TOWARD THE VALIDATION OF A FUNCTIONAL MODEL OF THE ADOPTION-REJECTION PROCESS

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WILLIAM JAMES WHITE

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This is to certify that the

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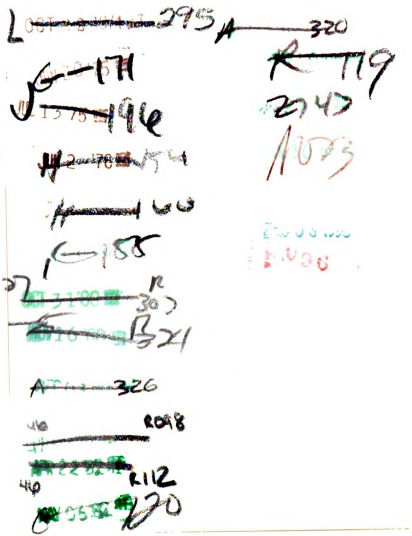
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ABSTRACT

TOWARD THE VALIDATION OF A
FUNCTIONAL MODEL OF THE
ADOPTION-REJECTION PROCESS

by William James White

One purpose of this research study was to validate a functional model of the adoption-rejection process. A second objective was to determine the relationship between a number of social and personal variables and knowledge about four innovations.

The theoretic model which is presented assumes there are three stages or sub-processes within the adoption-rejection process. The three types of activity, which are believed to interact, are related to (1) information accumulation, (2) attitudinal development and (3) choosing among alternatives. For ease of discussion the three stages are called Information, Persuasion and Decision Making. Detailed study of the information stage was undertaken to determine the relationship between knowledge about four farm innovations and a number of social and personal variables.

A sample of cash crop farmers from two counties of Southwestern Ontario was drawn by selecting names at random from lists of active and former sugar beet growers. Personal interviews were completed with 106 farmers during January and February of 1967.

The interview schedule consisted of a series of questions and indices designed to gather information regarding major changes in the farm

business, knowledge about and attitudes toward new crop practices and measures of each farmer's education, age, social status, opinion leadership, the number of mass media available, mass media usage, community participation and sources of information used in gathering information on new farm practices. The innovations selected for study were sugar beet herbicides, corn herbicides, the use of a mechanical thinner on sugar beets and soil sampling. Each farmer was asked a series of questions regarding one of these innovations which he had adopted and one which he had not adopted.

The validity of the three stage model was tested by means of partial correlation, path analysis, Hyman's elaboration analysis and Guttman scalogram analysis. Only partial support of the model was provided by the data. The relationship between knowledge about an innovation and a number of social and personal variables was tested using zero-order and partial correlations and multiple regression procedures. Knowledge was found to be positively related to education and the number of mass media available, negatively related to age, and not related to opinion leadership, social status, mass media usage and participation in formal organizations.

An attempt was made to identify the major factors which are considered in the decision making stage of the adoption-rejection process. Four factors, perception of self-image, costs, the perceived cost/reward ratio and the existence of internal or external restraints were hypothesized. The extence of the first three was supported by the responses of the farmers who had considered making a major change during the previous year.

The implications for action programs and future research of both the three stage model and the findings regarding knowledge about innovations were discussed. The discussion includes the presentation of a system for classifying messages and the integration of this classification system and the functional model of the adoption-rejection process, to produce a communication model of the adoption-rejection process.

TOWARD THE VALIDATION OF A FUNCTIONAL MODEL OF THE ADOPTION-REJECTION PROCESS

By

William James White

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CHAPTER I

INTRODUCTION

The purpose of this investigation is to study the process of change. The major interest and emphasis of the study is not to determine what changes have occurred or why change has or has not taken place, but to investigate the process by which individuals go about deciding to adopt or reject new patterns of behavior. In order to understand, predict and institute change, more knowledge is needed about the process of individual decision-making. Research is required to determine which factors influence, encourage and impede change and how the various factors interact under different circumstances.

In order to study the process by which individuals decide to adopt new patterns of behavior, it is necessary to have a conceptual framework or model of the process. The purpose of a model is to represent a complex process in a manner which makes it easier to understand. The criterion used in judging models is not whether or not they are right or wrong, but how useful they are in achieving a particular goal. There are three types of models: (1) descriptive models, which identify the elements of a process; (2) operational models, which attempt to describe the process in a way which makes measurement operations and predictions possible; and (3) functional models, which attempt to specify certain relationships between elements of the process so that other and new relationships are generated.

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An original functional model of the adoption-rejection process is presented and the validity of the model is tested in relation to the adoption of new farm practices. This model is based on the belief that adoption can be conceived of as three sub- or meta-processes which are related to the way in which an individual becomes informed about a new behavior or action, the way in which persuasion takes place, and the decision-making activities which are involved prior to adoption.

Although the social and economic context within which the adoption and rejection of new types of behavior is to be studied is that of the adoption of technical innovations by farmers, this does not mean the conceptual model is limited to this one type of decision-making situation. It is a basic assumption of the conceptual farmework under study, that the process by which an individual decides to adopt or reject an innovation can be generalized to other common situations involving choice, such as the purchase of alternative products, making investments, or voting for a candidate.

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The author's interest in the development and validation of a model of the adoption-rejection process* is an outgrowth not of a specific interest in the problem of decision-making or adoption per se, but rather of the problem of communicating to produce behavioral change. Traditional adoption models are of limited use in the planning and execution of communication programs. Their originators, mainly rural sociologists, were primarily interested in classifying and describing what happens to an individual from the time he first hears about a new practice until he adopts. Consequently, a descriptive model met their specific needs.

In order to identify the factors and to understand the relationship among these factors which determine adoption, an original functional model has been developed. This model is more complete than previous models because it takes into consideration not only adoption but also rejection. It is also more general, in that it includes considerable research from outside the usual diffusion traditions. The model is simpler in that it consists of fewer stages than traditional models, but at the same time is more detailed, since it presents the major determinants and factors within each stage. The adoption-rejection model attempts to show at which stage of the process various personal abilities, personality characteristics, communication contacts and situational factors influence the outcome of the process.

The specific objectives of this research project are (1) to test the validity of a functional three stage model of the adoption-rejection

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*In this report adoption-rejection process is used, instead of adoption process, to draw attention to the two potential outcomes of the process.

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CHAPTER II

THEORETIC RATIONALE

In order to provide a conceptual farmework which will be useful in developing hypotheses, an original model of the adoption-rejection process will be presented. Then literature relevant to an investigation of the validity of the model will be reviewed. Finally, there will be an explication of the factors within the information process which are believed to be related to information or knowledge levels.

The Adoption-Rejection Process

The adoption-rejection process is the series of steps, over time, through which an individual progresses while deciding whether to adopt or reject an innovation.* This process considers not only adoption, but also the possible rejection of a new practice. There are many points within each stage of the process at which an individual may decide to either temporarily or permanently reject the innovation. It is because of the explicit consideration of potential rejection points that the following model has been called an "adoption-rejection" model, rather than an "adoption" model.

The following model is predicated on the assumption that three different types of cognitive processes are involved in the adoption-rejection process an individual goes through before adopting an

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*In this report the term innovation is used to refer to any change behavior which involves doing something for the first time. Examples include the use of a new farm practice, the purchase of a product for the first time and the acceptance of a new idea or behavior.

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The boundaries between these three types of activity are indistinct and difficult to operationalize. The three types of activity overlap and interact. The interaction may lead to situations where it is very difficult, if not impossible, to say which process preceeds the other. In general, the author believes that the three processes usually proceed in a time sequence of information accumulation, attitudinal change or reinforcement, followed by choosing among alternatives. This general pattern does not preclude the possibility that further information accumulation or seeking may follow attitudinal evaluation, or that evaluation of the innovation in terms of resources does not lead to further information seeking. The belief that the three processes take place in sequence had led to the use of the term "stage". The meaning attached to this word is a very general one and its use will not imply exclusiveness in terms of either time or independence from preceding or antecedent variables. The use of the term stages may tend to oversimplify, but it is useful in pointing to the general types of activities which are involved and the order in which they tend to occur.

The adoption-rejection model presented here is an oversimplification of a very complex psychological process. The author's main purpose in developing the model is to point out those activities which go on within the adoption-rejection process, and to identify some of the factors which

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influence the outcome of the process. The use of three metaprocesses alerts the communicator to the need to design his messages to inform his audience about the innovation, to use arguments which will elicit a favorable attitude toward the innovation and to show the audience how obstacles to adoption can be overcome or avoided.

One of the major problems associated with the development of any model of human behavior is the tremendous variability of such behavior. The innovator probably goes through a slightly different adoption-rejection process, or goes through the same process in a slightly different way, than does the late adopter. The innovator* is probably much more active in searching for information about innovations. In contrast, laggards and late adopters probably fall on the passive end of the continuum, and learn about new innovations in a more haphazard and passive way. As a result of these differences, the factors or variables which determine adoption are somewhat different.

A further difference in the way in which individuals proceed to adopt or reject innovations relates to the extent to which they are satisfied with present practices. If an individual is faced with a problem, he may actively search for an innovation which will solve his problem. This is in contrast to the usual assumption that the farmer is a passive receiver (see Hassinger, 1959). In a sense, the innovator is continually searching for ways to improve his operation or increase

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*Adopters are traditionally categorized as innovators, early adopters, early majority, late majority and laggards depending upon the relative time at which they adopt a given innovation. See Rogers (1962, pp. 148-192).

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his satisfaction. When individuals are faced by problems, they are not only searching for innovations, but they are also more psychologically prepared to adopt an innovation. Under these conditions individuals pass through the adoption-rejection process in a shorter time than if they were relatively satisfied with present practices.*

In view of individual differences in predispositions to look for innovations and the need to solve problems, it is anticipated that not all individuals will go through exactly the same process or will be influenced by exactly the same factors. The model presented later is a general one, and is based upon the assumption that most adoption-rejection decisions have much in common.

The adoption-rejection model presents an overview of the process of rejection and adoption and explicates the important variables at each stage. It attempts to utilize research findings and theories from three areas: (1) communication and diffusion of information; (2) persuasion and attitude change; and (3) decision-making. The three areas are taken as blocks of theories and integrated en toto into the present model, rather than taking unique findings from each area and trying to synthesize a new theory from the disparate parts. The three stages which are assumed to be part of the total adoption-rejection process and which correspond to the three areas of research and theory are called: information, persuasion and decision-making. Each of these three stages

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*See Campbell (1967) for a further discussion of this point.

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The Conceptual Model

The basic conceptual model of the adoption-rejection process consists of three stages or meta-processes called: the information process, the persuasion process and the decision-making process.

Definitions

The information process is defined as the process by which an individual becomes aware of and informed about a new idea. The important aspects of this stage are centered around information flow, information seeking and exposure. Past research suggests that some of the more important intra-personal dimensions are personal abilities, personality characteristics and communication contacts. These dimensions will be discussed later.

An individual is said to be informed when he knows about a new practice. If he hears about an idea that interests him or that he believes is consistent with his self-perceived role, he may actively seek more information and then pass to the next stage. Consideration of the practice will not pass beyond the information level if the individual never becomes informed, defines the information as irrelevant to him or does not seek enough information to become adequately informed so that he can be persuaded.

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The persuasion process is defined as the process by which an individual develops a favorable or unfavorable attitude* toward an innovation. Attitudinal development may involve either attitude formation or change. If one develops a favorable attitude toward the new practice, he is said to be persuaded. Once information is available, an individual will develop a favorable or unfavorable attitude toward the new practice. If the attitude is unfavorable, he will reject. This rejection may be permanent or temporary.** If further positive information is forthcoming at a later time, an unfavorable attitude may change to a favorable one, and the individual will pass on to the decision-making stage. Or, the addition of further information may produce a more negative attitude.

The decision-making process is the final process in the model, and is defined as the procedures an individual goes through in choosing among alternative actions. Many decisions are involved at each step or within each process of the adoption-rejection model. For example, in the information process decisions are made regarding the attention given to messages on specific subjects from specific sources. In the decision-making process the type of decision involved is slightly different in that the alternatives are adopt vs. not adopt. This specific decision involves a consideration of whether or not to actually try the innovation.

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*An attitude is a learned predisposition of an individual to evaluate some symbol or object in a favorable or unfavorable manner.

**The distinction between temporary or permanent rejection is made to indicate that some individuals may stop for a period of time at any stage of the process, and then later continue through the process. It is difficult to differentiate between a temporary and a permanent rejection at any specific point in time, however.

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The Rejection Points

Each dimension within the three meta-processes represents a potential rejection point. Rejection may be either permanent or temporary. An individual may stop at any point within any of the stages for a period of time until more information is secured, which may produce a more or less favorable attitude and lead to either adoption or rejection. These temporary halts within the process of acceptance may be difficult to distinguish from permanent rejections because what appears to be permanent rejection at time one, often has to be considered a temporary rejection at time two, because the individual later accepts the practice.

Since some of the dimensions are more important and have a larger number of factors associated with them than others, the rejection points can be thought of as obstacles which an individual must pass. Some of the obstacles are larger than others and some can be passed by going back and obtaining more information, while others are such that if an individual defines himself in a given way, he cannot pass the obstacle no matter how much information or how favorable an attitude he has toward the innovation.

Development of the Model

The adoption-rejection model developed out of a desire to conceptualize the adoption process in a way which would integrate the findings from many empirical studies by a wide variety of researchers. The traditional models do not explicate the variables which are salient

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The idea that acceptance is a process which can be divided into stages was first expressed by Wilkening (1953, p. 16), who stated "An understanding of why farmers do or don't accept improved practices requires that one recognize acceptance as a process composed of learning, deciding and acting over a period of time." He divided the acceptance process into four stages: (1) obtaining initial knowledge about the practice; (2) obtaining ideas and information leading to acceptance of the practice as a 'good idea' for most farms; (3) deciding that the practice is worthwhile for one's own farm, followed by adoption on a trial basis; and (4) adopting the practice completely on one's own farm.

The idea of dividing the adoption process into a series of sequential stages was further pursued by the North Central Rural Sociology Subcommittee on Diffusion. In 1955 they suggested a five stage model which has gained general acceptance. A recent statement by one of the originators of the model, Bohlen (1967), suggests the basic model is still regarded as the best available even though there are still innumerable unanswered questions regarding the adoption process.

The five stages and the operational definition of each stage is presented as follows. The definitions are those of Bohlen (1967).

> "1. Awareness. This is the stage at which the individual knows of the existence of an idea or practice, but lacks details concerning its intrinsic nature and use. Awareness may begin as an involuntary act or as serendipitous behavior.

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2. Information. This is the stage at which the individual becomes interested in the idea. He seeks further basic information of a general nature regarding it. He wants to know why and how it works, how much it costs, and how it compares with other ideas or practices purported to perform the same or similar functions. He is concerned with knowing the conditions of use and the resources necessary to get optimum benefits from its use.

3. Evaluation. This is the stage at which the individual takes the knowledge he has about the idea and weighs the alternatives in terms of his own use. He considers his own resources of land, labor, capital and management ability and decides whether or not he has the necessary resources to adopt the idea. He also evaluates the idea in terms of the available alternatives and of his overall goal structure. He considers whether or not the adoption of the idea will help him maximise his goals and objectives. If he thinks it will, in most cases, he makes the decision to give the idea or practice a physical trial.

4. Trial. At this stage the individual has the empirical experience of observing the idea in use. The trial stage is characteristically one of the small-scale use by the potential adopter, or his observation of use under conditions which simulate those of his own situation. At this stage the individual is concerned with the specifics of application and use; the mechanics and actions relating to how to use the idea.

5. Adoption. At this stage the individual uses the idea on a full-scale basis in his operations and is satisfied with it. He is no longer trying to decide whether or not the idea is good for him in his operations. He has accepted it as an integral part of the particular operation into which he has incorporated it."

The traditional model has not gone completely unquestioned. Mason (1962, p. 103) argues that only two stages are necessary and sufficient in the adoption process. "These are awareness and adoption, with awareness occurring before adoption." He believes that rural sociologists are mistaken in assuming that five stages will usually be present and that they will be in the same sequence. This point is well taken because

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there are many practices and products which cannot be tried before they are adopted. The distinction between trial and adoption is mainly one of degree and there is little logical support for this distinction in the development of a general model, particularly since trial is sometimes impossible.

The distinction which has been made by the rural sociologists between the awareness and the information stages is also one of degree. It is difficult to conceive of an individual being aware of a practice without having some information about it. In fact, it can be argued that awareness without information is impossible. The basic purpose of dividing the adoption process into stages is to differentiate between different types of activity which are assumed to go on within each stage. The awareness stage becomes entirely static if all information-seeking and interest is assumed to take place at the second stage. There is limited logic to call awareness a stage of the process since, as Bohlen (1967) stated, "awareness may begin as an involuntary act or as serendipitous behavior." Therefore awareness is assumed to be a precondition for the adoption-rejection process to occur, rather than the first stage of the process.

Mason's statement that two stages are necessary and sufficient can also be challenged. The idea that awareness must come before adoption is obvious. It is not so obvious that awareness alone can lead directly to adoption. There is ample evidence that many more people are usually aware of new practices than adopt. Why? It is quite possible to be aware and to have a negative attitude toward a practice. Thus adoption

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would not take place. Similarly one may have a positive attitude but not adopt because, upon evaluating the practice in relation to one's present situation, resources and risks, one decides not to adopt. Between awareness and adoption there are two stages, one involving the development of a favorable attitude toward the new practice, called persuasion, the other involving an evaluation of the practice and deciding whether or not to adopt, called decision-making. Thus, there are three stages prior to adoption: information, persuasion and decision-making.

Although it has been common practice to include adoption as one of the stages within the adoption process, the author will not do so in this thesis. Adoption is defined as the behavior associated with carrying out an innovation. As such it is the resultant of the adoption process, and it is the dependent variable, so to speak. It appears reasonable to think of the adoption-rejection process as the series of steps which an individual goes through before adopting or rejecting a new practice. Adoption may be one result of the process but not the final stage. If one wants to include an adoption stage within the model, he would have to include rejection stages also, to be logically consistent. To introduce a large number of rejection stages would complicate rather than simplify the adoption-rejection process.

Each of the three meta-processes, although necessary, is not sufficient to produce adoption. There may be a minimum level of persuasion, as indexed by a favorable evaluation of the innovation, which is necessary before an individual starts to choose among alternatives. It is difficult to believe that a given amount of information is necessary before either

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positive or negative attitudes toward the innovation start to develop. There may be a direct relationship between knowledge about an innovation and attitude toward it. In other words, the communicator may find that unless the individual knows specific facts about the innovation, he will probably not develop a positive attitude toward the innovation.

The Adoption-Rejection Model

Each of the three meta-processes will now be discussed in terms of the number of intra-individual dimensions present and the factors important for each dimension. The following exposition is not exhaustive, but is suggestive, and based on previous research findings. The major components of the three stages are presented in Figure 1.

The Information Process

The information process represents the way in which an individual becomes aware of and informed about a new innovation. Different types of content may be present in messages about a specific innovation. Some messages produce awareness, that is, the individual learns of the existence of the innovation. Other messages may provide information about how the innovation relates to or may be useful to him. A third class of information is that which provides specific details of how to utilize the innovations.

The major dimensions which influence how messages are received by individuals are: personal abilities, socio-psychological characteristics, and communication contacts.

Precondition

INFORMATION

Major Determinants

Stages in Process

PERSUASION

Major Determinants

Result

DECISION-MAKING

Major Considerations

1. Self-perception of own

Figure 1

Model of Adoption-Rejection Process

Precondition	Stages in Process			Result
	INFORMATION	PERSUASION	DECISION-MAKING	
	Major Determinants	Major Determinants	Major Considerations	
	1. Personal Abilities Hearing and seeing Intelligence Education Literacy Age	1. Personality Factors Beliefs, attitudes and values (both structure and content) Dogmatism Tolerance for ambiguity	1. Self-perception of own role in relation to new practice 2. Perception of resources 3. Perceived cost/reward ratio	
Awareness	2. Personality Factors Belief, attitudes and values (both structure and content) Social Status Opinion leadership	2. Message Credibility Perceived credibility of the source and channel Perceived intention of source Source preference Channel preferences	4. Perceived freedom from internal and external restraints	Adoption or Rejection
	3. Communicative Activities Mass media availability Mass media usage Media preference Interest in topics, sources, or media Interpersonal Communicative activities Community participation		Major Determinants 1. Personality Beliefs, attitudes and values, such as risk orientation and achievement motive 2. Resources Money and credit Personal energy, ability and skills	

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Personal abilities can be arbitrarily divided into those which are primarily physical such as hearing, sight and age, and those which are psychological such as the ability to deal with abstract ideas, literacy, education and intelligence.

