1965

An Analytical Study of the Degree and the Nature of Association Between Problem Recognition and the Personal Characteristics of Farm Operators in Lake County, South Dakota

Amir Khalili

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AN ANALYTICAL STUDY OF THE DEGREE AND THE NATURE OF
ASSOCIATION BETWEEN PROBLEM RECOGNITION AND THE
PERSONAL CHARACTERISTICS OF FARM OPERATORS
IN LAKE COUNTY, SOUTH DAKOTA

BY

AMIR KHALILI

A thesis submitted
in partial fulfillment of the requirements for the
degree Master of Science, Major in
Economics, South Dakota State
University

1965
AN ANALYTICAL STUDY OF THE DEGREE AND THE NATURE OF
ASSOCIATION BETWEEN PROBLEM RECOGNITION AND THE
PERSONAL CHARACTERISTICS OF FARM OPERATORS
IN LAKE COUNTY, SOUTH DAKOTA

This thesis is approved as a creditable and independent
investigation by a candidate for the degree, Master of Science,
and is acceptable as meeting the thesis requirements for this
degree, but without implying that the conclusions reached by the
candidate are necessarily the conclusions of the major department.

Thesis Adviser

Date

May 17, 1965

Head, Economics Dept.

Date

May 17, 1965
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CHAPTER I

INTRODUCTION

The Problem

The distribution of farm income depends greatly upon resources available to individual farm operators and their ability to combine resources profitably.

Table 1 indicates that during the period 1959-1960, cash farm receipts from marketing per farm in Lake County, South Dakota, were consistently the lowest among the counties in economic area 4-B (shown on the map on page 4).

Table 1. Cash Farm Receipts from Marketing per Farm, by County, Economic Area 4-B, South Dakota, 1959-1960*

<table>
<thead>
<tr>
<th>County</th>
<th>1959</th>
<th>1960**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minnehaha</td>
<td>$10930</td>
<td>$11209</td>
</tr>
<tr>
<td>Yankton</td>
<td>10576</td>
<td>10435</td>
</tr>
<tr>
<td>Lincoln</td>
<td>10480</td>
<td>10903</td>
</tr>
<tr>
<td>Moody</td>
<td>11611</td>
<td>11018</td>
</tr>
<tr>
<td>Union</td>
<td>10250</td>
<td>10429</td>
</tr>
<tr>
<td>Clay</td>
<td>11935</td>
<td>11757</td>
</tr>
<tr>
<td>Turner</td>
<td>10156</td>
<td>10196</td>
</tr>
<tr>
<td>Lake</td>
<td>9901</td>
<td>9875</td>
</tr>
</tbody>
</table>

*Data for total cash farm receipts from marketing for the counties in economic area 4-B were obtained from the South Dakota Crop and Livestock Reporting Service, and the number of farms for these counties was obtained from the U.S. Census of Agriculture, South Dakota.

**The number of farms for the year 1960 for different counties in economic area 4-B, was obtained by projecting the yearly decrease in the number of farms during the period 1954-1959.
Table II indicates that a high percentage of rural families in Lake County, South Dakota, in 1959 was concentrated in lower income classes. It also shows that in 1959, approximately 45 percent of rural families in the county were living in poverty—poverty being indicated by a family income of less than 3,000 dollars.¹

Table II. Percentage Distribution Rural Family Incomes, by Income Class, Lake County, South Dakota, 1959.

<table>
<thead>
<tr>
<th>Class</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 1,000</td>
<td>13.7</td>
</tr>
<tr>
<td>1,000 - 1,999</td>
<td>14.4</td>
</tr>
<tr>
<td>2,000 - 2,999</td>
<td>16.8</td>
</tr>
<tr>
<td>3,000 - 3,999</td>
<td>16.5</td>
</tr>
<tr>
<td>4,000 - 4,999</td>
<td>10.7</td>
</tr>
<tr>
<td>5,000 - 5,999</td>
<td>10.7</td>
</tr>
<tr>
<td>6,000 - 6,999</td>
<td>6.1</td>
</tr>
<tr>
<td>7,000 - 7,999</td>
<td>2.2</td>
</tr>
<tr>
<td>8,000 - 8,999</td>
<td>2.4</td>
</tr>
<tr>
<td>9,000 - 9,999</td>
<td>1.6</td>
</tr>
<tr>
<td>10,000 and under</td>
<td>4.9</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
</tr>
</tbody>
</table>


The consistently low cash farm receipts from marketing in Lake County as compared to other counties in economic area 4-B in 1959 and 1960, and the widespread low farm incomes in the distribution of rural family incomes in this county indicate that a great proportion of the farm families in this area have not made appropriate adjustments to changing economic, technological, and production factors. Through more efficient management of production factors—land, labor, and capital—the farm operators in this area might improve their net earnings. The widespread incidence of low incomes in this area might indicate that low income farm operators are facing complex resource management problems. The recognition of these problems is a necessary first step. Therefore, research was conducted to study the personal factors that are associated with problem recognition among farm operators in Lake County, South Dakota, in order to determine the factors that impede their progress.

2John E. Lee, and E. D. Chastian, Problem Recognition in Agriculture ... Managerial Adjustment Opportunities, Bulletin 319, November 1959, Agricultural Experiment Station of the Alabama Polytechnic Institution, Auburn, Alabama, pp. 10.
Objectives

This study has the following objectives:

1. To define problem recognition ability as a quantifiable variable.

2. To find out whether or not problem recognition ability of farm operators in Lake County, South Dakota, is related to their net earnings.

3. To determine the personal factors that are associated with problem recognition ability among farm operators in this area.

