure status, amount of formal education, and amount of formal participation. No attempt was discovered in a review of the literature, however, to construct a composite measure of these status-giving factors and determine the relationship between this composite measure and adoption.
The separate status-giving factors have been found to be highly interrelated by Duncan and Artis (27, p. 32). On the basis of this evidence, a composite status achievement index was constructed to measure the concept of status achievement.

Status achievement is defined as the degree to which an individual has achieved high social status in the social system. It should be emphasized that this concept measures how much status has been achieved relative to other individuals in the social system, the community, in this case. The concept of status achievement does not measure only the factors which give status in the system, but also to what extent an individual possesses these status-giving factors.

Evaluation of the concept

The concept of status achievement is sociological in nature. It is at a fairly general level of abstraction. Status achievement can be measured in any social system. The data required to construct a measure of status achievement were secured in the field interviews. One of the five criteria by which the independent conceptual variables were selected was that they should be dynamic. It must be pointed out that status achievement is relatively less dynamic than the other conceptual variables in the present study. It is probably very difficult for a change agent to alter the status of his constituents. One reason for including the static concept of status achievement in the analysis is that it may be
used as a control variable. The effect of status may be controlled in order to determine more clearly the relationship between the other five independent concepts and technological change. Status achievement has been found to be highly related to certain of the other independent variables in past research studies. For instance, both Fliegel (33, p. 77) and Lionberger (56) found a high positive relationship between status and a concept similar to communication competence. Both Fliegel (33, p. 77) and Wilkening (102, pp. 40–47) reported a positive relationship between change orientation and status.

Past research findings

On the basis of past research findings there is good reason to expect individuals of higher status to adopt more technological changes. As was already pointed out, these past studies have used single measures of status rather than a composite status index. Fliegel (33, p. 77) reported a correlation of .312 between a level of living index and the adoption of farm practices.

Copp (22, p. 16) also reported a positive relationship between a level of living index and the adoption of farm practice. Copp (22, pp. 17–19) reported positive correlations between five different measures of economic status and adoption of farm practices.

Wilkening (102, p. 46) also found a positive relationship
between a level of living index and the adoption of farm practices.

In some rural communities, tenure status is a measure of
the more general trait of status achievement. Copp (22, pp.
19-20), however, found little relationship between tenure
status and adoption.

Wilkening (102, pp. 41-43) reported that size of farm
was related to the adoption of farm practices. On the con-
trary, Fliegel (33, p. 77) found no relationship between a
size of operation index and adoption. The size of farm might
be regarded as one indication of social status.

The number of years of education is also a measure of
status. Wilkening (102, pp. 44-45) found that farmers with
more education had higher adoption. A similar finding was
reported by Copp (22, p. 14).

Another indicator of an individual's status is his
participation in formal organizations. Copp (22, pp. 14-15)
reported that farmers with high adoption scores were more
active in formal organizations. Wilkening (103, pp. 40-41)
reported a similar finding in his study. Kaufman (49, pp.
16-17) also reported that farmers with a high degree of formal
participation had adopted a greater number of soil conserva-
tion practices.

**General and empirical hypotheses**

On the basis of these findings the general hypothesis is
suggested: **The degree of technological change varies directly with the degree of status achievement.** The adoption of farm practices scale is the measure of technological change and the status achievement index is the operational measure of the concept of status achievement. An empirical hypothesis is formulated that a positive relationship would be expected between the adoption of farm practices scores and the status achievement index.

Cohesion With the Locality Group

**Reference group theory**

Many past research studies have been concerned with the effect of various group pressures and group influences on the individual and his adoption behavior. Many of these writings have suffered from a lack of adequate theoretical orientation. One theoretical framework that might be considered in analyzing group influences on individual behavior is that of reference group theory.

Although the writings concerned with reference group theory are numerous,* the main idea of reference group behavior may be stated rather succinctly. An individual acts in relation to those groups whose expectations or influences are important to him. Those groups to which the individual refers

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*For example see: Merton and Kitt (70), Shibutani (88) and Kelley (51).*
are called reference groups. The specific reference groups that are important to an individual in influencing his decision making would be different for different types of decisions. Important referents for a farmer in making decisions to adopt new practices might be his family, his neighbors, his community and his formal organizations.

The major concern of this section will be the effect of the locality group as a referent in the adoption of farm practices. The term locality group might be used to include the individual's neighborhood, community, state, or major farming region. In this dissertation, the term locality group will be used to refer to the farm operator's community of residence.

Copp (22), Spaulding (89), Wilkening (99, 100, and 102), Marsh and Coleman (63 and 64), Duncan and Kreitlow (28), Ryan and Gross (86), and Lionberger (58 and 59) have studied locality group influences on adoption and their findings are included in a later part of this section. Although many researchers have been concerned with the effect of locality reference groups, a review of the literature disclosed that only Copp (22, pp. 22-23) and Spaulding (89, p. 7) have attempted to place their analysis in a reference group framework.

Past research findings seem to indicate that locality reference groups seem generally to act as a deterrent to technological change. However, it might be possible for a neigh-
neighborhood reference group to place a positive value on technological change. Then the reference group influence would encourage the adoption of farm practices. The value that the reference group places upon the specific type of behavior under consideration has been labeled the "reference norm".*

On the basis of past research findings it might be assumed generally that locality reference norms would not tend to encourage technological change. However, Wilkening (102, p. 36) has reported wide neighborhood differences as to the average adoption score, as have Marsh and Coleman (64, p. 385). These latter researchers (63) have found that the reference norm seemed to be related to the type of farmer named by his neighbors as a source of information. Those farm operators named as sources of information by two or more farmers (leaders) in neighborhoods of high adoption had higher average rates of adoption and leaders in low adoption areas had lower than average adoption of farm practices.

Duncan and Kreitlow (28) found that neighborhoods that were more homogeneous in ethnic and religious make-up were more resistant to technological changes and reasoned that this was because these neighborhoods demanded greater conformity from their members.

It will be assumed that the locality group generally places a negative value upon technological change. The farmer

*For writings concerning reference norms and reference groups, see: Eisenstadt (30) and Rogers (78).
who is one of the first to adopt new practices may find that his neighbors will regard him as "foolish" or "crazy". An example of how one farm operator perceived the reference norm of his locality groups is found in the following statement which was given to the author by one of the respondents during a field interview:

I know that a lot of my neighbors around here give me the old horse laugh about some of the things I do on my farm. They kid me a lot about some of the modern farming methods I use. I suppose they think I am trying to show off. I usually get the last laugh, however.

The reasons why the locality reference group would place a low value on technological change might be questioned. One reason might be that the locality group tends to resist any influence that might possibly disrupt the established harmony of the group. Individuals would generally be expected to be more likely to be idiosyncratic than would a group. This would result in a gap between the behavior approved by the group and the actual behavior of certain of its members. The behavior of a number of members in a group would generally be expected to be slower to change than the behavior of certain members of the group.

A locality group might be expected to be of a more "primary" nature than some other groups to which a farmer might belong. The "status quo" norms and values of the pri-

*For a description of the primary group, see Cooley and others (19, pp. 55-56).
mary group would be expected on the basis of its more traditional, non-rational orientation. Loomis and Beegle (61, pp. 789-825) use the term of gemeinschaft to refer to the locality group. In a gemeinschaft locality group the emphasis would be placed upon norms that were determined by tradition, rather than on the basis of rational efficiency.

Another reference group that would generally be expected to place a relatively lower value on technological change might be the kinship group. The discussion of the effect of the kinship group on the adoption of technological change is placed in a later section of this dissertation.

The individual who deviates from the reference group norms will have negative sanctions levelled against him. An example is the innovator who is laughed at by his neighbors. The role expectations prescribed for a neighbor embody the norms and values of the locality group. It is assumed that the role prescribed for most farm operators by their locality group members is adoption behavior similar to that of their status quo minded neighbors.

A farmer who does not fulfill these role expectations of his neighbors may even be rejected by that group. This rejection might be expected to be reflected by a shift in the individual's orientation from the locality group to other groups. It is assumed that there is usually a need for buttressing and acceptance of an individual in some group. If the individual rejects the role prescribed for him by his locality
group, he would probably tend to accept roles in other groups outside of the locality. These extra-locality group role expectations would probably be more likely to encourage adoption.

Cartwright (16, p. 389) summarized certain group dynamics research to point out that:

During the past few years a great deal of evidence has been accumulated showing the tremendous pressures which groups can exert upon members to conform to the group's norms. The price of deviation in most groups is rejection or even expulsion. If the member really wants to belong and be accepted, he cannot withstand this type of pressure.

Definition of the concept

On the basis of the above discussion there is some reason to believe that cohesion with a locality group would be negatively related to technological change. The concept of cohesion was defined by Hamblin (41) as "The degree to which individuals in a social system accept their prescribed roles." The individual who is highly oriented toward his locality group would be expected to have a high degree of cohesion with that group.* On the contrary, it would seem that the individual who is oriented outside of his locality group would not tend to accept his prescribed role in the locality group. Hamblin's concept of cohesion must be changed

*It should be pointed out that just as individuals may vary as to the degree of cohesion each has with a group so may groups vary as to the degree of cohesion that they possess. A measure of cohesion might be obtained at the individual level, as it is in the present study, or at the group level.
slightly for the purposes of this dissertation because the locality is analyzed as a reference group rather than as a social system, although the two terms are used in a similar nature in this specific case. The concept of cohesion is defined as the degree to which individuals accept the roles prescribed by a reference group.

In the specific application of this general concept to the situation under discussion, the reference group is the individual’s locality group. The operational measure of the concept of cohesion that will be used is an index of extra-locality orientation. Extra-locality orientation is defined as the degree to which an individual is oriented toward groups outside of the locality rather than towards the locality group. The discussion of the construction of this index of extra-locality orientation will be found in the next chapter.

Evaluation of the concept

The index of extra-locality orientation is a negative measure of the concept of cohesion. The data from which to construct the index were secured in the field interviews. In evaluating the other criteria by means of which the conceptual variables were selected, the concept of cohesion seems to fulfill the requirements of being dynamic, sociological, and general in nature.
Past research findings

The degree to which technological change might be expected to vary inversely with the degree of cohesion is suggested by a number of past research findings. These findings were generally concerned with the relationship between the adoption of farm practices and single measures of locality orientation, rather than a composite measure of locality orientation.

Copp (22, pp. 22-23) studied the relationship between a number of factors indicating locality orientation and the adoption of practices. He found that lower adoption was associated with a feeling that neighborhood ties were strong, with neighborhood work exchange, holding local offices, subscription to a local newspaper, the discussion of farming matters with immediate neighbors, and with utilization of local sources of information. He concluded that, "The evidence from this study . . . indicates quite conclusively that high local-group identification is negatively associated with adoption."

Wilkening (99, p. 362) found that dependence upon neighborhood ties was negatively associated with the acceptance of technological changes. His rating of the farm operators' degree of dependence upon neighborhood ties was determined by content analysis of the answers to a number of open-ended questions.

Lionberger (56) suggested that conformity to local group
norms would be negatively associated with technological change. A Subcommittee of the Rural Sociological Society (84) has suggested the hypothesis that the greater the extent to which farming matters are locality group sanctioned the slower will be the acceptance since new practices involve change in group as well as in individual evaluations.

Lionberger (59) also reported that those farmers who had "expansive associational patterns" (less local orientation) tended to be named by other farmers as good sources of farm information and to have a higher degree of technological change.

Wilkening (100) related the case of two farmers who had only recently moved into the community that he studied in North Carolina. Their ties outside of the local area resulted in their adoption of several innovations that their new neighbors regarded as "crazy". These two farmers may have been able to escape the social control of their neighbors because the neighborhood was not an important reference group to them. They did not fulfill the role expectations of their neighbors and so their neighbors laughed at them.

Ryan and Gross (86) found that the farm operators who were the first adopters of hybrid seed corn in Iowa were those who made frequent trips outside of the community such as to Des Moines.

The general finding from these research studies is that a high degree of orientation with the locality group is nega-
tively related to the adoption of farm practices. Extralocality orientation is similar in some respects to the term "anonymity" as used by certain authors. Anonymity might be defined as the degree to which an individual is free from the social pressures to fulfill the reference group's role expectations for him. Merton (68, pp. 125-150) has suggested that innovation will occur under conditions where detection or punishment is either unlikely or not important to the individual. He suggested that anonymity would afford this lack of detection or punishment.

Kelley and Volkart (52, pp. 453-454) commented upon the effect of anonymity on attitude change by saying:

So long as attitudes can be expressed privately and anonymously, the threat of external penalties is diminished and members can change their expressed opinions or not, depending upon the strength of their own convictions about the issue in question.

They (52, p. 454) then proceed to point out that:

Translated into testable terms, this means that the amount of resistance to change of norm-anchored attitudes will, in general, be greater under public than under private conditions.

A good example of the effect of anonymity upon behavior is afforded by LeBon's study (53) of the crowd. LeBon (53, p. 33) stated:

He will be the less disposed to check himself from the consideration that, a crowd being anonymous, and in consequence irresponsible, the sentiment of responsibility which always controls individuals disappears entirely.
General and empirical hypotheses

On the basis of the research findings and the reasoning cited above, the general hypothesis is suggested that: The degree of technological change varies inversely with the degree of cohesion an individual has in the locality group. The measure of technological change is the adoption of farm practices scale. The index of extra-locality orientation was constructed as a negative measure of the concept of cohesion with the locality group. Therefore, the empirical hypothesis is formulated that a positive relationship is expected between the adoption scale and the extra-locality orientation index.

Family Integration

Definition of the concept

Research studies have been concerned with the relationship between technological change and what has been called "familism". For example, Fliegel (33, p. 77) found a -.198 correlation between his familism index and the adoption of farm practices. Wilkening (103, p. 33 and 105, p. 33) reported no significant relationship between his measure of familism and the adoption of farm practices.

One possible explanation for these contradictory findings might lie in the variety of definitions that have been used for the concept of familism. Fliegel (33, p. 66) defined familism as "the relative concentration of efforts of the
family toward the achievement of group (family) as opposed to individual ends." Wilkening (105, p. 33) defined familism as:

... the ascendance of family interests over the interests of the individual members as expressed in the maintenance of family tradition, property, social contacts, and occupational pursuits.

Rohwer (82, p. 826) defined the concept of familism as "the subordinating of individual interests to those of the family group." Burgess and Locke (13, pp. 69-92) defined familism in terms of: (1) ethnocentrism of the family members; (2) integration of individual activities for the achievement of family goals; (3) mutual assistance among family members in times of need; (4) mutual support in case of attack by outsiders; and (5) perpetuation of the family on the farm.

Cleland (17, p. 249) stated that the concept of familism referred "to a social system in which behavior and values are dominated by family, rather than individual interests."

It is difficult to suggest a sound theoretical argument for a positive or negative relationship between familism, as previously defined, and technological change. However, it seemed to the author that one possible reason for this lack of a sound theoretical argument was because such a wide variety of actual behavior might be included under the concept of familism. This is illustrated by the variety of items that have been included by Fliegel, Wilkening, Cleland, and Rohwer in their familism scales.

The attempt in this dissertation will not be to study
the relationship between familism and technological change. Rather, the emphasis will be placed upon two main types of family orientation that have sometimes been subsumed as part of familism. These two family concepts are family integration and cohesion with the kinship group.

The first of these two family concepts, family integration, will be discussed in this section. There is some evidence that family integration is relatively unrelated to the more general concept of familism. Wilkening (105, p. 32) reported a correlation of -.04 between his familism scale and his family integration scale. Cleland (17, p. 255) reported low and nonsignificant correlations between a family integration scale and five other measures of the concept of familism. The highest correlation was +.124.

A wide variety of definitions for the concept of family integration were discovered in a review of the literature.

Wilkening (105, p. 32) defined family integration as "the degree to which the family functions as a unit in attaining common goals with the interest of the individual members being considered."

Cleland (17, p. 250) implied that his definition of family integration was the degree to which the family members took part in shared activities.

Angell (3, p. 15) defined family integration as the "bonds of coherence and unity running through family life, of which common interests, affection, and a sense of economic inter-
dependence are perhaps the most prominent."

Hill (45, pp. 130-131) stated that family integration:

"... involves the unifying phenomena seen in the sense of economic and educational interdependence: the strong affectional ties between husband and wife, father and mother, mother and children, and among children; a certain pride in the family traditions, and high participation as a family in joint activities.

Dunigan (29, p. 13) defined family integration as:

"... a core of unity or solidarity, a cohesive quality, a certain amount of organization and structuring... built up around affection, joint activities, goals and objectives, a feeling of mutual interdependence, and other activities and feelings in the family living which contribute to unity and solidarity.

The Royal Commission on Agriculture and Rural Life (83, p. 66) stated that:

Family integration involves a "wholeness" of family activity and thinking, a feeling of belonging or solidarity among family members. It implies relative agreement about family procedures. It means that family members know how to coordinate their activities, so that they work and play together harmoniously. The concept includes the idea that there is a consistency among the activities, beliefs, and attitudes of the family; they are all cut from the same cloth.

Burgess and Locke (13, p. 441) defined family integration as "the process by which interdependence is achieved through the sharing of memories and experiences."

LeMasters (54, p. 226) stated:

By family "integration" we understand the ability of the family to function as an organized group - that is, with a common subculture and all which that implies, such as shared values, ability to communicate, some degree of group consensus, and an ability to operate with some efficiency in solving problems facing the group."
Integration is a concept that has been utilized by sociologists in the study of a wide variety of different social systems. Hamblin (41) has defined integration as "the degree to which units of a social system are oriented toward optimizing rewards for other units." In the more limited usage of this dissertation, the concept of family integration is defined as the degree to which an individual is oriented toward optimizing rewards and satisfactions for other family members.

Evaluation of the concept

The definition of family integration in the present study is more consistent with the more general sociological definition of integration than are most of the definitions by other authors cited previously. Hence, the concept of family integration in the present study is more general and has the advantage of an application to a wider range of situations. For example, the more general definition of family integration might be utilized even in other cultures, whereas some of the more specific definitions cited previously describe certain types of behavior that would reflect family integration in our culture but not in some others.

Family integration is probably not very dynamic in the sense that it could be changed by the change agent. The data required to construct an operational measure of family integration were secured from the field interviews. The concept of family integration is sociological in nature. The extent
to which family integration would be expected to be related to technological change is discussed in the next section.

Past research findings

Wilkening (105, p. 32) found little relationship between operational measures of family integration and the adoption of farm practices. Wilkening had suggested the hypothesis that family integration would be negatively related to technological change. His reasoning was that technological changes tend to disrupt established behavior patterns and expectations which would be reflected in a lack of family integration.