Socio-psychological factors which may be related to the receipt of information include: information-seeking activities, opinion leadership, social status, cosmopoliteness, receptivity of new ideas, dogmatism, authoritarianism, tolerance for ambiguity, and attitudes toward various sources, channels and message treatments.

Among those socio-psychological variables which have been studied and shown to be related to knowledge about innovations or new practices are: opinion leadership by Leuthold (1965) and Berelson and others (1954); cosmopoliteness by Hobbs (1960); and participation in formal organizations by Leuthold (1965).

The third dimension of the knowledge process is that of communication contacts. It seems logical to assume that information levels will be directly related to the number and type of mass media available, the amount of time spent with the various mass media and the number and of type of interpersonal contacts of both a formal and informal nature.

The information or knowledge level varies considerably not only between individuals in different communities, but also among individuals in the same community. It is assumed the major differences are a function of the variables listed previously. The information level of an individual can be measured by use of a knowledge index utilizing measurement technique such as multiple choice, forced choice or sentence completion.

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The Persuasion Process

Persuasion is defined as the process by which an individual develops a favorable or unfavorable attitude toward an innovation. The distinction between information and persuasion may be difficult to establish if one follows the Hovland and others (1953) conceptualization of persuasion as three phases: attention, comprehension and acceptance of conclusions. For the purposes of developing a model, the attention aspect will be considered entirely in the information stage. Support for the distinction between the information and persuasion stages is given by Klapper (1960): "Several studies have found that communications designed to change opinions have succeeded in communicating the facts which were expected to create the new opinion without, however, changing the opinion itself". It is possible to have information or learning without persuasion, but not the reverse.

Persuasion is a psychological process which is influenced by personality characteristics. Among those personality variables which have been studied are: overall level of susceptibility to any form of persuasion or social influence by Hovland and Janis (1959), Ferguson (1944), and Janis and Field (1956); anxiety by Janis and Feshbach (1953) and Janis (1955); dogmatism by Rokeach (1960) and Powell (1961); intelligence by Hovland and others (1949) and Janis and Field (1956); and authoritarianism by Adorno and others (1950). It is hypothesized that personality differences also exist in relation to an individual's readiness to accept a favorable or unfavorable position regarding particular topics and pre-dispositions toward different sources, channels and message treatments.

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Persuasion can be indexed by means of any one of several standard attitude scaling procedures. Under some conditions the attitude of the individual toward the innovation in relation to a specific environment or situation may provide a more accurate measure of the degree of persuasion than the measurement of attitude toward the innovation (without the situation specified).

The Decision-Making Process

The decision-making stage represents the process of choosing among alternative actions. The central concern of this process is the way in which an individual goes about deciding which alternative. In many cases there are two alternatives: adopt or not adopt. In others there may be more than two courses of action which can be followed.

Decision-making by farmers has been studied by a number of agricultural economists.* They have tended to become involved in the study of decision-making because of their interest in the managerial process.** Since their primary interest is in evaluating farm managers, they placed more emphasis on studying variables which predict managerial success than on the actual decision-making process. In general, the emphasis on management has led to more interest in ongoing management decisions than to the question of how a farmer behaves when faced with an innovation.

*These include Johnson and others (1961), Haver (1960), Dillon and Heady, (1960), Heady and others (1957), and Nielson (1961).

**The managerial process consists of five functions: (1) observation, (2) analysis, (3) decision, (4) action, and (5) acceptance of responsibility.

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One of the most extensive attempts to understand managerial processes was undertaken by Johnson and others (1961). The Interstate Managerial Survey focused on the analytical processes in farm management, the making of decisions and the managerial behavior of farmers in formulating expectations of future events. The authors report that making a decision may be influenced by (1) the manager's value concepts and concepts of what will be and/or is, (2) how he analyzes the problem, (3) the consequences he expects will follow from alternative courses of action, and (4) his ability to carry out alternative decisions. This study did not determine what factors the farmer took into consideration in making a decision or how personality differences influence the way in which the various factors are evaluated.

A large number of decision theories* have been developed to indicate which alternatives should be chosen in order to produce given criteria under varying degrees of uncertainty. These are reviewed by Dillon and Heady (1960). Although sophisticated mathematically, these models do not indicate how an individual makes a decision, only which alternative he should select.

The previous studies and statements of opinion on decision-making do not suggest what obstacles exist in the mind of an innovator or how different personal abilities, personality characteristics or resource situations influence the decision-making process. In order to plan a communication program to encourage adoption, it is desirable to know the

*Some of the major contributors have been A. Wald, L.J. Savage, L. Hurwicz, H.A. Simon, and G.L.S. Shackle.

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cognitive as well as physical barriers to adoption. It is also desirable to know how important these various barriers are to different individuals and what personal, personality and resource factors determine the relative importance of the various barriers. It is necessary to construct a model which explicates the major barriers which are considered prior to adoption and to show what factors determine the relative importance of each barrier to different people. The following conceptual farmework attempts to explicate both the barriers, in terms of which the innovation is considered, and the factors which determine how the innovation is evaluated.

It is assumed that each innovation is evaluated by an individual in terms of four considerations: (1) whether it is consistent with his self-image, (2) the resources he has available, (3) the ratio of perceived costs to potential rewards, and (4) perceived internal and external restraints. For ease of discussion it will be assumed the decision is made by evaluating the innovation in terms of these four considerations in sequential order. This order may not actually exist, but it helps to simplify and explicate the discussion. The steps are discussed as follows.

The first step in the decision-making process refers to how the individual perceives the innovation in relation to his self-image; that is, how he perceives the innovation with respect to his occupation, personal relationships, basic beliefs, values and past behavior. In other words, how does the innovation fit with the many roles he plays?

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The second step involves the individual's perception of his resources in relation to the resources needed to adopt the innovation. Both monetary and personal resources are probably considered.

The perceived cost-reward ratio is thought to be a very important step in the decision process. When an individual chooses among several alternatives, he probably compares the alternative rewards and costs for each. The alternative which provides the largest reward for the least cost is considered the most rational choice. It is assumed that not only economic but also social and psychological costs and rewards are important in arriving at a final decision.

The final dimension that is hypothesized to be involved in decision-making, is the individual's perception of internal and external restraints. Internal restraints probably arise from a fear of the unknown and untried, a reluctance to change and uncertainty about the future. External restraints may involve the lack of adequate markets, legal prohibitions, need for approval of superiors or dependence upon others to also adopt at the same time.

Although the four steps or barriers which must be considered in the decision-making process are assumed to be involved in every decision, this does not imply that <u>all</u> people make decisions in the same way. Much of the difference in decision-making style, and consequently in the outcome of the decision, is a function of the interaction between personality variables and the four steps explicated previously.

A number of personality variables have been studied and shown to be related to the tendency to adopt innovations. Among those personality

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variables studied have been: value orientations by Oliver-Padilla (1964) and Ramsey and others (1959); achievement motivation by Neill (1963) and Rogers and Neill (1966); risk orientation by Lassey (1967); dogmatism by Jamias and Troldahl (1965); and conservatism by Hoffer and Stangland (1958).

A second group of factors, called resources, also influence the pattern and result of the decision-making process. These are non-personality characteristics. Among the more important are: (1) physical assets such as land, buildings and machinery; (2) monetary assets and liabilities such as cash, credit and debts; (3) personal abilities such as social, mechanical and administrative skills; and (4) physical characteristics such as health and age.

Empirical Support for the Three Stage Model

Empirical evidence indicates that for a given sample of potential adopters, more people know about the practice (information) than have a favorable attitude toward it (persuasion), which is larger than the number who have actually adopted the practice (acceptance). Aurbach and Kaufman (1956) studied knowledge about the use of 12 recommended farm practices among 139 farmers in a Mississippi county. They reported that an average of 97 per cent of the farmers had heard about each practice, 83 per cent had favorable attitudes toward the practice, but only 49 per cent of the farmers had adopted. For all 12 of the practices studied, the percentage of farmers who had heard (information), was higher than the percentage who had a favorable attitude (persuasion), which was higher than the percentage who had adopted (acceptance).

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Similar results were found by Anderson (1955), who studied the acceptance of fertilizer. He reported that 88 per cent of Iowa farmers believed fertilizer was beneficial and 69 per cent were actually using it. Further implicit support for the model is provided by the work of Beal and others (1957) and Rogers and Meynen (1965). They also found that there are meaningful differences in the number of people who know about, are favorably disposed toward and have adopted an innovation. Only the study by Aurback and Kaufman (1956) explicitly supports the three stage conceptualization. The others used the traditional five stage model.

Hypotheses

The following hypotheses are based upon the adoption rejection model.

The first hypothesis derives directly from the basis conceptualization of the existence of a three-stage model of the adoption-rejection process. The theoretic hypothesis and two resultant empirical hypotheses are presented below:

Theoretic Hypothesis 1: The process by which an individual decides to adopt an innovation can be divided into the three stages of information, persuasion, and decision-making.

Empirical Hypothesis 1(a): Individuals will identify three stages when asked about the process they went through in deciding to adopt an innovation.

Empirical Hypothesis 1(b): The three stages identified will be related to information accumulation, attitudinal development, and choosing among alternatives.

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The second hypothesis is based on the four steps believed to be important within the decision-making stage of the adoption-rejection model. The conceptualization presented previously predicts the existence of four important steps. The following hypothesis is designed to test this assumption.

Theoretic Hypothesis 2: Four steps, involving the evaluation of innovations in terms of self-image, resources, cost/reward ratio and external restraints can be identified within the decision-making process.

Empirical Hypothesis 2: Individuals will report evaluating an innovation in terms of how it fits into their farm operation, its cost, the relationship between costs and expected benefits and the presence of other non-personal factors which prevent adoption.

The validity of the model outlined previously depends upon the existence of a series of stages or steps which an individual goes through in deciding whether or not to adopt an innovation. If each of the steps is necessary but not sufficient, it follows that if an individual fails to pass one step, he will not go on to later stages of the process. Similarly, if an individual completes a given step, it is reasonable to expect that he will have completed all previous steps. If this type of relationship holds for almost all individuals, then the series of steps is said to form a cumulative scale.

Theoretic Hypothesis 3: An individual who is at any stage of the adoption-rejection process will have completed all previous stages but none of the following stages.

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Empirical Hypothesis 3: A cumulative scale pattern can be formed using the outcome of each of the following steps: knowledge, level, attitude and decision-making.

The Information Process

The purpose of this part of the study is to look more intensively at the first stage of the adoption-rejection process in an effort to determine which factors are related to information accumulation or knowledge levels. Some of the factors believed to be related to knowledge levels are difficult to index in a field survey, for example, intelligence, physical characteristics abilities such as eyesight and hearing or psychological characteristics such as authoritarianism or tolerance for ambiguity. Only those which are believed to be of major importance and which can be measured in a field interview situation will be studied.

Very little research has been done by diffusion researchers on knowledge about innovations. They have tended to focus on innovativeness; in other words, to concentrate on whether or not the individual actually adopted the innovation rather than whether or what he knew about the innovation. Less than five per cent of all the empirical studies listed in the Diffusion Documents Center at Michigan State University consider knowledge about innovations as their dependent variable. Most of these studies do not actually index knowledge level, but just awareness about a given innovation. This overlooked aspect of diffusion appears to warrant critical analysis, particularly since any communication strategy must take into consideration what and how much an individual knows about

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an innovation. The effectiveness of a communication program of information program may be more reliably evaluated by indexing knowledge level than adoption, which also depends on other than strictly communication variables.

A review of the diffusion literature indicates that the relationship between knowledge of innovations and a number of variables has been studied. Among these have been education, age, opinion leadership and participation in formal organizations. Each of these and a number of others will be discussed as follows.

The majority of studies indicate that educational achievement is positively related to knowledge about innovations.* This finding appears logical since individuals with more education probably read more, and can comprehend a wider range of materials and probably remember more than those with less education. A positive relationship between education and information level was reported by Troldahl and others (1964), who found that as years of education increased, information about local public affairs, national public affairs and civil defense increased. On the basis of the previously-cited research, the following general hypothesis is suggested:

General Hypothesis 4: Knowledge about an innovation is positively related to educational achievement.

Empirical Hypothesis 4: An individual's score on the knowledge index is positively correlated to the last year of school completed.

The diffusion literature suggests that the relationship between age and knowledge of innovations may be negative, positive or non-existant.

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A negative relationship is reported by Bauder (1960). Positive relationships are reported by Leuthold (1965), Defleur (1958) and Greenberg (1964). Nonsignificant relationships are reported by Deshmukh (1960), Dodd (1951), Bogart (1951), Deutschmann (1965), Wilson (1933), and Troldahl and others (1964). The relationship between age and knowledge has been assumed to be linear in these studies. The relationship is more likely curvilinear with individuals who are in the middle-aged group having more knowledge than either those who are younger or older. Although the differences were not significant in the Troldahl and others (1964) study of knowledge about the Detroit fall-out shelter program, the findings support our hypothesis in that the middle-aged group had the highest knowledge scores.

On the basis of the preceeding reasoning, the following theoretic hypothesis is presented.

Theoretic Hypothesis 5: The relationship between knowledge about an innovation and age is curvilinear.

Empirical Hypothesis 5: Those individuals who are between the ages of forty-one and fifty will score higher on the knowledge index than those who are either younger or older.

Opinion leaders are individuals who influence the opinions of other people through interpersonal contact. Individuals who believe themselves to be a source of information for other people and who indicate that they are more likely to contribute rather than receive information in interpersonal interactions are expected to have more information than the average. Leuthold (1965) reports a positive relationship between

knowledge of innovations and opinion leadership. Similarly, Berelson and others (1954) found that opinion leaders knew more about an election campaign than followers. The following theoretic hypothesis is presented.

Theoretic Hypothesis 6: Knowledge about an innovation is positively related to opinion leadership.

Empirical Hypothesis 6: An individual's score on the knowledge index is positively correlated to his score on the self-designated opinion leadership scale.

Social status is an indication of one's position in the social structure. High social status usually implies higher levels of both income, and education, and more and wider social contacts. Individuals with these characteristics are more likely to have more communicative contacts, both of the mediated and interpersonal type.

A review of the diffusion literature does not reveal any research on the relationship between information about innovations and social status. In his review of the factors related to innovativeness, Havens (1962) reports that a positive relationship was found between social status and innovativeness in all 21 studies he reviewed. Since social status is positively related to innovativeness and such adoption is highly improbable without information about an innovation, it appears reasonable to believe that social status is related to knowledge about innovations.

In view of the preceeding reasoning, the following theoretic hypothesis is proposed:

Theoretic Hypothesis 7: Knowledge about an innovation is positively related to social status.

Empirical Hypothesis 7: An individual's score on the knowledge index is positively correlated to his score on the status index.

A positive relationship between participation in formal organizations and knowledge of innovations was found by Leuthold (1965). It appears logical to expect that individuals who participate in more formal organizations and thus have contact with many people, will know more about relevant innovations. In a rural area where the majority of members of any formal organizations are likely to be farmers, participation in most organizations probably leads to greater knowledge about farm practices. In an urban area where the population is less homogeneous in terms of occupational interest, only those formal organizations which are related to occupation probably contribute to greater knowledge about occupational innovations. Since the setting for the proposed study is rural, this latter aspect will not be considered.

Since holding an executive position in an organization leads to more interaction than just organizational membership, it follows that executive membership should not only be related to knowledge level but the relationship should also be stronger than the relationship between membership and information.

The theoretic hypothesis developed from the preceeding argument is:

Theoretic hypothesis 8: Knowledge about an innovation is positively related to membership and participation in formal organizations.

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Empirical Hypothesis 8(a): An individual's score on the knowledge index is positively correlated to the number of formal organizations to which he belongs.

Empirical Hypothesis 8(b): An individual's score on the knowledge index is positively correlated to the number of executive positions he holds in formal organizations.

Empirical Hypothesis 8(c): The correlation between an individual's score on the knowledge index and number of executive positions held in formal organizations will be larger than the correlation between score on the knowledge index and the number of formal organizations to which he belongs.

Since the use of mass media is one of the major channels for information flow on most subjects, it seems reasonable to expect that information about farm innovations will be influenced by the number of mass media available and the number of hours per week spent in watching, listening or reading.

Theoretic Hypothesis 9: Knowledge about an innovation is positively related to mass media availability.

Empirical Hypothesis 9: An individual's score on the knowledge index is positively correlated to the number of mass media available.

Theoretic Hypothesis 10: Knowledge about an innovation is positively related to media usage.

Empirical Hypothesis 10(a): An individual's score on the knowledge index is positively correlated to the total number of hours spent per week in watching television, reading newspapers and magazines and listening to radio.

Empirical Hypothesis 10(b): An individual's score on the knowledge index is positively correlated to the number of hours spent per week in watching, reading and listening to farm related topics.

Preference for sources of information has not been related to knowledge about innovations by any diffusion researchers. Sources of information used by farmers were studied by Lionberger (1959), Wilkening (1956), Rogers and Beal (1958) and Beal and Rogers (1957), to mention only a few. These studies support the generalization that mass media sources are more important during the early stages of the adoption process while interpersonal sources are more important in the evaluation stage of adoption. Also, late adopters tend to use interpersonal sources, while innovators more often use mass media as sources of information. It seems reasonable that individuals who rely on interpersonal sources will know less about innovations than individuals who receive their information direct from the mass media.

Theoretic Hypothesis 11: Knowledge about an innovation is related to the relative importance attributed to mass media rather than interpersonal sources of information about innovations.

Empirical Hypothesis 11: An individual's score on the knowledge index is positively correlated to his tendency to choose one of the mass media sources in preference to one of the interpersonal sources when asked to make such a choice using The Most Important Source Index.

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Further Analysis of the Data

All of the hypotheses of the present study mainly involve zero-order correlation analysis. In order to determine the relative importance of each of the independent variables to information levels, multiple correlation analysis will be undertaken. The amount of variance explained by each independent variable in information levels of different individuals for different innovations will be determined. Separate analyses will be performed while controlling for the type of innovation, number of recommended practices used and farm characteristics. For this type of analysis it will be possible to determine which communication variables in combination exert the most influence on knowledge levels.

CHAPTER III

METHODOLOGY

This chapter outlines the operationalization of the dependent and independent variables discussed in the previous section and sampling and interviewing procedures used in the collection of the data. Each of the variables is operationalized in turn and a rationale presented to explain the procedure used. In some cases internal consistency correlations were appropriate and are presented. The final section of the chapter outlines the sampling and interview procedures that were utilized.

Operationalization of Adoption-Rejection Variables

One of the first problems in testing a model of adoption was to decide upon an objective criterion which would be generally acknowledged as evidence that adoption has occurred. In terms of the present study this was the problem of operationalizing the dependent variable. Since the basic approach of the model is behavioristic, and it is assumed there should be some type of new overt behavior, it seemed reasonable to demand that adoption have a behavioral referent. This meant the individual had to perform overt behavior of a type not previously exhibited before we could say that he had adopted. Such a criterion would have allowed us to rigidly define adoption. Unfortunately this stand would have raised almost as many problems as it would have solved.

The two theoretical problems which had to be considered in relation to the operationalization of adoption were: (1) does adoption always produce overt behaviors? and (2) does behavior always indicate adoption? Theoretically, the answer to both questions is "no." Coercion can prevent adoption or produce behavior which may appear to be adoption. Since farmers are assumed to be independent decision-makers, in this study it was assumed that if a farmer exhibited overt behavior, he had done so voluntarily and he had actually adopted the given innovation. In all cases the innovations chosen for study were ones a farmer was not compelled by external pressure to adopt.

The problem of adoption without overt behavior arises under circumstances where an individual cannot adopt a new practice until others have also adopted or there is a time delay between the time at which a decision is made to adopt and when it is possible or appropriate to perform the new activity. For the purpose of the present study all of the practices studied were such that adoption was not dependent upon others, and adoption was defined as having actually used the practice during the preceding crop year.

Validating the three stages of the model presented difficult problems of operationalization. The problems arose primarily because adoption is a process and any attempt to divide it into stages or sub-processes is arbitrary and tends to distort the overall process. Rogers (1962), mentions four types of evidence which support the five stage model. The validity of the five stage model was reported to be supported by the experience of the interviewers who found that most

people had little trouble recalling the time at which they become aware, tried and adopted the innovations. Beal and Rogers (1960) reported that there were very few stages skipped by respondents. They also found that all their respondents reported different information sources according to the stage as they moved through the adoption process. The same authors emphasize that none of their respondents reported immediate adoption upon becoming aware of an innovation. This indicates that adoption behavior is a process, but does not give much indication as to the number of stages.