4. To establish implications for policy and extension work.
CHAPTER II

DEVELOPMENT OF METHODS USED IN THIS STUDY

Methodology and Conclusions in Previous Studies

Five decision-making principles were explained by Glenn L. Johnson and Cecil B. Haver in 1953:

1. Observation
2. Analysis
3. Decision concerning problems under consideration
4. Action-taking
5. Acceptance of responsibility

In 1959, a revised framework for the decision-making process was used by Lee and Chastain. It was argued that the problems created by change were not really given or well defined as assumed by Glenn L. Johnson and that farmers might in fact, encounter significant difficulty in recognizing problems. Therefore, "problem recognition" should be considered as a logical first step in the decision-making process rather than "observation." The framework used by Lee and Chastain is as follows:

\[\text{Reference 3: Glenn L. Johnson and Cecil B. Haver, Decision-Making Principles in Farm Management, Bulletin 593, Kentucky Agricultural Experiment Station, University of Kentucky, Lexington, Kentucky, January 1953, p.8.}\]

\[\text{Reference 4: John E. Lee and E. D. Chastain, Problem Recognition in Agriculture...Managerial Adjustment Opportunities, Agricultural Experiment Station of the Alabama Polytechnic Institute, Auburn, Alabama, p. 11.}\]
(1) Problem recognition
(2) Observation
(3) Analysis of alternatives
(4) Making of decision
(5) Action taking
(6) Acceptance of responsibility

Steps 2, 3 and 4 could be called the problem solving step. Therefore there are four basic steps in managerial adjustment:

(1) Problem recognition
(2) Problem solving
(3) Action taking
(4) Responsibility acceptance

A sample representing many types and sizes of family farm operation was drawn by Lee and Chastain. This sample was drawn from a population that consisted of farm families participating in Farm and Home Development (FHD) activities in Alabama. Among 252 usable family interviews recorded in the study conducted by Lee and Chastain, more than 40 percent said they saw no way to increase income on their farms at prevailing prices (while the analysis of the record showed

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5Ibid., p. 11.
6Ibid., p. 15.
that the rates of production were often below the break-even point.

Half of the farm operators in the sample had negative labor income, and more than half had negative returns on capital. It was found that the following characteristics of respondents influenced problem-recognition ability:

(1) There was a negative association between the age of the farm operator\(^7\) and his ability to recognize problems;

(2) There was a positive association between the number of years of formal education and the farm operator's ability to recognize problems. There was also a positive association between off-farm experience, progression in the stage of family cycle, and organized agricultural training and this ability.

The work of Lee and Chastain was the first major effort in the study of problem recognition among farmers as a definite step in managerial adjustment and of the human and social characteristics that influence the ability to recognize problems. However, in a study in 1958 on personal and environmental obstacles to production adjustments\(^8\) the analysis of attitudes of a sample of full-time operators of medium-size farms helped to isolate and to appraise some of the major

\(^7\) Ibid., p. 33.

\(^8\) Calvin C. Taylor and Thomas A. Burch, Personal and Environmental Obstacles to Production Adjustments on South Carolina Piedmont Area Farms, Bulletin 466, December 1958. South Carolina Agricultural Experiment Station, Clemson Agricultural College, Clemson, South Carolina.
obstacles that tended to discourage or prevent many farm operators from making desirable production adjustments. It was found that age and limited education and training were among the personal obstacles to production adjustment.

There have been two studies dealing with degree of problem recognition among farm operators in Lake County, South Dakota. The methods and conclusions in these two studies are of interest for the present analysis.

Silva and Kao defined problem recognition as intellectualizing a felt difficulty. They used the following nine indicators of farming success to "assess the accuracy with which farm operators realized their problems":

1. Yield index for corn and oats,
2. Number of work units per worker,
3. Number of animal units per worker,
4. Number of animal units per 100 acres,
5. Crop machinery investment per crop acre,
6. Power machinery investment per crop acre,
7. Crop acres per worker,

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10 Ibid., p. 10.
(8) Percent lamb crop,
(9) Eggs per hen. 11

Silva divided the distribution of each indicator of farming success into three equal parts. By this method each individual index of efficiency was placed in the upper, middle, or lower third of the distribution. Then the following question was asked of each respondent. "At present prices, are there some farming changes that might be investigated, to see if your farm income could be increased?"

(1) Yes ( )
(2) No ( )
(3) Does not know ( )

Then on the basis of the answers to the above question, farmers were given one of the following three degrees of problem recognition:

(1) If the respondent's answer was either "no" or "I don't know," but the efficiency indicators showed that, in fact, there were changes needed, he had a problem recognition index of one.

(2) If a respondent indicated that there were some changes that could result in a higher net income to him, but could not indicate any particular change that needed to be made, he had a problem recognition index of two.

(3) If the respondent indicated changes that needed to be investigated, or that there were no changes to be investigated, and he was relatively correct in either case, he had a problem recognition index of three.

11Ibid., p. 10.
Both Silva and Kao used the frequency distribution method to find how problem-recognition ability, income, and certain characteristics of farm operators in Lake County, South Dakota, were related.

Silva concluded the "89 percent of the operators interviewed in Lake County, South Dakota, had significant needs for change, when in fact they failed to recognize these needs." He found that "studying price outlook information and farm records, making short time plans and contacts with county agent were more frequently associated with operators at the highest level of problem recognition." No significant relationship was found between formal education and varying degrees of problem recognition. Kao studied variation of income with the managerial characteristics mentioned previously. It was found that older farmers were more frequently in the lowest level of problem recognition than in the highest level. Level of problem recognition was associated positively with income.

Further studies were needed in this area for the following reasons:

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12 Don Silva, op. cit. p. 40

13 Ibid., p. 40.
(1) Statistically, the method used by Silva and Kao to define problem recognition as a quantified variable does not seem sound. There is some arbitrariness in dividing the distribution of each indicator of farming success into three equal parts, each with 33 1/3 percent of the total distribution. This does in effect alter the degree of problem recognition assigned to each individual farm operator on the basis of his present efficiency score.

(2) This method of definition of problem recognition is based upon judgment of the researcher which is best avoided. Statements such as "39 percent of the farmers failed to recognize their problems ..." after such method of arbitrary division of the distribution in the "Degree of Problem recognition" seem to contain a great deal of judgement. All a researcher can do in this case is to find what the factors are that explain variations in the "Degree of Problem recognition," as measured here.

(3) There does not seem to be any theoretical support for the way problem recognition is defined in terms of indexes of efficiency.

(4) There is not much support for the choice of variables and their functional forms in this study.