If the farm operator is well integrated into his immediate family, he might be expected to be more reluctant to undertake new farm practices. The family might be expected to generally place a low value on adoption, as the group is generally slower to change than the individual. Also, it might be assumed that the family is sometimes in competition with the adoption of farm practices for scarce resources, such as capital.

Kelley and Volkart (52, p. 454) stated that individuals who are more completely integrated into a group will be more reluctant to make attitude or behavior changes. They said:

The attitudes of high valuation members (high integration) will have a greater resistance to change than will those of low valuation members, when the attitudes involved relate to group norms.

Following this line of reasoning, an individual with a high
degree of family integration will tend to have a low degree of technological change if the family places a low value on technological change. Most farm families would be expected to place a lower value on technological change than would the individual. Of course, there are some exceptions to this tendency, for example, the family that places a high value on technological change and encourages its members to adopt new practices.

**General and empirical hypotheses**

The general hypothesis is suggested that: **The degree of technological change varies inversely with the degree of family integration.** The measure of technological change is the adoption of farm practices scale and the family integration index is the operational measure of the concept of family integration. The empirical hypothesis is formulated that a negative relationship is expected between the adoption of farm practices scale and the family integration index.

**Cohesion With the Kinship Group**

**Reference group theory**

In a discussion appearing earlier in this chapter, the concept of cohesion with the locality group was defined. The locality group was analyzed in the framework of reference group theory. It was pointed out that an individual who had
a low degree of cohesion with the locality reference group would tend not to fulfill the roles prescribed for him by the locality group. One type of these role prescriptions or role expectations would tend to deter the adoption of new technological practices. A negative measure of the degree to which an individual fulfills the roles prescribed by his locality reference group (i.e., the degree to which he has cohesion with the locality group) is the degree to which he is oriented outside of the locality group.

In this section of the thesis, the kinship group will be analyzed from the viewpoint of reference group theory. Certain of the reasoning in this section will be similar to that found in the discussion of locality cohesion, but the application will be to the degree of cohesion with the kinship group. In this thesis the kinship group is considered to be an individual's relatives or kin living outside of the immediate household. These kin may be located across the road or 100 miles away. From this definition of kinship group it can be seen that the kinship group would not necessarily be a locality group. The relationship between kinship cohesion and the concept of family integration will be explained in a later section.

Both Cleland (17) and Wilkening (79 and 105) have studied the effect of the kinship group on the adoption of farm practices. However, neither of these researchers have placed their analyses in a reference group framework.
It might be reasoned that just as the locality reference group builds up role expectations for the farmer so does the kinship group prescribe roles that they expect their kin to fulfill. One of these prescribed roles might concern the adoption of farm practices. As the group is usually slower to change than the individual, the kinship reference group might be expected to place a lower value on technological change than some individuals. These norms and values would be reflected in the roles that the kinship reference group prescribes for the individual.

Another reason to believe that the kinship group might tend to deter the adoption of technological changes is that the kinship group would generally tend to be of a more "primary" or gemeinschaft nature than other groups to which a farmer belongs. A tendency toward status quo norms in more primary groups would be expected on the basis of their more traditional, non-rational orientation. In regard to its primary or gemeinschaft nature, the kinship group is similar to the locality group.

The conflict that might arise due to the disparity between the prescribed role and the individual's wishes and actual behavior would be reflected in the farmer's relationship with his kin. The farmer who does not fulfill the kinship group's role expectations for his adoption behavior will be rejected by that reference group. This rejection might be reflected in a shift in orientation from the kinship group to
other groups. The degree to which a farmer is oriented toward his kinship group might be regarded as a measure of the degree to which he is fulfilling the role prescriptions of that group. Kinship orientation is defined as the degree to which an individual is oriented toward his kinship group rather than to non-kinship groups. In the following chapter the index of kinship orientation will be constructed to measure this definition of kinship orientation.

The general concept that this index is designed to operationally measure is cohesion with the kinship group.

**Definition of the concept**

The concept of cohesion was defined earlier as the degree to which individuals accept the roles prescribed for them by a reference group. In the specific application of this general concept to the situation under discussion, the reference group is the individual’s kinship group. The operational measure of the concept of cohesion is the index of kinship orientation. Kinship orientation was previously defined as the degree to which an individual is oriented toward his kinship group rather than to non-kinship groups. An individual who has a high degree of cohesion with his kinship group would be expected to have a high score on the index of kinship orientation.

In discussing the concept of kinship cohesion, some mention will be made of the difference between this concept and
the concept of family integration that was previously discussed. While kinship cohesion is concerned with the farm operator's relationships with his extended family, the concept of family integration was only concerned with an individual's immediate family. The extended family consists of the scattered adult relatives of a farm operator and is referred to as "the family of orientation" by Parsons (74, p. 173). The immediate family consists of the members of a farm operator's household and is referred to as "the family of procreation" by Parsons (74, p. 173). While the concept of family integration was concerned with what Parsons termed the family of procreation, the concept of kinship cohesion deals with what Parsons called the family of orientation. This division of the concept of familism into family integration and kinship cohesion was originally suggested by Wilkening (107).

The degree to which family integration and cohesion are separate concepts is suggested by Cleland (17, p. 255). He found a correlation of +.124 (which was not significantly different from zero) between operational measures of these two concepts.

**Evaluation of the concept**

The concept of cohesion seems to fulfill the desired requirements of being dynamic, sociological and general in nature. The data by which to construct a measure of the concept were secured in field interviews. The degree to
which technological change might be expected to vary inversely with the degree of kinship cohesion is suggested both by past research findings and by logic.

**Past research findings**

The problem of measuring cohesion with the kinship group is more fully discussed in the next chapter. However, an operation that has been used to measure a similar concept in other studies is the index of kinship contacts. The reasoning is that a farm operator who is responsive to the expectations of his kinship group would participate, exchange work, and communicate with them. This type of kinship orientation index has been utilized by Cleland (17, p. 252), Wilkening (105, p. 34), and Wilkening (99, p. 362). The index of kinship orientation utilized in this study is similar.

Wilkening (99, p. 362) found a negative relationship between what has been called kinship orientation in this dissertation and adoption of farm practices. However, in another study (105, p. 35) Wilkening found no significant relationship between kinship orientation and adoption.

For some of the same reasons that were suggested concerning locality reference groups, the kinship reference group would be expected generally to have a negative reference norm on the adoption of technological changes. A farm operator is less likely to be an innovator if he is responsive to the expectations of such a reference group. Identification with
such a reference group with a low value on adoption would have a negative influence on the individual's adoption of new practices.

**General and empirical hypothesis**

On the basis of the previous discussion, the general hypothesis is suggested that: The degree of technological change varies inversely with the degree of cohesion that an individual has with the kinship group. The measure of technological change is the adoption of farm practices scale. The index of kinship orientation was constructed as a measure of the concept of cohesion with the kinship group. The empirical hypothesis is formulated that a negative relationship is expected between the adoption scale and the index of kinship orientation.
CONSTRUCTION OF THE INDEXES

Introduction

In this chapter a detailed description will be given of the method by which the dependent and the six independent indexes were constructed. In each case, the reasoning and logic will be given for the way in which each concept was operationalized as an index. A brief description will be given of indexes constructed by other research workers in order to operationalize the same or a similar concept. The actual elements or items composing each index will be listed and some reasons for their inclusion will be given. In addition, an estimation of the validity and reliability for each of the seven operational measures will be made.

The validity of an index or scale is the degree to which it measures the dimension or trait which it was designed to operationalize. Cronbach (23, p. 48) discussed validity in these terms:

A test is valid to the degree that we know what it measures or predicts. There are two basic approaches to validity: logical analysis and empirical analysis. In logical analysis, one attempts to judge precisely what the test measures. In empirical analysis one attempts to show that the test is correlated with some other variable and therefore measures the same thing.

The logical analysis mentioned by Cronbach will be used in this chapter to show how the selection of the scale items was consistent with the definition of the concept that the
scale or index was constructed to measure. The empirical analysis mentioned by Cronbach consists of determining the validity of an index by obtaining its relationship with some criterion that was not included as part of the scale and that is an accepted measure of the dimension that the index purports to measure. No outside criterion was available in the case of most of the seven indexes utilized in this dissertation.

An alternative method of determining the validity of an index is to compute the relationship between each item and the total index score for each individual. This method implies the assumption that the total index scores are a measure of the desired dimension or trait. Flanagan's method will be utilized as a means of determining the approximate correlation between each of the responses to each item and the total index scores. This method of item analysis is a measure of the internal consistency of an index as well as the validity of an index. Internal consistency is defined by Thorndike (94, p. 252) as the degree to which the items in an index are homogeneous in the sense that they measure the same trait or characteristic.

Two main shortcomings of the item-index correlations as measures of validity must be pointed out. One shortcoming is that each of the item-index correlations are spurious because each index item is correlated with the total index score which also includes the contribution of that same item. This spuriousness becomes less serious when the index contains a greater
number of items. The other shortcoming is that measures of validity are usually computed only when reliability is relatively high, which is not so in the case of several of the indexes in the present study. For these reasons, the item-index correlations that are presented in later sections of this chapter should be considered only as very crude estimations of index validity.

In the case of certain of the indexes, an attempt will be made to construct a Guttman-type scale.* This is one means of determining the degree to which an index measures a single dimension or trait. If a coefficient of reproducibility of 90 percent or higher is attained, it can be assumed that the index does measure only one dimension and does not overlap with other dimensions. However, it must be pointed out that the Guttman scale analysis sheds little light on the determination of content. Stouffer (92, p. 85) said:

Scale analysis does not define content . . . scale analysis as such gives no judgment on content; it presumes that the universe is already defined and merely tests whether or not the area is representable by a single variable.

The reliability of an index is defined as the degree to which it consistently measures the dimension or trait that it was designed to measure. The split half method of estimating reliability entails dividing the index items into two groups.

*For descriptions of this means of scale analysis see Hagood and Price (40, pp. 143-155), Stouffer and others (92, pp. 3-212), and Guttman (38).
usually on an odds and even basis. The relationship between the scores on the even numbered items and the corresponding odd numbered items is determined. It is known that the reliability of an index generally increases with the addition of more items. Hence, the odds-evens method of determining reliability provides an underestimate of reliability. The modified Spearman-Brown correction formula\(^*\) is utilized to correct for this tendency to obtain the reliability for an index twice as long as either of the two versions, which are really half-length indexes.

Adoption of Farm Practices Scale

The dependent variable in this study is a measure of the adoption of farm practices. This variable will be precisely defined before tests of hypotheses involving the variable are described. This section of the dissertation will explain how a measure of the adoption of farm practices was developed and tested for validity and reliability.

The adoption of farm practices scale was constructed to operationalize the concept of technological change. Techno-

\[ r_p = \frac{2r_{oe}}{1 + r_{oe}} \]

where \( r_p \) = the coefficient of reliability of the index, and \( r_{oe} \) = the coefficient of correlation between odd and even items.
logical change is the degree to which an individual accepts or adopts new technological ideas. In a specific application of this concept to the adoption situation under study in this dissertation, it seemed reasonable to measure the degree of technological change by means of a scale in which the elements were new farm practices which were either adopted or not adopted (i.e., the change was either accepted or not accepted). Only one specific portion of technological change was utilized in constructing the operational measure of the concept. For example, technological changes in education, industry, homemaking, and other areas were not included. Only technological farming changes were included. However, it is hoped that the hypotheses regarding farm technology will also apply in the case of these other aspects of technological change. This is one of the advantages of operating at a more general or abstract level in developing concepts and hypotheses.

The term "adoption" has been used by those studying the adoption of farm practices in many different ways. Some researchers (26, p. 11) have conceptualized the adoption of a new practice as a matter of degree on a five point continuum from "never use" to "always use". Adoption can mean the extent to which a practice is used as a proportion of its possible use (e.g., a ratio of the number of acres planted with hybrid seed corn to the number of acres planted with corn on a farm). Certainly, the adoption of a new practice is a matter of a gradual shift in orientation from an old to a new practice. This
adoption process may be viewed as a series of stages or steps progressively advancing from awareness (first hearing about the new practice) to adoption.*

For the purposes of this dissertation, adoption will be regarded as satisfaction with the new practice and intention to make continued use of the new practice in the next decision making period.

In order to secure a broader measure of the concept of technological change than could be afforded by the adoption of a single farm practice, a composite adoption scale was constructed (composed of the adoption or non-adoption of a number of farm practices). Various attempts to measure the adoption of farm practices by means of composite scales have been reported by rural sociologists. The assumption underlying the construction of these composite scales is that the tendency to adopt farm practices (i.e., accept new ideas) is a single dimension or unidimensional. Recently, an attempt has been made to test this assumption of unidimensionality. Fliegel (33, p. 57) concluded:

The most important of these (results of a factor analysis of the adoption variable) for present purposes is the demonstration of a single dimension which can be termed adoption of farm practices.

One means, in addition to that of factor analysis as used by Fliegel, of determining the degree to which adoption scales

*For evidence as to the validity of this conceptualization, see Beal, Rogers, and Bohlen (8); or Rogers and Beal (61).
measure a single dimension or trait is to attempt to construct a Guttman-type scale. At least two attempts by rural sociologists to construct Guttman-type scales measuring adoption of farm or homemaking practices have been unsuccessful. This does not necessarily indicate that the adoption of farm practices is not unidimensional, however, as there are other reasons that responses may not be scalable.

The measures of the adoption of farm practices utilized by other rural sociologists have exhibited a wide range in the number of farm practices included. Of the 19 research workers (who reported using a composite adoption scale) whose reports were encountered in a review of the literature, only four reported more than 13 farm practices in their adoption of farm practices scales. The low intercorrelations that have been

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*One attempt by Copp (22, pp. 7-8) was unsuccessful. Another series of attempts reported by Abell (1) was largely unsuccessful in the case of homemaking practices.

**These included: Copp (22, p. 8), eight practices; Fliegel (33, p. 47), 11 practices; Cummings (24), eight practices; Lionberger (57, p. 9), eight practices; Chaperro (16, p. 36), eight practices; Duncan and Kreitlow (28, p. 263), 25 practices; Gross and Taves (37, p. 321), 10 practices; Marsh and Coleman (63, p. 385), 21 practices; Wilkening (101, p. 274), 11 practices; Kaufman (49), 12 practices; Bimit (25, p. 75a), 10 practices; Wilkening (98, p. 21), eight practices; Wilkening (105, p. 31), 18 practices; Marsh and Coleman (62, pp. 2-3), 13 practices; Wilkening (103, p. 13), 20 practices; Wilkening (102, p. 9), 11 practices; Lionberger (61, p. 13), 10 practices; Kaufman (50, p. 16), seven practices; and U.S. D.A. (95), seven practices.
found between the farm practices included in certain of these adoption scales suggest that the strength of this type of index could be improved by increasing the number of farm practices in the index. The adoption of farm practices does not appear to be entirely a consistent type of behavior, that is, there is little ordering or interrelationship between the various practices.**

**Linkage between concept and operation**

The adoption of farm practices aimed to measure the concept of technological change which is defined as the degree to which individuals accept new technological ideas. The strength of the epistemic correlation, or the degree to which the operation measures the concept, is yet to be established. A question might be raised as to whether an adoption scale that measures how many farm practices are adopted

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*Fliegel (33, p. 48) found intercorrelations ranging from a -0.07 to a +0.45 among 11 farm practices. Only one correlation was higher than +0.26. Fliegel (33, p. 18) also reported only two correlations higher than +0.26 among the intercorrelations he computed among 18 farm practices. Copp's findings (22, p. 9) are similar in the case of 21 farm practices.

**An exception to this statement is reported by Bauder (5) who did find that the adoption of six fertilizer-related practices occurred in a consistent order. This might be expected on the basis of the relationships that were generally known to exist among these practices. For example, Bauder found that the adoption of the practice of applying lime to the soil usually preceded the adoption of using nitrogen fertilizer.
would also measure the tendency to adopt new practices at an early date. The answer is "yes" if we consider that at any one point in time (the time that the adoption scale is administered), the farm operator who has adopted, say 12 practices, has generally tended to adopt practices at an earlier date than the individual who has adopted six practices.

By only determining whether each farm practice in the scale was adopted versus non-adopted, only an indirect estimate of time of adoption of each practice is secured. More precise information could be secured by inquiring as to the estimated date that each practice was adopted and by giving greater credit (a higher score) for adopting a practice at an earlier date. However, there are certain arguments against this technique. When asking farmers to recall the date at which they adopted a practice, it is necessary to depend upon their ability to recall accurately. There is no doubt that inquiry as to the present adoption versus non-adoption of each practice may be done more accurately, even though less detailed information is secured. This saving in interviewing time can be utilized by including a greater number of farm practices in the adoption scale.

Most past adoption scales have been constructed by asking respondents if they adopted or did not adopt each practice. The researchers utilizing these adoption scales did not claim that they measured the general tendency to adopt new practices at an earlier point in time, although the logic presented above
suggests that they would have been justified in doing so. However, did secure information from his respondents not only as to whether or not they had adopted each of 10 practices but also as to when they had adopted each practice. More credit was given to the individuals who had adopted practices at an earlier date. used this adoption scale as an operational measure of his concept of technological competence.

In order to test the strength of the assumption that the adoption of farm practices scale used in this study was a measure of the general tendency to adopt farm practices at an earlier time, two different types of adoption scores were computed. One type, hereafter termed a "simple" score, credited an individual with one point for adoption and zero points for non-adoption of each practice. The adoption of farm practices scale used in this dissertation is of this type. The other adoption score that was computed will be termed a "weighted" score in that more credit was given to the individual who had adopted a practice at an earlier date. The adoption scale used by was of this type.

Both the simple and weighted types of adoption scales were computed for each of the 148 farm operators in this study. However, as the time of adoption information necessary to compute a weighted type adoption score was only available on three practices, only these three farm practices were included in both the simple and weighted type scores. The three prac-
tices were use of 2, 4-D spray for weed control, feeding of antibiotics to swine, and the planting of ladino clover. The coefficient of correlation between these two different types of scores would be expected to be high if they both measured the similar tendency to adopt new farm practices at an early point in time. Correlation is +.787 which is more than that required to be significantly different from zero at the 1 percent level of probability. Although only 62 percent of the variation in one score is accounted for by variation in the other score, this finding does provide tentative evidence that the adoption of farm practices scale utilized in this dissertation is to a certain extent a measure of both the number of practices adopted and the time at which they were adopted. The validity of the "simple" type of scale has been partially established by correlating it with a "weighted" type scale that is known to measure the desired quality, adoption of technological farm practices at an earlier point in time.

There seems to be considerable evidence that the operation (adoption scale) could measure the concept of technological change.