The validity of the three stage model was tested by two approaches using two separate sets of data. The first approach was an effort via probing to have the respondent describe how he solved a specific problem which involved a major change in his farm business during the previous year. The second approach was based on the assumption that if the model is correct, it logically follows that the number of people who have heard about any given innovation (information) is larger than the number who have a favorable attitude toward the innovation (persuasion), which in turn is greater than the number who have either adopted or state that they will adopt when an opportunity arises. The second set of data consisted of measures of knowledge, about attitude toward and adoption of four innovations. This set of data is discussed in a later section.

Pre-testing indicated that farmers have difficulty in remembering and describing exactly how they decided to adopt or reject innovations which involved a relatively small capital investment or minor changes

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in operating procedures. In an effort to overcome this problem each farmer was asked if he had made a major innovation or change in his business during the last year. This was done because it was assumed that a farmer would have spent more time in making a decision involving a large investment and would be able to recall how be made such a decision. A series of questions were asked about the innovation adopted or contemplated in an effort to determine what steps he went through in making his decision. The data collected on this major innovation were used to test the first and second theoretic hypotheses.

It was hypothesized that there were five logical classes into which a farmer would fit in regards to consideration and/or adoption of a major innovation: (1) he did not consider making a change; (2) he actually made a change; (3) he decided to make a change but had not done so; (4) he considered making a change but decided not to, that is he rejected the change, or (5) he still had a change under consideration but a final decision had not been made.

If a subject had not considered making a major change he was excluded from further questioning. A series of questions appropriate to each of the remaining four classes were constructed (see Appendix I for the questions used).

The distribution of subjects into the five classes is shown in Table 1. The majority of farmers said they had not considered making a change. It is noteworthy that only one subject stated that he had considered an innovation, and had decided not to adopt it. This suggests a type of respondent bias. Probably a number of those who

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stated they had not considered a change had actually done so, but had decided not to carry it out. Otherwise, the data suggest 95 per cent of the subjects who considered making a change decided to actually carry it out.

Table 1. Distribution of Subjects by Consideration of Major Change

Type	Per Cent
1. Did not consider a change	58
2. Actually made a change	37
3. Decided to change but not made	2
4. Considered but decided not to make change	1
5. Change still under consideration	2
Total	100

The 44 subjects who considered making a major change were classified as to the outcome of their decision and the type of change or innovation considered. Of the 39 subjects who had actually made a change the majority, 22, had purchased a new machine. Ten had bought, sold or rented land, three had erected or remodelled farm buildings and four had made other types of changes. The remaining five subjects had not carried out the change considered, had decided not to change or were still deciding what to do. These five were not included in the analysis because of the small number of cases of each type.

Operationalization of Knowledge and Attitude Levels

Indices of level of knowledge about and attitude toward specific innovations were needed to test the hypothesis that knowledge and attitude are precursors of adoption and to test the information hypotheses. In order to construct a meaningful measure of knowledge of innovations it was essential to select a limited number of specific innovations.

The five innovations selected for study were the use of chemical weed killers on sugar beets (beet herbicides), the use of a machine to thin sugar beets (beet thinner), the use of chemical weed killers on corn (corn herbicides), the use of the recommendations of the Ontario Corn Committee in deciding which variety of corn to plant (Ontario Corn Committee) and the use of soil samples to determine the quantity and analysis of fertilizers need on specific fields (soil sampling).

Each respondent was asked a series of questions about one innovation he had adopted and one he had not adopted. Only two innovations were considered by each respondent because half of the farmers were no longer growing sugar beets and thus could not be expected to have adopted or rejected beet herbicides or mechanical thinning. It was assumed that most respondents would be unwilling to answer knowledge and attitude questions about more than two innovations. Experience in field pretesting showed this to be a correct assumption. A further limitation was imposed by the fact that the present research project was part of a larger study on sugar beet producers and there were limits on how many questions could be included in the instrument.

The number of respondents who answered the knowledge and attitude questions for each innovation and the percentage of those completing the questions who had adopted that innovation are presented in Table 2. A total of 200 out of a potential 212 knowledge schedules were completed. In a few cases the respondent had not adopted any of the innovations or had adopted them all so that only one instead of two schedules were completed. The marked tendency for the respondents to have adopted all rather than none is indicated by the fact that 107 schedules were completed for an innovation which had been adopted.

Table 2. Number of Respondents Questioned About Each Innovation and the Percentage of Respondents Who Had Adopted the Innovation

Innovation	Number Responding	Number of Adopters	Percentage of Respondents Adopting
1. Chemical weed control on sugar beets	50	17	34
2. Mechanical thinning of sugar beets	33	3	9
3. Chemical weed control on corn	67	61	91
4. The Ontario Committee Recommendations	22	4	18
5. Soil sampling	28	22	79
Totals	200	107	--

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An effort was made to index awareness of the existence of each innovation. Two slightly different questions were used. In the case of the more common innovations, namely soil sampling and chemical weed sprays for corn and sugar beets, the subjects were asked "What is (name of innovation)?" In all cases their response indicated that they had some awareness of the innovation. For those respondents who answered the questions on mechanical thinning of sugar beets, the question "Have you heard of (name of innovation)?" was used. This question was not used with the three more common innovations because questions had already been asked about them in a previous section of the interview schedule. The respondents who answered the section on the Ontario Corn Committee were asked both questions in an effort to determine how many subjects would say they had heard of this organization compared to the number who could correctly describe or identify it. The question "What is (name of innovation)?" proved quite awkward in that, except for the Ontario Corn Committee, the innovation was so well known to the respondents they assumed the interviewer would also know exactly what it was. The respondent was not sure whether he was expected to provide a definition, the brand name or a description. The question was modified in the case of weed spray on corn and on sugar beets. The question used was "What is a pre-emergence weed spray?". This was challenging enough that the respondent usually did not decide the interviewer was asking a trivial question. In the case of a mechanical beet thinner, the awareness question was eliminated because those respondents who grew beets during

the previous year had already been asked a question about the use of a thinner. All of the respondents obviously knew what a sugar beet thinner was just as all the respondents had heard of soil sampling. The awareness question would be more useful if the innovations being studied were relatively recent and knowledge of their existence not widely diffused.

Knowledge Scales

In constructing the knowledge level index for each of the five innovations, an effort was made to keep the number of items or questions to a minimum in order to facilitate field use of the instrument. Three items were used for each index. In general, an attempt was made to tap the respondent's knowledge of when it is appropriate to use the innovation, how to actually use it and either the cost or other details of its applicability. Since the five innovations varied considerably, it was difficult to use similar questions in all cases. The items used are shown in Tables 3, 4, 5, 6 and 7. Also presented are the inter-item and item-total correlations based on the raw scores.

Table 3. Inter-Knowledge Index for Chemical Weed Control on Sugar Beets (N=50) Item and Item-Total Correlations

Item	Correlation with Item #2	#3	Total
1. Which of the following chemicals are recommended for use with sugar beets?	.46	.42	.82
2. How much does Pyramin cost per pound?		.46	.78
3. How much Pyramin should be used per acre if used as a pre-emergent?			.78

Table 4.

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Table 4. Inter-Item for the Knowledge Index for Mechanical Thinning of Beets, (N=30) and Item-Total Correlations

Item	Correlation with Items #2	#3	Total
1. How important is weed control if one uses a mechanical thinner?	.48	.03	.63
2. How high should the beets be when they are mechanically thinned?		.08	.62
3. Can you give me the names of some of the different makes of machines which have been used in this area?			.73

Table 5. Inter-Item for the Knowledge Index for Chemical Weed Control on Corn, (N=67) and Item-Total Correlations

Item	Correlation with Items #2	#3	Total
1. Which of the following are recommended for use as pre-emergents in corn?	.15	.16	.75
2. How much does atrozine cost per pound?		.18	.43
3. At what stage does corn become susceptible to damage from 2, 4-D?			.73

Table 6. Item-Item and Item-Total Correlations for the Knowledge Index for Ontario Corn Committee (N=22)

Item	Correlation with Items #2	#3	Total
1. What is the Ontario Corn Committee?	.31	.44	.64
2. What three things do they report about each variety?		.79	.91
3. Who makes up the Ontario Corn Committe?			.91

Table 7. Item-Item and Item-Total Correlations for the Knowledge Index for Soil Sampling (N=28)

Item	#2	#3	Total
1. A soil tells one?	-.33	.34	.82
2. When you send in a soil sample to have it tested, it is important to include information about?		-.10	-.05
3. How much soil has to be sent away for an accurate sample?			.76

Final index construction consisted of excluding those items which did not correlate adequately with the total score. Two other criteria were also considered, the inter-item correlation and the number of respondents answering each item. All the items for the indices of

chemical weed sprays on sugar beets and mechanical thinning of sugar beets were correlated .60 or more with the total scores. One item in the corn herbicide index only correlated .43 with the total score. One item had to be excluded from the soil sampling index because it correlated negatively with the total score, and with both of the other items. A check of the data indicated that it did not discriminate because of the twenty-eight respondents, twenty-six answered it correctly.

The index of knowledge about the recommendations of the Ontario Corn Committee was excluded from further analysis because of the small number of people who were questioned about this innovation, the high rate of non response, the inadequacy of the attitude index (which will be demonstrated as follows), interviewer and investigator belief that the items were not a valid measure of knowledge about the recommendations of the Ontario Corn Committee, and finally the opinion of the investigator that the recommendations of the Ontario Corn Committee were being used by respondents even though they had never heard of the Committee.

Each respondent's knowledge score was based on the sum of his normalized score on each of the three items (in the case of soil sampling, there were only two items). Each score was normalized by subtracting the respondent's score on that item from the mean for all respondents who answered that question, and dividing the difference by the sample's standard deviation. The three normal scores were summed and a constant of ten was added to eliminate negative values.

A problem arose due to the fact that the two items used in the soil sampling index were scored as dichotomies. Consequently, the final

knowledge scores based on these two items may not be as precise as those based on the items used in the other indices. When a dichotomous score is converted to a normalized score using the procedure previously discussed, the normalized score is determined by the number of individuals who answered the item correctly. The two items were rescored to provide a simple non-normalized index of knowledge about soil sampling. This score was then correlated with the normalized score, and the correlation was found to be .884. Since this correlation is relatively large, the normalized scores were retained in the analysis, on the basis of the assumption that normalizing the two dichotomous items did not seriously distort the scores, which were relatively crude indicators of the dimension anyway.

Attitude Scales

In measuring the attitude of the respondent toward a given innovation, two alternatives were considered. The attitude of the respondent toward the innovation itself or the attitude toward the innovation within some situation or context could have been indexed. Rokeach (1967) suggests that it is the latter measure of attitude which is generally more important. The conceptualization of the acceptance-rejection process developed in the previous chapter arbitrarily made a distinction between the persuasion and decision-making processes. The point at which the persuasion process appears to merge with the decision-making process is the point where the individual starts to evaluate the innovation in terms of his own situation. In order to be consistent with this previous conceptualization, the scales constructed to measure the level of

persuasion endeavored to measure only the respondent's attitude toward the innovation.

The procedures used in construction of the attitude scales were the same as for the knowledge scales. The actual items used are shown, with their inter-item and item-total correlations, in Tables 8, 9, 10, 11 and 12. The correlations are such that no items were excluded from the calculation of final attitude scores except those for the Ontario Corn Committee. The very low correlation of .20 between item three and the total score, and the correlation of -.39 between items two and three suggested that the index was not very reliable. Consequently, for these and the other reasons presented in the section on the knowledge index, this innovation was excluded from further analysis.

The calculation of each respondent's attitude score was done in the same manner as his knowledge score.

Table 8. Inter-Item and Item-Total Correlations for the Attitude Index for Chemical Weed Control on Sugar Beets (N=50)

Item	Correlation with Items #2	#3	Total
1. How do you feel about the use of pre-emergent weed sprays?	.23	.42	.73
2. Should chemical weeds killers be used on sugar beets?		.35	.74
3. How valuable (useful) is chemical weed control on sugar beets?			.75

Table 9. Inter-Item and Item-Total Correlations for the Attitude Index for Mechanical Thinning of Beets (N=33)

Item	Correlation with Items #2	#3	Total
1. How useful is mechanical thinning?	.32	.60	.78
2. How do you feel about using mechanical thinning?		.52	.81
3. Are you in favor of mechanical thinning?			.81

Table 10. Inter-Item and Item-Total Correlations for the Attitude Index for Chemical Weed Control on Corn (N=67)

Item	#2	#3	Total
1. How do you feel about the use of pre-emergent weed sprays?	.02	.23	.77
2. Should chemical weed killers be used on corn?		.11	.56
3. How valuable is chemical weed control in corn?			.55

Table 11. Item-Item and Item-Total Correlations for the Attitude Index for Ontario Corn Committee (N=25)

Item	Correlation with Items #2	#3	Total
1. Of how much value are their recommendations?	.24	.02	.83
2. How do you feel about having an independent organization to test corn varieties?		-.39	.60
3. When do you usually try a new variety of corn?			.20

Table 12. Item-Item and Item-Total Correlations for the Attitude Index for Soil Sampling (N=28)

Item	Correlation with Items #2	#3	Total
1. Soil samples are useful	.82	.43	.84
2. Indeciding how much fertilizer to use, soil samples are:		.59	.91
3. Since only a small amount of soil is used by the people who analyze a soil sample their recommendations are:			.83

Operationalization of Independent Variables Related to Knowledge

The independent variables used in the present study were age, education, social status, opinion leadership, mass media usage, mass media availability, formal organization membership, number of executive positions in formal organizations, and most important source of information. The sample's averages on each of the independent variables are presented in Table 13. The actual distribution of respondents for each of the variables is shown in Appendix B.

Age was operationalized by asking each respondent "What is your age?" The average for the sample was 45.5 years.

Education was operationalized by asking "What was the last year of school you completed?" The average for the sample was 8.9 years of school completed.

Social status was indexed by means of an index which took into consideration the respondent's financial assets, educational achievement and membership in community organizations. This index was constructed because most traditional social status indices are based primarily on occupation. Since all the respondents were farmers, such an index would not be of value. The three status factors were chosen because they all appear to be logically related to "one's position in the social structure". The index was constructed by determining the distribution of the respondents on each of the three factors. The distributions were each divided as near to the median as the data allowed. Thus, each respondent was categorized as having a low or high score on each of the factors. The median cuts were made as follows: education at eight

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years or less to divided the sample into 59 lows and 47 highs; membership

Table 13. Description of Respondents in the Present Study

Variable	Average for The Sample	Unit of Measure
1. Age	45.5	years
2. Education	8.9	years
3. Social Status	1.4	
4. Opinion Leadership	2.5	
5. Number of Mass Media	9.9	per respondent
6. Total Time Using Mass Media	29.6	hours per week
7. Time on Farm Subjects	6.0	hours per week
8. Membership in Community Organizations	1.6	organizations
9. Membership in Farm Organizations	0.5	organizations

in formal organizations at one or less, to divide the sample into 60 lows and 46 highs; and investment in land, buildings and machinery at $100,000 or less, to divide the sample into 48 lows and 58 highs.

Each subject's score was calculated by counting the number of factors on which he fell into the high group. This gave a possible range of scores from zero to three. The average score was 1.44.

Opinion leadership was measured by means of a self-designating scale consisting of items chosen from scales developed by Lazarsfeld and others (1944) and Rogers (1957). The three questions used and their inter-item and item-total correlations are presented in Table 14. The average opinion leadership score was 2.52.

Table 14. Inter-Item and Item-Total Correlations for the Items Used in Opinion Leadership Index.

Item	Correlation with Items #2	#3	Total
1. Has anyone recently asked you for advice on a new farm practice?	.30	.33	.76
2. Which happens more often, (a) you tell your neighbors about some new farm practice, or (b) they tell about a new practice? (Scored a = 2, b = 0, both or even = 1)		.31	.65
3. Compared with your circle of friends, are you more likely, or less likely to be asked for advice or opinions on a new farm practice? (Scored more = 2, less = 0, same = 1)			.71

Mass media availability was measured by counting the total number of radios, television sets, newspapers, farm magazines and farm organization publications to which the respondent sais he had access. The average was 9.9 per respondent.

Mass media usage was measured by asking the respondent how many hours per week he spent watching, listening to or reading each of the media listed just previously. Two measures of usage were calculated. First, the total hours spent using the mass media, and secondly, the number of hours spent on topics related to agriculture. The average total time spent using mass media and time spent on topics related to agriculture was 29.6 and 6.0 hours, respectively.

Membership in community organization and number of executive positions held in these organizations were indexed by asking the respondent to list all the organizations he belonged to and indicate those in which he held an executive position. Most of the respondents belonged to a relatively small number of organizations. The average was 1.62. As might be expected an even smaller number of individuals held executive positions. The average was 0.52.

The relative importance of various agencies as sources of information about new farm practices was measured using The Most Important Source Index, an instrument based on the forced-choice attitude measurement procedure. The instrument was modified to reduce the number of choices so it could be more easily used in a field interview. The procedure was to first determine which of ten potential sources of information had been used by the respondent in adopting a specified innovation. The respondent was then asked "Which is more important as a source of information about a new farm practice such as _____?" In each case he was asked to indicate the most important of two sources he had utilized. This procedure differed from the standard forced-choice

procedure in that a definite sequence was always used. The sources used were considered in a sequence designed to force the respondent to choose between different types of print media, different electronic media and commercial vs. non-commercial personal sources. Then a choice was forced between the print and electronic media to obtain a mass media source which was compared to the most important interpersonal source (see Appendix A).

Pre-testing indicated that unless all the sources which had not been utilized were first eliminated from the comparisons, the respondents were being asked to make meaningless comparisons. A few subjects found it difficult to make a choice between two quite important sources but the majority answered the instrument quite easily.

Data Collection

The present study was part of a larger research project undertaken by the Economics Branch of the Canada Department of Agriculture to acquire up-to-date information about the production of sugar beets in Ontario. The purpose of the larger study was to determine why former sugar beet growers left the industry, what alternative crops they were now growing, how returns from these crops compared with returns previously received for sugar beets, future intentions of present growers and to compare former and present growers in terms of both farm and personal characteristics.

Data were collected from farmers in the counties of Essex and Kent in Ontario by means of personal interviews by the author and two

assistants, during the months of January and February, 1967. The survey was limited to the two counties where the majority of sugar beet growers reside in order to save time and reduce interviewing costs. In 1964, 85 per cent of all sugar beets in Ontario were grown in these two counties. In 1965, the comparable figure was 80 per cent.

The sample was selected from 1964 and 1966 grower lists supplied by the Canadian and Dominion Sugar Beet Company in Chatham, Ontario. All growers from the two counties involved, who grew beets in 1964 but not in 1966, were assumed to have quit growing beets and were sampled to provide a sample of former growers. All farmers who were on the 1966 list were assumed to be active growers. The growers in both lists were stratified on the basis of whether they grew more or less acres than the yearly average. The interviewees were sampled from the four alphabetic lists by taking every nth name. The number of farmers in each of the four sampling lists, the numbers selected and the number interviewed are shown in Table 15.

Table 15. Sampling Procedure and Completion Rates for the Sugar Beet Study in Ontario

Group	Number in Universe	Number Chosen	Number Interviewed
1. Small Former-Growers	214	55	24
2. Large Former-Growers	121	51	25
3. Small Active Growers	298	47	27
4. Large Active Growers	167	45	30
Totals	800	198	106

In order to increase comparability, simplify data collection and interpretation, those farmers who grew beets in partnership with someone else, women growers, and company farms were not included in the sampling universe. About 6 percent of the growers in 1966 appeared to be either partnerships or females.

The potential interviewees were called on the telephone in order to make an appointment for a personal interview. Of the names selected, 32 individuals were excluded from the survey because they were deceased, had quit farming, left the community, were children, or worked their farm in a partnership with someone else. Thirty potential interviewees could not be found in the local telephone directory, their telephone had been disconnected or the husband could not be contacted when called. Five interviews were calcelled and not rescheduled due to the weather or the failure of the interviewee to be at home when the interviewer called. Thirteen people refused to be interviewed when contacted and an appointment could not be made with 12 others because the farmer was sick, away on a holiday or too busy. One hundred and six interviews were completed. Table 16 presents this information in tabular form.

Table 16. Types of Sample Non-Response

	Number	Per Cent
1. Interviews completed	106	54
2. Excluded because no longer in area or unsuitable	32	16
3. Could not be located	30	15
4. Interviews cancelled because of weather or missed appointment	5	2
5. Refused	13	7
6. Husband sick, too busy or on holidays	12	6
Totals	198	100

Data-Analysis

The information from the questionnaires was coded and punched on electronic data cards. Preliminary data preparation included cleaning the data card decks to check for omissions and errors, the calculation of inter-item and item-correlations to test the reliability of the knowledge and attitude indices and calculation of final knowledge and attitude scores.