(5) The statement of the problem needs improvement as far as the justification of the undertaking of research in this particular area is concerned.

(6) The method of analysis used did not enable Silva and Kao to get at association between the factors that were supposed to be
"associated" with degree of problem recognition. In addition the effect of the inclusion of each additional "variable" could not be measured.

It is doubtful, therefore, whether the same conclusions would be reached had a more sound statistical technique been used in defining problem recognition.

(7) From a statistical point of view, the use of the frequency distribution as a technique to determine relationships between economic variables serves a useful preliminary step. Here the Chi-square test is used to tell whether or not two selected attributes of the sample are independent. But this test will tell neither the degree of association nor the direction of dependency. Although the frequency distribution and the Chi-square test used in previous studies of "problem recognition" ability among farmers served the useful purpose of a preliminary step, it is necessary to use regression analysis and correlation analysis -- whose principal objectives are measurement of relationships -- to find the "nature" and the "extent" of relationships that are hypothesized to exist between problem-recognition ability and certain environmental and personal factors among farm operators in Lake County, South Dakota.
The Methodology Used in This Study

This study employs the farm management decision model used by Trimble R. Hedges. He distinguishes three unique and vital functions for management: making decisions, carrying out decisions, and accepting responsibility.

According to Hedges, there are five steps in making decisions:

(1) Recognizing the problem, a need for action.
(2) Identifying and assembling all relevant facts that bear on this problem.
(3) Sorting, summarizing and analyzing of these facts, identifying the problem and arriving at tentative answers--hypotheses--for solving them.
(4) Testing of these hypotheses--need for collection of more facts.
(5) Finally, arriving at a decision--choosing a course of action as the solution to the problem.

Therefore, the relative importance of problem recognition as the first step in the decision-making function of a farm operator is evident.

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15 Ibid., p. 4.
To give theoretical support to the choice of basis for the definition of problem recognition, in this study, a model was developed.

It was thought that the definition of problem recognition should be based on extensive ground. In general, it was thought that the definition of degree of problem recognition should be based upon three sets of factors. These three sets of factors present problems to management because of their influence upon net earnings:

1. **Economic factors.** The realization by the farm operator of the combined effects of prices received and prices paid does help him in making proper decisions. Even the farm operator who feels that his business is at the mercy of the price-making forces still must realize the relevant facts about such prices at the time he plans his production, purchases his production inputs, and sells his product.

2. **Production factors.** Production factors are traditionally classified as land, labor, capital, and management. An efficient allocation of a proper amount of any factor will, ceteris paribus, bring higher earnings to the manager than otherwise.

3. **Technological factors.** Given amounts of land, labor, and capital and the nature of their allocation will give a certain level of production, if technology is held constant. But in fact technology does change over time. Thus the management must make decisions with respect to the adoption of new techniques of production. The appropriateness of such decisions affects the level of the management's net earnings.
As indicated earlier, realization of the problems associated with these three factors is a necessary first step. Thus in developing a complete technique of measurement for the "degree of problem recognition" variable, these factors must be taken into consideration. That is, the level of degree of problem recognition of an individual farm operator depends merely on these three sets of factors. However, it is doubtful whether the individual farmer's degree of recognition of problem associated with such factors as price changes or technological changes can be measured without a normative model at hand. Since there is no normative model based on the above three factors to measure the degree of problem recognition, the definition of problem recognition is based on production factors alone. Among the four factors of production - land, labor, capital, and management - this study actually intends to find how efficient management uses the other three factors - land, labor and capital, and what the personal characteristics of such managers are.

First, however, a model must be developed to explain variations in problem recognition. Then in the specification of such a model the degree of problem recognition (the dependent variable) is to be defined using the three factors of production - land, labor, and capital - as the basis for such definition.
It is hypothesized that the ability to recognize problems is affected by the following three factors:

1. **Personal Factors.** Personal factors such as age, education, marital status, attitudes, experience, values, and goals, and the ability to verbalize such goals are associated with the level of net earnings of the farm operator. If, as assumed earlier, net earnings and problem recognition ability are related, these personal factors will be associated positively with problem recognition success.

2. **Environmental Factors.** Many agricultural problems are the direct result of rapid changes in technology, living standards, demand for agricultural products, and

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19 Calvin C. Taylor and Thomas A. Burch, *op. cit.*, p. 16.
availability of information²⁰ to the farm operators. These changes have occurred with such rapidity that many farmers have not been able to keep pace with desirable adjustments. Consequently, these farmers face situations in which adjustments are progressively more difficult. As mentioned earlier, one of the requirements for making the correct decision and adjusting is the ability to recognize problems. Therefore, mechanization, shifting demands, living standards, and availability of information to the farmers may be associated with problem-recognition ability.

(3) **Occupational Factors.** Factors such as tenure status,²¹ size of farm, economic class of farm (full-time farm, part-time farm, commercial farm, and non-commercial farm) and availability of capital,²² by influencing the farmer's net earnings, are associated with problem-recognition ability.

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The model presented is too broad to be used here; yet it presents many interrelated factors that are shown by separate studies to influence managerial success. To limit the scope, a less extensive model is presented for use in this study.23

The Models Used in this Study

In general it is hypothesized that:

\[ Y = F(P), \text{ and} \]
\[ P = G(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9) \]

where:

- **Y** = Net farm income.
- **X_1** = Age of farm operators.
- **X_2** = Years of formal education.
- **X_3** = Degree of contact with county agent.
- **X_4** = Innovation proneness.
- **X_5** = Security as a goal.
- **X_6** = Farming as a way of life.
- **X_7** = Profit as a goal.
- **X_8** = Prestige as a goal.
- **X_9** = Attitude toward efficiency and practicality.

These variables are defined below:

---

23 Only those factors were considered that could be obtained from the questionnaire.
Net Farm Income

Farm operators were asked "what was your 1960 net income as reported on your income tax statement?" In order to obtain net family farm incomes, the reported figures were adjusted for the number of dependents, for most of the sample farm operators had deducted for dependents already.

It was hypothesized here that recognition of farm problems contributes to an increase in the net farm income in the long run. Therefore, the equation reflecting the association between income and degree of problem recognition would be of the type \( Y = a_1 + b_1 P \) where \( b_1 \) is hypothesized to be positive.