Selection of farm practices

On the basis of past findings, it was decided to construct an adoption scale which contained more than 30 elements, each of which preferably would be applicable to as wide a range
of farming conditions as possible. In order to select the practices to be included in the scale, Extension Service Specialists in Animal Husbandry, Agronomy, Dairy Husbandry, and Entomology were consulted. Eleven swine practices, 17 crops and soils practices, and nine dairying practices were selected as meeting the following criteria: (1) applicable to a wide range of farming situations, including farm size; (2) requiring a minimum of capital or equipment to use; and (3) recommended by the Iowa State College Agricultural Extension Service within the past five to 10 years. These practices were productive farm practices and no attempt was made to include new farm management or consumption farming practices.

The 37 farm practices were included in the printed interview schedule and administered to the 148 farm operators described in an earlier chapter. Each farm operator was asked whether he had adopted or had not adopted each farm practice or whether it did not apply to his farming situation.

The nine dairying practices were found to apply to only 10 of the 148 farm operators and on this basis they were discarded from further analysis. Four of the 11 swine practices were eliminated from the adoption scale on the basis of advice from the Extension Service Swine Animal Husbandrymen because the practices had been recommended for a much longer period of

*These Iowa State College Agricultural Extension Service Specialists were: Norman Jacobsen, Dairy Husbandry; William Zmolek and Thomas Wickersham, Swine Animal Husbandrymen; E. R. Duncan, Agronomy; and Harold Gunderson, Entomology.
time than the other practices in the scale and had been adopted by almost all of the farm operators.

This resulted in an adoption scale composed of 24 new farm practices.

*Weighting to correct for "don't apply" responses*

Most adoption scales have been composed of items weighted on an equal basis. This assumes that each item or element (farm practice) in the scale is equally important in contributing to the composite adoption scale. The usual scoring has been one point for adoption and zero for non-adoption of each practice in the scale. Attempts to utilize judges or experts in order to place weightings on each element have been attempted but the resulting scores have usually been found to correlate highly with unweighted scores.*

On the basis of this experience by other rural sociologists no attempt was made to weight the 24 remaining farm practices by the use of judges or experts. However, two methods of weighting were used to correct for the practices that are not adopted by a farm operator because they do not apply to

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*Donahoo (26, p. 12) reported a correlation of .975 between weighted and unweighted adoption of soils practices scores. Fliegel (33, p. 55) reported a correlation of .96 between unweighted scores and scores weighted on the basis of factor loadings derived from a factor analysis of 11 farm practices. A similar correlation of .96 was reported by Fliegel (33, p. 60) in the case of 18 farm practices.*
his farming situation: (a) correction by computing the adoption of farm practices scale as a ratio of the number of practices adopted to the number that apply to each individual, resulting in a fraction that is usually expressed as a percentage; and (b) correction by assigning the average score on a practice to a farm operator to whom that practice does not apply.*

The correlation coefficient between scores computed by the (a) and (b) methods above was .95 which indicates that they have much in common. As most past researchers had used method (a) and this method actually required less computational effort, it was used to compute the adoption scores. For each individual the number of practices adopted was divided by the number of the 24 practices that applied. The resulting fraction was then converted to a percentage form. Hence, adoption scores could range from zero to 100.

In order to determine whether or not the computations required to correct the scores for the "doesn't apply" re-

*An example of this "average score" method of correcting for the "don't apply" responses would be as follows. A farmer does not raise hogs and so the practice of feeding antibiotics to swine would not apply. Fifty percent of the other farmers in the sample to whom the practice applied had adopted it. Hence, the practice is scored zero for non-adoption, one point for adoption, and 0.5 point for the individuals to whom the practice doesn't apply. The advantage of this method of correction is that the composite adoption score for each individual can be added to or subtracted from other adoption scores - whereas with the other method the composite adoption score is a percentage and as such cannot be meaningfully added or subtracted.
sponses were justified, a score for each individual was computed with no correction for the "don't apply" responses. The coefficient of correlation between the corrected and uncorrected adoption scores was found to be .89. The coefficient of determination, $r^2$, of .79 would indicate that 79 percent of the variation in the uncorrected scores was explained by the variation in the corrected scores. The unexplained 21 percent of the variation seems to be sufficient justification for correcting the adoption scores for the "don't apply" responses.

Unidimensionality

As one method of determining the unidimensionality of the tendency to adopt farm practices, the adoption scale data were subjected to a Guttman scale analysis. The findings of other research workers were supported to the extent that the adoption items were not scalable by this method. The coefficient of reproducibility is only 82.3 percent while the minimum acceptable level of reproducibility is 90 percent. This finding does not necessarily mean that the adoption tendency is not unidimensional, it merely means that one method of proving unidimensionality was not successful.

Another indication of the unidimensionality of the adoption tendency may be found in the extent to which the adoption elements in the scale were internally consistent as indicated by the coefficient of correlation between each element and
the total adoption scores. This means of item analysis is an estimate of the validity of the index.

In order to secure a range in scale values, there would be little justification for including practices that were adopted by all of the farm operators or practices that were adopted by none. Neither would there be justification for including in the adoption scale any items that were not related to the total adoption scores (in other words, elements that did not discriminate between individuals with high and those with low total adoption scores). The percentage of the 148 farm operators adopting each of the 24 farm practices is included in Table 1. This percentage was actually figured as the number of adopters divided by the number of farmers to which the practice applied.

Also shown in Table 1 are the coefficients of correlation between the responses on each item and the total adoption scores. These values are rough estimates of the validity of the items in the adoption scale and of the discriminatory power of each item, respectively. These correlation coefficients were computed by Flanagan’s method.*

*This method actually involves grouping the highest 27 percent of the total adoption scores and the lowest 27 percent. The 46 percent of the scores in the middle of the distribution are discarded. The coefficient of correlation between each item and the total scores is computed by determining the proportion of both the high 27 percent and the low 27 percent that were successful on the item and entering these values on Flanagan’s tables. Descriptions of the method and copies of Flanagan’s tables may be found in either Thorndike (94, pp. 240-243) or Flanagan (32).
Table 1. The percentage of adoption of each adoption scale item and the coefficient of correlation of each item with the total adoption scores

<table>
<thead>
<tr>
<th>Scale item</th>
<th>Percentage adopting</th>
<th>Coefficient of correlation with total adoption scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Boar on farm two weeks before breeding sows</td>
<td>66</td>
<td>.26</td>
</tr>
<tr>
<td>2. Purchased boar from accredited disease free herd</td>
<td>61</td>
<td>.34</td>
</tr>
<tr>
<td>3. Used clean sod, copperous compounds, or iron pills to control little pig anemia</td>
<td>89</td>
<td>.44</td>
</tr>
<tr>
<td>4. Weaned pigs at one to five weeks of age</td>
<td>17</td>
<td>.25</td>
</tr>
<tr>
<td>5. Castrated pigs before four weeks of age</td>
<td>49</td>
<td>.28</td>
</tr>
<tr>
<td>6. Used benzene hexachloride or lindane to control pig mange and lice</td>
<td>84</td>
<td>.25</td>
</tr>
<tr>
<td>7. Examined carcasses of marketed hogs</td>
<td>5</td>
<td>-.10</td>
</tr>
<tr>
<td>8. Made soil test during past two years</td>
<td>46</td>
<td>.44</td>
</tr>
<tr>
<td>9. Applied commercial fertilizer according to soil test recommendations</td>
<td>76</td>
<td>.56</td>
</tr>
<tr>
<td>10. Applied fertilizer to corn fields in past year</td>
<td>52</td>
<td>.63</td>
</tr>
<tr>
<td>11. Used starter fertilizer on corn</td>
<td>36</td>
<td>.56</td>
</tr>
<tr>
<td>12. Applied fertilizer in fall to corn ground for next spring</td>
<td>18</td>
<td>.61</td>
</tr>
<tr>
<td>Scale item</td>
<td>Percentage adopting</td>
<td>Coefficient of correlation with total adoption scores</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>---------------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>13. Fall plowed land with less than 4% slope</td>
<td>85</td>
<td>.25</td>
</tr>
<tr>
<td>14. Changed planter setting on second year corn</td>
<td>54</td>
<td>.31</td>
</tr>
<tr>
<td>15. Investigated the yield performance of seed corn before buying</td>
<td>69</td>
<td>.41</td>
</tr>
<tr>
<td>16. Fertilized crops other than corn</td>
<td>58</td>
<td>.81</td>
</tr>
<tr>
<td>17. Used certified legume and grass seed in past year</td>
<td>94</td>
<td>.10</td>
</tr>
<tr>
<td>18. Inoculated legume seed</td>
<td>94</td>
<td>.30</td>
</tr>
<tr>
<td>19. Used insecticide to control soil insects including corn root worm</td>
<td>56</td>
<td>.44</td>
</tr>
<tr>
<td>20. Contoured crop land with over 4% slope</td>
<td>33</td>
<td>.29</td>
</tr>
<tr>
<td>21. Planted legumes with oats</td>
<td>97</td>
<td>.30</td>
</tr>
<tr>
<td>22. Planted legumes or grasses for green manure</td>
<td>75</td>
<td>.06</td>
</tr>
<tr>
<td>23. Planted ladino clover</td>
<td>8</td>
<td>.29</td>
</tr>
<tr>
<td>24. Sprayed or dusted for corn borer</td>
<td>15</td>
<td>.50</td>
</tr>
</tbody>
</table>
Obviously, these coefficients of correlation are spurious to the extent that the relationships are between each adoption item and the total adoption scores (which also contains that adoption item as one of its constituent parts). However, this spuriousness may not be serious in a case where the total number of scale items is 24 and the effect of each on the total adoption score is likely to be slight. Wert and others (97, p. 339) stated that this type of spuriousness will be slight when the number of scale items is large.

Most of the coefficients of correlation were positive and significantly different from zero at the 1 percent level of significance except for three practices that were not significantly related, one of which was negative. This lends some evidence to the unidimensionality of the adoption scale (that is, the tendency to adopt farm practices may be a single dimension). Fliegel (33, p. 57) has reported that he found his adoption scale did measure a single dimension.

The only farm practice that was found to be negatively related to the total adoption scores was that of having examined the carcasses of marketed hogs. As the negative relationship was slight (only -.10) and only 5 percent of the 148 farm operators had adopted the practice, it was decided that discarding the practice from the scale would not justify the effort required to recompute the adoption scores with the one practice excluded.

The highest correlations between individual practices and
the total adoption scores were in the case of five practices that all involved the use of commercial fertilizer. It was unfortunate that this many practices in one specific area were included in the scale because, in effect, this "weighted" the adoption scale heavily in this one area. Higher item to total score correlations would be expected in the case of these five practices.

The item-total score correlations also provide some evidence to the validity and internal consistency of the scale items, if it can be assumed that the total adoption scores are a valid measure of the desired dimension.

In order to determine the reliability of the adoption scale, the 24 items were divided into two "half" scales, one composed of the odd-numbered items and the other composed of the even-numbered items. The uncorrected coefficient of correlation between the two half scales was .542. When corrected by means of the modified Spearman-Brown formula mentioned earlier, the coefficient of reliability was found to be .703.

**Summary**

To summarize this section, an attempt was made to operationalize the concept of technological change by means of an adoption of farm practices scale. Twenty-four farm practices were included in the adoption scale. The extent to which the adoption of farm practices is a unidimensional trait is questionable on the basis of the results of an attempt to construct
a Guttman-type scale. However, the results of analyses of adoption scores by other research workers suggests that a single dimension does exist. Estimation of the relationship between each scale item and the total score also contributed some evidence that the adoption trait is measured on a single dimension. A coefficient of reliability of .703 was found. A system of weighting to correct for "don't apply" responses was developed and utilized.

The adoption of farm practices scale will be used in this study as the operational measure of the concept of technological change.

Change Orientation Index

The change orientation index was constructed as an operational measure of the concept of change orientation. This concept was defined as the degree to which an individual possesses a favorable attitude toward technological change.

Other research workers have constructed indexes to measure this or a very similar concept. Fliegel (33, p. 15) and Wilkening (102, pp. 40-50) constructed "attitude toward new practices" indexes. These indexes were composed of a favorable versus unfavorable attitude reaction toward a number of different new practices. Some of the practices were the same as those included in the adoption scale and hence we would expect a rather high relationship on that account. An individual would be expected to exhibit a more favorable attitude
toward the farm practices he had adopted. Lionberger (60, pp. 15-16) used interviewer ratings on the respondent's receptivity toward new ideas as a measure of change orientation.

In a study done for Better Homes and Gardens magazine by Alfred Politz Research, Inc. (9) a measure rather similar to the change orientation index was used. Respondents were asked whether or not they would purchase immediately seven different products that were not yet on the market. An index of "venturesomeness" was thus constructed. A venturesome individual was defined (9, p. 147) as one who would be "the first to buy new products and try innovations". The individuals who scored high on the venturesomeness index were found to actually possess a number of new household products such as deep fat fryers, electric skillets, blenders, electric rotisseries, electric roasters, and window air conditioners (9, p. 99).

The change orientation index constructed for use in this dissertation is different from any of the operational measures used by other research workers. An attempt was made to select items for the change orientation index that measured more general attitudes toward new farm practices and changes.

Three items were included in the change orientation index. Each of these responses were on a five point scale: (1) importance of the adoption of new farm practices to a farmer's income, (2) importance of the adoption of new farm practices to a farmer's prestige, (3) favorableness of opinion toward innovators.
It might be reasoned that an individual with a more favorable attitude toward technological change would feel that the adoption of new farm practices was more important to a farmer's income and prestige. Actually these two items might be regarded as indirect methods of determining an individual's change orientation by asking him about the attitudes of "a farmer". One of the real problems in determining attitudes such as change orientation is to assess an individual's real attitudes, rather than just those that are socially acceptable. By wording the attitude questions in the third person ("the farmer") an attempt was made to uncover these real attitudes.

The same general comments might be applied to the third item in the change orientation index. By inquiring as to favorableness of opinion toward innovators, an indirect measure of attitude toward technological change was uncovered, in that attitudes toward an innovator (defined for the respondents as one who is always the first to adopt new farming ideas) might indirectly reflect attitudes toward the new technological ideas the innovator was adopting.

A Guttman-type scale was constructed from the three items above with a coefficient of reproducibility of 92.6 percent. The fact that the items were scalable indicates that the scale measures one trait or dimension, presumably that of change orientation.

At a later time two additional items were suggested for possible inclusion in the change orientation index. One item
was the respondents' self-rating as to how progressive they had been in adopting new farm practices. The other item was the respondents' self-rating as to how "up-to-date" they were in their major farming enterprise. These items did not exactly reflect directly a farm operator's change orientation but might be viewed as behavior products resulting from this basic attitude. However, the coefficient of correlation between the first item and the change orientation index is \(-0.12\) and between the second item and the change orientation index is \(-0.15\). On the basis of these correlation coefficients, it was decided not to include these two additional items in the change orientation index.

As there were only three items included in the change orientation index, it did not appear that an odds-evens test of reliability would be appropriate. However, estimates of the validity and the internal consistency of the index were estimated by computing the intercorrelations between the three items. The first item correlated with the second \(0.168\), the second item correlated \(0.381\) with the third, and the first item correlated \(0.261\) with the third. All of these correlations are significantly different from zero at the 5 percent level of probability and the latter two at the 1 percent level of probability.

Communication Competence Index

The communication competence index was constructed as an
operational measure of the concept of communication competence which is defined as the degree to which the individual regards as credible the relatively technically accurate sources of information. The reasoning follows that a farmer who placed greater credence in more competent information would be expected to be an earlier adopter of technological changes. The general finding from past research studies (71) is that earlier adopters make greater use of (and hence might be expected to place greater credence in) mass media, commercial, and agricultural agency communicating devices. These communicating devices might be expected to communicate relatively more technically accurate information than informal communicating devices such as a farmer's friends, relatives, and neighbors. There might be a tendency for informal communicating devices to present information about new technological practices inaccurately or to only present the more spectacular information. Informal communication might also be expected to be less accurate because the individuals who are informal sources usually obtain their information directly or indirectly from the mass media, agricultural agency, and commercial sources. In this filter down process the communicated information often becomes distorted.

On the basis of this reasoning, the mass media, commercial, and agricultural agency communicating devices are expected to communicate more competent information. An individual who places greater credibility in this more competent
information is said to have a higher degree of communication competence.

Information that is more technically accurate is also likely to be communicated to the farmer at an earlier time. Past studies have shown that informal sources of information are used to a greater extent by later adopters. It is unfortunate that this dimension of relative time is also included in the communication competence index. As such, this is one limitation of the index.

It has been stated that the individual who places credibility in the more technically accurate sources of information has a greater degree of communication competence than the individual who does not. The question remains, how may the degree of credibility in these sources of information be measured?

An attitude of credence toward a communicated message would be expected to be reflected in a more general attitude toward the communicating agent. It seemed logical to the author to measure communication credibility by determining the amount of use of the communicating device by the individual. For example, a farmer who regularly listens to a number of farm TV shows would be expected to place credence in their message. If he did not feel that farm TV shows had communication credibility, he either would not make the effort to listen regularly or would not pay attention to the communicated message. Of course, it is also possible that the farmer
regularly listens because of entertainment value or other reasons.

Although many other researchers had studied some aspect of the communication of information in the adoption of farm practices, a review of the literature disclosed that only Fliegel (33, p. 69) had constructed a general, composite communication index. His index was not developed to measure the concept of communication competence, however. In his attempt to measure the amount of contact with what he termed "rational, formal" information sources he included the following items: (1) learned most about farming from someone other than father, (2) visiting tended to be outside of three mile radius, (3) at least one son had enrolled in high school vocational agriculture, (4) farm operator had taken vocational agriculture, (5) at least one child had 4-H or other project, (6) membership and participation in farmer organizations, (7) agricultural agency given as contact for most information about new things in agriculture.

Fliegel found his index of communications contact composed of these items to be internally consistent and concluded that they measure a general characteristic. Some of Fliegel's items suggested items that might possibly be used to measure the somewhat similar concept of communication competence.

Following the reasoning that amount of use of some communication device reflects the credibility that is placed in it, 10 items were selected. For each individual greater use
of each communication device relative to the use made by the
other farmers in the study was taken as the measure of credi-
bility. Responses to these 10 items were coded on a nine
point scale. The ten items were:

1. Attendance at adult agricultural evening classes;
2. Participation in the veterans on-farm training program;
3. Number of farm magazines read;
4. Number of farm radio shows listened to;
5. Number of farm television shows watched;
6. Attendance at extension service meetings;
7. Degree of personal contact with extension service
   personnel;
8. Utilization of extension service mass media commu-
   nications;
9. Extent to which farming matters are talked over with
   agricultural agency and professional personnel;
10. Readership of Farm Science (an Iowa State College
    monthly research publication).