The data for each of the four innovations was analyzed separately. This was done because each individual answered questions on one innovation which he had adopted and one which he had not adopted. Since each farmer had completed knowledge and attitude schedules for only two of the four

innovations and the number of farmers who completed schedules for the various innovations was not equal, it was inappropriate to pool the results. By analyzing the four innovations separately, four replications of the hypotheses were achieved. This provided an opportunity to check on differences among innovations.

The data-processing procedures utilized in the analysis of the data consisted of the calculation of distributions, means, both zero-order and partial correlations and multiple regression techniques.

CHAPTER IV

FINDINGS AND DISCUSSION

In this chapter the results are presented and evaluated. Each of the empirical hypotheses is either confirmed or not confirmed and discussed.

Two complementary sets of data were collected which will be used to test the empirical hypotheses. The first consists of the responses of 44 farmers who had considered a major change or purchase during 1966. These data were used to test the first two hypotheses. The other set of data consists of measures of awareness, knowledge about and attitudes toward four innovations. These data were used to test the eight hypotheses dealing with knowledge, and two of the model-validation hypotheses.

Validation of the Conceptual Model

The 44 subjects who had considered making a major change were classified by the outcome of that decision and type of change or innovation contemplated or made. The results of their consideration of a change and the type of innovation involved are shown in Table 17.

The small number of interviews completed and the wide diversity in the type of innovation make analysis of the data difficult. Any findings and conclusions based on these data must therefore be very tentative.

Theoretic Hypothesis 1: <u>The process by which an individual decides to adopt an innovation can be divided into the three stages of information, persuasion, and decision-making</u>.

Table 17

Changes Considered by Respondents

Result of Consideration	Type of Innovation	Number of Subjects	
1. Change actually made	a) New Machine		
	Tractor	16	
	Corn Picker	2	
	Cultivator	1	
	Grain Dryer	1	
	Combine	2	
			22
	b) Buildings		
	Erect pole barn	1	
	Add to barn	2	
			3
	c) Change in land		
	Purchase land	7	
	Sell land	1	
	Rent land	2	
			10
	d) Other		
	Drain swamp	1	
	Increase fertilizer	1	
	Grow tomatoes	1	
	Adopt irrigation	1	
			4
2. Decided to change but not carried out	Chemical weed control	1	
	Steel storage bins	1	
			2
3. Decided not to change	Start Poultry/hog enterprise	1	
			1
4. Still considering	Start beef enterprise	1	
	Purchased land	1	
			2
	Total		44

Empirical Hypothesis 1(a): Individuals will identify three stages when asked about the process they went through in deciding to adopt an innovation.

Empirical Hypothesis 1(b): The three stages identified will be related to information accumulation, attitudinal development, and choosing among alternatives.

The two related empirical hypotheses stated, in effect, that there are three stages in the adoption process and they are related to information accumulation, attitudinal development and choosing among alternatives. The responses of the 44 individuals who had considered a major change in their farm enterprise provide limited support for these hypotheses.

When asked if they went through a series of steps or stages in making their decision, 17 immediately recalled having done so, 11 said they had when the idea of stages and a short outline of the model was presented and 10 said they had not gone through a series of stages.

When the respondents were asked to tell the interviewer what had happened between the time they first heard about the innovation and the time at which they had actually adopted it, only 16 out of 38 were able to explain what went on with any degree of precision. Of these, four explicity identified three stages which were related to information accumulation, attitudinal development and choosing among alternatives. A number of the others mentioned information seeking, acquiring financing, comparing alternative machines and discussion with the salesmen regarding the price. The information-seeking and financing aspects were most often mentioned by the respondents.

Although the data do not explicitly support either of the hypotheses regarding the existence of three stages or the three types of activity which were hypothesized to go on with the three stages, there is implicit support for the idea that the adoption process is a process and that it consists of a series of stages. All of the respondents except one indicated that their decision to adopt was not instantaneous. The one exception was a farmer whose wife had recently died and who, when approached by a sugar company representative, agreed to rent part of his farm to the company. The length of the period between awareness and adoption varied tremendously. For example, among the 16 farmers who had purchased a new tractor, the range extended from two weeks to four years. The average was 22 months.

Of the 10 individuals who said they did not go through a series of steps or stages it is noteworthy that two were respondents who were renting land, one was increasing his use of fertilizer, one had adopted the use of irrigation equipment, one was making an addition to a building, one considered the purchase of a piece of land, and one farmer debated the growing of tomatoes for the first time. Only three involved the purchase of a tractor or other machinery. In general the innovations for which the stages were not reported tended to be slow changes in standard procedures or extensions of previous programs rather than substantial, non-repetitive changes in the farm enterprise.

The failure of the respondents to report the three specific stages postulated while considering the adoption of an innovation may be, in part, a function of the respondent's inability to conceptualize abstract processes. The average number of years of schooling was 8.9. The

majority of respondents had not attended high school and consequently may have been unable to conceptualize a cognitive process in the manner predicted.

Theoretic Hypothesis 2: Four steps, involving the evaluation of an innovation in terms of self-image, resources, cost/reward ration and external restraints can be identified within the decision-making process.

Empirical Hypothesis 2: Individuals will report evaluating an innovation in terms of how it fits into their farm operation, its costs, the relationship between costs and expected benefits and the presence of other non-personal factors which prevent adoption.

The second hypothesis predicted that the respondents would report evaluating an innovation in terms of how it fits into their farm operation, its costs, the relationship between cost and expected benefits and the presence of other restraints. This hypothesis was partially supported by the data from the 41 farmers who indicated they had reached a decision on the major change under consideration. See Table 18 for details.

Table 18. Identification of Steps Within the Decision-Making Stage

	Steps Considered					
	Fit Into Farm Operation		Cost		Cost/Benefit Ration	
	Number	Percentage	Number	Percentage	Number	Percentage
Reported Considering	37	90	39	95	34	83
Reported But Did Not Consider	2	5	0	0	6	15
Unsure or No Reply	2	5	2	5	1	2
Totals	41	100	41	100	41	100

Thirty-seven of the respondents reported thinking about how the change would fit into their farm program. Two did not reply to this question, and two said they did not consider this factor in their decision.

When asked if they had considered the cost of the change, 39 replied positively. Two did not reply. These two were the respondents who had rented their land to the sugar beet processing company. It is not surprising they did not report considering the cost because any cost would be the income foregone by not cropping the land himself. Most farmers tend to think of costs only in terms of expenditures.

Thirty-four of the respondents said they had considered the ratio or relationship between the cost of making the change and the rewards or benefits to be gained. Six indicated they had not made such a comparison and one farmer was not sure if he had done so.

The existence of a step involving the perception of external restraints was difficult to operationalize. The respondents who had adopted the change were assumed not to have been hampered by external restraints. Since all but three of the respondents had actually adopted, the existence of other restraints was not serious.

The very high percentage of respondents who reported evaluating the major change in terms of three of the steps supports the hypothesis that steps or factors can be identified within the decision-making process. The failure to find the fourth step involving other restraints, was primarily due to problems of operationalization.

Attempts to construct a cumulative scale pattern using the four steps were unsuccessful because only three of the respondents who had

made a decision did not make a change. It is highly unlikely that there is a consistent ordering of the four steps because different individuals probably consider different factors first depending upon their circumstances and the type of practice under consideration.

Theoretic Hypothesis 3: An individual who is at any stage of the adoption-rejection process will have completed all previous stages but none of the following stages.

Empirical Hypothesis 3: A cumulative scale pattern can be formed using the outcome of each of the following steps: knowledge level, attitude and decision-making.

The adoption distributions were so skewed that Guttman scalogram analysis could not be properly used for three innovations. The fourth innovation, beet herbicides did not scale in a cumulative fashion. Consequently, the hypothesis was rejected.

Further Findings on Model Validation

Intercorrelations

Although theoretic hypotheses regarding the interrelationship of the three stages of the conceptual model were not developed, the data provided an opportunity to investigate these relationships. Zero-order and partial correlation coefficients were calculated to determine the relationship between knowledge scores and attitude scores, knowledge scores and adoption, and attitude scores and adoption, for each of the four innovations. The results are presented in Table 19.

Table 19. Zero-Order and Partial Correlations Between Knowledge Scores, Attitude Scores and Adoption

Correlation	Farm Practices			
	Beet Herbicides	Mechanical Thinning	Corn Herbicides	Soil Sampling
Knowledge with adoption	.525**	-.042	.232*	.113
Knowledge with adoption, attitude controlled	.495**	-.092	.221*	.084
Attitude with adoption	.217	.429**	.214*	.470**
Attitude with adoption, knowledge controlled	.078	.434**	.203*	.465**
Knowledge with attitude	.293*	.094	.079	.386*
Knowledge with attitude, adoption controlled	.220	.084	.031	.379*

* Significantly different from zero at the 5 per cent level.
** Significantly different from zero at the 1 per cent level.

In the conceptual model, attitude toward an innovation intervenes between knowledge and decision-making and directly precedes decision-making in sense of time. Therefore, it appears logical to expect attitude scores to be positively correlated to adoption, and the correlation to be larger than the correlation between adoption and knowledge scores. For three of the four innovations, the correlation between adoption and attitude score is significant. The correlation between adoption and attitude scores are larger than the comparable correlations between adoption and knowledge scores for two innovations, about the same size for one innovation, and smaller for one innovation.

The relationship between attitude and adoption is almost as strong when knowledge level is controlled as when it is not. This

suggests that the relationship between attitude and adoption is relatively independent of knowledge level. A similar situation exists in terms of the relationship between knowledge level and adoption.

When attitude is controlled, the correlation between knowledge and adoption decreases only slightly for three innovations and changes from -.042 to -.092 for one innovation. The reason the correlation increases for mechanical thinning is because the correlation between knowledge and adoption is negative, while the correlation between attitude and adoption is positive.

The partial correlations between knowledge and attitude with adoption controlled are only slightly smaller than the comparable zero-order correlations. This suggests that the relationship between knowledge and attitude is relatively independent of adoption.

Path Analysis

The data were subjected to further testing using Simon-Blalock causal model analysis (McCrone and Cnudde, 1967). This procedure, usually referred to as "path analysis", enables one to make inferences regarding the adequacy of causal models. In the case of the three variables, information, attitude and adoption, this procedure enables one to make inferences as to whether the path flows from knowledge via attitude to adoption, or alternatively from attitude via knowledge to adoption. In both cases, adoption is assumed to be the dependent variable.

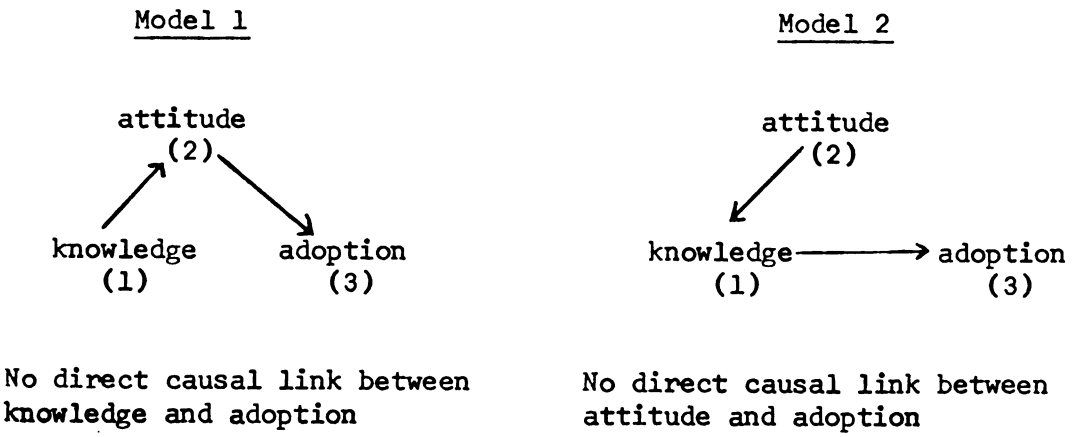
Path analysis consists of computing prediction equations, based on the correlation coefficients between the variables, for alternative

models. Then the predicted relationship is compared to that actually found in the data, and the prediction model which most closely fits the data is confirmed.

Two alternative models of the paths are tested, Model 1 predicts that knowledge influences attitude, which in turn influences adoption. Model 2 predicts that attitude influences knowledge, which in turn influences adoption. These alternative models are shown in Figure 2. For ease of identification, knowledge will be designated as variable #1, attitude as variable #2 and adoption as variable #3.

Figure 2

Alternative Models of the Path of Knowledge, Attitude, and Adoption



No direct causal link between knowledge and adoption

No direct causal link between attitude and adoption

The prediction equations and degree of fit are presented for the four innovations in Tables 20 to 23.

Table 20. Prediction Equations and Degree of Fit for Models of the Adoption Process for Beet Herbicides

Predictions			Degree of Fit	
Models		Predicted	Actual	Difference
1.	$r_{12} \times r_{23} = r\ 1, 3$	(.293)(.217) = .064	.525	.461
2.	$r_{12} \times r_{13} = r\ 2, 3$	(.293)(.525) = .154	.217	.063*

* Smaller discrepancy.

Table 21. Prediction Equations and Degree of Fit for Models of the Adoption Process for Mechanical Thinning

Predictions			Degree of Fit	
Models		Predicted	Actual	Difference
1.	$r_{12} \times r_{23} = r\ 1, 3$	(.094)(.429) = .405	-.042	.447
2.	$r_{12} \times r_{13} = r\ 2, 3$	(.094)(-.042) = -.004	.429	.433*

* Smaller discrepancy.

Table 22. Prediction Equations and Degree of Fit for Models of the Adoption Process for Corn Herbicides

Predictions			Degree of Fit	
Models		Predicted	Actual	Difference
1.	$r_{12} \times r_{23} = r\ 1, 3$	(.079)(.214) = .017	.232	.215
2.	$r_{12} \times r_{13} = r\ 2, 3$	(.079)(.232) = .018	.214	.196*

* Smaller discrepancy.

Table 23. Prediction Equations and Degree of Fit for Models of the Adoption Process for Soil Sampling

Models	Predicted	Degree of Fit	
		Actual	Difference
1. $r_{12} \times r_{23}$ = 1, 3	(.386)(.470) = .181	.113	.068*
2. $r_{12} \times r_{23}$ = 2, 3	(.386)(.113) = .044	.470	.426

* Smaller discrepancy.

On the basis of there findings, it is concluded that for the innovations of beet herbicides, mechanical thinning and corn herbicides, the path flows from attitude, to knowledge, to adoption. For soil sampling the path is infered to be from knowledge to attitude, to adoption.

Hyman's Elaboration Analysis

Further analysis of the data was undertaken, using Hyman's elaboration analysis (Hyman, 1955) to determine whether or not attitude intervenes between knowledge and adoption. The relationship between knowledge scores and the adoption of each of the four innovations is shown in Table 24.

Table 24. The Relationship Between Knowledge and Adoption

Knowledge Level	Percentage of Respondents Adopting			
	Beet Herbicides	Mechanical Thinning	Corn Herbicides	Soil Sampling
High*	59	12	94	77
Low	14	6	84	80

* The division between high and low uses the median as a cutting point. This same division is used for all data in the elaboration analysis.

The relationship between knowledge and adoption when attitude is held constant is shown in Table 25.

Table 25. The Relationship Between Knowledge and Adoption When Attitude Is Held Constant

	Percentage of Respondents Adopting							
	Beet Herbicides		Mechanical Thinning		Corn Herbicides		Soil Sampling	
	Knowledge Levels							
Attitude Score	High	Low	High	Low	High	Low	High	Low
High	18	22	25	14	95	100*	83	100
Low	33	13*	0	0*	94	75	71	63

* Difference is smaller than in the original distribution.

For attitude level to be an intervening variable between knowledge level and adoption, the partial relationship between knowledge level and adoption must be smaller when the total sample is stratified according to different attitude levels, than it was originally. This means that when attitude level is held constant, the difference in the percentage of respondents with high knowledge scores and those with low knowledge scores will be smaller than the difference when attitude is not held constant. This relationship can be checked for both those respondents with high and low attitude scores.

The data indicate that the difference in level of adoption is smaller for only those respondents with low attitude scores who adopted beet herbicides and mechanical thinning, and those with high attitude scores who adopted corn herbicides. Since the relationship held for only three out of eight tests and in each case for only one level of attitude, it is generally concluded that attitude level is not an intervening variable between knowledge level and adoption.

A similar analysis was undertaken to determine whether or not knowledge level intervenes between attitude level and adoption. The data are presented in Tables 26 and 27. A similar pattern of relationships was found as for the previous analysis. Therefore it is concluded that knowledge level is not an intervening variable between attitude level and adoption.

The previous analysis of the data suggests that adoption is relatively independent of both knowledge levels and attitudes. Neither appears to act as on intervening variable between the other and adoption.

Table 26. The Relationship Between Attitude and Adoption

	Percentage of Respondents Adopting			
Attitude Level	Beet Herbicides	Mechanical Thinning	Corn Herbicides	Soil Sampling
High	46	19	97	92
Low	46	0	85	67

Table 27. The Relationship Between Attitude and Adoption When Knowledge Is Held Constant

	Beet Herbicides		Mechanical Thinning		Corn Herbicides		Soil Sampling	
	Attitude Levels							
Knowledge Score	High	Low	High	Low	High	Low	High	Low
High	78	33	25	0	95	94*	83	71*
Low	22	13	14	0*	100	75	100	63

* Difference is smaller than in the original distribution.

Predicting Adoption

Given the significant relationships between adoption and knowledge scores, and adoption and attitude scores, the data are further analyzed to determine how useful these measures are as predictors of adoption. The probability of adoption for each of the innovations was calculated by dividing the number of adopters by the total number who were questioned on the given innovation. This was considered to represent the probability of adoption for the sample when knowledge and attitude are not considered. These probabilities are presented in Table 28.

The probability of adoption was calculated in a similar manner for the following categories of the sample for each innovation: (1) individuals who scored above the median on both knowledge and attitude indices; (2) individuals who scored below the median on both knowledge and attitude; (3) individuals who scored high on the knowledge index; (4) individuals who scored low on the knowledge index; (5) individuals who scored high on the attitude index; and (6) individuals who scored low on the attitude index. The probability of adoption is shown for each category in Table 28.

From Table 28 it is apparent that individuals who are above the median on both knowledge and attitude are more likely to adopt than those who are below the median on both, or are above the median on knowledge only. For two of the innovations it is also true that individuals who are high on both knowledge and attitude are also more likely to adopt than those who are only high on attitude.

If an individual scores below the mean on both indices, the probability he will adopt is lower than for any of the other situations.

If an individual has a positive attitude toward the innovation, as indexed by his median attitude score, his chances of having adopted are higher than if he has a negative attitude. For three of the innovations, the same holds true for a high knowledge score.

Attitude scores appear to be a better predictor of adoption than are knowledge levels, as we might expect. The likelihood of adoption was higher for subjects with positive attitudes than those with high knowledge levels for three of the four innovations. Similarly, the chance of adopting with a negative attitude is less than with low knowledge for two innovations, about the same for one, and higher for one.

In general the probability of adoption runs from highest to lowest in the following order: (1) above the median on both knowledge and attitude; (2) above the median on attitude; (3) above the median on knowledge; (4) nothing known about knowledge or attitude (control); (5) below the median on knowledge; (6) below the median on attitude, and (7) below the median on both. The ranks for the seven situations were tested by means of Kendall's test of concordance to determine whether or not the ranking on the four innovations differed. Kendall's W is .85, which is greater than the .52 necessary for significance at the 5 per cent level.

The previous findings suggest the conceptual model can be used in predicting adoption, if one has information about respondents' knowledge level and direction and intensity of attitude toward an innovation

Table 28. Probability of Adoption of Four Innovation for Various Knowledge and Attitude Levels.

Probability of Adoption	Innovation			
	Beet Herbicides	Mechanical Thinning	Corn Herbicides	Soil Sampling
1. For the Entire Sampling	.34	.09	.91	.79
2. If High Both in Knowledge and Attitude	.77	.25	.95	.83
3. If Low Both in Knowledge and Attitude	.13	.00	.76	.63
4. If High in Attitude	.46	.19	.97	.92
5. If Low in Attitude	.46	.00	.85	.67
6. If High in Knowledge	.59	.12	.94	.77
7. If Low in Knowledge	.14	.06	.82	.80

Information Hypotheses

The hypotheses relating various social and personal variables to knowledge about four specific innovations are discussed in the following section. The hypotheses are each tested using both zero-order and partial correlations.

The zero-order correlations are a much less precise estimate of the relationship between knowledge level and each of the variables studied than the partial correlations. Zero-order correlations make no allowance for the influence of other variables which may partly determine knowledge level. The partial correlations used are tenth-order correlations; that is, they are a measure of the relationship between knowledge level and a given variable when the influences of the other ten variables in the study are all held constant. The tenth-order correlations provide the more stringent test of the hypotheses.