Degree of problem recognition

The underlying concept of the measure of problem recognition, here, is the degree of efficiency -- the effective use of resources. If a farmer recognizes his inefficiency in an area, he is presumed to have recognized his farm problem in that area.

Four major indexes of efficiency are used here to reflect the problem recognition ability because:

1. They measure the relative efficiency with which the farm operator uses his resources - land, labor, and capital. Therefore, on the basis of the theoretical model presented earlier these measures would be a sound choice.
(2) Previous research indicates that in South Dakota these measures are associated with variations in earnings among farm operators within a given year. 24

(3) It was assumed that a high proportion of the variation in efficiency with which the farm operators use their resources is reflected in these four indexes.*

(4) It was apparent that these measures would be appropriate to all farm operators in Lake County.*

The four major indexes of efficiency are:

(1) Corn index

(2) Oats index

(3) Power machinery and crop machinery investment per tillable acre

(4) Number of work units per worker index

These measures were stated as ratios using the county sample mean as the base in each case except for the corn and oats ratios. Here, the base was the sample mean yield in the eastern or western part of the county depending upon the location of each individual farm.


*Here the author is indebted to Dr. S. Ray Schultz, the author’s major advisor.
The reason for this choice of base was that a significant difference was found between oats and corn yield in the eastern portion and the western portion of the county. The two indexes of oats and corn were assumed to reflect the efficiency with which the land was used by the individual farm operator.

The power machinery and crop machinery investment per tillable acre is a measure of average amount of investment in crop machinery and power machinery for each acre on which it was used. It was calculated by dividing the total crop machinery and power machinery investment by the number of tillable acres, exclusive of pasture and waste land. To estimate present value of crop machinery and power machinery, straight line depreciation was applied to estimated new cost obtained from a machinery dealer's guide, and from the Crop and Livestock Reporting Service. This measure was assumed to reflect the efficiency with which the farm operators used their capital.

To convert all the accomplishments of the labor on the farm to a common measure, the standard work units used in previous

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research were used. Then total work units were divided by the number of workers on the farm, including all part-time help. To get the index this measure was divided by the county's average work unit per worker. This index was assumed to be a measure of efficiency with which the labor was used on the farm.

Thus, for each farm operator in the sample, there were four indexes, each of which was designed to be a measure of efficiency. The individual farmer was given a score of 1, 2, 3, 4, 5 or 6 in each of the four ratios according to his deviation from the mean in standard deviation units \( \frac{x_i - \bar{x}}{s} \).

The following question was asked of all the farmers: "At present prices, are there some farming changes that might be investigated, to see if your farm income could be increased?" If the farm operator responded with either "no" or "I don't know," the total of his four efficiency scores was taken as being the equivalent to his degree of problem recognition.

However, if the respondent answered "yes," he was also asked to indicate what specific changes might be investigated. If he mentioned changes that involved any of the four efficiency indicators, that particular efficiency indicator (in terms of deviation from the mean in standard deviation units) was increased to the magnitude of 6 (maximum possible score in each of the four efficiency ratios.)

---

This increased efficiency indicator was then added to the other three (whether increased or not).

The total adjusted scores then were taken as a measure of the degree of problem-recognition ability (maximum possible level of problem recognition was "24," and the minimum level of problem recognition was "4").

**Personal characteristics that affect problem recognition ability**

It is hypothesized that a farmer's age has a bearing upon his effectiveness in performing management functions and thus upon his ability to recognize problems. This bearing might not be direct. A manager's age might affect his problem recognition ability through changes of his value system. More particularly, it is hypothesized that managerial ability to recognize problems goes through a three-phase cycle with actual and relative length of the phases varying for different individuals.

First is the learning period, next is full maturity with optimum performance in ability to recognize problems, and finally comes the past maturity or pre-retirement phase.

Some researchers use age as a continuous variable and some use it as a discrete variable in regression equations. There is considerable date to support treatment of age as a continuous variable.29

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29 *Bernard P. Karon, "A Note on Treatment of Age as a Variable in Regression Equation."* The American Statistician, June, 1964, Volume 18, No. 3, P. 27.
This study considers age as a continuous variable, but rejects the regression model presented by Karon\textsuperscript{30} as a proper model representing the theoretical relationship between problem recognition ability and age. Instead, the three-phase theory presented above suggests a second degree functional relationship with a negative coefficient for the second degree term; that is

\[ P = A' + B'X + B''X^2 + U' \]

where:

- \( P \) = Degree of problem recognition as defined in this study.
- \( X \) = Age of farm operators.
- \( A', B', \) and \( B'' \) = the usual regression coefficients where \( B'' \) is negative.
- \( U' \) = Stochastic variable with the following underlying assumptions:
  1. The individual residuals are independent of each other.
  2. The distribution of residuals is normal with mean of zero; \( E(U') = 0 \)
  3. \( \text{Var}(U') = \sigma^2 \), where \( \sigma^2 \) = the variance of the population

\textsuperscript{30}Ibid., p. 28

Years of formal education

Formal education is thought to have some bearing on success in recognizing problems. Variation in degree of problem recognition as a result of formal education may vary widely among individuals, depending on the knowledge and skills they acquire in their educational program. Formal education might enhance the ability to obtain and interpret technical and economic information. It is hypothesized, therefore, that formal education is positively correlated with the level of problem recognition.

Attitudes

An attitude refers to a specific response predisposition. Attitudinal variables listed below will be used in testing the hypothesis that there is a relationship between certain attitudes and the degree of problem recognition.

1. Attitude toward efficiency and practicality. It is hypothesized here that the attitude of a farm operator toward efficiency and practicality is correlated positively with his degree of problem recognition. To measure this attitude toward efficiency and practicality, the farm operators were asked four questions.\(^{32}\)

\(^{32}\) Different questions were asked in order to get a better measure of the attitudes of individual farmers. There was an attempt to measure other attitudes, and these attitudes were considered as variables; no other attitudinal variable was significant in explaining the variations in problem recognition.
(a) In being a successful farmer, what is most important?