These 10 items indicate amount of use and amount of
effort expended to obtain information from technically accu-
rate sources. The second item, participation in the veterans
on-farm training program, reflects not only communication
credibility but also response to financial payments for partic-
ipation. It will later be shown that this item was least
related to the rest of the communications competence index.
However, the decision was made to include it in the total
index as it was one means by which the veteran farmer might receive technically accurate information.

Three additional items were selected from those listed on the printed schedule used in the study as possible measures of the concept. These were responses to hypothetical questions as to what the farmer felt was the "best source of information" for three different communication-seeking situations. If an individual named, for example, the extension director as the best source of information in this hypothetical situation, some evidence would exist as to the credibility placed in that (competent) communicating agent.

On this basis, the responses to the three questions were placed on a nine point scale ranging from most to least credibility in the more competent sources of information. The three questions were:

1. What is the best source of information for crop problems?
2. What is the best source of information for swine problems?
3. What is the best source of information for farm management problems?

To obtain each operator's communication competence score, the scale point responses to the 13 items were added. As one means of determining the degree of item validity and internal consistency of the index, the coefficients of correlation between each item and the total index scores were determined by
the use of Flanagan's tables referred to previously. These correlations are presented in Table 2.

These correlations are spurious to a certain degree as pointed out in the case of the adoption of farm practices scale. However, the strength of the relationship between each item and the total index indicates a common dimension does seem to run through all of the 13 items, which will be assumed to be the credibility placed in competent communication devices. As such, the correlations presented in Table 2 offer some evidence of the validity and internal consistency of the items in the communication competence index.

The reliability of the communications competence index was determined by means of the odds-evens method described at the beginning of this chapter. The uncorrected coefficient of correlation between the odds and the evens versions of the index was .407. When corrected by means of the modified Spearman-Brown formula, the coefficient of reliability was found to be .578.

Status Achievement Index

The concept of status achievement was defined as the degree to which an individual has achieved high status in the social system. Many past research studies have reported a relationship between various indices of social status and adoption of farm practices but none have studied the relationship between a general measure of status achievement and
Table 2. The coefficient of correlation of each item with the total communications competence index

<table>
<thead>
<tr>
<th>Index item</th>
<th>Correlation with total index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Attendance at adult agricultural evening classes</td>
<td>.34</td>
</tr>
<tr>
<td>2. Participation in veterans on-farm training program</td>
<td>.16</td>
</tr>
<tr>
<td>3. Number of farm magazines read</td>
<td>.24</td>
</tr>
<tr>
<td>4. Number of farm radio shows listened to</td>
<td>.47</td>
</tr>
<tr>
<td>5. Number of farm television shows watched</td>
<td>.36</td>
</tr>
<tr>
<td>6. Best source of information for crop problems</td>
<td>.54</td>
</tr>
<tr>
<td>7. Best source of information for swine problems</td>
<td>.62</td>
</tr>
<tr>
<td>8. Best source of information for farm management problems</td>
<td>.52</td>
</tr>
<tr>
<td>9. Attendance at Extension Service meetings</td>
<td>.52</td>
</tr>
<tr>
<td>10. Degree of personal contact with Extension Service personnel</td>
<td>.23</td>
</tr>
<tr>
<td>11. Utilization of Extension Service mass media communications</td>
<td>.85</td>
</tr>
<tr>
<td>12. Extent to which farming matters are talked over with agricultural agency and business personnel</td>
<td>.45</td>
</tr>
<tr>
<td>13. Readership of Farm Science</td>
<td>.39</td>
</tr>
</tbody>
</table>
adoption of farm practices. Items that had been used as separate indicators of social status included amount of education, size of farm, scores on a level of living index, and amount of formal participation.

In an attempt to construct a general measure of the concept of status achievement, a first step might be to determine just what factors give prestige or status in a Central Iowa rural community. This was not done although some limited information of this nature was secured in the field interviews. However, Kaufman (48, pp. 10-21) found that occupational status, years of education and amount of formal participation were all highly related to community judges' prestige ratings of the members of a New York rural community.

There would seem to be sufficient justification for expecting positive interrelationships to exist among various separate measures of social status on the basis of the findings of Duncan and Artis (27, p. 32). They reported a high degree of relationship among such measures of social status as education, formal participation, income, and occupation. Duncan and Artis (27, pp. 8-22) asked the members of a Pennsylvania rural community what factors gave higher social status to individuals residing in the community. These authors reported that the status factors of education, income, formal participation, and occupation were among the most important. Each individual was asked to rate other community members on the basis of higher, the same, or lower status than himself.
"Community prestige scores" constructed from these data were correlated highly with education, formal participation, income, and occupation.

The studies of Kaufman (48) and Duncan and Artis (27) were used as a basis for the construction of the general measure of social status used in this dissertation, the status achievement index.

In the case of farmers, it seemed that rental status and net worth might function as some measure of occupational status. Other community members usually have some idea of a farmer's net worth and most are aware of his rental status. Both of these items were included in the status achievement index as partial measures of status.

Formal participation was found in past studies to be highly related to other measures of social status. Two types of participation data were available for the 148 farm operators. A formal participation scale measured the attendance and leadership of the individual in the formal organizations in the community. A semi-formal participation scale measured the individual's attendance at a variety of community activities including sales, ball games, religious celebrations, banquets, and other events. Participation in these activities and in formal organizations might both generally be expected to be some indication of an individual's status.

Education has been found in past studies to be highly related to other measures of social status. Information as
to the number of years of education possessed by a farm operator is usually common knowledge in a rural community. On this basis, amount of education was included as one item in the status achievement index used in this thesis.

In addition to the five items already described, information was also available as to each farm operator's self-rating as to his prestige position in the community. This might be viewed as a more general indicator of social status than the other five items, however, there might be reason also to expect it to be less accurate. In terms of its effect upon an individual's behavior, perhaps a self-rating as to prestige would be more important than more objective measures. Brown (11) has found that individuals' self-ratings as to formal participation were quite accurate when compared with actual participation. On the basis of the above reasoning, the farm operators' self-ratings as to prestige in the community were included as the sixth item in the status achievement index.

Each of these six items were categorized on a six point scale so that an individual's status achievement index score could range from six to 36. An attempt was made to construct a Guttman-type scale in order to determine whether the replies were ordered along a single dimension. A coefficient of reproducibility of only 65 percent was obtained which is less than the minimum of 90 percent. The index items were not ordered in a cumulative fashion.
As a method of determining the item validity of the index, correlation coefficients were computed between each item and the total index scores by Flanagan's method. As was previously pointed out, these correlations are spurious but do provide some rough approximation of the relationship between each item and the total index. These correlations are shown in Table 3.

Table 3. The coefficient of correlations of each item with the total status achievement index

<table>
<thead>
<tr>
<th>Index item</th>
<th>Correlation with total index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rental status</td>
<td>.41</td>
</tr>
<tr>
<td>2. Years of education</td>
<td>.28</td>
</tr>
<tr>
<td>3. Net worth</td>
<td>.71</td>
</tr>
<tr>
<td>4. Formal participation</td>
<td>.32</td>
</tr>
<tr>
<td>5. Semi-formal participation</td>
<td>.64</td>
</tr>
<tr>
<td>6. Self-rating as to prestige class</td>
<td>.39</td>
</tr>
</tbody>
</table>

The relationship between each item and the total index is positive and significantly different from zero. These correlations offer some tentative evidence of the validity and internal consistency of the index, although it must be remembered that they are somewhat spurious.

The reliability of the status achievement index was
determined by means of the odds-evens method. The uncorrected coefficient of correlation between the odds and evens versions of the index is .514. When corrected by means of the modified Spearman-Brown formula, the coefficient of reliability is .679.

The status achievement index will be used as the measure of the concept of status achievement.

Index of Extra-Locality Orientation

The concept of cohesion with the locality group was earlier defined as the degree to which individuals accept the role prescribed by the locality reference group. Extra-locality orientation was defined as the degree to which an individual is oriented toward groups outside of the locality. The reasoning was presented in the previous chapter that an extra-locality orientation index might serve as an operational measure of cohesion with the locality group. The main line of reasoning might be summarized by saying that a farm operator who was oriented outside of his locality group would probably be less likely to accept completely the roles prescribed by the locality reference group. He would more likely accept the roles prescribed by the groups outside the locality which would be more likely to place a higher value on adoption of new farm practices than would the locality group.

It should be pointed out that the intent of the extra-locality orientation index is not to measure an individual's
number of contacts with possible sources of information about technological changes. That was more closely the purpose of the communication competence index. The main intent in the construction of the extra-locality orientation index was to measure the extent of extra-locality group contacts. There might be some reason to expect that the individual with a high score on the extra-locality orientation index would also have a higher score on the communication competence index.*

Although many researchers had reported a positive relationship between the adoption of farm practices and various single measures of extra-locality orientation, a review of the literature revealed no attempt had been reported to construct a general index of extra-locality orientation. Lionberger (59, p. 329) attempted to measure his similar concept of "localistic orientation" by a categorization of farm operators on the basis of the type of formal organizations to which they belonged. Merton (69) listed the characteristics of what he termed "localites" and "cosmopolites". Localites tended to read only local newspapers, to have their friendships in the local area, to belong to only local formal organizations, and to seldom take extended trips and vacations. Cosmopolites tended to read other than local newspapers, to have their

*Evidence that the extra-locality orientation index and the communication competence index have little in common is shown by the correlation of -.265 which is later reported between the two indexes. This relationship is significantly different than zero at the 1 percent level of probability.
friendships outside of the local community, etc.

Eight different items on the interview schedule were selected as possible measures of the tendency for a farm operator to be extra-locality oriented. Each of the responses to these items were categorized on the basis of a 12 point scale. These items were:

1. Reading of non-local* rather than local newspapers;
2. Visiting with non-local rather than local people about farming;
3. Little identity or feeling of belonging with the local community;
4. Most often associating with non-local rather than local people;
5. Feeling that trips and vacations are very important;
6. Semi-formal participation outside of the community;
7. Formal participation in groups outside of the community;
8. Going directly to Iowa State College for farming information.

In an attempt to determine the internal consistency and validity of the index items, correlations were computed between each item and the total index scores by use of Flanagan's method (32) and are presented in Table 4.

*By "non-local" is meant outside of the trade area community in which the farm operator resided. This distinction between "non-local" and "local" is used consistently throughout the construction of the index.
Table 4. The coefficient of correlation of each item with the total extra-locality orientation index

<table>
<thead>
<tr>
<th>Index item</th>
<th>Correlation with total index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Reading of newspapers</td>
<td>.26</td>
</tr>
<tr>
<td>2. Location of people visited with about farming</td>
<td>.47</td>
</tr>
<tr>
<td>3. Identity with community</td>
<td>.50</td>
</tr>
<tr>
<td>4. Location of people associated with most often</td>
<td>.53</td>
</tr>
<tr>
<td>5. Importance of trips and vacations</td>
<td>.57</td>
</tr>
<tr>
<td>6. Semi-formal participation in groups outside of the community</td>
<td>.61</td>
</tr>
<tr>
<td>7. Formal participation in groups outside of the community</td>
<td>.35</td>
</tr>
<tr>
<td>8. Going directly to Iowa State College for farming information</td>
<td>.25</td>
</tr>
</tbody>
</table>

The relationship between each item and the total index is positive and significantly different from zero, although it must be remembered that each of these correlations is spurious. The reliability of the index was computed by means of the odds-evens method. The coefficient of correlation of .242 between the odd and even numbered items was found to be .390 when corrected by means of the modified Spearman-Brown formula.

The index of extra-locality orientation will be used as a negative measure of the concept of cohesion with the
locality group. An individual with a high degree of cohesion with the locality group would have a low score on the extra-locality orientation index.

Family Integration Index

The concept of family integration is defined as the degree to which an individual is oriented toward optimizing rewards and satisfactions for other family members.

A variety of scales have been used by sociologists to measure this concept of family integration. Cavan's* scale for rating family integration included the following major items: (1) degree of affection among family members, (2) extent to which the family engaged in joint activities, (3) willingness to sacrifice to attain family objectives, (4) degree of esprit de corps, (5) degree to which solidarity is present, (6) degree to which there is tension among family members.

Hill's (41, pp. 426-428) family integration scale included the first five items from Cavan's scale for rating family integration. The specific questions that Hill included in his interview schedule to measure family integration were:

1. Degree of affection: how close are members of the family affectionally?

*This scale was prepared by Ruth Shonle Cavan and is published in Burgess and Locke (13, pp. 481-482).
2. Extent to which the family engaged in joint activities: how frequently did you get out as a family to social activities?

3. Willingness to sacrifice to attain family objectives: do you have family objectives and goals which are so important that you subordinate your own individual desires to these goals?

4. Degree of esprit de corps: do either or both of you impress your children with pride in the family tree, in the line you come from, and in your illustrious forebears?

5. Degree to which solidarity is present: how interdependent do you feel as a family, are you dependent on one another for happiness, and is there a feeling of unity?

Dunigan (29) utilized Hill's family integration scale and tested it for validity and reliability. He reported (29, p. 25) that the scale possessed a high degree of internal consistency as determined by computing correlations between each item and the total scores. Dunigan stated that this finding offered some evidence that the scale was valid. Dunigan (29, p. 27) also reported a reliability coefficient of correlation of .77 on the basis of the odd-even method.

Both Cleland (17) and Wilkening (105) have also attempted to construct measures of this concept of family integration. Wilkening (105, pp. 32-33) constructed his family integration
index from four items: (1) amount of joint family participation in formal organizations and at informal activities, (2) degree of cooperation among family members, (3) feeling of family solidarity (interviewer rating on basis of interview questions about assisting children in getting started in farming or in another occupation, supporting parents in old age, attitude of wife toward helping with field work, attitude of husband toward helping with housework, and feeling about chores for children), (4) degree of esprit de corps (interviewer rating based upon reference to past and present family status and accomplishments).

Cleland (17, p. 251) listed seven items in his family integration index: (1) whole family goes into town as a group, (2) family stays together as a group when it gets to town, (3) family volunteers information on two or more types of activity its members do as a group, (4) wife indicates pride in observation of Christmas as a special family event, (5) other holidays are also celebrated as family events, (6) special celebrations are held for birthdays of children (a cake baked, a party, or some other family way of marking the event), (7) special celebrations are held for birthdays of adults.

From the schedule information that was available, 12 items were selected that might possibly be considered as operational measures of the concept of family integration. Certain of this information was of an attitudinal nature and certain was of a behavioral nature. However, in order to
construct a tentative measure of family integration, it was decided to combine these two different types of data. Certain of the data were responses by the farm operator and certain were responses by the farm operator's wife. As the dimension to be measured was a family characteristic this combining of husbands' and wives' responses into a family integration index seemed defensible.

Responses to each of the 12 items were converted to a five point scale with a score of five representing high family integration. By means of Flanagan's method, the correlation between responses to each of the 12 items and the total scores were computed and are presented in Table 5.

The relationship between each item and the total index is positive but not all are significantly different from zero. It must also be remembered that each of these correlations is slightly spurious. In view of this lack of a high degree of internal consistency, the items in the family integration index might be considered as to their agreement with the definition of the concept.

Items 1, 2, and 4 are all examples of the degree to which the family participates jointly in various activities. This has generally come to be regarded as one indication of family integration. If family members are oriented toward optimizing satisfactions for each other, it might follow that they would engage in joint activities together.

Another behavioral rather than attitudinal item included
Table 5. The coefficient of correlation of each item with the total family integration index

<table>
<thead>
<tr>
<th>Index item</th>
<th>Correlation with total index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Attend Collins events with immediate family rather than others</td>
<td>.56</td>
</tr>
<tr>
<td>2. Attend events outside Collins with immediate family rather than others</td>
<td>.48</td>
</tr>
<tr>
<td>3. Amount of farm labor provided by family</td>
<td>.26</td>
</tr>
<tr>
<td>4. Degree to which formal participation is a joint family affair</td>
<td>.24</td>
</tr>
<tr>
<td>5. Importance of education for children (as rated by husband)</td>
<td>.18</td>
</tr>
<tr>
<td>6. Importance of setting children up in farming (as rated by husband)</td>
<td>.17</td>
</tr>
<tr>
<td>7. Importance of a satisfactory family life (as rated by husband)</td>
<td>.10</td>
</tr>
<tr>
<td>8. Number of times husband says he talks over life goals with wife</td>
<td>.30</td>
</tr>
<tr>
<td>9. Importance of education for children (as rated by wife)</td>
<td>.15</td>
</tr>
<tr>
<td>10. Importance of setting children up in farming (as rated by wife)</td>
<td>.10</td>
</tr>
<tr>
<td>11. Importance of a satisfactory family life (as rated by wife)</td>
<td>.26</td>
</tr>
<tr>
<td>12. Number of times wife says she talks over life goals with husband</td>
<td>.32</td>
</tr>
</tbody>
</table>
in the index was the amount of farm labor provided by the family. Presence of an outsider as a hired laborer might be one factor that would decrease family integration. It might also be reasoned that a family that works together would more likely be more highly integrated.

Items 8 and 12 in Table 5 are an indication of the degree to which family decision-making is father-centered rather than family-centered. There is reason to believe that a well integrated family would tend to share the decision-making role between both father and mother.

Both husband and wife were asked to respond to three questions about the importance of certain family goals or values. If parents are oriented toward optimizing goals for their children, they would be expected to be in favor of providing them with an education and setting them up in farming. Parents also would be expected to feel that a satisfactory family life was more important in a well-integrated family. This is a rather indirect way of measuring how well-integrated a family is by asking the parents how important they feel it is to be well-integrated (by having a satisfactory family life).

The reliability of the family integration index was computed by means of the odds-evens technique. A coefficient of correlation between the odds and evens versions of .101 was corrected by means of the modified Spearman-Brown formula to a coefficient of reliability of .184.
Index of Kinship Orientation

The concept of cohesion with the kinship group was earlier defined as the degree to which an individual accepts the role prescribed for him by the kinship reference group. It was suggested that an index of kinship contacts might serve as an operational measure of the concept of cohesion with the kinship group. Kinship orientation was previously defined as the degree to which an individual is oriented toward his kinship group rather than to non-kinship groups. An individual with a high degree of cohesion with his kinship group would be expected to have a high score on the index of kinship orientation.