The zero-order correlations for each of the eleven independent variables are presented in Table 29 and the partial correlations in Table 30.

General Hypothesis 4: Knowledge about an innovation is positively related to educational achievement.

Empirical Hypothesis 4: An individual's score on the knowledge index is positively correlated to the last year of school completed.

The zero-order correlations are significant at the 5 per cent level for two innovations, beet herbicides and soil sampling. The correlations for the other two innovations are quite small. The partial correlations

Table 29. Zero-Order Correlations Between Knowledge Levels and Various Social and Personal Characteristics

Social and Personal Characteristics	Innovations			
	Beet, Herbicides	Mechanical Thinner	Corn Herbicides	Soil Sampling
1. Education	.306*	.050	-.032	.343*
2. Age	-.092	-.440	-.088	.182
3. Opinion Leadership	.096	.218	.013	.230
4. Social Status	.273*	.350*	-.143	.096
5. Membership in Formal Organizations	.215	.454**	.005	.181
6. Executive Positions in Formal Organizations	.122	.161	.031	.085
7. Membership in Farm Organizations	.413**	.222	-.051	.357*
8. Executive Positions in Farm Organizations	.258*	.033	.077	.168
9. Number of Mass Media Available	.098	.347*	.213	.158
10. Total Time Using Mass Media	.102	.369*	-.027	-.260
11. Mass Media Usage Related in Farming	.106	.121	.293*	-.134

* Significantly different from zero at the 5 per cent level

** Significantly different from zero at the 1 per cent level.

Table 30. Partial Correlations Between Knowledge Levels and Various Social and Personal Characteristics.

Social and Personal Characteristics	Innovations			
	Beet Herbicides	Mechanical Thinner	Corn Herbicides	Soil Sampling
1. Education	.228	-.007	.053	.346
2. Age	.114	-.277	-.061	.231
3. Opinion Leadership	.075	.149	-.031	.261
4. Social Status	.012	-.142	-.140	-.179
5. Membership in Formal Organizations	-.033	.331	.099	.137
6. Executive Positions in Formal Organizations	.099	-.085	-.168	-.009
7. Membership in Farm Organizations	.343**	-.227	-.128	.117
8. Executive Positions in Farm Organizations	-.179	.073	.124	.039
9. Number of Mass Media Available	-.200	.310	.129	.021
10. Total Time Using Mass Media	.044	.336	-.150	.053
11. Mass Media Usage Related to Farming	.025	-.293	.277*	-.331

* Significantly different from zero at the 5 per cent level.
** Significantly different from zero at the 1 per cent level.

between knowledge level and number of years of schooling, follow the same pattern as the zero-order correlations, except none are large enough to be significant.

The data only partially support the empirical hypothesis, and indicate that the relationship between knowledge level and education is a function of the innovation studied.

Theoretic Hypothesis 5: The relationship between knowledge about an innovation and age is curvilinear.

Empirical Hypothesis 5: Those individuals who are between the ages of forty-one and fifty will score higher on the knowledge index than those who are either younger or older.

The data, when tested by analysis of variance, reveals a significant relationship between age and knowledge about mechanical thinning of beets. The individuals who are forty and under have the highest scores while those over fifty have the lowest scores. A similar pattern was observed for the knowledge scores on beet herbicides but the differences in the means are not significant. The means follow the pattern hypothesized for only one innovation, soil sampling, but here again the differences are not significant. The negative relationship between age and knowledge, observed in the analysis of variance results for three innovations, is demonstrated for the same three innovations by the zero-order correlations. When the other ten variables are controlled, the negative relationship remains for only mechanical thinning and corn herbicides.

On the basis of the results of the analysis, the hypothesis must be rejected. The data indicate that the relationship between knowledge

level and age is negative.

Theoretic Hypothesis 6: Knowledge about an innovation is positively related to opinion leadership.

Empirical Hypothesis 6: An individual's score on the knowledge index is positively correlated to his score on the self-designated opinion leadership index.

The results of the data-analysis indicate that the correlations between knowledge level and opinion leadership, are positive but not significant for all four innovations. Two of the zero-order correlations, .22 and .23, approach significance. The two comparable partial correlations are also positive but not significant.

The empirical hypothesis is rejected because the correlations, although positive, do not reach the 5 per cent level of significance.

Theoretic Hypothesis 7: Knowledge about an innovation is positively related to social status.

Empirical Hypothesis 7: An individual's score on the knowledge index is positively correlated to his score on the status index.

For two innovations, the zero-order correlations are positive and significant at the 5 per cent level. One of the others is negative and not significantly larger than zero, while the other is .096. Three of the partial correlations are negative, and the fourth is only .012. This suggests that the apparent positive relationship between knowledge level and social status is spurious.

On the basis of the observed correlations, the hypothesis must be

rejected.*

Theoretic hypothesis 8: Knowledge about an innovation is positively related with membership and participation in formal organizations.

Empirical Hypothesis 8(a): An individual's score on the knowledge index is positively correlated with the number of formal organizations to which he belongs.

A zero-order correlation of .454 which is significantly different from zero at the 1 per cent level, exists between membership in organizations and knowledge of mechanical thinning of beets. The relationship is in the predicted direction for two other innovations. For the fourth innovation, herbicides on corn, the correlation is zero. While none of the partial correlations are significant, three of them are positive and one is almost significant at the 5 per cent level.

The hypothesis is rejected, since it is only supported for on of the four innovations.

Empirical Hypothesis 8(b): An individual's score on the knowledge index is positively correlated with the number of executive positions he holds in formal organizations.

The zero-order correlations are in the predicted direction, but none are significantly larger than zero. Two of the partial correlations are positive, and two are negative. Consequently the hypothesis is rejected.

* The index of social status, because it includes measures of education and membership in formal organizations, may not be reliable. This is particularly true for partial correlations because education and membership in formal organizations were held constant when they were calculated.

Empirical Hypothesis 8(c): The correlation between an individual's score on the knowledge index and the number of executive positions held in formal organizations, will be larger than the correlation between score on the knowledge index and the number of formal organizations to which he belongs.

This hypothesis is not supported by the empirical findings. For the innovations, a comparison of the correlations suggests that the opposite may be true. When "t" tests were computed to determine whether or not the correlations are significantly different, the results indicated a significantly larger relationship for only one innovation. The correlation between membership in formal organizations and knowledge about mechanical thinning is larger than between executive positions held and knowledge. For the other innovations, the correlations are not significantly different from each other.

The form in which the data were collected allows further analysis to investigate the relationship between knowledge scores and membership and executive position-holding in farm-related organizations. A positive zero-order correlation exists between knowledge scores and membership in farmer organizations for three innovations. One of these is significantly different from zero at the 1 per cent level of confidence, one at the 5 per cent level, and the third correlation of .222 is not significant. The fourth correlation is negative and quite small (see Table 29). A significant positive correlation exists between executive positions held in farmer organizations and knowledge scores for only one innovation. A comparison of the correlations shows that for three innovations, the correlation between knowledge level and executive position held in farmer

organizations is larger than the correlation between knowledge level and membership in farmer organizations.

A comparison of the correlations indicates a stronger relationship between membership in farmer organizations than total organization membership for two innovations, no difference for one innovation, and a weaker relationship in the fourth case. The same pattern of relationships is found when the correlations between knowledge and farmer organization executive positions are compared to those between knowledge and all executive positions.

The data suggest that knowledge about innovations is related to the four measures of community participation in the following order: (1) the number of farmer organizations in which membership is held; (2) total organizational membership; (3) number of executive positions in farmer organizations; and (4) total number of executive positions.

Theoretic Hypothesis 9: Knowledge about an innovation is positively related to mass media availability.

Empirical hypothesis 9: An individual's score on the knowledge index is positively correlated to the number of mass media available.

The zero-order correlations are all in the predicted direction, but only one, mechanical thinning, is significant. Three of the partial correlations are positive and one is negative. None of the latter are significant.

They hypothesis is rejected in view of the results of the analysis.

Theoretic Hypothesis 10: Knowledge about an innovation is positively related to mass media usage.

Empirical Hypothesis 10(a): An individual's score on the knowledge index is positively correlated to the total number of hours spent per week in watching television, reading newspapers and magazines and listening to radio.

Of the four zero-order correlations between knowledge and total mass media usage, one is positive and significant at the 5 per cent level, a second and third are positive and the fourth is negative and approaches significance. One of the partial correlations is almost significant, two others are positive but small, and the fourth is negative. Therefore, the hypothesis is rejected.

Empirical Hypothesis 10(b): An individual's score on the knowledge index is positively correlated to the number of hours spent per week in watching, reading and listening to farm-related topics.

Only one of the zero-order correlations, corn herbicides, supports the hypothesis at the 5 per cent level of significance. Two of the other correlations are positive and one is negative. The partial correlation for corn herbicides is positive and significant at the 5 per cent level. One of the others is positive but very small. The other two are negative.

The hypothesis is rejected because of the size and direction of the majority of the correlations.

Theoretic Hypothesis 11: Knowledge about an innovation is related to the relative importance attributed to mass rather than interpersonal sources of information about innovations.

Empirical Hypothesis 11: An individual's score on the knowledge index is positively correlated to his tendency to choose one of the mass media sources in preference to one of the interpresonal sources when asked to make such a choice using the most important source index.

The hypothesis that individuals who prefer mass media sources in preference to interpersonal sources would score higher on the knowledge indices could not be tested. Of the 96 respondents who answered the series of questions on source importance, only twelve indicated that one of the mass media was the most important source of information on a specific topic. Of these, the largest number of respondents whose knowledge level was measured for a given innovation was six. Such a small number of subjects per innovation did not allow meaningful analysis.

A comparison of the results of the analysis of the data using zero-order and partial correlations is presented in Table 31. From the table it is obvious that few of the zero-order correlations are significant and only one partial correlation is significant.

The use of partial correlations, which control on all the other variables measured, provides a more rigorous test of a hypothesis. Since the number of subjects was small and the knowledge indices were based on only three items, it is perhaps not surprising that few of the partial correlations are significant at the 5 per cent level.

Table 31. Comparisons of Results of Hypotheses Using Zero-Order and Partial Correlations

Independent Variable	Number of Innovations for which the Correlation Is Significant at the 5 per cent Level (and in the Predicted Direction)	
	Zero-Order Correlations	Partial Correlations
1. Education	2	0
2. Opinion Leadership	0	0
3. Social Status	2	0
4. Membership in Formal Organizations	1	0
5. Holding Executive Position in Organizations	0	0
6. Number of Mass Media Available	1	0
7. Total Mass Media Usage	1	0
8. Farm-related Mass Media Usage	1	1

A Comparison of Adopters and Non-adopters

In testing each of the information hypotheses, the data included the responses of some individuals who had adopted the innovation and others who had not. The existence of a positive relationship between knowledge score and adoption for two innovations, beet herbicides and soil sampling, suggested that the correlations should be recalculated separately for adopters and non-adopters. This was done for beet herbicides, but was not done for soil sampling because all but six of the subjects had adopted. Analysis based on such a small number of subjects was considered inappropriate.

The 50 subjects who completed the questions on beet herbicides were divided into two categories of 17 and 33, respectively, on the basis of whether or not they had adopted the new practice. The correlation between the independent variables and the knowledge scores of the individuals in the whole group, and the two sub-groups, are presented in Table 23.

The data indicate that the relationship between knowledge level and two factors, community participation and total mass media usage, is different for adopters than non-adopters. On the basis of the additional information gained from controlling for adoption, different findings are reported for Hypothesis 9, which related knowledge and community participation, and Hypothesis 11, which related knowledge and total mass media usage. The findings for the other hypotheses are not changed.

The results in Table 23 suggest that for adopters, knowledge about an innovation is related to membership and holding executive positions in both farm and non-farm organizations. For non-adopters,

Table 32. Correlations Between Knowledge Scores on Beet Herbicides and Various Social and Personal Characteristics

Independent Variables	Knowledge Scores on Beet Herbicides		
	All Respondents (N=50)	Adopters (N=17)	Non-Adopters (N=33)
1. Education	.306*	.408*	.339*
2. Age	-.092	.122	-.178
3. Opinion Leadership	.096	.125	.024
4. Social Status	.273*	.457*	.321*
5. Membership in Formal Organizations	.215	.637*	.074
6. Executive Positions in Farm Organizations	.122	.555*	-.006
7. Membership in Farm Organizations	.413**	.609*	.174
8. Executive Positions in Farm Organizations	.258*	.586*	.030
9. Number of Mass Media Available	.098	.283	.106
10. Total Time Using Mass Media	.102	-.243	.398*
11. Mass Media Usage Related to Farming	.106	-.108	.162

* Significantly different from zero at the 5 per cent level.
** Significantly different from zero at the 1 per cent level.

their knowledge levels appear to be independent of all four measures of community participation. The hypothesis that knowledge level is positively correlated to community participation is accepted for adopters and rejected for non-adopters.

Total time spent using the mass media is significantly, positively correlated to knowledge for non-adopters, but negatively correlated for non-adopters. This suggests that adopters obtain their information from personal sources while non-adopters get their information from the mass media.

The hypothesis that knowledge level is positively correlated to total mass media usage is accepted for non-adopters, but is rejected for adopters.

In the following section the results of further analysis of the data using multiple regression techniques are presented. Additional findings including a discussion of the interrelationship between the independent variables and the relationship between the independent variables and attitude scores are shown in Appendix B.

Further Analysis

The data were further analyzed using multiple regression procedures to determine the composite, relative importance of the independent variables in explaining variation in knowledge levels.

The computer program that was used removes the influence of each independent variable, one at a time, starting with the variable which

contributes the least to explaining variance in the dependent variable. Variables are deleted until only those which ontribute significantly to the total variance component, at the five per cent level, remain. These variables are the best predictors of knowledge level because they explain more of the variability in knowledge level than those previously deleted.

The analysis was undertaken for each innovation, first with all the farmers who answered questions on that innovation, and then the analysis was repeated for adopters and non-adopters separately. Since either the number of adopters or non-adopters is extremely small for all innovations except beet herbicides, the analysis was not done for groups of less than seventeen. The results will be presented by innovation.

Beet Herbicides

The results indicate that for all the farmers, only one independent variable meets the criteria at the five per cent level (Table 33). This variable, membership in farm organizations, explains 17 per cent of the total variance in knowledge about beet herbicides.

When the farmers are divided on the basis of adoption and non-adoption of beet herbicides, the single significant independent variable for adopters is total organizational membership and the two significant variables for non-adopters are total time spent using the mass media and social status. These results are not as inconsistent as they might appear to be on the surface. Membership in farm organizations and total organizational membership are correlated .61. Social status, one of the variables which met the 5 per cent level criterion for non-adopters, is correlated .59 with total organizational membership.

There is a common variance related to membership in organizations, which is most important in terms of total organizational membership, for adopters, social status for non-adopters, and membership in farm organizations for all the farmers.

Dividing the sample on adoption increased the amount of variance explained by both the eleven independent variables and by those which met the criterion (Table 33). The data for adopters include only 17 farmers, so it may not be very reliable.

Mechanical Thinner

Only one variable, total number of organizational memberships, met the criterion. It explains 21 per cent of the variance. Since only six farmers had adopted mechanical thinners, the results did not change very much when there respondents were removed from the sample and the coefficients of determination re-calculated for non-adopters. The total variance explained by all eleven variables increases by about 1 per cent, while the amount of variance explained by total membership in organizations rises from 21 per cent to 30 per cent.

Corn Herbicides

Only one variable, time spent using the mass media on topics related to farming, met the criterion for adopters and non-adopters combined. This same variable reached the criterion for adoptors. The calculations are not presented for non-adopters because the number of farmers involved was only six. Time spent on farm-related topics explained only 10 per cent of the variance, about half of the amount explained by all 11

Table 33. Percentage of Explained Variance in Knowledge Scores Accounted For by the Social and Personal Variables for Beet Herbicides and Mechanical Thinner

Variables	Innovations									
	Beet Herbicides						Mechanical Thinner			
	All Farmers		Adopters		Non-adopters		All Farmers		Non-adopters	
	Per Cent	Order Retained	Per Cent	Order Retained	Per Cent	Order Retained	Per Cent	Order Retained	Per Cent	Order Retained
Number of Mass Media Available	3.35	3	1.80	10	0.74	5	1.84	5	2.94	4
Total Time Using Mass Media	0.51	8	10.16	5	16.62*	1	7.67	3	4.45	3
Time on Farm Related Material	0.04	10	4.80	4	0.15	11	4.19	6	3.30	5
Membership in Farm Organizations	17.05*	1	2.51	8	3.15	8	9.12	2	3.81	2
Total Organization Memberships	0.04	9	40.63*	1	0.38	10	20.62*	1	30.29*	1
Executive Positions in Farm Organizations	1.90	4	2.06	7	0.90	7	0.27	10	0.29	10
Total Executive Positions	0.46	5	2.80	9	1.11	6	0.15	9	0.19	9
Age	0.52	2	8.28	2	1.70	4	5.16	4	3.14	6
Education	4.87	6	8.24	3	1.77	9	0.00	11	1.52	7
Opinion Leadership	0.68	7	3.45	6	2.45	3	0.55	7	1.64	8
Social Status	0.01	11	0.05	11	11.15	2	1.24	8	0.40	11
Total Variance Explained by All Above Variables	29.43		84.79		39.97		50.81		51.97	

* The amount of variance contributed to the total variability, by this variable, is significant at the 5 per cent level.

Table 34. Percentage of Explained Variance in Knowledge Scores Accounted For by the Social and Personal Variables for Corn Herbicides and Soil Sampling

Variables	Innovations							
	Corn Herbicides				Soil Sampling			
	All		Adopt		All		Adopt	
	Per Cent	Order Retained	Per Cent	Order Retained	Per Cent	Order Retained	Per Cent	Order Retained
Number of Mass Media Available	1.04	6	0.71	5	0.02	10	0.49	8
Total Time Using Mass Media	4.35	2	3.82	2	0.22	8	0.32	9
Time on Farm Related Material	9.58*	1	8.72*	1	7.59	3	6.19	2
Membership in Farm Organizations	.49	4	0.69	8	6.00	2	0.00	11
Total Organization Memberships	0.49	8	1.19	7	1.26	7	7.33	3
Executive Positions in Farm Organizations	1.80	3	0.20	10	0.13	9	0.49	7
Total Executive Positions	1.47	5	1.06	6	0.01	11	0.05	10
Age	0.36	9	0.02	11	3.21	5	3.07	4
Education	0.24	10	0.69	4	13.97	1	16.72	1
Opinion Leadership	0.07	11	0.34	9	5.92	4	0.68	6
Social Status	0.76	7	3.52	3	0.93	6	1.66	5
Total Variance Explained by All Above Variables	20.65		20.96		39.26		37.00	

variables for all the farmers and slightly less than that explained for adopters. See Table 34.

Soil Sampling

None of the variables met the criterion at the 5 per cent level for the soil sampling practice. The last variable deleted was education, which explained 14 per cent of the variance, compared to 39 per cent for all 11 variables. When the non-adopters were removed and the analysis repeated, all of the variables again failed to meet the 5 per cent criterion.

Discussion

Interpretation of the results is complicated by the inclusion of social status and two of the three component measures used in its construction. These were education and total number of memberships in organizations. There is a tendency for only one of the three variables to be a major contributor to the total amount of variance explained.

The majority of independent variables used in the analysis account for only a very small amount of the variability in knowledge about the four innovations. The variables which explain a significant amount of the variance are either measures of membership in community organizations or time spent in using the mass media. Adoption does not appear to determine whether media usage or membership in community organizations is the most important determinant of knowledge level.

Media usage is a direct measure of information contact while membership in community organizations is a measure of potential information exchange. Both of the variables which explain the largest amount

of variability in knowledge levels are measures of communication activity. Knowledge about an innovation is more directly related to communicative activity than to personal, social or situational variables. Knowledge about innovations is a function of how efficiently a farmer utilizes either of the two major sources of information, the mass media or interpersonal contacts gained through participation in community organizations.

CHAPTER V

SUMMARY, CONCLUSIONS AND IMPLICATIONS

In this chapter the research project is reviewed and summarized, conclusions are stated, the empirical findings are evaluated, the theoretic hypotheses discussed and the implications for action programs and future research are presented.

Summary

The objectives of this research project were twofold. The first objective was to validate a functional model of the adoption-rejection process. The second objective was to study the first stage of the theoretic model to determine the relationship between a number of social and personal variables and knowledge about specific innovations.