- keeping records
- working hard
- weighing each farm practice against the profit it gives you

(b) In judging neighbors, the most important thing is

- how much of a family man he is
- how efficient he is at farming
- how practical his ideas are
- how hard he works

(c) In raising children, what is the most important thing to teach them?

- to be practical
- to keep ties with their parents
- to spend money wisely
- to work hard

(d) In raising children, what is the most important thing to teach them?

- to learn to farm
- to judge every opportunity in terms of long range plans
- to take the job which they will enjoy the most
- to take the job which will give them the most income

33 Other attitudinal variables, such as attitude toward work and familism, were included in the original regression model. However, these were not found to be significant and therefore were excluded from the problem recognition model.
Here each farm operator was given a score of "1" if he responded positively to any of the answers involving "efficiency and practicality." Therefore, the variable "efficiency and practicality" would have a maximum possible score of "4," and a minimum possible score of "0".

2. **Innovation proneness.** To find out how the adoption of new practices varied among farmers in this area, the following question was asked: "We know that all farm people don't adopt new practices at the same time. About where would you rate yourself in respect to adopting new practices?"

(a) Among the first in the neighborhood
(b) A little faster than most of the neighbors
(c) About average
(d) A little slower than most of the neighbors
(e) Among the last in the neighborhood

To develop an index of the farm practice adoption attitude, it was hypothesized that innovation proneness is positively related to problem recognition. Five answers a, b, c, d, and e to the above question were rated 5, 4, 3, 2, and 1 respectively. Therefore, if answer (d) was checked, the

---

34 James Nielson, op. cit., p. 12.
individual was given a score of 2. Thus there would be a
maximum possible score of 5 and a minimum possible score
of 1 for any individual respondent.

**Goals of Farm operators**

Here goal is defined as an objective or condition to be
attained. It is hypothesized that the nature of goals influences
not only the choice between decisions, but the whole of the decision-
making process of which problem recognition is the first part. All
farm operators were asked to rank answers to the following questions
from the most important to least important:

In farming, the successful man is one who:

- stays out of debt
- sticks to farming even during bad times
- makes the most profit
- is highly respected by other farmers

(Now which is the second most important?)
(Now which is the least important?)

Assuming the rating reflects their goals the following variables
would be measured:

---

(1) Security as a goal
(2) Farming as a way of life
(3) Profit as a goal
(4) Prestige as a goal

The ranking is taken as a measurement of these variables. Here it is hypothesized that the first two variables are related to degree of problem recognition.

Three questions regarding acquaintance and contacts of the farm operator with a county agent were asked.

1. In 1960, did you read any newspaper articles, bulletins, or letters from your county agent or listen to him on the radio or T.V.?
   1. Yes ( )
   2. No ( )

2. Do you know the name of the county agent?
   1. Yes ( )
   2. No ( )

   a. If yes, do you know him personally?
      1. Yes ( )
      2. No ( )

3. In 1960, did you have any personal contact (at meetings or through visits or phone calls) with your county agent?
   1. Yes ( )
   2. No ( )
The farm operator was given a score of "1" in each question if his answer was yes, and a score of zero if his answer was no. The final score for each farm operator was obtained by summing his scores over all three questions.

**The Regression Equation**

In summary, one can write the hypothesized relationships between the factors considered in the model and the degree of problem recognition in regression equation form:

\[
P = A + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8
\]

where: \(B_1, B_4, \) and \(B_5\) are hypothesized to be negative and \(A, B_2, B_3, B_6, B_7, \) and \(B_8\) are hypothesized to be positive. The variables are defined above.
CHAPTER IV

PROCEDURE

Selecting of Sample

The study was limited to farm operators in Lake County, South Dakota, because the adjustment to changes in this area has been relatively slow.\(^{36}\)

In a survey of this area made during the spring of 1961, one hundred twenty farms from the county total of 1,172 were selected as a geographically stratified sample. The operators of these farms were interviewed in person.

Estimation of parameters of net income model

1. The parameters of the model representing the regression of net farm income of farm operators on their degree of problem recognition were as follows:

(a) The estimating equation:

\[ Y = 743.96410 + 323.23204P \]

\((74.57393)\)

The standard error of the coefficient of regression is in parentheses. Results of the "t" test indicated that the regression coefficient was significantly different from zero at the .01 level.

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\(^{36}\)The evidence for this slow adjustment to changes on the part of the farm operators in this area was presented in Tables I and II, pp. 2-3.
(b) The simple correlation coefficient \( r = .37059 \) (The determination coefficient, \( R^2 = .13734 \)).

Estimation of parameters of the problem recognition model:

1. The parameters of the second degree curvilinear regression model used to explain variations in degree of problem recognition, taking only age as the independent variable were as follows:

   (a) The regression equation (see Chart 1, page 35.)

   \[
   P = 11.55078 + .2959x - .038x^2 \\
   (\pm .16372) (\pm .00168)
   \]

   The standard errors of the coefficient of regression are in parentheses. Results of the "t" test indicated that the regression coefficients were significantly different from zero at the .05 level.

   Results of the "F" test indicated that the amount of explained variation in the dependent variable (degree of problem recognition) due to addition of \( x^2 \) (square of age) increased significantly at the .05 level.

   (b) The percentage of variation in degree of problem recognition explained by the curvilinear regression model was 12.3 percent. This multiple determination coefficient was significant at the .01 level.

   (c) The correlation between degree of problem recognition and age in linear form was \( r_{p,x} = .28923 \), and the correlation between degree of problem recognition and age in squared form was \( r_{p,x^2} = -.31431 \). These simple-correlation coefficients were significant at the .01 level.
2. If we call \( a, b_1, b_2, b_3, b_4, b_5, b_6, b_7, b_8, b_9 \) and \( u \), the direct estimates of \( A, B_1, B_2, B_3, B_4, B_5, B_6, B_7, B_8, B_9 \), and \( U \), respectively, the direct estimating procedure would give \( P = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9 + u \). To estimate the parameters of the equation, a single stage regression problem was used and through the use of a computer the parameters were estimated to be as follows:

(a) The estimating equation:

\[
P = 18.274 - 0.065x + 0.279x_2 + 0.893x_3 + 0.514x_4 + 0.235x_5^* + 0.518x_6^* + 0.233 \quad (0.121) \quad (0.207) \quad (0.307) \quad (4.98)
\]

The standard errors of these coefficients of regression are in parentheses. Results of the "t" test indicated that the regression coefficients \( b_1, b_2, b_3, \) and \( b_9 \) were significantly different from zero at the .05 level. \( b_4 \) was significant at the .10 level, while \( b_8 \) and the remaining coefficients of regression \( (b_5, b_6 \) and \( b_7) \) were not significant at the .05 level.