It is expected that a farm operator with a high degree of kinship orientation would have a considerable amount of contact with his kinfolk. In order for a farmer to be responsive to the expectations of his kinship reference group, at least a minimum level of communication with that reference group would be required. An individual's mental orientation toward his kinfolk would be expected to be reflected in his actual behavior, such as visiting, exchanging work, attending social events of various kinds, and associating with his kinfolk. Another way in which physical contact and mental orientation toward one's kinfolk might be indicated is by renting farm land from relatives. This item would only apply if an individual were a renter.
These items were included in the index of kinship orientation which was constructed to measure the concept of kinship cohesion. Other researchers have attempted to measure a similar dimension by means of an index of kinship contacts. Wilkening (99, p. 362) rated the farm operators in his study as to their degree of kinship orientation by means of a content analysis of responses to open-ended interview questions. Wilkening (105, pp. 34-35) constructed an index of kinship contacts based upon: (1) whether most of relatives of husband and wife lived nearby, (2) whether most of relatives of husband and wife belonged to same church, (3) whether family visited more with relatives than non-relatives, (4) whether husband exchanged work more with relatives than non-relatives, (5) whether family keeps in close touch with relatives not living near by.

Cleland (17, p. 252) included seven items in the index of kinship contacts that he constructed: (1) family has relatives located less than 10 miles away, (2) family visits with relatives at least weekly, (3) family visits more with relatives than with non-relatives, (4) equipment or help exchanged more often with relatives than with non-relatives, (5) in times of trouble, wife would rather ask relative than friend for help, (6) relatives are living in respondent's household, (7) family helps out older relatives not living on the farm.

Cleland reported that only the seventh item failed to
discriminate significantly between the high-scoring and low-scoring groups on the total index.

From the interview schedule information that was available, seven items were selected that might possibly be considered as measures of the degree of kinship orientation. This information was obtained from either the farm operator or his wife.

Responses to each of the seven items were computed on a three point scale with a score of three representing a high degree of kinship orientation. By means of Flanagan's method, the correlation between responses to each of the seven items and the total scores were computed and are presented in Table 6.

The relationship between each item and the total index of kinship orientation is positive and significantly different from zero. Each of these correlations is spurious but they do indicate that the index of kinship orientation items possessed a certain degree of validity and internal consistency.

The reliability of the index was determined by means of the odds-evens technique. The uncorrected coefficient of correlation between the odd and even numbered items is .329. When corrected by means of the modified Spearman-Brown formula the coefficient of reliability is .495.

The index of kinship orientation will be used as an operational measure of the concept of cohesion with the kinship group.
Table 6. The coefficient of correlation of each item with the total index of kinship orientation

<table>
<thead>
<tr>
<th>Index item</th>
<th>Correlation with total index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Attend Collins events with relatives rather than others</td>
<td>.36</td>
</tr>
<tr>
<td>2. Attend events outside Collins with relatives rather than others</td>
<td>.50</td>
</tr>
<tr>
<td>3. More informal participation with relatives than with others</td>
<td>.63</td>
</tr>
<tr>
<td>4. Exchange work more with relatives than with others</td>
<td>.60</td>
</tr>
<tr>
<td>5. If renter, related to landlord</td>
<td>.52</td>
</tr>
<tr>
<td>6. Farmer associates more with relatives than with non-relatives</td>
<td>.77</td>
</tr>
<tr>
<td>7. Farmer discusses farming matters more with relatives than with non-relatives</td>
<td>.79</td>
</tr>
</tbody>
</table>
ANALYSIS OF DATA

Use of Multiple Regression

The statistical technique of multiple regression was used to determine the relationships between the six independent variables and the dependent variable. Multiple regression was used rather than multiple correlation because one of the purposes of this study was to determine the degree to which the dependent variable, the adoption scale measuring the concept of technological change, could be predicted by its relationships with the six independent variables. When prediction is one of the purposes of an analysis and a prediction equation is desired, multiple regression is a more appropriate technique.

Linear rather than curvilinear regression techniques were used in the analysis of the data. Linear regression assumes that a straight line best fits the relationship between two variables. In order to obtain some indication of the appropriateness of the use of linear regression, the relationship between each of the six independent variables and the dependent variable were plotted on scatter diagrams. An inspection of these scatter plots revealed that there was little reason to suspect that curvilinear relationships were present.

This finding must be regarded as very tentative evidence that linear regression was more appropriate than curvilinear
regression. For the sake of the present analysis it was necessary to assume that curvilinear relationships were not present.

Procedure of Analysis

The major null hypothesis to be tested in this chapter may be stated: There are no significant relationships between the adoption of new farm practices, \( X_0 \), and any one of the independent variables, \( X_1 \ldots X_6 \), when the effects of the others are taken into account.

For purposes of clarity in the following writing, the system of symbols will be described in detail. An example of the relationship described in the null hypothesis stated earlier is in the case of the relationship between the adoption of new farm practices and change orientation which is expressed as \( r_{01.23456} \) or the partial correlation between \( X_0 \) and \( X_1 \), where:

\[
\begin{align*}
X_0 & \quad \text{adoption of farm practices scale} \\
X_1 & \quad \text{change orientation index} \\
X_2 & \quad \text{communication competence index} \\
X_3 & \quad \text{status achievement index} \\
X_4 & \quad \text{index of extra-locality orientation} \\
X_5 & \quad \text{family integration index} \\
X_6 & \quad \text{index of kinship orientation}
\end{align*}
\]

The first step in testing the major hypothesis is to determine the zero-order intercorrelations between the seven
variables. Twenty-one coefficients of correlation are re-
quired to express the relationships between each variable and
each of the other six variables. For example, the zero-order
correlation between \( X_0 \) and \( X_1 \) is written as \( r_{01} \).

The next step is to determine the coefficient of multiple
correlation, which expresses the relationship between the
dependent variable and the combined effect of the six inde-
pendent variables. The coefficient of multiple correlation
is written as \( R_{0.123456}^2 \). \( R_{0.123456}^2 \) is the percentage of the
variation in the dependent variable, \( X_0 \), that is explained by
the combined effect of the six independent variables. In
other words, \( R_{0.123456}^2 \) expresses the percentage of the vari-
ation in the adoption scores that is explained by the com-
bined effect of the six independent variables. One of the
purposes of this dissertation is to determine the extent to
which technological change can be predicted from a conceptual
variable analysis of the six independent variables.

The third step in the analysis of data is the determina-
tion of the partial correlations. The example used before
was \( r_{01.23456} \) which is the relationship between \( X_0 \) and \( X_1 \)
when the effects of \( X_2, X_3 \ldots X_6 \) are controlled.

The first of the subhypotheses may now be stated: There
is no significant relationship between adoption of farm prac-
tices, \( X_0 \), and change orientation, \( X_1 \), when the remaining inde-
dendent variables, \( X_2 \ldots X_6 \), are taken into account. The
independent variable of change orientation, \( X_1 \), will be
omitted and the multiple correlation between adoption of farm practices and the remaining independent variables will then be computed. The resulting multiple correlation, R_{0.23456}, will then be compared with that containing all of the variables, R_{0.123456}, and the first subhypothesis will be either accepted or rejected.

To test the subhypothesis that the inclusion of the additional variable, X_1, makes a significant difference in accounting for variation in the adoption of farm practices, the formula given by McNemar (67, p. 266) is used:

\[ F_{1,141} = \frac{(R^2_{0.123456} - R^2_{0.23456}) / 6 - 5}{(1 - R^2_{0.123456}) / 148 - 6 - 1} \]

An appropriate change in the above formula is made in order to test each of the five other subhypotheses.

Lastly, the prediction equation will be computed whereby an estimate of the adoption of farm practices scale may be made by substituting appropriate values of X_1, X_2 \ldots X_6 in the general formula:

\[ X_0 = a + b_1 X_1 + b_2 X_2 + b_3 X_3 \ldots b_6 X_6 \]

The first step to be presented in the actual analysis of data will be the zero-order correlations between each of the seven variables.

Zero-Order Correlations

The first step in analyzing the relationships between
the seven conceptual variables is to compute the zero-order intercorrelations. These correlations are called zero-order correlations because no variables are held constant.

An example of a zero-order correlation would be the correlation between $X_0$ and $X_1$, which is written as $r_{01}$. A first-order partial correlation is obtained by holding constant one other variable. For example, the first-order partial correlation between $X_0$ and $X_1$ holding constant the effect of $X_2$ is written as $r_{01.2}$. A second-order partial correlation is obtained by holding constant the effect of two variables.

This method of nomenclature may be continued to higher order partial correlations. For example, in a later section of this chapter, fifth-order partial correlations will be presented between two variables holding constant the effect of the other five.

The 21 coefficients of correlation expressing the interrelationships between the seven conceptual variables are presented in Table 7.

An inspection of the zero-order correlations of the independent variables with the dependent variable shows them to be in the expected direction but not all of them to be statistically significant from zero. Neither extra-locality orientation, family integration, nor kinship orientation are significantly correlated with adoption. These variables will be retained in the multiple regression analysis because certain of them are significantly related to certain of the other
Table 7. Zero-order correlation coefficients and their significance

<table>
<thead>
<tr>
<th>Variable</th>
<th>$X_0$</th>
<th>$X_1$</th>
<th>$X_2$</th>
<th>$X_3$</th>
<th>$X_4$</th>
<th>$X_5$</th>
<th>$X_6$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$X_0$</td>
<td>-</td>
<td>.262*</td>
<td>.275*</td>
<td>.231*</td>
<td>.026</td>
<td>-.083</td>
<td>-.144</td>
</tr>
<tr>
<td>$X_1$</td>
<td>-</td>
<td>-</td>
<td>.275*</td>
<td>.144</td>
<td>-.118</td>
<td>.074</td>
<td>.010</td>
</tr>
<tr>
<td>$X_2$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.282*</td>
<td>-.265*</td>
<td>-.007</td>
<td>-.232*</td>
</tr>
<tr>
<td>$X_3$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-.117</td>
<td>.075</td>
<td>.070</td>
</tr>
<tr>
<td>$X_4$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-.005</td>
<td>-.128</td>
</tr>
<tr>
<td>$X_5$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-.104</td>
</tr>
<tr>
<td>$X_6$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Indicates a coefficient of correlation significantly different from zero at the 1 percent level of probability.

**Where:**
- $X_0$: adoption of farm practices scale
- $X_1$: change orientation index
- $X_2$: communication competence index
- $X_3$: status achievement index
- $X_4$: index of extra-locality orientation
- $X_5$: family integration index
- $X_6$: index of kinship orientation

Only four of the 15 intercorrelations among the six independent variables are significantly different from zero. The change orientation index is correlated .275 with the independent variables. They will function primarily as control variables or "suppressants".*

*A more detailed description of suppressants in multiple regression analysis is contained in McNemar (67, pp. 163-164).
communication competence index. The communication competence index is correlated .282 with the status achievement index. The communication competence index is correlated -.265 with the index of extra-locality orientation and -.232 with the index of kinship orientation. This latter relationship might have been expected on the basis of the nature of the concepts of communication competence and kinship cohesion.

Coefficient of Multiple Correlation

The coefficient of multiple correlation expresses the relationship between the dependent variable and the combined effect of the six independent variables. The coefficient of multiple correlation is written as $R_{0.123456}^2$. $R_{0.123456}^2$ is the percentage of the variation in the dependent variable, $X_0$, that is explained by the combined effect of the six independent variables and is termed the coefficient of multiple determination. The equation which will yield the coefficient of multiple determination is:

$$R_{0.123456}^2 = b_1 r_{01} + b_2 r_{02} + \ldots + b_6 r_{06} \quad (1)$$

Solution of this equation requires prior determination of the six unknown regression coefficients: $b_1, b_2, b_3 \ldots b_6$. These regression coefficients were determined by the Doolittle method.*

*Descriptions of the procedure involved in the Doolittle method may be found in Wert and others (97, pp. 390-392) or McNemar (67, pp. 156-160).
The coefficient of multiple determination, \( R^2_{0.123456} \), is .167. In other words, 16.7 percent of the variation in the adoption scores can be accounted for by the combined effect of the six independent variables. \( R^2_{0.123456} \) is obtained by computing the square root of \( R^2_{0.123456} \). The coefficient of multiple correlation is .409. Both Copp (22) and Fliegel (33) reported higher coefficients of multiple correlation. Copp (22, p. 29) reported an \( R \) of .69 in the case of a six variable multiple regression and an \( R \) of .70 in the case of a four variable multiple regression. Fliegel (33, p. 79) reported a coefficient of multiple correlation of .57 in the case of a six variable multiple regression. Copp and Fliegel included different variables in their analyses than were included in the present study and this is one reason they found different coefficients of multiple correlation.

Partial Correlations

One of the purposes of this dissertation was to determine the relationship between each independent variable and the dependent variable while controlling on the effect of the other five independent variables. Six fifth-order partial correlations are necessary to express these relationships. As an example of the notation used in this section, \( r_{01.23456} \) is the relationship between \( X_0 \) and \( X_1 \) when the effects of \( X_2, X_3 \ldots X_6 \) are controlled.

The formula for obtaining \( r_{01.23456} \) was given by Wert
and others (97, p. 250) as:

\[
\hat{r}_{01.23456} = \frac{r_{01.23456} - r_{06.2345} r_{16.2345}}{\left(1 - r^2_{06.2345}\right) \left(1 - r^2_{16.2345}\right)}
\]  \quad (2)

This formula necessitates the prior computation of a number of lower order partial correlations in order to obtain the fifth-order partial correlation desired, \(r_{01.23456}\). A formula that requires less computational effort, in terms of the regression values that have been already obtained, is given by Ezekiel (31, p. 215) as:

\[
fq^2 = 1 - \frac{1 - R^2_{01.23456}}{1 - R^2_{0.23456}}
\]  \quad (3)

The desired fifth-order partial correlation coefficient, \(r_{01.23456}\), is then secured by obtaining the square root of \(f^2_{01.23456}\) computed by formula (3) above.

This fifth-order partial correlation, \(r_{01.23456}\), is .214. This is the relationship between the adoption scores and scores on the change orientation index, while controlling on the effect of the other five independent variables. In comparison, the zero-order correlation, \(r_{01}\), is .262. The correlation between adoption scores and scores on the change orientation index is lower when the effect of the other five

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*Ezekiel (31, p. 215) stated that partial correlation coefficients obtained by formula (3) will differ slightly from those obtained by formula (2). However, Ezekiel felt that partial correlation coefficients obtained by formula (3) would be sufficiently accurate for most practical purposes.*
variables is controlled.

The fifth-order partial correlation between the adoption scores and scores on the communication competence index is .166. In comparison, the zero-order correlation, \( r_{02} \), is .275. The correlation between adoption scores and scores on the communication competence index is lower when the effect of the other five variables is controlled.

The fifth-order partial correlation between the adoption scores and scores on the status achievement index is .171. In comparison, the zero-order correlation, \( r_{03} \), is .231. The correlation between adoption scores and scores on the status achievement index is lower when the effect of the other five variables is controlled.

The fifth-order partial correlation between the adoption scores and scores on the extra-locality orientation index while controlling on the effect of the other five variables is .109. The zero-order correlation, \( r_{04} \), is .026. When controlling upon the effect of the other five independent variables, the correlation between \( X_0 \) and \( X_4 \), is higher than when the effect of these other five independent variables is not controlled.

The fifth-order partial correlation between adoption and family integration, \( r_{05} \), is .127. In comparison, the zero-order correlation, \( r_{05} \), is -.083. The correlation between adoption scores and scores on the family integration index is higher and is positive rather than negative when
the effect of the other five variables is controlled.

The fifth-order partial correlation between adoption and kinship orientation is 0.091. In comparison, the zero-order correlation, \( r_{0g} \), is -0.144. The correlation between adoption scores and scores on the index of kinship orientation is lower and positive rather than negative when the effect of the other five variables is controlled.

The significance of these fifth-order partial correlations from zero is also tested by the testing of the appropriate subhypothesis in the following section.

Testing the Subhypotheses

It was stated in this chapter that 16.7 percent of the variation in the adoption of farm practices can be accounted for by the combined effect of the six independent variables. The question now may be raised as to whether this differs significantly from the variation accounted for by any five of the independent variables. One of the independent variables at a time will be omitted.

The first of the six subhypotheses, stated in null form, is: There is no significant relationship between adoption of farm practices and change orientation, \( X_1 \), when the remaining independent variables, \( X_2, X_3 \ldots X_6 \), are taken into account. The multiple correlation between adoption of farm practices and the remaining independent variables, \( r_{0.5456} \), is compared with the multiple correlation containing all of
the variables, $R_{0.123456}$, as a means of testing the first null hypothesis. To test the null hypothesis that the inclusion of the additional variable, $X_1$, makes a significant difference in accounting for variation in the adoption of farm practices scores, the F test is used:

$$F_{1,141} = \frac{(R_{0.123456}^2 - R_{0.23456}^2) / 6 - 5}{(1 - R_{0.123456}^2) / 148 - 6 - 1}$$  \hspace{1cm} (4)

$F$ is 6.79 which is more than the 3.91 required for significance at the 5 percent level but less than the 6.81 required for significance at the 1 percent level. There is sufficient evidence to reject the null hypothesis. There is a significant relationship between adoption of farm practices and change orientation when the five remaining independent variables are taken into account.

The second of the six subhypotheses, stated in null form, is: There is no significant relationship between adoption of farm practices, $X_0$, and communication competence, $X_2$, when the remaining independent variables, $X_1$, $X_3$, $X_4$, ..., $X_5$, are taken into account. The F test specified in formula (4) is used to test the null hypothesis that the inclusion of the additional variable, $X_2$, makes a significant difference in accounting for variation in the adoption of farm practices scores.

$F$ is 3.99 which is more than the 3.91 required for significance at the 5 percent level. There is sufficient evidence to reject the null hypothesis. There is a significant rela-
tionship between adoption of farm practices and communication competence when the five remaining independent variables are taken into account.

The third of the six subhypotheses, stated in null form, is: There is no significant relationship between adoption of farm practices, \( X_0 \), and status achievement, \( X_3 \), when the remaining independent variables, \( X_1, X_2, X_4 \ldots X_6 \), are taken into account. The F test specified in formula (4) is used to test the null hypothesis that the inclusion of the additional variable, \( X_3 \), makes a significant difference in accounting for variation in the adoption of farm practices scores.

\( F = 4.26 \), which is more than the 3.91 required for significance at the 5 percent level but less than the 6.81 required for significance at the 1 percent level. There is sufficient evidence to reject the null hypothesis. There is a significant relationship between adoption of farm practices and status achievement when the five remaining independent variables are taken into account.

The fourth of the six subhypotheses, stated in null form, is: There is no significant relationship between adoption of farm practices, \( X_0 \), and extra-locality orientation, \( X_4 \), when the remaining independent variables, \( X_1, X_2, X_3, X_5, X_6 \), are taken into account. The F test specified in formula (4) is used to test the null hypothesis that the inclusion of the additional variable, \( X_4 \), makes a significant difference in
accounting for variation in the adoption of farm practices scores. Since the zero-order correlation between \( X_0 \) and \( X_4 \) is not significantly different from zero it is not likely that including the additional variable, \( X_4 \), will make a significant difference in accounting for variation in the adoption scores. An exception might occur if the variable, \( X_4 \), serves as a suppressant through correlations with the other independent variables.