The theoretic model presented assumes there are three stages or sub-processes within the adoption-rejection process. The three types of activity, which are believed to interact, are related to (1) information accumulation, (2) attitudinal development, and (3) choosing among alternatives. For ease of discussion the three stages are called Information, Persuasion and Decision-Making. Detailed study of the information stage was undertaken to determine the relationship between knowledge about four farm innovations and a number of social and personal variables.

A sample of cash crop farmers from two counties of Southwestern

Ontario was drawn by selecting names at random from lists of active and former sugar beet growers. Personal interviews were completed with 106 farmers during January and February of 1967 by the investigator and two associates from the Economics Branch of the Canada Department of Agriculture.

The personal interview schedule consisted of a series of questions and indices designed to gather information regarding major changes in the farm business, knowledge about and attitudes toward new cropping practices and measures of each farmer's education, age, social status, opinion leadership, the number of mass media available, mass media usage, community participation and sources of information used in gathering information on new farm practices. The innovations selected for study were sugar beet herbicides, corn herbicides, the use of a mechanical thinner on sugar beets and soil sampling. Each farmer was asked a series of questions regarding one innovation which he had adopted and one which he had not adopted.

The responses were coded, punched on electronic data-processing cards and analyzed to test 11 hypotheses. The theoretic hypotheses and the findings for each are presented below:

Hypothesis 1: The process by which an individual decides to adopt an innovation can be divided into the three stages of information, persuasion, and decision-making. This hypothesis was partially supported.

Hypothesis 2: Four steps, involving the evaluation of innovations in terms of self-image, resources, cost/reward ratio and external restraints can be identified within the decision-making process. This hypothesis was supported for the first three of the steps but not the fourth.

Hypothesis 3: An individual who is at any stage of the adoption-rejection process will have completed all previous stages but none of the following stages. This hypothesis, when tested using Guttman scaling techniques was not supported.

Hypothesis 4: Knowledge about an innovation is positively related to educational achievement. This hypothesis was supported for two innovations, but not for two others.

Hypothesis 5: The relationship between knowledge about an innovation and age is curvilinear. This hypothesis was not supported.

Hypothesis 6: Knowledge about an innovation is positively related to opinion leadership. This hypothesis was not supported.

Hypothesis 7: Knowledge about an innovation is positively related to social status. This hypothesis was supported for two innovations.

Hypothesis 8: Knowledge about an innovation is positively related to membership and participation in formal organizations. This hypothesis was not generally supported. There is evidence that it is supported for adopters but not for non-adopters.

Hypothesis 9: Knowledge about an innovation is positively related to mass media availability. This hypothesis was supported for two innovations.

Hypothesis 10: Knowledge about an innovation is positively related to media usage. This hypothesis was not generally supported for all the farmers, but there was evidence to suggest that it was supported for non-adopters but not adopters.

Hypothesis 11: Knowledge about an innovation is related to the relative importance attributed to mass media rather than interpersonal sources of information about innovations. This hypothesis could not be tested because of the very small number of farmers who chose one of the mass media as the most important source of information on farm-related subjects.

Conclusions

The following specific conclusions were derived directly from the tests of the theoretic hypotheses.

1. The validity of the three stage model was partially supported by the data from the farmers who had considered making a major change.
2. The validity of the three stage model was not supported by attempts to construct a cumulative scale pattern.
3. The existence of three steps or considerations within the decision-making stage, namely perception of self-image, costs and the cost/reward ration, was supported by the data.
4. Knowledge about innovations was positively related to:
   (a) Education
   (b) The number of mass media available

5. Knowledge about innovations was negatively related to age.
6. Knowledge about innovations was not related to:
   (a) Opinion leadership
   (b) Participation in formal organizations
   (c) Social Status
   (d) Mass media usage

The following general conclusions were derived from the results of the present research study.

1. It is possible to construct knowledge level and attitude indices which can be used in a field interviewing situation.
2. Attitude toward an innovation is more highly correlated to adoption than knowledge about the innovation. Therefore, attitude toward an innovation is a better predictor of adoption than knowledge about the innovation.
3. Multiple regression analysis indicates that knowledge about innovations is more directly related to measures of communication contact, such as mass media usage and community participation, than to personal or social characteristics.
4. Interpersonal sources are more important as sources of information to farmers, on farm-related subjects, than are the mass media.
5. The majority of personal and social variables used in the study are poor predictors of knowledge level.

Evaluation of Empirical Methods

The empirical hypotheses were not supported for a number of reasons. These include inadequacies in the theory of conceptual framework from which the hypotheses were derived; improper analysis of the data in the sense of not utilizing all the information collected; using improper statistical tests or failing to collect all the data needed; improper operationalization of the dependent and independent variables; and non-representativeness of the sample due to either sampling bias or the presence of intervening variables. Each of these potential shortcomings will be discussed, and then the empirical findings will be reviewed to determine why the research results differed from the theoretic hypotheses.

The Sample

In analyzing potential sources of error in the sample, the major concern is to determine the presence of intervening variables. Intervening variables of two types are discussed, those which make the sample non-representative of the population and those, which if uncontrolled, invalidate the findings.

The farmers who were interviewed are believed to be representative of the population from which they were chosen, but are not necessarily representative of all Canadian farmers. They were chosen on the basis of growing a specific crop, sugar beets, and were selected to provide equal numbers of farmers who had discontinued beet production and farmers who had grown beets in 1966, for the purposes of the longer project of which this study was one part. If beet growing is related

to personal characteristics of farmers, then the sample may be biased on them. No data exist to suggest this is the case. The farmers interviewed are not typical of all Canadian farmers because the region is one of the most productive agricultural areas in Canada. The average investment in land and buildings, average crop yields, and potential number of cash crops which can be grown are higher than the national averages.

The correlation between knowledge levels and adoption suggests that adoption may be an intervening variable. Had the number of farmers who had not adopted, and the number of subjects been large, this would not have been a problem. It would have been quite easy to control for adoption and determine the correlations first for adopters and then for non-adopters. This was done for the innovation of best herbicides. For the other three innovations the number of individuals in either the adopter or non-adopter cell was too small to permit meaningful analysis. In the case of the mechanical thinner, only three farmers had adopted. In the case of corn herbicides and soil sampling, all but six of the farmers had adopted.

Accurate measures of the degree of adoption of the various innovations were not available, and there was no way of identifying adopter and non-adopters in advance. Had these data been available, the sample could have been chosen in such a manner as to guarantee adequate numbers of both adopters and non-adopters, and thus provide a means of controlling for adoption.

Operationalization and Measurement

The present study required the operationalization of a large number of dependent and independent variables. The reliability of each of the knowledge and attitude indices was determined by means of item-total and item-item correlations. These correlations were presented in Chapter III and indicated, except for one innovation (recommendations of the Ontario Corn Committee) that the indices are generally adequate. One item was dropped from the knowledge of soil sampling index because it failed to discriminate. All but one farmer had correctly answered the question.

The reliability of the independent variables could not be checked by correlational methods except for the opinion leadership index. In this one case, the correlations indicated an adequate level of reliability.

The major problem of testing the hypotheses regarding the validity of the conceptual model was to find an innovation or change which was so important that the farmer could remember how he had decided to adopt or reject. Information gathered about a minor decision, or one which was made several years before the interview, cannot be expected to be reliable in the test-retest sense. Efforts were made to overcome these problems by asking about a major change in the farm enterprise. This attempt proved only partly successful because only one farmer said that he had contemplated making a change but had decided not to carry it out. The results suggest that farmers who have rejected a change tend to forget or are unwilling to admit that they had decided

not to make a change. A further problem with these data was the small number of cases collected because the majority said they had not contemplated making a major change.

Operationalizing some of the steps which were hypothesized to exist within the decision-making stage proved difficult, particularly the consideration of external restraints. Similarly, indexing awareness proved difficult because it is conceptually difficult to differentiate between awareness and knowledge. It also presents operational problems because respondents were unwilling to admit they had not heard of a new product or practice.

Measuring knowledge level presents the problem of deciding whether to attempt to index absolute or relative levels of information. In order to measure the absolute level of information a very long and detailed schedule would be necessary. Using a few questions is easier but difficulties arise when efforts are made to evaluate the data in scaling procedures such as Guttman scalogram analysis. The cutting points on the knowledge index may be so high or so low that the number of subjects in the extreme group is very small, and thus limits the use of the scaling technique.

Data-Analysis and Controls

It was not possible to control for adoption in the analysis of the relationship between knowledge levels and social variables for three of the innovations because the number of adopters was so much different than the number of non-adopters. The skewed adoption distributions resulted from a lack of information on the degree of adoption

in the population and from the sampling procedure. Each respondent was questioned regarding one innovation he had adopted and one he had not adopted. With a small sample it was difficult to meet this criterion and obtain a relatively equal number of adopters and non-adopters for each innovation. Adoption was in effect controlled for by sampling, as almost all respondents answered questions for one innovation they had adopted and one they had not adopted, but not for the individual innovations.

Hypotheses

The final type of shortcoming which should be considered in trying to determine why an empirical hypothesis was not confirmed is incorrect hypotheses. In trying to explain the failure of the data to confirm an empirical hypothesis, the experimenter looks at the potential sources of error discussed previously; if none of these appear to be present, he is forced to accept the conclusion that his theoretic hypothesis was wrong. At this point the investigator is faced with the problem of revising his theory to be consistent with his research findings.

One word of caution regarding types of error must be presented. Findings which support an empirical hypothesis must be as rigorously evaluated for sources of error as those which do not support a hypothesis. Otherwise the experimenter may be led to believe a relationship exists which in fact is a function of the sample, his operationalizations or inadequate analysis and controls.

In the following section each of the empirical hypotheses will be evaluated to determine potential sources of error.

Discussion of Theoretic Hypotheses

The purpose of this section is to review the results of the empirical hypotheses, to try to establish potential sources of error in the data, to determine the effect of error on the results and to draw conslusions regarding each of the theoretic hypotheses. Each hypothesis will be discussed in the order tested.

Hypothesis 1: Existence of Three Stages

The first hypothesis predicted that the respondents would identify three stages related to information accumulation, attitudinal development and decision-making. The empirical results were difficult to interpret but provided limited support for the existence of three stages. A number of potential sources of error are present in the data. The most important limitation is the small size of the sample; only 39 subjects were used in the analysis.

A second major problem is the apparent bias due to the tendency of only those farmers who had actually carried out a major change to indicate that they had considered doing so. Ninety-one per cent of the sample had completed the change considered. This suggests that individuals who had not made a change which they had considered, either had forgotten doing so or were unwilling to indicate to an interviewer that they had done so. A third potential source of error was the

difficulty of operationalizing the stages in a manner which would test their existence without cueing the respondents as to the number or types of stages predicted. Asking the farmers to describe what happened between the time they become aware and actually adopted did not successfully overcome the problem because of the limited verbal ability of the respondents. Individuals with only grade school education have difficulty describing cognitive processes because they lack a language to explain their thought processes.

A further potential source of error was the diversity of the innovations considered. The majority of the farmers had purchased either a new tractor or a farm machine, but 17 of the 39 had considered some other major change. The lack of comparability of the innovations makes interpretation of the results difficult.

On the basis of the empirical results and an evaluation of potential sources of error it can be concluded that there is only partial support for the theoretic hypothesis that the process by which an individual decides to adopt an innovation can be divided into the three stages of information, persuasion and decision-making.

Hypothesis 2: Steps Within the Decision-Making Stage

The second hypothesis predicted the presence of four steps or considerations within the decision-making stage. These steps were evaluation of the innovation in terms of self-image, cost, cost/reward ratio and external restraints. The steps or considerations were operationalized by asking the farmers how an innovation fit into

their farm operations, its cost, and the relationship between cost and expected benefits. The fourth step, external restraints was not effectively operationalized. The data supported the existence of the first three steps or considerations. Attempts to scale the steps were unsuccessful because all but three of the respondents had actually adopted the innovation under consideration.

Potential sources of error include the small size of the sample, the skewed distribution due to the very high proportion of adopters and the apparent tendency for only those who had actually carried out a major change to indicate that a change had been considered. All of these were discussed in relation to the first hypothesis.

The fourth step, external restraints, was not operationalized and consequently no conclusion can be drawn regarding its existence or importance. The skewed distribution did not permit testing for a cumulative scale pattern.

On the basis of the empirical findings and an evaluation of potential sources of error, it is concluded that innovations are evaluated in terms of self-image, cost and cost/reward ratio during the decision-making stage.

Hypothesis 3: Cumulative Scale Pattern

The fourth hypothesis predicted that an individual at any stage of the adoption-rejection process would have completed all previous, but none of the following, stages. Attempts were made to test this hypothesis using Guttman scalogram procedures for each of the four

innovations. For three of the innovations the distribution according to adoption was so skewed that the scaling technique could not be used. In the fourth case, the scale was not as predicted.

The major problem was in the adoption distribution which precluded the use of the Guttman technique. On the basis of the empirical results, the fourth hypothesis was rejected.

Hypothesis 4: Education

The fourth hypothesis predicted a positive correlation between knowledge about an innovation and educational level. A significant positive zero-order correlation was found for two innovations. In the other two cases, the correlations were very small. None of the partials were significant.

A major source of error in the data used to test this and the following hypotheses, involving knowledge levels, was found to exist for two innovations. In the case of the data on corn and beet herbicides a positive correlation was found between knowledge level and adoption. This intervening variable may have influenced the results to either reduce or increase the size of the relationship between knowledge level and the independent variable being tested. The small number of individuals who had not adopted corn herbicides made it impossible to recalculate the correlations while controlling for adoption. In the case of beet herbicides it was possible to control for adoption but the number of subjects in each group was rather small.

The fact that four different innovations are considered in testing each of the knowledge level hypotheses presents a problem of inter-

pretation. In a number of cases, including education, the relationship between knowledge level and the independent variable is significant for one or two innovations but not for the others. In some instances, but not all, the conflicting results may be produced by the intervening variable of adoption. These sources of error may exist in all the knowledge hypothesis but will not be discussed again for each hypothesis.

The empirical results, while not conclusive, suggest the existence of a positive relationship between knowledge about an innovation and education. This finding is consistent with the findings of Leuthold (1965), Bhosal (1960), Bogart (1951), Bauder (1960), and Troldahl and others (1964).

Hypothesis 5: Age

The fifth hypothesis postulated a curvilinear relationship between knowledge level and age. The data did not support this prediction. A negative relationship was found for three of the innovations.

The empirical evidence did not support the hypothesis, so it was rejected. The data suggest a negative relationship between knowledge level and age. Such a relationship would be consistent with the research findings of Bauder (1960). The relationships between knowledge about a specific subject and age appears to be content-determined. Research results have been reported which indicate the relationship between knowledge and age may be negative, positive, curvilinear or non-existent. The various studies which reported these different results were cited in Chapter II.

Hypothesis 6: Opinion Leadership

The sixth hypothesis predicted a positive relationship between knowledge level and opinion leadership. The data did not support the hypothesis. None of the four correlations were significantly larger than zero.

A potential source of error is the operationalization of opinion leadership. The reliability of the index was checked by inter-item and item-total correlations. The three items were correlated with each other .30, .31 and .33. The item-total correlations were .76, .71 and .65, respectively. The relatively low inter-item correlations make the index suspect.

On the basis of the data, the hypothesis was rejected. Until further evidence is available it must be assumed that knowledge levels are independent of opinion leadership, as measured by the self-designating index. This conclusion contradicts the previous findings of Leuthold (1965) and Berelson and others (1954).

Hypothesis 7: Social Status

The seventh hypothesis predicted a positive relationship between knowledge level and social status. The empirical findings partly supported this hypothesis. For two innovations the zero-order correlations are significant and positive. The third is negative and the fourth is positive but neither of the latter two are significantly larger than zero. The partial correlations suggest that the relationship is negative.

Social status was operationalized by means of a composite index which included education, membership in community organizations and investment in land and buildings. Each of the three factors appear to be logically related to "one's position in the social structure". A check of the relationship between the components and knowledge level indicated that value of land and buildings is negatively correlated to knowledge level for the same two innovations as were not significantly related above. This suggests that one of the components of the index, namely investment in land and buildings, has produced the inconsistent findings.

On the basis of the data and the relationship between one of the index components and knowledge level it is concluded that knowledge level is not related to social status. Since no previous studies relating knowledge about innovations and social status were found in the diffusion literature, this conclusion cannot be evaluated in terms of previous research.

Hypothesis 8: Participation in Formal Organizations

The eighth hypothesis stated, in effect, that knowledge about an innovation is positively related to community participation. When measures of membership in community organizations and executive positions held in these organizations were correlated to knowledge levels, the relationships were found to be positive but not significantly greater than zero.

On the basis of the data considered, the hypothesis would be rejected. Further analysis of the data, including measures of membership and executive positions held in farm organizations, suggested that for some innovations a strong relationship does exist between knowledge level and community participation. When adoption was controlled for the beet herbicide data, a very strong and consistent relationship was found for adopters but not for non-adopters. This additional evidence suggests that knowledge levels are related to community participation for adopters but not for non-adopters. Leuthold (1965) did not control for adoption when he found a positive relationship between knowledge of innovations and participation in formal organizations.

Hypothesis 9: Mass Media Availability

The ninth hypothesis predicted a positive relationship between knowledge level and the total number of mass media available. The empirical results partially supported the hypothesis. All four of the zero-order correlations were positive and for two innovations, mechanical thinning and corn herbicides, were significantly greater than zero. When adoption was controlled for beet herbicides, the correlation increased substantially for the adopters but did not change for non-adopters.

On the basis of the empirical findings, it is concluded that knowledge level is positively related to the number of mass media available.

Hypothesis 10: Mass Media Usage

The tenth hypothesis postulated a positive relationship between knowledge level and time spent using the mass media. Two measures of media usage were utilized, total time using the mass media and time spent on material related to farming. Knowledge level was significantly correlated to each of these measures for only one innovation each. Total time was significantly correlated to knowledge level about the mechanical thinner and time spent on farm material was significantly related to knowledge about corn herbicides.

It is noteworthy that the single innovation for which knowledge is significantly correlated to total mass media usage is the one which few farmers had adopted. When adoption is controlled on beet herbicides, a significant correlation emerges for the non-adopters, and the parallel correlation for the adopters becomes negative. This suggests that knowledge level is not related to total mass media usage for adopters but is related for non-adopters.

On the basis for these data the theoretic hypothesis was rejected. Limited evidence exists to suggest that total mass media may be related to knowledge level for non-adopters but not for adopters.

Hypothesis 11: Source Preference

The final hypothesis predicted that farmers who prefer mass media sources in preference to interpersonal sources would have a higher knowledge score. This hypothesis could not be tested because of the small number (12) of farmers who stated a preference for mass media

sources. Of the 12, no more than six had answered the questions on any given innovation.

In view of the results, the hypothesis remains untested so no decision can be made regarding its acceptance or rejection.

Implications for Action Programs

Implications of the Model

If the adoption-rejection model, as outlined in Chapter II, is assumed to be a relatively valid description of the cognitive process an individual follows in evaluating and deciding to either adopt or reject an innovation, there are a number of implications for the change agent. The first implication is that he should use a different communication strategy depending on whether he wants to inform people, persuade them or get them to perform a new behavior. Unless the communicator decides in advance exactly what he wants to achieve, he will not likely be successful. Many information and public relations people who actually want to produce changed behavior or attitudinal change, appear to assume they can achieve their objective by simply informing their audience. It is much easier to inform a group of farmers about a new farm practice than to convince them to adopt it. A communication program designed to accomplish the former, although relatively inexpensive, is not likely to achieve the latter.

A second implication follows from the first. The procedures used in evaluating a communication program depend upon whether the communicator is attempting to inform, persuade or produce adoptions. Although

communication and extension programs are seldom formally evaluated, it is important that a proper measure be used, given different goals. The proper measure of the effectiveness of an information program is the increase in knowledge produced by the program. This is most accurately done, according to Kerlinger (1964), by employing a four group experimental and control design using any one of a number of standard measurement techniques which include multiple choice, true and false or recall questions. A program aimed at producing a change in attitude is properly evaluated by using the same experimental design as above and utilizing standard attitude measuring techniques such as Likert scaling or the semantic differential. A program which is supposed to produce adoption is properly evaluated by measuring the increase in adoption in the client population.

The third and most important implication of the model is that it can be used to design communication strategies and construct messages to produce increased knowledge, attitude change or new types of overt behavior. This can be achieved by drawing from the three bodies of literature which exist on information and communication, persuasion and decision-making. The literature on decision-making is of less use in designing messages than that on information or persuasion because message variables are not directly involved in the decision process. The literature on decision-making is most important in pointing out the types of obstacles which must be overcome. In other words, the decision-making literature suggest what specific subjects or obstacles should be

considered by the communicator but does not suggest how to design the messages for maximum effect.