The results of the "F" test indicated that the amount of explained variation in the dependent variable (degree of problem recognition) caused by the addition of variables such as age, education, degree of contact with county agent, innovation proneness, and attitude toward efficiency and practicality was significant at the .05 level.

*The regression coefficient \( b_8 \) is not significant at .05 level.
X = Age

Y = Degree of Problem Recognition

Chart 1: Association Between Degree of Problem Recognition and Age of Farm Operators in Lake County, South Dakota, March, 1961

p = 1.15 + 2.96X - 0.039X^2

S_p = 3.129
The following additional independent variables did not significantly increase the proportion of variation in the degree of problem recognition, security as a goal, farming as a way of life, profit as a goal, and prestige as a goal.

The coefficient of multiple determination $R^2 = .312$ was significant at the .05 level. Coefficients of simple correlation (upper triangular matrix) for this analysis are the following:
Table III. Simple Correlations of the Problem Recognition Model* Upper Triangular Matrix

<table>
<thead>
<tr>
<th></th>
<th>$X_1$</th>
<th>$X_2$</th>
<th>$X_3$</th>
<th>$X_4$</th>
<th>$X_5$</th>
<th>$X_6$</th>
<th>$X_7$</th>
<th>$X_8$</th>
<th>$X_9$</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>$X_1$</td>
<td>1.000</td>
<td>-0.292**</td>
<td>-0.078</td>
<td>-0.243**</td>
<td>0.124</td>
<td>0.020</td>
<td>-0.257**</td>
<td>0.134</td>
<td>-0.294**</td>
<td>-0.290**</td>
</tr>
<tr>
<td>$X_2$</td>
<td>1.000</td>
<td>0.204**</td>
<td>0.190*</td>
<td>-0.150</td>
<td>-0.120</td>
<td>0.289**</td>
<td>0.046</td>
<td>0.255**</td>
<td>0.018</td>
<td></td>
</tr>
<tr>
<td>$X_3$</td>
<td>1.000</td>
<td>0.194*</td>
<td>-0.286**</td>
<td>0.201**</td>
<td>0.022</td>
<td>0.082</td>
<td>0.195</td>
<td>0.408***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_4$</td>
<td>1.000</td>
<td>-0.085</td>
<td>0.020</td>
<td>0.056</td>
<td>-0.029</td>
<td>0.066</td>
<td>0.241***</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>$X_5$</td>
<td>1.000</td>
<td>-0.276***</td>
<td>-0.314**</td>
<td>-0.369**</td>
<td>-0.208**</td>
<td>-0.167</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_6$</td>
<td>1.000</td>
<td>-0.291***</td>
<td>-0.165</td>
<td>0.009</td>
<td>0.015</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_7$</td>
<td>1.000</td>
<td>-0.380***</td>
<td>-0.265***</td>
<td>0.036</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_8$</td>
<td>1.000</td>
<td>-0.161</td>
<td>0.081</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_9$</td>
<td>1.000</td>
<td>0.273***</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>P</td>
<td>1.000</td>
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</tbody>
</table>

*The variables used in this table are defined on page 19.
**Significant at the .05 level. The simple correlation coefficient at the .05 level for 118 degrees of freedom (120 - 2) is .180.
***Significant at the .01 level. The simple correlation coefficient at the .01 level for 118 degrees of freedom is .2381.
CHAPTER V

EVALUATION OF THE MODELS

Net Income Model

Problem recognition alone does not account fully for all the variation in net farm income. In fact, a low, however significant, determination coefficient here is evidence that there are other factors that explain the rest of the variation in net farm income. This in fact is the very reason why net farm income would not have been a logical choice as a measure of problem recognition. The recognition of the inefficiencies as a first step, however, does contribute to a higher net farm income. Therefore, it can be seen that the problem recognition model presented here is part of a larger model which explains variation in net income.

Degree of problem recognition model

The personal factors, as shown earlier, are part of a larger model explaining the variation in degree of problem recognition. The regression model used here explained 32.23 percent of the variation in the degree of problem recognition. This was significant at the .01 level. Degree of contact with county agent, age of farm operator, years of formal education, and attitude toward efficiency and practicality increased the proportion of explained variation in the degree of problem recognition significantly. Addition of innovation
proneness and prestige as a goal did not increase the proportion of explained variation in degree of problem recognition at the same level of significance (.05 level). The importance of the variables that contributed significantly to an increase in explained variation in degree of problem recognition is noted in the following pages.
CHAPTER VI

DEGREE OF PROBLEM RECOGNITION ASSOCIATED WITH
THE DEGREE OF CONTACT WITH COUNTY AGENT

Degree of contact with the county agent on the part of the farmer significantly contributed to the farmer's level of problem recognition. This suggests that the county agent plays an important role in helping farm operators realize their inefficiencies in certain areas. Contact with the county agent appears to provide the farm operator with the information he needs in order to analyze the situations and recognize his problems.

When a second degree curvilinear model was used to describe the association between degree of problem recognition and degree of contact with the county agent, the squared form of the independent variable (degree of contact with the county agent) did not increase the explained variation in the dependent variable (degree of problem recognition) significantly. Therefore, a linear model was more relevant.

In order to discover the personal characteristics of the farmers who contact the county agent often, it is necessary to look at the intercorrelation between degrees of contact with the county agent and these characteristics.
Table III shows that the farm operators with higher formal education contact the county agent more often. Perhaps the farmers with more years of formal education know the benefits of information received through contacts with the county agent.