\( F \) is 1.66 which is less than the 3.91 required for significance at the 5 percent level. There is not sufficient evidence to reject the null hypothesis. There is no significant relationship between adoption of farm practices and extra-locality orientation when the five remaining independent variables are taken into account.

The fifth subhypotheses, stated in null form, is: There is no significant relationship between adoption of farm practices, \( X_0 \), and family integration, \( X_5 \), when the remaining independent variables, \( X_1 \ldots X_4, X_6 \), are taken into account. The \( F \) test specified in formula (4) is used to test the null hypothesis that the inclusion of the additional variable, \( X_5 \), makes a significant difference in accounting for variation in the adoption of farm practices scores. Since the zero-order correlation between \( X_0 \) and \( X_5 \) is not significantly different from zero it is not likely that the inclusion of the additional variable, \( X_5 \), will make a significant difference in accounting for variation in the adop-
tion scores. An exception might occur if the variable, $X_5$, serves as a suppressant through correlations with the other independent variables. However, this is not likely as none of the zero-order correlations between $X_5$ and the other five independent variables were significantly different from zero.

$F$ is 2.33 which is less than the 3.91 required for significance at the 5 percent level. There is not sufficient evidence to reject the null hypothesis. There is no significant relationship between adoption of farm practices and family integration when the five remaining independent variables are taken into account.

The last of the six subhypotheses, stated in null form, is: **There is no significant relationship between adoption of farm practices, $X_0$, and kinship orientation, $X_6$, when the remaining independent variables, $X_1, X_2 \ldots X_5$, are taken into account.** The $F$ test specified in formula (4) is used to test the null hypothesis that the inclusion of the additional variable, $X_6$, makes a significant difference in accounting for variation in the adoption of farm practices scores.

Since the zero-order correlation between $X_0$ and $X_5$ is not significantly different from zero it is not likely that the inclusion of the additional variable, $X_6$, will make a significant difference in accounting for variation in the adoption scores. An exception might occur if the variable, $X_5$, serves as a suppressant through correlations with the other independent variables.
F is 1.18 which is less than the 3.91 required for significance at the 5 percent level. There is not sufficient evidence to reject the null hypothesis. There is no significant relationship between adoption of farm practices and kinship orientation when the five other independent variables are taken into account.

The Prediction Equation

An estimate of the adoption of farm practices may be secured by substituting appropriate values of $X_1$, $X_2$, ..., $X_6$ in the prediction equation:

$$X_0 = a + b_1 X_1 + b_2 X_2 + \ldots + b_6 X_6 \tag{5}$$

The value of the regression coefficients have been determined in an earlier section of this chapter in order to determine the multiple coefficient of correlation. After solution for the "a" value, sometimes called the "y-intercept", the prediction equation is obtained:

$$X_0 = 37.7398 - .4513 X_1 - .3923 X_2 + .1333 X_3 + .4662 X_4 + .1834 X_5 + 1.6516 X_6$$

By substituting an individual's scores on each of the six independent variables, his adoption score may be estimated. As prediction of the adoption scores for individuals was not one of the main purposes of this study, no attempt was made to construct a prediction table from the prediction equation

*This formula was given by McNemar (67, p. 266).
given above. There would be little practical value for such a prediction table because the change agent seldom has available an individual's scores on the six indexes.
DISCUSSION AND SUMMARY

Implications for Future Research

Additional conceptual variables

It was stated in an earlier chapter that one of the shortcomings of the present study is that the selection of sociological conceptual variables was limited to a certain extent by the availability of existing data. In this section an attempt will be made to select additional conceptual variables that might well be included in future studies of technological change.

One of the concepts that was included in the present study was change orientation which is defined as the degree to which an individual possesses a favorable attitude toward technological changes. Perhaps a similar concept of "research orientation" might be suggested. Research orientation is defined as the degree to which an individual possesses a favorable attitude toward research. This concept of research orientation might be measured by an index of attitudes toward certain research activities or toward certain research agencies. Typical items might include attitude toward the agricultural college research program and attitude toward the research programs of commercial concerns. The degree of technological change is expected to vary directly with the degree of research orientation.
Another concept that might be suggested for possible inclusion in future studies is that of "rationalism". Rationalism is defined as the degree to which an individual is oriented toward utilizing efficient means to accomplish desired goals. A "professionalism" index has been suggested as one partial measure of this concept of rationalism by Copp (22). This professionalism index included such items as might measure a rational orientation toward the profession of farming (e.g., one of Copp's items was membership in a farmer organization).

It might appear that one of the first steps in constructing an operation to measure the concept of rationalism might be to determine the "desired goals". These would probably vary among individuals but perhaps several main goals could be specified. One might be, for instance, maximization of farm production. A typical item in an index to measure this type of rationalism might be, "If you knew that by specializing in poultry farming next year you could double your present farm income, would you do so even if you had a strong dislike for chickens?" Other hypothetical decision-making items of a similar nature might be suggested.

The degree of technological change is expected to vary directly with the degree of rationalism. One of the major problems concerned with this concept of rationalism might be the task of developing empirical measures of it.

Risk preference is another conceptual variable that might
be included in future research studies of technological change. Risk preference is defined as the degree to which an individual selects alternatives in decision-making situations which entail a degree of chance (which can be measured). This definition is essentially consistent with that of Heady (44, pp. 439-443). It would seem that the individual who adopts a new practice at a relatively early time is selecting an alternative which entails a higher degree of chance of failure. By waiting to adopt the practice until a later time (selecting the alternative of postponing the decision to adopt), an individual would exhibit less risk preference. Risk has been differentiated by Heady (44, pp. 439-443) from "uncertainty". The degree of chance that is involved cannot be objectively determined in the case of uncertainty. Information is generally available so that an individual may estimate the chance of success he can expect with a new practice, so this concept is more appropriately labelled as risk preference than as uncertainty preference.

The degree of technological change is expected to vary directly with the degree of risk preference. Developing a measure of this concept of risk preference may pose a problem. However, the "venturesomeness" scale developed by Alfred Politz Research, Inc. (9) might serve as a measure of one type of risk preference. Individuals were asked whether or not they would purchase immediately seven different products that were not yet on the market.
A risk preference scale might be constructed from items in which an individual is forced to select either high or low risk alternatives in a hypothetical decision-making situation. A typical item might be, "If a new variety of oats was placed on the market that would yield 10 bushels more per acre but that cost a dollar a bushel more than the seed oats you had been planting, would you purchase the new variety?" Other items of this nature might also be proposed to measure the degree of risk preference involved in other types of farming decisions.

Other conceptual variables in addition to those suggested above might be listed on the basis of present knowledge about technological change. Perhaps as the body of general sociological theory is more fully developed, additional sociological concepts may be derived which would be expected to be related to technological change. For example, it was hypothesized in the present study that the degree of technological change varies inversely with the degree of (family) integration. There may be some reason to believe, on the basis of general sociological theory, that the degree of integration varies directly with the degree of role clarity. Therefore, the general hypothesis might be derived that the degree of technological change varies inversely with the degree of family role clarity. Other general hypotheses between technological change and other concepts might be derived as general sociological theory is more fully developed.
In addition to suggesting additional conceptual variables that might be analyzed in future research studies as they relate to technological change, improvements might also be suggested in the operations that were used to measure the conceptual variables included in the present study.

Additional items for present indexes

It was stated in an earlier chapter that one of the shortcomings of the present study is that the operational indexes were constructed after the data were gathered in the field interviews. This limited the nature and length of the operational indexes in the present study because the only items that could be included in the indexes were those that were included in the existing information. In this section, an attempt will be made to suggest improvements that might have been included in the present indexes so that these improved indexes could be used in future research studies of a similar nature.

A prior consideration might be to determine the ideal number of items that should be included in each index. One of the major reasons for lengthening an index is to increase the coefficient of reliability. The makers of standardized I.Q. and achievement (recall of information) tests consider a minimum coefficient of reliability of .90 to be sufficient. For the six indexes utilized in the present study for which reliability coefficients were determined, the highest coeffi-
cient of reliability was stated to be .679 and the lowest was .184. This lack of reliability in the indexes used in the present study is not as serious a shortcoming as might be expected, however, as the degree to which these indexes will yield consistent results in future administrations is not a major consideration. Also, a practical limit is imposed upon the number of items that could be included in the present indexes because of the nature of the method by which the data were secured. The makers of standardized tests do not have this limiting factor because their tests are not usually administered in field interviews.

Even though the minimum coefficient of reliability of .90 is highly arbitrary and may not be very applicable to the present indexes because of the nature of their possible future use, the number of items that each of the indexes should contain in order to reach a coefficient of reliability of .90 was computed. The Spearman-Brown "prophecy" formula as given by Wert and others (97, p. 333) is:

\[ N = \frac{r'(1 - p)}{r(1 - r')} \]

where \( N \) = number of times the index should be lengthened,
\( r' \) = the desired coefficient of reliability, which is .90 in this case,
\( r \) = the actual coefficient of reliability prior to lengthening.

As an example, the index of kinship contacts, composed
of seven items, yielded an estimated coefficient of reliability of .50 in the present study. By use of the prophecy formula given above the desired coefficient of reliability of .90 could be obtained if the index were lengthened nine times until it included 63 items. It is assumed that the 56 added items would be similar to the seven included in the present study in that they would also measure kinship contacts.

Table 8 shows the number of times that each of the other five indexes (for which reliability was estimated in the present study) should be lengthened in order to reach the arbitrary minimum of a coefficient of reliability of .90. The number of items that each index would then contain is also indicated.

From Table 8 it may be seen that the reliability of each of the indexes could be improved by the addition of items. In the case of the adoption of farm practices scale, it is difficult for the author to suggest specific additional items for inclusion in future adoption scales because each of the farm practices must be in a period of partial adoption at the time the future study is being done. However, several general considerations might be suggested.

First, other sources than Extension Service Specialists might be used to develop the list of farm practices to be included in the adoption scale. These other sources might include county agents, vocational agriculture teachers, and other change agents who might be likely to have more intimate
Table 8. Number of items required for each of six indexes to reach a coefficient of reliability of .90

<table>
<thead>
<tr>
<th>Index</th>
<th>Coefficient of reliability prior to lengthening</th>
<th>Number of items prior to lengthening</th>
<th>Number of times the index should be lengthened</th>
<th>Number of items after lengthening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adoption of farm practices scale</td>
<td>.703</td>
<td>24</td>
<td>3.89</td>
<td>93</td>
</tr>
<tr>
<td>Change orientation index*</td>
<td>--</td>
<td>3</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Communication competence index</td>
<td>.578</td>
<td>13</td>
<td>6.52</td>
<td>85</td>
</tr>
<tr>
<td>Status achievement index</td>
<td>.679</td>
<td>6</td>
<td>3.86</td>
<td>23</td>
</tr>
<tr>
<td>Index of extra-locality orientation</td>
<td>.390</td>
<td>8</td>
<td>14.08</td>
<td>113</td>
</tr>
<tr>
<td>Family integration index</td>
<td>.184</td>
<td>12</td>
<td>41</td>
<td>492</td>
</tr>
<tr>
<td>Index of kinship orientation</td>
<td>.495</td>
<td>7</td>
<td>9</td>
<td>63</td>
</tr>
</tbody>
</table>

*The coefficient of reliability prior to lengthening was not determined as the split-half technique of estimating reliability would not be very appropriate when the index contained only three items.
contact with their constituents than do Extension Service Specialists. Commercial change agents might also be utilized to suggest new farm practices for inclusion in the adoption scale. Another approach would entail interviews with a small sub-sample of farmers to determine which practices might be included in the adoption scale in the larger study.

Second, in some future research studies there may be a reason for securing the time at which each practice in the adoption scale was adopted. As has been pointed out, the adoption scale used by Lionberger (60) was of this type. If this type of adoption scale is used, the researcher will wish to include practices that have been completely or almost completely adopted, rather than practices that have been only partially adopted. One of the shortcomings of the adoption scale that allows more points for an earlier time of adoption is the dependence upon the farmer's ability to recall the time at which he adopted various practices.

Third, practices in a variety of farm enterprises should be included in the adoption scale. For example, only adoption of practices in two main farm enterprises (swine and crops) were included in the present study. By use of one of the several alternative means mentioned in this dissertation for correcting for "don't apply" responses, one serious shortcoming of past adoption scales can be overcome. That shortcoming was the tendency for the researcher to include only practices dealing with a few farm enterprises because they
were the only enterprises that were found on almost all farms. Poultry, dairy, sheep, beef, gardening, farm machinery, and farm management practices might be included by using one of the methods to correct for the farmers who have no poultry, dairy, or other specific farm enterprise. By including practices dealing with a wider range of farm enterprises, more possible farm practices could be included in the scale and the adoption scale would probably tend to be less biased against the farmer who does not specialize in a major enterprise.

Perhaps the change orientation index is in need of more improvement than any of the other six indexes used in the present study. The concept of change orientation is defined as the degree to which an individual possesses a favorable attitude toward technological changes.

One of the problems involved in certain past research attempts to measure this concept of change orientation is to construct a measure of change orientation that does not overlap with actual adoption of technological changes. For instance, Fliegel (33) constructed an attitude index composed of favorable versus unfavorable attitudes toward a number of new farm practices. The same practices were included in both the attitude index and the adoption scale. An individual might be expected to exhibit a more favorable attitude toward a practice that he had already adopted.

The three items included in the change orientation index
used in the present study were more general in nature. Rather than measuring favorableness of attitudes toward specific farm practices, the attempt was to measure a more general orientation toward technological change. The major weakness of the present change orientation index was that it contained only three items.

In an attempt to improve the change orientation index, the author has recently pretested a revised index with additional items added. Some of the typical items added were:

1. A sound farmer will make decisions on the basis of habits and tradition rather than try out new ways to do things.
2. There is something about using new ideas and new things that just makes me feel good.
3. I am very interested in new discoveries and changes in farming.
4. Many of the new farming ideas that come out these days are not practical for the average farmer.

The communication competence index that was used in the present index was composed of 13 items. It was necessary to assume that use or amount of contact with each of certain competent communication devices reflected the credibility that an individual placed in those communication devices. There are other means by which the concept of communication competence might be measured.

One method might be by means of a knowledge index. There
is some reason to think that an individual with a high degree of communication competence should possess a high degree of knowledge about new farm practices. The author has attempted to construct such an index with typical items such as:

1. The purpose of feeding stibestrol to beef cattle is to increase their appetites so they will eat more feed.

2. It is advisable to use birdsfoot trefoil in a two-year pasture mixture.

3. Most of the weeds in the mustard family can be controlled by 2,4-D spray.

The status achievement index used in the present study was composed of six items and yielded a coefficient of reliability of .679. Perhaps one of the better methods that might be suggested as a means to secure additional items is to first determine more specifically what factors give a farm operator relatively higher prestige. Then these prestige factors might be included in future status achievement indexes.

Another approach to the problem of measuring the concept of status achievement might be to utilize key informants in a community to rank all of the community members as to prestige. This method of securing prestige rankings has been used by Duncan and Artis (27) and Kaufman (48). No studies relating these prestige rankings to adoption of farm practices were disclosed in a review of the literature.
The index of extra-locality orientation used in the present study was composed of eight items and yielded a coefficient of reliability of .39. The author has recently pretested a revised version of the extra-locality orientation index with some of the typical items as follows:

1. A person should not have all of his social life centered right here in this community.
2. The person who doesn't get out to the big city once in awhile hasn't really lived.
3. I have often thought about leaving this town for a more progressive community.

All of the items in the revised index are attitude type items. Some of the items in the index used in the present study were of this nature but some were also of a behavioral nature (such as actual participation in formal groups outside of the community). There may be some advantage to either having completely attitudinal or completely behavioral items in the scale.

The family integration index used in the present study contained 12 items and yielded a reliability coefficient of .184. A number of additional items might be suggested for possible inclusion in future administrations of the index. These items should flow consistently from the definition of the concept of family integration. The concept is defined as the degree to which an individual is oriented toward optimizing rewards and satisfactions for other family members. Some
additional items might be suggested on the basis of this definition:

1. How willingly do the members of your family sacrifice their individual desires to help achieve each other's goals?
2. Do the members of your family co-operate with each other in trying to get things you each want?
3. Do the members of your family discuss each other's activities and interests?

Five items in the family integration index used in the present study were found to have very low relationships with the total index scores and on this basis there might be some reason to question their inclusion in future uses of the index. These five items were:

1. Importance of education for children (as rated by husband).
2. Importance of setting children up in farming (as rated by husband).
3. Importance of a satisfactory family life (as rated by husband).
4. Importance of education for children (as rated by wife).
5. Importance of setting children up in farming (as rated by wife).

In the present study the items listed above that exhibited low correlations with the total index scores were all atti-
tudinal type items. The six behavioral type items were all correlated more highly than were the attitudinal type items.

The index of kinship orientation utilized in the present study was composed of seven items and yielded a coefficient of reliability of .495. All of the seven items correlated fairly highly with the total index scores, which suggests that the index has a relatively high degree of internal consistency in the present study.

Contact and communication with kinfolk as measured by the index of kinship orientation were taken as an operational measure of the concept of kinship cohesion. This concept is defined as the degree to which an individual accepts the role prescribed for him by the kinship reference group. Other measures than just the index of kinship orientation might be used to measure this concept of kinship cohesion.

For example, data might be gathered from respondents as to the degree to which they feel they are fulfilling the role prescribed for them by their kinfolk with regard to the adoption of farm practices.

An inter-disciplinary approach

A certain amount of the variation in the adoption of farm practices scale was explained by the effect of six conceptual variables in the present study. If a long range goal of research in the area of technological change is to explain as large a percent of the variation in the adoption scale
as possible, there may be good reason to employ an inter-
disciplinary approach to the problem.

Sociologists should certainly be included in this inter-
disciplinary study of technological change. Their background
of findings regarding group influences on behavior would
probably prove valuable.

Economists as well as sociologists have been concerned
with the study of decision making and could contribute a
decision making approach to adoption behavior. In addition,
economists have several operational measures of such concepts
as risk preference, efficiency and utility. Psychologists
and educators could perhaps bring a problem solving framework
and learning theory to the inter-disciplinary study. Social
psychologists could contribute such personality concepts (and
measures of these concepts) as dogmatism, rigidity and secu-
rity.

Certainly one aspect of adoption behavior is the commu-
nication of information about new technological practices.
Perhaps journalists could contribute communication theory to
the inter-disciplinary approach.

As one of the purposes of future studies of technological
change may be to generalize the findings from a sample to a
larger population of individuals, there may be reason to
include statisticians in the inter-disciplinary approach.
One of the stated shortcomings of the present study was the
strength of the assumption that the 148 respondents were a
random sample from a larger population. Future studies might include a sample of farm operators from a number of communities or a sampling scheme consisting of many small area clusters selected on a random basis.