In order to design messages, defined as "any stimuli sent between persons", it is necessary to have a system for classifying messages. Systems for describing messages have been presented by Hovland and others, Berlo and Deutschmann. Each is discussed as follows and a new classification system presented.

Hovland and others (1959) developed a model of attitude change within which they hypothesized four types of observable communication stimuli. These were content, communicator, media characteristics and situational surroundings. Under content were listed the sub-categories of: topic, which relates to the subject of the message; appeals, which refers to the use of logic or emotional threats or promises; arguments, which refers to the order of presentation, sidedness and conclusion drawing; and stylistic features.

The three hypothesized distinct communicator characteristics are: role, which is the social positions held by the communicator; affiliation, which refers to the relationship between the two people and intentions, which involves the perceived intent of the communicator in sending the message. The media characteristics hypothesized were called (1) direct vs. indirect interaction, which is basically the distinction between face-to-face and mediated interaction and (2) sense modality which refers to the number of senses which are involved in receiving the message. The fourth group of stimuli hypothesized were the situational surroundings. It was believed that the social setting, extraneous noxious stimuli and extraneous pleasant stimuli were also present.

Berlo (1960) discusses the structure of messages in terms of code, content and treatment. He defines code 1960, (p. 57) as "any group of symbols that can be structured in a way that is meaningful to some person". Code under this definition can refer to languages, music or dance. Content is defined as 1960, (p. 59) "the material in the message that is selected by the source to express his purpose". It should be realized that content has both elements and structure. Not only the actual pieces of information must be considered under content but also the way in which they are ordered.

Treatment is the way in which content and code are arranged to produce the message. A source makes decisions on what to include in a message, how to order it, what type of appeals to use, how much information to use, whether to draw conclusions and how long his message will be. These are a few examples of the different ways message treatment may be varied.

Deutschmann (1957) developed a sign-situation classification of human communication. He hypothesized that signs can take four forms: auditory, gestural, orthographic and graphic. Auditory signs are those made by the human voice. Gestural signs are the motions of the body. Orthographic signs are printed or written words made up of letters. Graphic signs are significant lines, marks or forms usually impressed on a surface but sometimes presented in three dimensions. His classification of situation are three continual private-public; face-to-face-interposed; and assembled-non-assembled. The public-private dimension refers to the presence or absence of other people besides the

communicator and receiver at the time of communication. Face-to-face and interposed refers to the special relationship between the communicator and the receiver. Examples of interposed include television, radio, telephone and printed matter. Assembled-non-assembled refers to the physical location of the receivers. Examples of assembled include classrooms, watching a play or a political rally. Non-assembled refers to the receiver being able to receive the communication while alone for example, television viewing or reading a book.

The three systems outlined previously do not lend themselves to an adequate description of messages. The writer believes that messages can be described in terms of who they are from (source), how they are transmitted (channel), what they say (content) and how it is said (treatment). Most of the factors discussed by Hovland, Berlo or Deutschmann can be subsumed under these four headings.

The factors believed to be important within the source dimensions are credibility, status of the source, role relationship between the source and receiver, perceived intentions of the source and the communication skills of the source. For experimental purposes it is possible to manipulate the source of a message on each of these factors.

It is hypothesized that the channel dimension can be manipulated in terms of at least three factors. These are credibility of the channel, number of channels used (or sense modality in Hovland's terms), and face-to-face vs. interposed. This last factor includes within it the distinction between electronic and print media. Both of the latter are examples of interposed or mass media as it is usually called.

The content dimension is not as easily measured or manipulated as the other two. Two factors at least are present. These are amount of information presented and the position of the message on the subject. The amount of information presented might be measured in terms of length of the message or number of references to the topic. Position on a topic is less easily measured because different people will have different perceptions of the position. It is usually easy to tell whether a message is for or against a topic but more difficult to index the degree.

The treatment dimension is a sort of catch-all involving many different types of message variation. The factors here include code, appeals used and arguments utilized. Code refers to the language used, its level of difficulty and abstraction and degree of technicality. The message treatment can vary in terms of appeals used, for example, the degree to which a message is rational as opposed to emotional or the amount of fear which is produced in the receiver. The third factor found in the treatment dimension is the arguments used. This refers to the order of presentation, of pro and con arguments, the number of sides of the issue given and the amount of conclusion drawing done by the source.

The four dimensions and the factors within each are presented not as an exhaustive list of ways that messages can vary but as suggestive of the ones which appear to be most pertinent to the empirical study of communication problems and ones on which research data are readily available.

Given the previous system of classifying messages and the various dimensions and factors within each of the sub-processes of the adoption-rejection model, a matrix as shown in Figure 3 can be constructed. In this matrix, the message variables are considered to be the independent variables, the components of the adoption-rejection model are considered to be interviewing variables and the outcome, adoption or rejection, is considered to be the dependent variable. This matrix or communication model of the adoption-rejection process can be used to design messages to produce adoption, attitude change or learning depending upon whether over behavioral action, persuasion or information accumulation is defined as the dependent variable. The construction of a message to produce adoption presupposes that it will produce persuasion and a persuasive message is assumed to have produced an increase in knowledge.

Figure 3

Communication Model of Adoption - Rejection Process

Independent Variables	Intervening Variables			Dependent Variable
MESSAGES	INFORMATION	PERSUASION	DECISION-MAKING	
	Major Determinants	Major Determinants	Major Consideration	
1. Source Credibility Status Relationship to Receiver Communication skills	1. Personal Abilities Intelligence hearing and seeing Education Literacy Age	1. Personality Factors Beliefs, Attitudes and Values (both structure and content) Dogmatism Tolerance for ambiguity	1. Self-perception of own role in relationship to new practice	
2. Channel Credibility Number Mass Media vs. Inter-Personal	2. Personality Factors Belief, attitudes and values (both structure and content) Social Status Opinion Leadership	2. Message Credibility Perceived credibility of the Source and Channel Perceived intention of source Source preference Channel preferences	2. Perception of resources 3. Perceived cost/reward ratio 4. Perceived freedom from internal and external restraints	Adoption or Rejection
3. Content Topic Position on Topic Amount of Information	3. Communicative Activities Mass Media Available Mass Media Preference Interest in Topics Useage Sources or Media Interpersonal Activities Community Participation		Major Determinants	
4. Treatment Code Arguments Used Appeals Used			1. Personality Beliefs, attitudes and values, e.g., rish orientation and achievement motive 2. Resources Money and credit personal energy, ability and skills	

The actual use of the communication model to construct messages requires the cross-indexing of available research to provide guides as to which sources, channels, contents and treatments to use given different receiver characteristics. The receiver characteristics are indexed by the dimensions and factors within the three sub-processes of the adoption-rejection model. At the present time a complete cross-indexing does not exist but preliminary literature reviews such as Cohen (1963), Abelson (1959), and Hovland and others (1959), suggest how messages may be more effectively constructed.

Implications of the Information Hypotheses

Any implications must be tempered by the lack of consistency of the relationships tested. The variation between innovations suggests that different social and personal characteristics are related to knowledge levels in different ways depending upon the innovation involved. Further variation depends upon adoption. Adoption was controlled for only one innovation, beet herbicides. Controlling adoption changed the relationship between knowledge level and a number of social and personal variables including total time spent using mass media, and all four of the measures of commodity participation.

In terms of communication strategy the results suggest that using a large number of mass media does not necessarily lead to an increase in knowledge about an innovation. The specific media used and type of material consumed should be considered in designing a communication program. The shortgun approach to communication is not supported by previous research.

A second implication of the present results is that interpersonal communication is important in spreading knowledge about innovations, particularly for adopters. The significant correlation between knowledge level and each of the four measures of community participation for those who had adopted best herbicides, and the lack of such a relationship for non-adopters, suggests that adoption may be a function of interpersonal contact. Therefore, any communication program should utilize interpersonal channels by working through formal organizations.

A third implication, based on the finding that attitude toward an innovation is not necessarily related to knowledge about the innovation, is that a communication program designed to inform does not necessarily persuade and vice versa. Consequently, any communication program should be designed to achieve the specific goal or goals desired.

Implications for Further Research

Implications of the Model

The theoretic model has several implications in terms of the types of research needed. In the past there has been a tendency to relate specific factors within one of the stages directly to adoption or rejection without taking into consideration or controlling for variation in factors within the other stages. Not surprisingly, contradictory findings abound in the literature because of this failure to control intervening variables.

The adoption-rejection model suggests several different research approaches. The first research project suggested by the model is that of further validating the idea of three stages. This research exercise has

tentatively supported the concept of a three stage model but further research is needed to determine whether three stages are always necessary, if the order is always the same and to what extent the model explains and predicts adoptive behavior.

The second research problem is to determine the generalizability of the model. It has been hypothesized that the model will cover farm practices, voting behavior, and the purchase of new products. This should be tested empirically under a large number of different situations. A second class of problems can also be considered under this heading. What are the differences, if any, between the adoption-rejection process when only on individual is involved as compared to group adoption. Further study of the small-group research may suggest meaningful approaches to this problem. Other questions include the relationship between group and individual adoption where the group must adopt before the individual can adopt and when are group decisions to adopt most binding upon individuals?

The validity, number and relative importance of the rejection points should be studied. This aspect of adoption has received relatively little interest or study as yet. If one can pin-point the rejection points at which most people leave the process then precautions can be taken to overcome the factors which are critical at these points.

The fourth type of research suggested is to determine the level necessary at each stage for adoption to occur. The problem is basically one of determining how much information is necessary to produce persuasion and how favorable an attitude is necessary to induce the individual to

continue to the decision-making stage. Not only the minimum necessary but also the optimum level for each stage should be determined.

A fifth potential research area derives from questioning the assumption that the factors within one sub-process do not interact with those within the other. Research is needed to determine whether this is in fact so.

An area of research considered in this project which needs much further work is that of the major considerations in the decision-making process. The farmers indicated that in making a decision to adopt or reject a major change that they had considered how an innovation fit into their farm program, its cost and costs in relation to returns. Other considerations may be present under certain circumstances. An attempt should be made to determine the generalizability of the previous considerations and to identify others under different situations. The identification of these considerations is important so that messages can be designed to show how barriers to adoption may be overcome.

A seventh area of potentially useful research would be to study whether or not innovators and laggards go through the adoption-rejection process in about the same way. Do they both go through three stages, why do some go through the stages quicker than others, are the same dimensions and considerations within each stage of equal importance to both groups, how important is the ability to command resources to each group, do laggards tend to get bogged down at one specific stage of the process or do they fail to adopt because they never become aware, etc. These and many other questions are worthy of research.

Additional research on the process of socialization to determine how social and environmental factors influence personality characteristics such as need for achievement, dogmatism and risk orientation, is also needed. In the adoption-rejection model the social, economic, and political environment has been taken as given. This assumption should be relaxed and research undertaken to learn how perceptions, beliefs and attitudes are formed.

Although the eight areas of research presented previously are not exhaustive of problems which are suggested by the model they point to some of the major areas as yet inadequately studied.

Implications of the Information Hypotheses

The results of the study of the information process suggest that further research is needed on the relationship between knowledge levels and several personal and social variables. The lack of consistency, in the relationship between knowledge level and the various social measures depending upon whether the individual had or had not adopted and across innovations, suggests that much unexplained variance exists in the system. Further, research is needed which will determine under what circumstances different social and personal characteristics determine knowledge about various topics. Larger samples which allow control of intervening variables such as adoption are needed.

Further research is needed on measuring techniques to be used in indexing knowledge levels. The present research project demonstrated that farmers will answer multiple choice and Likert type questions in a field interview situation. Research is needed to determine exactly what

type and how many questions will provide reliable and valid measures of knowledge levels at a reasonable cost. Measures of, not only the relative, but also the absolute level of knowledge should be studied to determine which are more useful in predicting attitude change and adoption.

Further research is also needed to validate the Most Important Source Index used in this study. This modified forced-choice instrument should be validated by having a number of different groups complete a regular forced-choice instrument and the index for a number of different subjects such as new products, political candidates and national or international affairs.

Further research on interpersonal sources of information is needed. In this present research project interpersonal information sources were not directly measured. Information levels are undoubtably a function of interpersonal contact and more precise measures than those used in our study: social status, opinion leadership and the four measures of participation in community organizations. Probably measures of source credibility, length of interaction, relationship between source and subject and purpose of interaction would be more useful in explaining information levels than the sociological variables used in this project.

A further area of potentially useful research involves a conceptual analysis of different types of knowledge. At least three types of knowledge can be easily identified: knowledge that an innovation exists, usually called awareness; knowledge of how a product or innovation might be used or what it will do; and specific details of how to use or apply a product or innovation. Knowledge scales can be constructed to index

each of these three types of information and research should be done to determine the sources and determinants of each.

A final area of research which the research suggested involves trying to determine the etiology of the correlation between knowledge level and adoption, which was found for two innovations. Is adoption the result of increased knowledge or vice versa? Research to answer this question must be done over an extended period of time under different circumstances on different innovations and products.

REFERENCED BIBLIOGRAPHY

1. Adorno, T.W. and others, The Authoritarian Personality, Harper Row, 1950.

2. Anderson, M.A., Information Sources Important in the Acceptance and Use of Fertilizer in Iowa, Knoxville, Tennessee Valley Authority Report, 1955.

3. Anderson, M.A. and others, An Appraisal of Factors Affecting the Acceptance and Use of Fertilizer in Iowa, Ames, Iowa Agr. Exp. Station Special Report 16, 1956.

4. Aurbach, H.A. and Kaufman, H.F., Knowledge and Use of Recommended Farm Practices, State College, Mississippi Agr. Exp. Station Information Sheet, 1956.

5. Bauder, W.W., Iowa Farm Operators and Farm Landlord's Knowledge of, Participation in and Acceptance of The Old Age and, Survivors Insurance Program, 1960, Iowa Agricultural and Home Economics Experiment Station, Research Bulletin 479, Ames.

6. Beal, G.M. and others, Validity of the concept of Stages in the adoption process, Rural Sociology, 22, 166068, 1957.

7. Berelson, B. and others, Voting: A Study of Opinion Formation in a Presidential Campaign, University of Chicago Press, 1954.

8. Berlo, D.K., The Process of Communication, Holt, Rinehart and Winston Inc., 1960.

9. Bhosale, R.J., Relative Effectiveness of Extension Techniques for Popularizing Improved Vegetable Growing in the I.C. Scheme Area, Nangloi, M.S. Thesis, Indian Agricultural Research Institute, New Delhi, 1960.

10. Bogart, L., The spread of news on a local event, Public Opinion Quarterly, 1951, 15, 769-72.

11. Bohlen, J.M., Needed Research on Adoption Models, Sociologia Ruralis, 7, 113-129, 1967.

12. Cohen, A.R., Attitude Change and Social Influence, New York, Basic Books, 1964.

13. Copp, J.H. and others, The function of information sources in the farm practice adoption process, Rural Sociology, 23, 146-57, 1958.

14. Defleur, M.L. and Larson O.W., The Flow of Information, An Experiment Mass Communication, 1958, Harper.

15. Deshmukh, B.R., Relative Influencing Capacity of Different Agencies in persuading Rural Youth to Adopt Improved Farm Practices, M.S. Thesis, 1960, Indian Agricultural Research Institute, New Delhi.

16. Deutschmann, P.J., The Sign and symbol classification of messages, J. of Communication, 1957, p. 90.

17. Deutschmann, P.J. and others, Adoption of New Foods and Drugs in Five Guatemalan Communities, Unpublished Paper, Institute de Nutricion de Centro America and Programa Inter-Americano de Informacion Popular, San Jose, Costa Rica, 1965.

18. Dillon, J.L. and Heady, E.O., Theories of Choice in Rleation to Farm Decisions, Agricultural and Home Economics Experiment Station, Iowa State University, Ames, Iowa, 1960, Research Bulletin 485.

19. Dodd, S.C., A Measured wave of intersocial tension, Social Forces, 1951, 29, 281-89.

20. Eichholz, G., Development of a rejection classification for newer educational media, Unpublished Doctoral dissertation, Ohio State University, 1961.

21. Eicholz, G. and Rogers, E.M., Resistance to the adoption of audio-visual aids by elementary school teachers: Contrasts and similarities to Agricultual innovation, in M.B. Miles Innovation in Education, N.Y. Columbia University, 1964.

22. Ferguson, L.W., An analysis of the generalizability of suggestibility to group opinion, Character and Personality, 1944, 12, 237-43.

23. Ferris, Diana, Availability and use of mass information media in rural Ontario, The Economic Analist, Dec. 1962, 137-42.

24. Greenberg, B.S., Person-to-person communication in the diffusions of news events, Journalism Quarterly, 1964, 41, 490-94.

25. Hassinger, E., Stages in the adoption process, Rural Sociology, 1959, 24, 52-53.

26. Havens, A.E., A Review of Factors Related to Innovativeness, Columbus: Ohio Agr. Exp. Station Mimeo Bulletin A.E., 329, 1962.

27. Heady, E.O. and others, Uncertainty, Expectations and Investment Decisions for a Sample of Central Iowa Farmers, Agricultural Experiment Station, Iowa State College, Ames, Iowa, 1957, Research Bulletin 477.

28. Hobbs, D., Factors Related to the Use of Agricultural Chemicals on Iowa Farms, M.S. Thesis, Iowa State University, 1960.

29. Hobbs, D.J. and others, The Relation of Farm Operator Values and Attitudes to their economic performance. Dept. Economics and Sociology, Iowa State University, Ames, Iowa, 1964.

30. Hoffer, C.R. and Stangland, D., Farmer's Attitudes and values in relation to adoption of approved practices in corn growing. Rural Sociology 23, 1958; 112-120.

31. Hovland, C.I. and Janis, I.L., Personality and Persuasibility, Yale, 1959.

32. Hovland, C.I. and others, Communication and Persuasion, New Haven, Yale University Press, 1953.

33. Hovland, C.I. and others, Experiments in Mass Communication, Princeton, 1949.

34. Hyman, H., Survey Design and Analysis, New York, Free Press, 1955.

35. Jamias, J.R. and Troldahl, V.C., Dogmatism, Tradition and General Innovativeness, Unpublished Manuscript Dept. of Communication, Michigan State University, 1965.

36. Janis, I.L., Personality Correlates of susceptibility to persuasion, Journal of Personality, 22, 1954, 504-18.

37. Janis, I.L., Anxiety indices related to susceptibility to persuasion, J. Abnorm. Soc. Psychol., 51, 1955, 663-7.

38. Janis, I.L., and Feshbach, Effects of fear arousing communications, J. Abnorm. Soc. Psych., 48, 78-92.

39. Janis, I.L. and Field, B.P., Sex differences and personality factors related to persuasibility in Personality and Persuasibility by C.I. Hovland and I.L. Janis, Yale 1956.

40. Johnson, G.L. and others, A Study of Managerial Processes of Mid-western Farmers, the Iowa State University Press, Ames, Iowa, 1961.

41. Johnson, G.L. and Harver, C.B., Agricultural Information as an Aspect of Decision Making, Michigan State University, Agricultural Experiment Station Bulletin #273, East Lansing, Michigan, 1960.

42. Klapper, J.T., The Effects of Mass Communication, Free Press, 1960.

43. Lassey, W.R., Communication, Risk, and Investment Decision-Making in Costa Rica. Unpublished Ph.D. Thesis, Michigan State University, 1967.

44. Leuthold, F.O., Communication and Diffusion of Improved Farm Practices in Two Northern Saskatchewan Farm Communities, Canadian Centre for Community Studies Saskatoon, Saskatchewan, 1965.

45. Lionberger, H.F., Community prestige and the Choice of Sources of farm information, Public Opinion Quarterly, 1959, 23, 111-18.

46. Lionberger, H., Adoption of New Ideas and Practices: A Summary of Research, Ames: Iowa State University Press, 1960.

47. Mason, R., An ordinal scale for measuring the adoption process, in Wilbur Schramm (ed.) Studies of innovation and of Communication to the Public, Stanford, Stanford University Institute for Communication Research, 1962.

48. McCrone, D.J. and Cnudde, C.F., Toward a Communication Theory of Democratic Political Development; A Causal Model. Amer. Pol. Sci. Rev., 61, 1967, p. 72-79.

49. Miles, M.B., Innovation in Education, New York, Columbia University, 1964.

50. Neill, R.E., Achievement Motivation among Ohio Farmers, M.S. Thesis, Columbus, Ohio State University, 1963.

51. Nielson, J., Improved managerial processes for farmers, J. of Farm Economics, 1961, 43, 1250-61.

52. Oliver, Padilla O., The Role of Values and Channel Orientations in the Diffusion and Adoption of New Ideas and Practices, Ph.D. Thesis, East Lansing, Michigan State University, (1964).