This table also shows that the farm operators who had a more favorable attitude toward adoption of new practices had significantly more contacts with the county agent.

The farmers with less security orientation contacted the county agent more. The farmers who thought of farming as a way of life tended to contact the county agent more. Finally farm operators with a more positive attitude toward efficiency and practicality contacted the county agent more often.
CHAPTER VII

DEGREE OF PROBLEM RECOGNITION ASSOCIATED
WITH THE AGE OF FARM OPERATORS

Personal characteristics alone do not account fully for the failure or inability of farm operators to recognize their problems and to use their resources efficiently. But they do fit logically within a framework in which other contributing and related factors may be discussed.

Therefore, some personal factors found to be related to recognition of problems are discussed here.

Age is shown to be an important variable. It has a bearing upon effectiveness in performing the managerial functions. The coefficients of the estimating equation describing the association between age and degree of problem recognition indicate that there are three phases. In the first phase, managerial ability increases with age. In the second phase, it reaches full maturity with optimum performance. In the third phase, problem recognition is declining.

To find the maximum level of problem recognition and the age associated with this optimum level, the regression equation was differentiated with respect to $X$. 
\[
P = 11.551 \cdot 296x - 0.004x^2 (1)
\]
\[
\frac{dP}{dx} = 0.296 - 2(0.004x)
\]
\[
\frac{dP}{dx} = 0.269 - 0.008x
\]

Setting this derivative equal to zero gives \( x = 37.9 \)

Substituting this value of \( x \) in equation (1) will give

\[
P = 11.551 \cdot 269 (3719) - 0.004 (37.9)^2
\]
\[
= 11.551 \cdot 11.2184 - 5.74564 = 17
\]

Therefore the point \( M(37.9, 17.0) \) is the maximum point of the second degree regression equation (1). The surprising fact about this finding is the age associated with this optimum level of problem recognition. This age may be called "Optimum efficiency age." The optimum efficiency age of about 39 seems surprisingly low.

The younger farmers are not as experienced as some of the older farmers. But they have the distinct advantage of youthful vigor, a closer association with developing technology through their modern educational program, and a more favorable attitude toward efficiency adjustments of a long-run nature. Experience still seems however to weigh heavily against the younger farmers. On the other hand, the older farmers are at an apparent disadvantage with regards to their reluctance to adopt the developing technology. The above generalizations are complicated by other factors. Many of these factors are found to be personal in nature and directly related to individual environment. They are best shown by inter-correlations between age and other personal factors.
The older farm operators seem to be more reluctant to adopt new practices. In fact, a positive association between age and security as a goal, although not significant, may explain why the older farmers are reluctant to adopt new practices. Here it could be mentioned that retirement plans on the part of the older farm operators may serve to discourage such activities as starting new enterprises or expanding existing ones.

A positive association between age and prestige as a goal, although not significant, may explain why older farm operators had significantly a negative attitude toward profit as a goal. The older farm operators tended to think that efficiency and practicality were not the most important determinant of success in farming. These personal factors affect the personal environment of the older farmers and influence their level of problem recognition.
CHAPTER VIII

DEGREE OF PROBLEM RECOGNITION ASSOCIATED WITH OTHER PERSONAL FACTORS

Years of Formal Education

Although the zero-order coefficient of correlation between the degree of problem recognition and the years of formal education was not significant, the fact that the sign of the coefficient was positive is of importance. For, on the one hand, there is negative correlation between years of formal education and age; on the other hand, there is negative correlation between age and degree of problem recognition. To be consistent, there should be a positive correlation between years of formal education and the degree of problem recognition. This consistency, in fact, exists throughout the model. The variable, years of formal education, should not be ignored because the addition of this variable was shown by the "F" test to increase the explained variation in problem recognition significantly. However, the eighth-order regression coefficient between degree of problem recognition and education indicates that as formal education increases by one year, the degree of problem recognition is decreased by .279 units. This finding shows that years of formal education, taken by itself, does not contribute to the degree of problem recognition of the farm operators, but when complemented with vigor of
youth, information obtained from the county agent, profit motive as a goal, and a favorable attitude toward efficiency and practicality, it has had a positive effect on the degree of problem recognition.

**Attitude toward Efficiency and Practicality**

A positive attitude toward efficiency and practicality, when considered in the problem recognition model, significantly increased the explained variation in the degree of problem recognition. The farm operators with a more favorable attitude toward efficiency and practicality tended to be more profit oriented and less security oriented. Also they tended to have more education and tended to be younger.

**Innovation Proneness**

A positive attitude toward the adoption of new practices was found to contribute to the recognition of farm problems. It was found that younger farm operators tended to have a more favorable attitude toward adoption of new practices. Innovation proneness increased the explained variation in the degree of problem recognition significantly. However, the coefficient of regression of problem recognition in innovation proneness was only significant at the .10 level.
Prestige as a Goal

Although the coefficient of correlation between this variable and the degree of problem recognition was not significant, the sign of this coefficient showed consistency with the rest of the model. It was found that the farm operators who were more prestige motivated were less security and profit oriented. Addition of this variable to the problem recognition model increased the explained variation in degree of problem recognition significantly at only the .10 level. The coefficient of regression of degree of problem recognition on prestige as a goal was not significant.

Other Factors Intercorrelated

Some of the interrelationships among the variables that significantly explained some of the variation in degree of problem recognition have already been mentioned within the framework of these variables themselves. However, other intercorrelations need to be discussed here.

Table III shows that those farm operators who were more security oriented, thought less of farming as a way of life, and were less profit oriented. This is consistent with the association between farming as a way of life and profit as a goal. For the farm operators who thought of farming as a way of life were less profit oriented.
CHAPTER IX

IMPLICATIONS FOR POLICY AND EXTENSION

This study indicates that higher net earnings are associated with problem recognition. Recognition of the inefficiencies on the farm supported by a supply of technical and economic information may help farm operators adjust to the continually changing environment.

The study indicates the continuing importance of the role of the county agent in helping farm operators realize the situations they are in and in improving their level of net earnings.