Summary

The relationships among six conceptual variables and the dependent conceptual variable, technological change, were analyzed by means of the statistical method of multiple regression. Data were secured from 148 farm operators in a Central Iowa rural community and indexes to measure each of the six independent and the dependent variables were constructed.

One of the purposes of this dissertation was to determine the extent to which technological change might be predicted from the six independent variables. Almost 17 percent of the variation in the adoption of farm practices scale, measuring the concept of technological change, was explained by the variation in the six independent variables.

Another purpose of the present study was to determine which conceptual variables are the best predictors of technological change. Relationships significantly different from zero were found between technological change and the concepts of change orientation, communication competence, and status achievement. Relationships not significantly different from zero were found between technological change and the concepts
of locality group cohesion, family integration, and kinship group cohesion.

When the effect of the other five independent variables were controlled by partial correlation techniques, relationships significantly different from zero were found between technological change and the concepts of change orientation, communication competence, and status achievement. Relationships not significantly different from zero existed between technological change and locality group cohesion, family integration, and kinship group cohesion.

The prediction equation was computed from which the degree technological change for an individual might best be predicted from his scores on the six independent conceptual variables.

Other sociological concepts and improved operational measures of sociological concepts which might be employed in future research endeavors to predict technological change were suggested. An inter-disciplinary approach to the study of technological change was proposed that would include economics, psychology, education, and journalism in addition to sociology.
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Lastly, a grateful tribute is paid to those many research workers whose past findings greatly aided the author in the development of the present study.
APPENDIX A. INTERVIEW SCHEDULE FOR FARM OPERATOR
1. Interviewee ________________
2. Name of Spouse ________________

3. How many acres do you farm (Continue schedule only if he is farming 21 or more acres)

   How many acres do you

   4. own ________
   5. rent ________

       _____crop land or rotation pasture
       _______ acres in corn
       _______ permanent pasture
       _______ rent out or put out on shares
       _______ remainder
       _______ remainder

   6. (If rent portion of land) what is your rental arrangement:

       cash _____ livestock share _____ crop share _____

   7. Who is your landlord __________________________

   Name Location

   8. Are you or your wife related to the landlord? Yes No

   9. What do you consider to be your main crop or livestock product marketed last year?

       Product % Total farm income (get at least 75% of total income)

       Main product

       2nd product

       3rd product

   10. Do you work off the farm for pay? Yes No

       (If Yes)

   11. Type of work

   12. Where

   13. Number of days per year

       ____________________________

       ____________________________
14. How many years have you farmed on your own?______

15. How many years have you farmed in the Collins community?______

16. Have you farmed continuously (except for service) since you completed formal schooling? Yes____ No____

17. How much of your life up to age 16 did you spend on the farm?
   ( ) All
   ( ) Part
   ( ) None

18. What was the last grade of formal schooling that you completed?
   1-7____ , 8____ , 9-11____ , 12____ , 13-15____ , 16____ , 17____

19. (If went to high school) Did you take agricultural courses in high school?
   Yes____ No____ (If yes) How many years?______

20. Were you a member of Future Farmers of America? Yes____ No____

21. Were you a member of 4-H clubs? Yes____ No____ (If yes) No. of years____

22. Have you attended young farmers or adult farmer evening classes?
   Yes____ No____ (If yes) Number of years____

23. Have you been in Veterans on-Farm Training? Yes____ No____
   (If Yes) Number of years____

24. (If attended college) What was your major?____________________

25. What is your age?________

26. What newspapers do you take?

   Daily                                     Weekly
   ( ) Des Moines Register                ( ) Collins Gazette
   ( ) Des Moines Tribune                  ( ) Maxwell
   ( ) Nevada Journal                      ( ) Cambridge
   ( ) Marshalltown, Republican            ( ) others, specify
   ( ) others, specify                      Sunday
   ( ) Register & Tribune                  ( ) other, specify
27. What farm papers and farm magazines do you take? (open end)

( ) Better Farming
( ) Cappers Farmer
( ) Farm Bureau Spokesman
( ) Successful Farming
( ) Farm Journal
( ) Hoard's Dairyman

( ) Poultry, Tribune
( ) Wallace's Farmer
( ) Other, specify

28. Do you take Farm Science from Iowa State College?
Yes____ No______

29. Do you have a radio? Yes____ No______

30. (If Yes) Do you listen to any radio programs giving farm information?
Yes____ No______

(If Yes) From what station? (open end)

<table>
<thead>
<tr>
<th>Station</th>
<th>Program</th>
<th>Frequency of Listening</th>
</tr>
</thead>
<tbody>
<tr>
<td>( ) WOI</td>
<td>( ) Down to Earth, Williams, 6 a.m.</td>
<td>( ) ( ) ( )</td>
</tr>
<tr>
<td></td>
<td>( ) Farm Facts, McGinnis, noon</td>
<td>( ) ( ) ( )</td>
</tr>
<tr>
<td></td>
<td>( ) Market News, spotted thru day</td>
<td>( ) ( ) ( )</td>
</tr>
<tr>
<td></td>
<td>( ) Other, specify</td>
<td>( ) ( ) ( )</td>
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<tr>
<td>( ) WHO</td>
<td>( ) Planbeck, noon show</td>
<td>( ) ( ) ( )</td>
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<tr>
<td></td>
<td>( ) Other, specify</td>
<td>( ) ( ) ( )</td>
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</tbody>
</table>

31. Station | 32. Program                                | 33. Almost Always | Usually | Seldom |
<table>
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<tbody>
<tr>
<td>( ) WOI</td>
<td>( ) Down to Earth, Williams, 6 a.m.</td>
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<td></td>
<td>( ) Farm Facts, McGinnis, noon</td>
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<tr>
<td></td>
<td>( ) Market News, spotted thru day</td>
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<tr>
<td></td>
<td>( ) Other, specify</td>
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<tr>
<td>( ) WHO</td>
<td>( ) Planbeck, noon show</td>
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<td></td>
<td>( ) Other, specify</td>
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</tbody>
</table>

34. Do you have a television set? Yes____ No____

35. (If Yes) Do you listen to any television programs giving farm information?
Yes____ No____
36. (If Yes) What station? (Open end)

<table>
<thead>
<tr>
<th>Station</th>
<th>37. Program</th>
<th>38. Almost Always</th>
<th>Usually</th>
<th>Seldom</th>
</tr>
</thead>
<tbody>
<tr>
<td>( ) WOI</td>
<td>Service Wagon (noon)</td>
<td>( )</td>
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<td>( )</td>
</tr>
<tr>
<td>( ) Farm Facts (evening)</td>
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<td>( )</td>
<td></td>
</tr>
<tr>
<td>( ) Down to Earth (evening)</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td></td>
</tr>
<tr>
<td>( ) other, specify</td>
<td>( )</td>
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<tr>
<td>( ) WHO</td>
<td>RFD (noon)</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>( ) other, specify</td>
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</tr>
</tbody>
</table>

39. Can you give me the names of the three or four people you most frequently talk over farming and farming problems with?

<table>
<thead>
<tr>
<th>Name</th>
<th>40. Location</th>
<th>41. Relative, neighbors, prof.</th>
</tr>
</thead>
<tbody>
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</table>

42. Where do you most frequently talk to these people about farming and farming problems?

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</table>

43. Have your neighbors or friends or other people visited your farm during the past year to observe some particular phase of your farm operations? Yes____ No____

44. (If yes) What phase of your farm operations 45. Who?

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</table>

46. Managing a farm is a pretty complex operation. What do you think is the greatest problem in managing a farm? (Open end)

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</thead>
</table>
You have just mentioned what you think is a major problem to you. Here is a list of things that are problems to some people. Would you please rate the 3 most important problems on this list that you feel you have in relation to your farm and farming. (Hand respondent care with problem list on it and check problem below. Get 3, if wants to rank 1 or 2 more o.k.)

Rating

( ) 1. Livestock and poultry diseases such as coccidiosis, erysipelas, cholera.
( ) 2. Insect damage to crops such as corn borers and root worms.
( ) 3. Construction and maintenance of farm and home buildings.
( ) 4. Buying and maintenance of farm equipment.
( ) 5. Crop Rotations
( ) 6. Crop production such as soil fertility, fertilizers, limeing, varieties of crops, rate of planting rates of application, etc.
( ) 7. Soil conservation such as contouring, terracing and waterways.
( ) 8. Swine production such as type of hogs, management practices, feeds, etc.
( ) 9. Marketing and prices of farm products such as outlooks, markets.
( ) 10. Understanding government agencies and farm programs
( ) 11. Sources and use of credit
( ) 12. Overall farm management--making decisions regarding where you will get the most returns for dollar invested, what crops to grow, what livestock to have, etc.
( ) 13. Tax problems.
( ) 14. School problems
( ) 15. Community services such as health, recreation, markets, stores
( ) 16. Family problems such as parent child relations, husband and wife relations
( ) 17. Farm leasing agreements
( ) 18. Transferring the farm business to the family or relatives.
On the back of the card are three problem areas that are important problems to many farm families in this area... (comment on his agreement or not agreeing with them)... We would like to ask you your ideas on these problem areas.

<table>
<thead>
<tr>
<th>A. RATE</th>
<th>B. WHAT</th>
<th>C. KNOWS</th>
<th>D. INFORMATION</th>
<th>E. ORGANIZE COMMUNITY</th>
<th>F. ORGANIZE NEIGHBOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>49. 2. Swine product.</td>
<td></td>
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<tr>
<td>50. 3. Farm manage.</td>
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</tbody>
</table>

A. RATE  If the above have not been rated on previous page, get rating of importance on problem and place in rate column

B. WHAT  As you see it, what is the best source of information on this problem..... (ask this for each problem area and record in WHAT column)

C. KNOWS  Of those people you know about, who do you think knows the most about ..... (ask this for each problem area and record name and location in KNOWS Column)

D. INFORMATION  Of those people you know about, who would you probably go to for information on..... (Ask for each problem area and record name and location in INFORMATION Column)

We have been talking mainly about what are the best sources for information about this problem. I'd like to ask a couple questions now about organizing people to work on this problem.

E. COMMUNITY ORGANIZER  If the people of the Collins community wanted to set up some sort of a program to work on.... (specify problem above).... who do you think would be the best person in the community to take the lead in organizing it. (record in COMMUNITY column)

F. NEIGHBORHOOD ORGANIZER  If the people of Collins community decided to set up some sort of a program to work on.... (specify problem above).... who in your neighborhood--the 5 to 10 persons that live close to your home-- would you think would be best to help organize it. (record in NEIGHBORHOOD column)
51. Are there any of these problem areas you would be willing to help with organizing? Yes_____ No_______

52. (If Yes) Which ones? Crop Product_____ Swine_____ Farm Management_______

53. Do you think the Extension Service might provide you with any information or help on any of the problems we have been talking about? Yes_____ No_______

54. (If Yes) Which ones? Crop Production_____ Swine_____ Farm Manage_______

55. (If Yes) How would you like to get this help or information from the Extension Service

<table>
<thead>
<tr>
<th>A: Crop Product</th>
<th>B: Swine</th>
<th>C: Farm Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A county wide meeting</td>
<td></td>
<td></td>
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<tr>
<td>2. A Collins community meeting</td>
<td></td>
<td></td>
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<tr>
<td>3. A county-wide farm tour</td>
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<td></td>
</tr>
<tr>
<td>4. A local Collins Community tour</td>
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<tr>
<td>5. A local farm tour in the Collins Community from</td>
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<td></td>
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<tr>
<td>6. A Personal visit on your farm/your County Agent</td>
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<tr>
<td>7. A personal visit with the County Agent or Extension worker at his office or at the college</td>
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<tr>
<td>8. Pamphlets, bulletin or the reading material sent to you</td>
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<tr>
<td>9. Television programs on it</td>
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<td></td>
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<tr>
<td>10. Radio programs on it</td>
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<tr>
<td>11. Other, specify</td>
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</tbody>
</table>

56. Is there some farmer or farmers in the community that usually try new farming ideas, or practices long before everyone else?

<table>
<thead>
<tr>
<th>Name</th>
<th>Specific Example</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>
57. What do you think of them? (Probe)

58. Are there any of your neighbors - 5 to 10 farmers who live close to you who usually try new farming ideas and practices before the rest of you do? Yes _____ No _____

Name ________________ Specific example ________________

59. How important do you think it really is to a farmer's income that he keeps up on and adopts the latest recommended farm practices such as new varieties of seed, proper use of fertilizer, new equipment, new feeds, and new ways of doing things, etc.?

Not too important _____, Important______, very important______,
an absolute necessity______.

60. Comment ________________________________

61. How important do you think it is in adding to a farmer's prestige---the way other farmers regard him--that he keeps up on and adopts the latest recommended farm practices.

Not too important _____, important______, very important______,
an absolute necessity if he is to be highly regarded______.

62. Comment ________________________________

63. How would you classify yourself in relation to keeping up with new ideas and practices?

( ) I try anything new that comes along.

( ) If I see or hear of a new idea and know a little about it, I try it.

( ) I like to read up and pretty thoroughly understand an idea, then I try it.

( ) I like to talk over a new idea with some other persons or several people before I try it.

( ) I like to actually see if the idea works (test plot, field day, demonstration, neighbors, etc.) before I try it.

( ) I just don't like to try new ideas.

64. Thinking of your major enterprise.......how do you rate yourself on keeping up on and using new farming ideas and practices?

Quite a bit above average, _____ above average______,
about average______, a little below average______.
(Ask questions under each of three major headings until get Yes answer).

(If get No answers to all questions under any major heading ask)
Have you ever tried.....(each question until yes answer).

(If yes answer above)

We all know that most farmers adopt a lot of new practices. Some practices are good for some people but not for others. We also know that in most cases you don't adopt a new idea the minute you hear about it—you want to know a lot about it before you decide. We might say you go through a series of steps in adoption—we would like to ask you some questions about where you get information as you go through these steps.

**AWARENESS**
Where or from whom did you first see or hear about.....(reading, in practice or idea—enter in awareness column).

**INFORMATION**
After you first hear about.....where or from whom did you first get additional more detailed about.....(enter in Information column).

**APPLICATION**
After you had enough information to know quite a lot about.....where or from whom did you get the information that helped you decide whether or not to actually try it on YOUR OWN farm?

**TRIAL**
After you decided to try out.....on your own farm, where or from whom did you get the most information or help on: how much to use...how to apply...how to use...where to get it...the kind to use on your own farm.

**ADOPTION**
After you once tried.....on your own farm, how did you decide whether or not to continue using it—actually adopt it?

**TIME**
When would you say you first heard about.....(enter in Awareness column).
When did you first try it out on your own farm? (enter in Trial column)
When did you adopt the idea—decide to use it as much as possible on the farm? (enter in adopt column)
<table>
<thead>
<tr>
<th>IMPROVED PRACTICE</th>
<th>A.Awareness</th>
<th>B.Information</th>
<th>C.Application</th>
<th>D.Trial</th>
<th>E.Adoption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you use ladina clover in your hog pasture mixture</td>
<td></td>
<td></td>
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<tr>
<td>Have you increased your rate of planting corn as you have increased your fertilizer</td>
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<tr>
<td>Do you use supplementary nitrogen on second year corn</td>
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<tr>
<td>Do you use certified seed oats, legumes or grasses</td>
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<tr>
<td>NEW PRACTICE, NO NEW EQUIPMENT</td>
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<tr>
<td>Do you feed antibiotics such as procaine, penicillin, aureomycin and terramycin to your hogs</td>
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<tr>
<td>Do you vaccinate for Erysiplas in hogs</td>
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<tr>
<td>NEW PRACTICE</td>
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<tr>
<td>NEW EQUIPMENT</td>
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<tr>
<td>Do you use 2,4-D for weed control (more than just lawn)</td>
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<tr>
<td>Do you use some chemical treatment for rootworm in corn</td>
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<tr>
<td>Do you use a starter fertilizer</td>
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<tr>
<td>Do you use a corn stock shredder as a part of corn borer control</td>
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</table>
Now we would like to ask you a few questions about the practices you now use.

Swine Production

75. How many hogs per year do you market?_______
   If farmer raises less than 20 hogs
   per year check here_______
   and go to Soil and Crop Production
   |
   Yes | No | Don't
   __|___|____

76. How long before you plan to breed
    your sows do you have your boar
    on the farm?
    (Check yes if 2 weeks or more)

77. Do you get your boar from an accredited
    disease free herd?

78. Do you clean and scrub farrowing quarters
    with boiling Lye water

79. Do you wash your sows before farrowing?

80. Do you litter mark your little pigs?

81. Do you do anything to prevent little
    pig anemia? Yes____ No_______
    (If Yes, what?)
    (Check yes if clean sod, copperous
     compounds or iron pills)

82. What age do you wean?_______
    (Check yes if 1-5 weeks.)

83. At what age do you castrate your pigs?
    (Check yes if before 1 month)

84. Do you vaccinate for cholera?

85. Do you use anything to control mange
    and lice? (Check yes if Benzene
    Hexachloride or Lindane)

86. Have you ever examined carasses from
    your marketed hogs to determine the
    quality of pork you are producing?

87. How many pigs did you farrow per litter
    last year?_______

88. How many pigs did you wean per litter
    last year?_______

89. How many pigs did you raise per litter
    (including; sold, butchered and kept
    for breeding stock)?_______
<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Don't Apply</th>
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</thead>
<tbody>
<tr>
<td>90. Have you had a soil test made of your fields during the past 2 years?</td>
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<tr>
<td>91. (If yes) do you apply commercial fertilizer according to soil test recommendations?</td>
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<tr>
<td>92. Did you use fertilizer for the 1955 corn crop?</td>
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<tr>
<td>93. (If yes) Pound per acre on first year corn</td>
<td>xxx</td>
<td>xxx</td>
<td></td>
</tr>
<tr>
<td>Pound per acre on second year corn</td>
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<tr>
<td>95. Do you use starter fertilizer on your corn?</td>
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<tr>
<td>96. Do you apply fertilizer in the fall to ground that is to be planted to corn the next spring?</td>
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<tr>
<td>97. Do you fall plow your ground (with less than 4% slope) which is to be planted in corn the next spring?</td>
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<tr>
<td>98. Do you plant the same number of plants per acre on first and second year corn?</td>
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<tr>
<td>99. Do you investigate the yield performance of seed corn before you buy it?</td>
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<tr>
<td>100. Do you fertilize crops other than corn? Yes__No__</td>
<td>xxx</td>
<td>xxx</td>
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<tr>
<td>(If yes) what crops</td>
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<td>101. Did you use certified legume and grass seed in 1954-55?</td>
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<tr>
<td>102. Do you inoculate the legume seed that you plant?</td>
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</tbody>
</table>
103. Do you use any insecticide to control soil insects including corn root worms?  
Yes No  
(If Yes) What?  
Check yes if used aldrin, chlordane, dieldrin, Benzin hexachloride) (If used some other write in )  

104. Do you have crop land with over four percent slope? Yes No  
(4 ft. of fall per 100 ft.)  
Do you plant it on the contour?  