53. Powell, F.A., Open and Closed- Mindedness and the Ability to Differentiate Source and Message, M.S. Thesis, Michigan State, 1962.

54. Ramsey, C.E. and others, Values and the adoption of practices, Rural Sociology, 24, 1959, 35-47.

55. Rogers, E.M., Personality correlates of the adoption of technological practices, Rural Sociology, 1957, 22, 267-68.

56. Rogers, E.M., Diffusion of Innovations, New York, Free Press, 1962.

57. Rogers, E.M. and Beal, G.M., The importance of personal influence in the adoption of technological changes, Social Forces, 1958, 36, 329-35.

58. Rogers, E.M. and Meynen, Wicky L., Communication sources for 2, 4-D weed spray among Colombian peasants, Rural Sociology, 1965, 30, 213-19.

59. Rokeach, M., The Open and Closed Mind, Basic Books, 1960.

60. Rokeach, M., Attitude change and behavioral change, Public Opinion Quarterly, 30, 529-50, 1966.

61. Rokeach, M., The Nature of Attitudes, in the International Encyclopedia of the Social Sciences, 1965.

62. Troldah., V.C. and others, Information Seeking During a National Crisis, Communication Research Report, Department of Communication, Michigan State University, Mimeo, 1964.

63. Wilkening, E.A., Adoption of Improved Farm Practices as Related to Family Factors, Madison, Wisconsin, Exp. Station Research Bulletin 183, 1953.

64. Wilkening, E.A., Roles of communicating agents in technological change in agriculture, Social Forces, 1956, 34, 361-67.

65. Wilson, M.C. and Trotter, I.P., Results of Legume Extension in Three Southeast Missouri Countries Representing Three States of Development of a State-Wide Legume Program, U.S.D.A. Federal Extension Service Circular 188, Washington, D.C., 1933.

Appendix A.

Interview Schedule

FARM DECISION MAKING STUDY

Name _____ Number _____

Address _____ Type _____

Location _____

_____

Phone _____

Interview:

	Date	Situation
Call 1		
Call 2		
Call 3		

Final Result: _____

Interviewer: _____

Adopted _____
-Not adopted _____

12. A. CHEMICAL WEED CONTROL -- SUGAR BEETS

1. When did you first hear of controlling weeds in beets by means of chemicals or weed sprays?

If adopted

2. When did you first use chemical weed control? _____
no reply _____

3. What is a pre-emergence weed spray? _____

4. Which of the following chemicals are recommended for use with sugar beets?

Pyramin _____
2, 4-D _____
Dalapon _____
T C A _____
Linuron _____

5. How much does Pyramin cost per pound? _____

6. How do you feel about the use of pre-emergent weed sprays?

Strongly dislike _____
Slightly dislike _____
Neutral _____
Slightly like _____
Strongly like _____

7. Should chemical weed killers be used on sugar beets?

Every year _____
Most years _____
Only if weeds are bad _____
Never _____
No reply _____

8. How much pyramin should be used per acre if used as a pre-emergent?

9. How valuable (useful) is chemical weed control in sugar beets?

No value at all _____ Quite useful _____
Slightly valuable _____ Extremely useful _____
No reply _____

Adopted _____
-Not adopted _____

MECHANICAL THINNING OF BEETS

12. B. Have you heard of mechanical or machine thinning of sugar beets?
Yes _____ No _____ No reply _____

2. When did you first hear of mechanical beet thinners? _____
No reply _____

If adopted

When did you first use a thinner? _____
No reply _____

3. How important is weed control if one uses a mechanical thinner?

No at all _____
Slightly important _____
Quite important _____
Extremely important _____
No reply _____

4. How useful is mechanical thinning?

No value at all _____
Slightly valuable _____
Quite valuable _____
Extremely valuable _____
No reply _____

5. How do you feel about using a mechanical thinner?

Disapprove strongly _____
Disapprove slightly _____
No reply - neutral _____
Approve slightly _____
Approve strongly _____

6. How high should the beets be when they are mechanically thinned?

Higher than when blocked by hand _____
Shorter than when blocked by hand _____
About the same size _____
No reply _____

7. Are you in favor of mechanical thinning?

Not at all _____
Slightly _____
Considerably _____
Extremely _____
No reply _____

8. Can you give me the names of some of the different makes of machines which have been used in this area?

Dixie _____
Silver _____
Pallgrove _____
Eversman _____
Jauniaux _____
Blackwelder _____
Others (list) _____
Electric eye _____

Adopted _____
Not adopted _____

12. C. CHEMCIAL WEED CONTROL CORN

1. When did you first hear of chemical weed control in corn? _____
No reply _____

If Adopted

2. When did you first use chemical weed control on corn? _____
No reply _____

3. What is a pre-emergence weed spray? _____

4. Which of the following are recommended for use as pre-emergents in corn? (Get yes, no or uncertain).

Simazine _____
2, 4-D _____
Atrozine _____
Eptam _____
Linuron _____

5. How much does Atrazine cost per pound? _____

6. How do you feel about the use of pre-emergent weed sprays?

Strongly disapprove _____
Slightly disapprove _____
Neutral _____
Slightly approve _____
Strongly approve _____

7. Should chemical weed killers be used on corn?

Every year _____
Usually _____
Only if weeds are bad _____
Never _____
No reply _____

8. At what stage does corn become susceptible to damage from 2, 4-D?

2 " _____
4 " _____
6 " _____
8 " _____
No reply _____

9. How valuable is chemical weed control in corn?

No value at all _____
Slightly valuable _____
Quite _____
Extremely _____
No reply _____

12. D. CORN VARIETIES

1. Have you ever heard of the Ontario Corn Committee?

yes _____ no _____ no reply _____

If yes, go to 2 If no, go to 6

2. What is the Ontario Corn Committee? _____

3. Of how much value are their recommendations?

none _____
a little _____
some _____
quite a lot _____

4. What three things do they report about each variety? (Do not read answers).

% broken stalks _____
% moisture _____
yield in bus. per acre _____

5. Who makes up the Ontario Corn Committee?

C.D.A. _____
O.D.A. _____
Ont. Soil Crop Improvement Association _____
Ont. Seed Corn Growers _____
Marketing Board _____
Canadian Seed Growers Association _____
No reply _____

6. How do you feel about having an independent organization to test corn varieties?

Approve strongly _____
Approve slightly _____
Neutral _____
Disapprove slightly _____
Disapprove strongly _____

7. When do you usually try a new variety of corn?

When it first comes out _____
After it has been approved by the O.C.C. _____
After you have seen it on a neighbors farm _____
No reply _____

Adopted _____
Not adopted _____

12. E. SOIL SAMPLING

1. What is soil sampling? _____

No reply _____

2. When did you first hear of soil sampling? _____

No reply _____

If Adopted

3. When did you first use soil samples? _____

No reply _____

4. A soil sample tells one:

How coarse the soil is _____
What kind of fertilizer to use _____
How much fertilizer to use _____
Both how much and what kind of fertilizer to use _____
No reply _____

5. Soil samples are useful

Never _____
Seldom _____
Often _____
Always _____
No reply _____

6. When you send in a soil sample to have it tested, it is important to include information about?

What crops you intend to plant _____
The date on which sample was taken _____
No information is needed _____
No reply _____

7. In deciding how much fertilizer to use, soil samples are:

Completely unnecessary _____
Seldom necessary _____
Often necessary _____
Always necessary _____
No reply _____

8. How much soil has to be sent away for an accurate sample?

A tablespoon full _____
Half a pint _____
A quart _____
A bushel _____
No reply _____

14. a) Ask respondent if he has used each of the below as a source of information about a new farm practice such as _____ (Write in an innovation adopted). Check yes or no. Then ask. "Which is more important to you as a source of information about a new farm practice such as _____?" Ask for each pair in order as numbered. If some not used leave out from paired comparisons.

Source of Information	Yes	No
Daily Newspapers		
Weekly Newspapers		
Farm Magazines		
Pamphlets or Government Bulletins		
Radio		
Television		
Company fieldmen		
Merchants and Mill operators		
Neighbors		
Agricultural Representative and other specialists from Dept. of Agriculture eg. Ridgetown, Guelph, or Harrow		

1. _____ _____ _____

2. _____ _____ _____

3. _____ _____ _____

4. _____ _____ _____

6. _____ _____ _____

7. _____ _____ _____

8. _____ _____ _____

9. Since only a small smount of soil is used by the people who analyze a soil sample, their recommendations are:

Often wrong	_____
Sometimes wrong	_____
Usually correct	_____
Always correct	_____
No reply	_____

14. MAJOR DECISION:

1. Did you make an important change in your farm business during 1966? (Try to get major investment, change in enterprises, new technology adopted etc.)

Yes _____ no _____ no reply _____

If yes, go to schedule A below
If no, go to 2 below

2. Did you consider making an important change in your farm business during 1966?

Yes _____ no _____ no reply _____

If yes, go to 3
If no, go to question 16

3. What kind of an outcome has resulted from your consideration of this change?

Decided to make change	_____	go to B
Decided not to make change	_____	go to C
No final decision yet	_____	go to D
No reply	_____	

A. CHANGE ACTUALLY CARRIED OUT

A. Will you give me some information on your decision to _____ (Write in Change)

1. Why did you (X)? _____

2. When did you first hear about (X)? _____

5. What were the most important factors or considerations when you were considering (X)? _____

6. Do you remember thinking about how (X) would fit into your farm program?

   Yes _____ no _____ no reply _____

7. Do you remember thinking about how much (X) would cost?

   Yes _____ no _____ no reply _____

8. Did you have the money to (X)?

   Yes _____ no _____ no reply _____

   If no

9. Would you have (X) if you had the money?

   Yes _____ no _____ no reply _____

10. Do you remember comparing the cost to the returns to be expected from (X)?

    Yes _____ no _____ no reply _____

11. What or who was the most important source of information in your decision not to (X)? _____

12. Would your friends and neighbors have approved if you had (X)?

    Yes _____ no _____ no reply _____ don't know ___

13. Did you go through a series of steps or stages in your decision to (X)?

    Yes _____ no _____ no reply _____

14. Can you describe what happened between the time you first heard about (X) and the time at which you decided not to actually adopt (X)? _____

15. Other comments on the decision. (Probe pertinent details). _____

D. CHANGE STILL UNDER CONSIDERATION

D. Will you give me some information on how you approached the

problem of _____
(Write in change being considered).

1. When did you first hear about(X)? _____

2. Where or for whom did you first hear about (X)? _____

3. In general do you feel (X) is a good idea?

   Yes _____ no _____ no reply _____

4. Do you now have enough information to make a decision?

   Yes _____ no _____ no reply _____

5. If you needed more information who would you contact? _____

6. Have you considered how (X) would fit into your farm program?

   Yes _____ No _____ no reply _____

7. How much would it cost you to (X)? _____

8. What benefits would you gain from (X)? $ _____

   Other _____ _____

9. When do you expect to decide whether or not to (X)? _____

10. Other comments _____

15. OPINION LEADERSHIP

1. Has anyone recently asked you for advice on a new farm practice?

   Yes _____ no _____ no reply _____

2. Which happens more often, (a) you tell your neighbors about some new farm practice, or (b) they tell you about a new practice?

   (a) _____ (b) _____ no reply _____

3. Compared with your circle of friends, are you more likely, or less likely to be asked for advice or opinions on a new farm practice?

   More _____ less _____ no reply _____

16. MEDIA AVAILABILITY AND USAGE

	Number	General Use	Farm related material
Radio			
Television			
Daily Paper			
Local Paper			
Farm Magazines			
Gov't and Pamphlets			
Farm Organization Publications			
Total	_____	_____	_____

17. COMMUNITY PARTICIPATION

1. How many different community organizations do you belong to and attend at least half of the meetings?

Agricultural _____
Service _____
Fraternal _____
Social _____
Religious _____
Other _____

2. In how many of the above do you hold executive positions?

Agriculture	_____
Service	_____
Fraternal	_____
Social	_____
Religious	_____
Other	_____

18. 3. Just a few final questions about yourself:

A. Are you married?

Yes _____ no _____ no answer _____

B. What is your age? _____ yrs.

C. How many children do you have? _____

D. How many help on the farm? _____ How do they help? _____

_____

E. What was the last year of school you completed? _____

F. Have you had any special training or special skills?

Yes _____ no _____ no reply _____ What? _____

_____

G. How many days did you work off the farm in the last year? _____

H. What proportion of your total income comes from non-farm sources?

Less than ¼	_____
¼ to ½	_____
½ to 3/4	_____
Over 3/4	_____
No reply	_____

I. Approximately how much would you receive if you sold:

A. Your land and buildings $ _____
B. Your machinery $ _____

thank you!

APPENDIX B

DISTRIBUTION OF RESPONDENTS ON INDEPENDENT VARIABLES

Table 35. Age of Respondents

Years	Number	Percentage
Less than 30	12	11
31-40	25	24
41-50	34	32
51-60	25	24
61 and over	10	9
Totals	106	100

Table 36. Educational Attainment of Respondents

Years of school completed	Number	Percentage
Less than 8	11	10
8	48	45
9 or 10	24	23
11 or 12	16	15
13 or more	7	7
Totals	106	100

Table 37. Distribution of Respondents by Social Status Score

Score	Number	Percentage
0	18	17
1	41	39
2	29	27
3	18	17
Totals	106	100

Table 38. Distribution of Respondents by Opinion Leadership Score

Score	Number	Percentage
0	18	17
2	15	14
2	26	24
3	15	14
4	13	12
5	11	11
6	8	8
Totals	106	100

Table 39. Distribution of Respondents by Total Mass Media Available

Number of Mass Media	Number	Percentage
0 - 3	2	2
4 - 7	14	13
7 - 9	33	31
10 - 12	38	36
13 - 15	13	12
16 and over	6	6
Totals	106	100

Table 40. Distribution of Respondents by Total Mass Media Usage

Total Minutes per Week	Number	Percentage
600 and Less	5	5
601 - 1,200	30	28
1,201 - 1,800	29	27
1,801 - 2,400	20	19
Over 2,400	22	21
Totals	106	100

Table 41. Distribution of Respondents by Mass Media Usage Related to Agriculture

Total Minutes per Week	Number	Percentage
120 or less	15	14
121 - 240	25	24
241 - 300	13	12
301 - 600	38	36
601 - and over	15	14
Totals	106	100

Table 42. Distribution of Respondents by Membership in Organizations

Number of Organizations	Number	Percentage
0	35	33
1	25	23
2	18	17
3	11	10
4	10	10
5 and over	7	7
Totals	106	100

Table 43. Distribution of Respondents by Executive Positions in Organizations

Number of Executive Positions	Number	Percentage
0	68	64
1	28	26
2	4	4
3	5	5
4	1	1
Totals	106	100

Appendix C

ADDITIONAL FINDINGS

Inter-Correlations Among Independent Variables

A correlation matrix was prepared to show the correlation between each of the twelve independent variables and all of the others. The correlations are presented in Table 1. The relationships are discussed below.

Age

Age is slightly negatively related to all of the other variables except education. In this one case, the negative relationship reached the five per cent level of significance. In effect, all the other variables appear to be practically independent of age. Therefore, age is a very poor predictor of other personal or social characteristics except education.

Education

Education, as indexed by the last grade of school completed, appears to be related to community participation in general but not to total membership in organizations. This suggests that better educated farmers are much more likely to belong to farmer organizations, and to hold executive positions in either farm or non-farm organizations but are only slightly more likely to belong to more organizations than their less educated neighbors.

Education is significantly related to total mass media available. This relationship is probably due to utilization of magazines and newspapers.

Table 44. Intercorrelations of the Independent Variables Used in Testing the Knowledge Hypotheses (N = 106)

Variables	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1. Total Mass Media	.06	.42**	.45*	.44*	.48*	.47*	-.10	.18*	.10	.41*	.40**
2. Total Time Mass Media	.41**	-.03	.00	-.15	-.07	-.02	-.01	.08	-.01	.00	
3. Farm Time Mass Media		.21*	.26**	.23**	.30**	-.09	.07	.26	.22*	.14	
4. Number Farm Organizations			.69**	.81**	.47**	-.05	.26**	.13	.30**	.53**	
5. Total Organizations				.53**	.65**	-.07	.15	.07	.25**	.63**	
6. Farm Executive Positions					.65**	-.01	.27**	.16*	.28**	.40**	
7. Total Executive Positions						-.03	.17*	.05	.20*	.34**	
8. Age							-.18	-.13	-.13	-.13	
9. Education								-.05	.16*	.43**	
10. Investment									.17*	.15	
11. Opinion Leadership										.39**	
12. Social Status											

* Significantly greater than zero at the 5 per cent level.
** Significantly greater than zero at the 1 per cent level.

The strong relationship between education and social status is not surprising since one of the components of the social status scale was education.

Social Status

Social status scores were derived from pooled measures of education, membership in community organizations and investment in land and buildings. The inter-correlations between three components and social status are presented in Table 45. The intercorrelations suggest that the choice of investment in land and buildings as one of the factors in deriving the social status score was an unfortunate one. It does not correlate significantly with the final social status score. Both education and organizational membership are significantly related to the final score but not significantly intercorrelated.

Social status is correlated quite highly to all four of the measures of the community participation, to total mass media available and to opinion leadership. The correlation between leadership and each of the three component factors which were used in constructing the composite index.

Table 45. Intercorrelation between Social Status and Three Component Factors.

	Education	Organization Membership	Value	Social Status
Education		.15	-.05	.43
Organization Membership			.07	.63
Value land and building				.15

Community Participation

The intercorrelations between the four measures of community participation are presented below in Table 46. The high intercorrelations are not surprising since the total number of organization membership and total executive positions figures include the farm organization memberships and executive positions, respectively. Also, a high relationship between the number of organizations which one belongs to and the number of executive positions held is to be expected.

Table 46. Intercorrelation Between Measures of Community Participation.

	Total Organization Membership	Farm Organization Membership	Total Executive Positions	Farm Organization Executive Positions
Total Organization Membership		.69	.65	.53
Farm Organization Membership			.47	.81
Total Executive Positions				.65
Farm Organization Executive Positions				

Since the four community participation measures are highly intercorrelated, all or none tend to be either related or not related to the other independent variables. The four measures are significantly correlated to all of the other independent variables except time using the mass media, age and investment in land and buildings. The unique relationship of the measures to education was discussed previously.

Opinion Leadership

Opinion leadership as measured by a self-designated index is significantly related to all four measures of community participation, number of mass media available, social status, inverstment in land and buildings and time spent reading, watching or listening to information related to farming. This latter relationship is interesting in that opinion leadership is correlated -.01 to total time using mass media. This is consistent with the questions used to index opinion leadership. They asked about information sought and given in relation to new farm practices.

Mass Media Available

The total number of mass media available is correlated to community participation, education, opinion leadership and social status. The number of mass media available was also significantly related to time spent receiving farm-related information, but not to total time using the mass media. This suggests that while total time using the mass media is not related to the total number of mass media available, that time spent receiving farm information is related to the number of farm magazines and government pamphlets and bulletins available.

Time Using Mass Media

Two measures of mass media consumption were collected. One was a measure of total media usage and the other, a component of the former, was measured in minutes, of time spent watching, reading or listening to material related to farming. Total time is significantly correlated only

to time spent on agricultural subjects. This suggests that total mass media usage is a very poor predictor of any of the independent variables.

Time spent receiving information related to farming is significantly related to community participation, opinion leadership, investment and number of media available.

Relationship Between Independent Variables and Attitude Toward Innovations

The correlations between the independent variables discussed above and attitude toward each of the innovations are presented in Table 47.

Attitudes toward the four innovations are relatively independent of the personal and social variables except the number of mass media available. The size and direction of the correlations suggest that education, social status and participation in farm organizations may influence the attitudes of farmers toward new farm practices.

Table 47. Correlations Between Attitude Scores and Various Social and Personnal Characteristics

Social and Personal Characteristics	Innovations			
	Beet Herbicides	Mechanical Thinner	Corn Herbicides	Soil Sampling
1. Education	.307*	.285	-.008	.244
2. Age	.035	.142	-.127	.077
3. Opinion Leadership	.119	.009	.166	.324*
4. Social Status	.115	.233	-.021	.252
5. Membership in Formal Organizations	.065	.032	.032	.168
6. Executive Positions in Formal Organizations	.095	.105	.046	.125
7. Membership in Farm Organizations	.280*	-.042	.189	.112
8. Executive Positions in Farm Organizations	.342	.090	.233	-.037
9. Number of Mass Media Available	.309*	.144	.359*	.308*
10. Total Time Using Mass Media	-.108	-.255	.128	.058
11. Mass Media Usage Related to Farming	.125	-.330*	.115	.411*

* Significantly larger than zero at the five per cent level.
** Significantly larger than zero at the one per cent level.