However, younger farm operators were mainly the ones who obtained help from the county agent. The older farm operators tended to make much less use of the county agent. They tended to have the lower net incomes. If low net farm incomes are taken as evidence of existence of farm problems, then the farm problem tends to be concentrated among farm operators who are older, have a negative attitude toward adoption of new practices, are less profit oriented, are more security oriented, have a less favorable attitude toward efficiency and practicality, view farming as a way of life, have a lower level of education, and make less use of the county agent. The farm operators who viewed farming as a way of life were found to be less profit oriented. National policies in agriculture imply improvements of farmer's net earnings. With such an orientation on the part of the individual farm operators, it is doubtful whether
national policies would be effective where change is needed the most. Further, a program that supplies farmers with information does not get at the fundamental difficulty. The fundamental difficulty involves attitudes that are not consistent with the national policies to increase income, and attitudes are generally slow to change. National policies usually focus upon commodities. Perhaps a more appropriate policy would focus upon people.

Findings appear to indicate that the more educated farmers tended to recognize their problems less. An explanation of this rather curious finding may be that the farm operators who have higher levels of education are not necessarily the most perceptive among those with the same level of education. The more perceptive individuals in this group may be the ones who left the farm. They saw more non-farm opportunities.
CHAPTER X

SUMMARY AND CONCLUSIONS

The distribution of farm income depends, to an important extent, upon resources available to individual farm operators and their ability to combine resources profitably.

Widespread low farm incomes in Lake County, South Dakota, were taken as evidence that low farm income farm operators were facing complex resource management problems. Treating recognition of these problems as a major first step in the decision-making process, research was conducted to study the personal factors associated with problem recognition ability among farm operators in this area, in order to determine the factors that impeded their progress. The findings obtained from a geographically stratified sample of farm operators in this area lends support to the general hypotheses that:

(1) The degree of problem recognition of farm operators in Lake County, South Dakota, is associated positively with their net earnings.

(2) The definition of degree of problem recognition in terms of four efficiency indicators which reflect the effective use of land, labor, and capital on the farms gives meaningful and significant relationships.

(3) Certain personal factors influence problem recognition ability among the farm operators in the area.
The general model was presented to give theoretical support to the choice of the four efficiency indicators as the basis of measurement of the degree of problem recognition. A general model was presented in order to serve as a support for the choice of variables that were hypothesized to explain variations in degree of problem recognition and explain variations in this variable does in fact give meaningful and significant relationships.

A statistical technique was used to quantify the degree of problem recognition on the basis of the four efficiency indicators and answers to questions designed to determine awareness of the existence of problems which, if solved, would increase their net income.

Personal and environmental variables which significantly explained variation in problem recognition were age, education, degree of contact with the county agent, innovation proneness and attitude toward efficiency and practicality.

The above personal and environmental variables were presented in order of their significance in explaining the variations in degree of problem recognition.

It was found that degree of contact with the county agent on the part of the farm operator significantly contributed to the farmer's level of problem recognition. This emphasizes the role of the county agent in helping farm operators realize their inefficiencies in certain areas.
The table of intercorrelation among the personal factors showed that farm operators at higher levels of education contacted the county agent more often. Farm operators with a more favorable attitude toward adoption of new practices had significantly more contacts with the county agent. Farmers who contacted a county agent more, were less security oriented, tended more to view farming as a way of life, and had a more positive attitude toward efficiency and practicality.

A second degree curvilinear regression model was used to reflect the association between age and degree of problem recognition. The coefficients of the estimating equation describing this association reflected three phases. In the first phase, problem recognition ability increased with age; in the second phase, it reached full maturity with optimum efficiency. In the third phase, it declined. This regression model gave significant and meaningful association between age and degree of problem recognition.

Age associated with maximum degree of problem recognition was 38. Intercorrelation between age and other personal factors showed that the older farmers were more reluctant to accept new practices. This finding may be explained by the fact the retirement plans on the part of older farm operators serve to discourage starting new enterprises or expanding existing ones. Also, the older farm operators had a negative attitude toward efficiency and practicality and toward profit as a goal.
The study indicated that years of formal education significantly contributed to the explanation of variation in degree of problem recognition. However, the zero-order coefficient of correlation between years of formal education and degree of problem recognition was not significant.

A positive attitude toward efficiency and practicality and adoption of new practices on the part of the farmer significantly contributed to the degree of problem recognition.

The personal factors, security as a goal, profit as a goal, and farming as a way of life had significant intercorrelations. The farm operators who tended to view farming as a way of life were security and profit oriented.

It was implied from this study that the educational programs through the county agent were the most effective means of increasing farm operators' net earnings. It was implied that the usual educational programs for the older farm operators do not get at the fundamental difficulty. The attitudes and goals of older farm operators are inconsistent with change.

Finally, a negative association was found between degree of problem recognition and amount of formal education. A possible explanation of this seemingly strange finding was that farm operators with more formal education were not necessarily more perceptive than those with less. It was found that the farmers with more education
tended to be younger. It is known that over the past 30 years or more many potential farm operators have been going into non-farm jobs. These may have been the more perceptive of their age group.
CHAPTER XI

SUGGESTIONS FOR FUTURE STUDY

Research on decision-making ability involves the study of ability to recognize problems that hamper the opportunity to increase net earnings. Thus, the researcher is confronted with how to measure the farm operator's ability to recognize his problems and the associated factors.

In future studies new ways of defining problem recognition, which take into consideration problems associated with economic and technological factors, need investigation. Also the variables that were hypothesized as being related to problem recognition ability but did not increase the variations in degree of problem recognition significantly must be found before the results of this and other future related studies can be developed into a systematic theory which specifies the suggested models.

The variables that merit further investigation are security as a goal, farming as a way of life, and profit as a goal in particular and environmental and occupational variables in general.

In defining problem recognition ability, a normative model could be developed which would determine whether an individual farm operator recognizes problems associated with changes in prices, changes in technology, and changes in the allocation of his available resources. It could also be determined to what degree he recognizes
these problems. Then the general model suggested earlier could be used as a guide to select variables which are supported theoretically and give meaningful and significant relationships. Here other aspects of decision-making theory merit further empirical investigation.
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