105. When you sow oats do you plant legume with it.  

106. Do you plant legumes or grasses to be plowed under for green manure?  
Yes No  
(If yes) Do you plant ladino clover as a part of your green manure seeding?  

107. Do you spray or dust for corn borer?  
(If Yes) What method do you use to check when to spray or dust for corn borer. (If check tallest most vigorous corn for leaf feeding as soon as find out corn borer moths are flying, by radio, T.V. etc. Check Yes)  

108. (If Yes) When will you dust or spray? (Check yes if spray as soon as 75% of plant show leaf feeding)
<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Don't Apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many dairy cows do you have?</td>
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<td>(If less than 11 go to next section)</td>
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<tr>
<td>109. Do you keep accurate production and breeding records on each cow?</td>
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<tr>
<td>110. Do you have your cows tested for Tuberculosis and Bangs disease?</td>
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<tr>
<td>111. Do you quarantine purchased stock for 30 days?</td>
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<tr>
<td>112. Do you feed a concentrate mixture (Calculated to balance roughage) in accordance with the milk production of each cow?</td>
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<tr>
<td>113. Are you using grass or legume silage as a part of your feeding program?</td>
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<tr>
<td>114. Are you using a &quot;whole milk replacement&quot; feeding program for raising dairy calves?</td>
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<td>115. Do you massage and wash the udder before milking?</td>
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<td>116. Do you use a milking machine? Yes____No_______</td>
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<tr>
<td>117. (If Yes) Do you remove the teat cups from the cow as soon as the udder is empty? xxx</td>
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</tbody>
</table>
118. Have you heard of the county Extension program?
   Yes____No____ (If no skip to question 120.)
   (If yes ask this question)

119. Do you know the names of any people that work for the Extension Service?
   Yes____No____ (If yes) Who?
   ( ) Gauger (C. J. Carlyle)
   ( ) Christy (Jim)
   ( ) Zeiner (Jacky)
   other (specify)____________________

120. (If No) Have you heard of the work done by C. J. Gauger, the County
   Agent, or Jacky Zeiner, the County Home Economist, or Jim Christy, the
   County Youth Assistant who works with 4-H clubs?
   Yes____No____
   Comments ____________________________________________________________

Where is your nearest Extension office located? Knows____Don't Know____

121. (If Yes to any above) From your knowledge of this kind of work, (County
   Extension program) what would you say they are trying to accomplish?

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

122. As you understand it, what kind of information and assistance are
   available from the Extension Service?

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

123. How much help would you say the Extension Service or the County Agent
   has been to you on farming matters?
   ( ) no help
   ( ) a little help
   ( ) quite a bit of help
   ( ) much help
   ( ) very much help
During the past year: (Write in number of times in column headed "contact")

<table>
<thead>
<tr>
<th>DURING THE PAST YEAR</th>
<th>Contact</th>
<th>Idea 1</th>
<th>Idea 2</th>
<th>Idea 3</th>
<th>Idea 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>124. Have you visited the County Agent's office?</td>
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<tr>
<td>125. Has the County Agent visited your farm?</td>
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<tr>
<td>126. Have you talked about farming matters by telephone with the County Agent?</td>
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<tr>
<td>127. Have you read a circular letter sent out by the County Agent?</td>
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<td>128. Have you read a newspaper article written by the County Agent?</td>
<td>( )</td>
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<td>129. Have you requested any form of written information such as a circular or bulletin from the County Agent?</td>
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<td>130. Have you seen a TV program on which the County Agent or Extension Workers talked about farming matters?</td>
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<tr>
<td>131. Have you heard a radio program on which the County Agent or other Extension workers talked about farming matters?</td>
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<td>132. Has your farm ever been used for a demonstration or farm tour by the County Agent?</td>
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<td>133. Have you attended demonstrations or farm tours in which the County Agent took part?</td>
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</table>

- Swine tour
- Dairy tour
- Beef Producers' tour
- Pasture tour
- Carcass display at Fort Dodge
134. Have you attended any country-wide farm meetings where the County Agent was present and discussed farming matters?

- Pasture Improvement Clinic
- Corn Borer meeting
- Weed control meeting
- Public affairs series of meetings

<table>
<thead>
<tr>
<th>Contact</th>
<th>Idea 1</th>
<th>Idea 2</th>
<th>Idea 3</th>
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</table>

135. How about local meetings here in Collins where the following were discussed by the County Agent?

- Outlook information
- Fertilizer
- Cattle Feeders meetings
  (Wilder Grain)

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<thead>
<tr>
<th>Contact</th>
<th>Idea 1</th>
<th>Idea 2</th>
<th>Idea 3</th>
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136. Have you attended any of the field days held at Iowa State College?

- Swine Producers Day
- Cattle Feeders Day
- Cow Conference
- Agronomy Field Day
- Ag Engineering Field Day

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<thead>
<tr>
<th>Contact</th>
<th>Idea 1</th>
<th>Idea 2</th>
<th>Idea 3</th>
</tr>
</thead>
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</table>

137. Do you ever go directly to the college to get information or to talk to someone about farming matters? 

(Specify)

<table>
<thead>
<tr>
<th>Contact</th>
<th>Idea 1</th>
<th>Idea 2</th>
<th>Idea 3</th>
</tr>
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</table>

138. During the past year have you gotten any ideas from the County Agent or the Extension program work that you have used? Yes____ No____ Don't Know____

139. (If Yes) What would you say are the two or three most important?

1. 
2. 
3. 

140. How can you tell me where you got those ideas— which of the above contacts with the County Agent gave you the idea? (Check columns Idea 1, Idea 2, Idea 3 above)

Comments

________________________________________

________________________________________
141. As you understand it, what is the relation between the Farm Bureau and the Extension Service? (open end)

( ) Completely separate
( ) Separating them
( ) They used to be together
( ) They are related
( ) They are about the same or the same

Significant statements

Now we would like to ask you several questions about the Collins Community.

142. How would you describe the feeling of most of the people toward the Collins community?

1. ( ) People are rather indifferent, expressing only slight interest in the affairs of the community.
2. ( ) People are only mildly interested, but not enthusiastic about the community.
3. ( ) People are fairly interested, get behind most community activities.
4. ( ) People seem real interested, they actively support programs which concern the community.

143. How would you describe the way the organizations operate in the Collins community?

( ) There seems to be conflict between the organizations.
( ) Most organizations seem to work independently of the other organizations.
( ) The organizations often work together and cooperate.
( ) The organizations almost always work together and cooperate.

144. To what extent do you feel a part of the Collins community?

Very much___, quite a bit___, not very much___, very little or not at all___.
145. Which of the following statements best describes how you think the community feels about you and your organizational activities (church, clubs, farm organizations) in the community.

( ) They don't know me well enough to consider what I should do.

( ) They know me but I don't think they have any particular feeling about what I should do.

( ) They expect me to be a member in several organizations.

( ) They expect me to be a leader in community activities.

( ) It is none of their business what I do.

146. If all the people in the community were ranked according to how much regards the rest of the community has for them, where do you think you would be ranked—the lower third, the middle third, or the upper third?

147. Would you be in the upper half or lower half of that third?

148. Who are the people you most frequently associate with?

<table>
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<tr>
<th>Name</th>
<th>Location</th>
<th>Relation</th>
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In terms of what you want out of life how important would you say the following things are to you?

<table>
<thead>
<tr>
<th></th>
<th>Very Important</th>
<th>Quite Important</th>
<th>Important</th>
<th>Not Very Important</th>
<th>Unimportant</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>( ) Having money to buy all the machinery you want</td>
<td></td>
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<td>2.</td>
<td>( ) Owning a farm debt free</td>
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<td>3.</td>
<td>( ) Being able to take vacations and trips with the family</td>
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<tr>
<td>4.</td>
<td>( ) Security in old age—enough money to retire on at 65 or so</td>
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<td>5.</td>
<td>( ) College education for the children</td>
<td></td>
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<tr>
<td>6.</td>
<td>( ) Having a comfortable house that the family will enjoy and be proud of</td>
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<td>7.</td>
<td>( ) Being free of debt</td>
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<td>8.</td>
<td>( ) Being respected by neighbors and other community members</td>
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<tr>
<td>9.</td>
<td>( ) Having enough land and other resources to set the children up in farming.</td>
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<td>10.</td>
<td>( ) Having influence in community affairs</td>
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<td>11.</td>
<td>( ) Having good health</td>
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<td>12.</td>
<td>( ) Having a good insurance and investment program to protect the family if anything should happen to you</td>
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<tr>
<td>13.</td>
<td>( ) Having a satisfactory family life—a happy family that gets along together</td>
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<td>14.</td>
<td>( ) Are there other things that are important to you in life</td>
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<td>15.</td>
<td>( ) Specify</td>
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</table>

Out of this list which 2 or 3 of these are most important to you?

(Place rating to left of numbers)
150. Have you ever talked these things over with your wife?

Yes____No____D. A._____

151. (If Yes) How frequently would you say you have talked these things over?

( ) less than once a year
( ) once a year
( ) several times a year
( ) once a month
( ) every week or so
( ) almost every day

Some of the past research has shown that there is a relation between the net worth of farmers and the kind of practices they adopt.

152. We’d like to get an estimate of your net worth.

a. Could you please give me your best estimates of the sole value of your assets at the beginning of the year? We want estimates of the actual values you think they would bring on the market. (If renter, just his part, not landlord’s)

Value of your land and buildings

Value of your livestock

Value of your machinery and equipment

Value of your feed and crops

Cash on hand

Value of your stocks, bonds and other investments or savings.

Amount of money owed to you

Value of household furnishing and goods

Value of your other assets

(TOTAL) (don’t compute)

153. b. Now, how about your financial obligations at the beginning of the year? What was the amount of:

Your real estate debt

Your short-term notes
<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
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<tbody>
<tr>
<td>Your other notes</td>
<td></td>
</tr>
<tr>
<td>Your accounts payable (money you owe)</td>
<td></td>
</tr>
<tr>
<td>Your household installment debts</td>
<td></td>
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<tr>
<td>Your other installment debts not covered in short-term notes</td>
<td></td>
</tr>
<tr>
<td>Your other debts</td>
<td></td>
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<tr>
<td>(TOTAL) (don't compute)</td>
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<tr>
<td><strong>NET WORTH</strong> (don't compute)</td>
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</table>
APPENDIX B. QUESTIONS UTILIZED FROM INTERVIEW SCHEDULE FOR FARM OPERATOR'S WIFE
124. In terms of what you want out of life how important would you say the following things are to you?

<table>
<thead>
<tr>
<th>Very Important</th>
<th>Quite Important</th>
<th>Not Very Important</th>
<th>Un-Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>( ) 1. Having money to buy all the household equipment you want.</td>
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<tr>
<td>( ) 2. Owning a farm debt free</td>
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<tr>
<td>( ) 3. Being able to take vacations and trips with the family</td>
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<tr>
<td>( ) 4. Security in old age—enough money to retire on at 65 or so</td>
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<tr>
<td>( ) 5. College education for the children</td>
<td></td>
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<tr>
<td>( ) 6. Having a comfortable house that the family will enjoy and be proud of</td>
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<tr>
<td>( ) 7. Being free of debt</td>
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<td>( ) 8. Being respected by neighbors, friends and other community members</td>
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<tr>
<td>( ) 9. Having enough land and other resources to set the children up in farming</td>
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<td>( ) 10. Having influence in community affairs</td>
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<tr>
<td>( ) 11. Having a good insurance and investment program to protect you and the family if anything should happen to your husband</td>
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<td>( ) 12. Having good health</td>
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<td>( ) 13. Having a satisfactory family life—a happy family that gets along together</td>
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<tr>
<td>( ) 14. Are there other things that are important to you in life</td>
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<tr>
<td>( ) 15. (Specify)</td>
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</tbody>
</table>

Out of this list which 2 or 3 of these do you think is most important

(Place rating to left of numbers)
125. Have you ever talked these things over with your husband?
   Yes ___ No ___ D.A. ___

126. (If Yes) How frequently would you say you have talked these things over?
   ( ) less than once a year
   ( ) once a year
   ( ) several times a year
   ( ) once a month
   ( ) every week or so
   ( ) almost every day

Now we would like to know if you or your family belong to any formal organizations—that is organizations that have a set of officers, regular meetings and activities, etc.—such as church, farm organizations, lodges, social groups, etc.

127. Organization Participation Head Wife Other over 18 specify

<table>
<thead>
<tr>
<th>Organization</th>
<th>Participation</th>
<th>Head</th>
<th>Wife</th>
<th>1</th>
<th>2</th>
<th>3</th>
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</thead>
<tbody>
<tr>
<td>Church: regular Sunday</td>
<td>service</td>
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<td>Member</td>
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<td>Attend less 1/2</td>
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<td>Church: Sunday school</td>
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<td>Church: Women's</td>
<td>Organization</td>
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<td>Church: Men's</td>
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<td>Church: other</td>
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<td><strong>130. Lodges: Such as Masons, Eastern Star, Rebekahs, Odd Fellows</strong></td>
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<td>131. School oriented:</td>
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<td>such as Band Mothers, PTA, etc.</td>
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<td>Civic: Lions, Fireman, etc.</td>
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133. Sports and recreational:
such as Saddle Club, 
Square Dance Club, 
Isaac Walton, Nevada 
Country Club

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<th>Organization</th>
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<th>Head</th>
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134. Misc. and all other political

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(If any of these organizations or their main meetings are outside of Collins community, note the location in organization column).

135. Do you or your husband (or others over 18 reported on) hold any other offices such as on School Board____, Soil Conservation Service____, ACP____, Town Council____, Township Trustee____, 4-H Leader____, FHA, FFA, 4-H Advisors____, other county or state offices____.

Other____.

(Write in H (husband) or W (wife) or 1, 2, 3 to represent others.)
Now we are interested in knowing what public events you or members of your family might have taken part in or attended: (ask number of times during year where appropriate).

How many times during the past year have you attended or participated in the following in the Collins community?

<table>
<thead>
<tr>
<th>136. Sporting Contests</th>
<th>Husb.</th>
<th>Wife</th>
<th>Others over 18</th>
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<tbody>
<tr>
<td>Basketball</td>
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<td>Baseball</td>
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<td>Football</td>
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<td>Wrestling</td>
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<td>Rodeo</td>
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<td>Horse Show (Saddle Club)</td>
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<td>Other (specify)</td>
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<tr>
<th>137. Church Sponsored Community Affairs</th>
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<tbody>
<tr>
<td>World day of prayer</td>
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<tr>
<td>Good Friday, Monday, &amp;</td>
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<tr>
<td>Thursday service sponsored by the Methodist, Christian and United Brethren</td>
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<tr>
<td>Mother-daughter banquet</td>
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<tr>
<td>sponsored by Methodist Church</td>
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<tr>
<td>Christian church bazaar</td>
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<td>Christmas programs presented by</td>
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<tr>
<td>Sunday schools of Methodists, Christian and United Brethren</td>
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<tr>
<td>Methodist Smorgasboard</td>
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<td>Others (specify)</td>
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### Events connected with the school

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<tr>
<th>Event</th>
<th>Hub, Wife</th>
<th>Others over 18</th>
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<tr>
<td>Commencement</td>
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<td>Baccalaureate</td>
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<td>Band parents breakfast</td>
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<td>Senior class play</td>
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<td>Alumni Banquet</td>
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### Public Activities sponsored by Saddle Club:

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<th>Event</th>
<th>Hub, Wife</th>
<th>Others over 18</th>
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<tr>
<td>Card Party (Feb.)</td>
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<td>Box Supper (March)</td>
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<td>White elephant sale (March)</td>
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<td></td>
</tr>
<tr>
<td>Horse and pony sale</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fun show</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Other community events such as:

<table>
<thead>
<tr>
<th>Event</th>
<th>Hub, Wife</th>
<th>Others over 18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lion Club Amateur Nite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lions Club ice cream social</td>
<td></td>
<td></td>
</tr>
<tr>
<td>at the park</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Legion furniture auction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farm sales or auctions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baby picture contest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farm Bureau women's</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pancake breakfast</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memorial Day services at the cemetery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (specify)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
141. Do you usually attend such events with people in addition to your immediate family? Yes____ No______

(If Yes) Who are the other people you usually attend with?

________________________________________________________________________

________________________________________________________________________

(Circle if relatives)

142. Do you attend similar events such as athletic contests, concerts, stage shows, plays, lectures, fairs, funfines, etc. outside of the Collins community? Yes____ No______

143. (If Yes) Please list them.  

Husb. Wife Others 18 or over

1 2 3

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

144. Do you usually attend such events with people in addition to your immediate family? Yes____ No______

(If Yes) Please list them. (Circle if relatives)

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Now if we may, we would like to talk to you about some of your more informal activities with people other than your immediate family. (Circle if relatives)

How many times since the first of the year have you--

<table>
<thead>
<tr>
<th>Number</th>
<th>With Whom</th>
</tr>
</thead>
<tbody>
<tr>
<td>145.</td>
<td>Eaten meals with friends or neighbors—invited them in or went to their house.</td>
</tr>
<tr>
<td>146.</td>
<td>Been at a party or played cards at friends' or neighbors' homes.</td>
</tr>
<tr>
<td>147.</td>
<td>Visited with friends or neighbors in your home or their home.</td>
</tr>
<tr>
<td>148.</td>
<td>Gone to town or gone shopping with friends or neighbors.</td>
</tr>
<tr>
<td>149.</td>
<td>Gone camping, fishing or hunting with friends or neighbors.</td>
</tr>
<tr>
<td>150.</td>
<td>Exchanged work, tools or equipment.</td>
</tr>
<tr>
<td>151.</td>
<td>Borrowed or lent food, money, etc.</td>
</tr>
<tr>
<td>152.</td>
<td>Other forms of informal activity. (Specify)</td>
</tr>
</tbody>
</table>

How many times in the past year have you--

<table>
<thead>
<tr>
<th>Number</th>
<th>With Whom</th>
</tr>
</thead>
<tbody>
<tr>
<td>149.</td>
<td>Gone camping, fishing or hunting with friends or neighbors.</td>
</tr>
<tr>
<td>150.</td>
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</tr>
<tr>
<td>151.</td>
<td>Borrowed or lent food, money, etc.</td>
</tr>
<tr>
<td>152.</td>
<td>Other forms of informal activity. (Specify)</td>
</tr>
</tbody>
</table>