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Problem Recognition Among Farm Operators

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PROBLEM RECOGNITION

Among Farm Operators

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INTRODUCTION

Theorists have long recognized that managerial ability is important in achieving the objectives of the firm.

Researchers for years have argued that it is important to measure managerial ability on the general grounds that practical uses could be made of this measure. This argument was sharpened considerably by Griliches[1] in 1957. An implication of his work is that when efforts are made to estimate production functions, unless an estimate of managerial ability is included in the model as an *independent* variable, the model will likely involve specification bias. Thus, measures of managerial ability are desired for immediately practical uses, and they are also necessary intermediary measures so that other parameters (such as output) can be estimated properly.

Heady and Ball[2] have predicted that during the period 1965-1985 the number of farms in the United States will decline by 40% to 50%. Heady and Ball dramatize the increasing role of capital in farming with the following estimates:

Year	Capital as a Percentage of All Inputs Used in Farming
1910	15%
1960	67%
1980	80%

One implication of these figures is that greater managerial ability will be needed by farmers in future

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[1]Zvi Griliches, "Specification Bias in Estimating Production Functions," *Journal of Farm Economics,* Vol. 39, February, 1957, pp. 8-20.

[2]Earl O. Heady and Gordon Ball, "Economic Growth of the Farm Firm and Projected Changes in Farming," *Structural Changes in Commercial Agriculture,"* Center for Agricultural and Economic Development, Iowa State University, Ames, Iowa, 1965, report 24, p. 13. Proceedings of a conference held in Chicago, April 12-14, 1965.

years. They are expected to need competence in identifying and fashioning the variables that affect the achievement of the firm's goals.

In spite of the acknowledged importance of managerial ability, not much is actually known about it, and there is no widely accepted measure of it.

"The criterion problem" refers to the question as to what is the output of management. On the level of theory, this problem has not been solved. In 1962, two industrial psychologists[3], reporting to researchers on farm management ability, suggested that managerial output might be defined as including productivity, integration, and morale. At this point, they argued that the criterion problem was generally misstated (oversimplified): and evidently they presumed that this criticism would apply to management of farms as well as to management of other firms.

The criterion question with respect to management ability in farming had been raised in 1949 by an agricultural economist.[4] He pointed out the limitations of using residual earnings as an evaluation of managerial ability. In addition, he suggested a plurality of goals as opposed to the single goal of money income maximization. Broadly speaking, Frost and Erickson are in agreement with this point: i.e., that the output of management is rather complex. Woods Thomas[5] in 1962 suggested that the farm management function has several components and that these are interdependent.

The complexity of the management process is one reason why management is difficult to measure, and it helps explain why, as Nielson[6] pointed out, researchers generally have not given much attention to measuring management as a form of human behavior and instead have emphasized the *results* of management. Theorists and researchers therefore are faced with a dilemma: On the one hand, management is very complex and difficult to measure; on the other hand, if in an effort to simplify the measurement task, *results* of management are measured, a dependable measure is not obtained. Is there a way out of this dilemma?

The dilemma occurs when one accepts the task of measuring management as the task of measuring the *whole* of management. Perhaps it is overly ambitious to have this research goal at this stage

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[3]Carl F. Frost and David J. Erickson, "Criteria of Successful Managerial Performance," *A Symposium on Measuring Managerial Ability of Farmers,* mimeographed report by North Central Regional Research Committee on the Management Resource in Farming (NC-59) and the Farm Foundation, December 17-18, 1962, p. 68.

[4]F. J. Reiss, "Measuring the Management Factor," *Journal of Farm Economics,* Vol. 31, November, 1948, p. 1066.

[5]D. Woods Thomas, "Agricultural Economics Research Related to the Measurement of Managerial Ability," *A Symposium on Measuring Managerial Ability of Farmers,* mimeographed report by North Central Regional Research Committee on the Management Resource in Farming (NC-59) and the Farm Foundation, December 17-18, 1962, p. 7.

[6]James Nielson, "Management of Marketing Firms: Some Conceptual and Empirical Contributions from Farm Management," mimeographed by Michigan State University and presented at Chicago, October 31 and November 1, 1963, p. 21.

of development of management theory. Nielson[7] suggests that a model of the managerial process might be taken to include " . . . the following eight processes or functions: (1) formulation of the goals or objectives of the farm or unit; (2) recognition and definition of a problem, or recognition of an opportunity; (3) obtaining information—observation of relevant facts; (4) specification of and analysis of alternatives; (5) decision making—choosing an alternative, which is the core of the management process; (6) taking action—implementation of the alternative selected (assuming that the decision was to take action); (7) bearing responsibility for the decision or action taken; and (8) evaluating the outcome."

The eight functions do appear to be interrelated. However, some appear to be more nearly "key" functions than others. For example, number 2, problem recognition and definition, will surely influence all subsequent functions of the manager: (1) The relevance of the information gathered will depend upon the accuracy of definition of the problem. (2) The alternatives visualized will depend upon the problem as the manager sees it. (3) The choice of an alternative, the action taken, and so on, take their particular form because of the way the problem is recognized and defined.

In many research problems, when two or more variables show interrelationships, sorting out the various relationships and estimating their separate influences becomes a difficult task. Even if the decision is made to choose one or a few of the interrelated variables as representative of the others, this is not easy if there is no clear ground for anticipating a particular direction of dependency. But since in the case of the eight functions of management mentioned above, six of the other managerial functions are dependent upon problem recognition, this function is a reasonable choice for study.

The massive study known as the Interstate Managerial Survey failed to give explicit attention to problem recognition. But it should not be inferred that those researchers considered problem recognition to be unimportant. To the contrary, H. R. Jensen[8] wrote, "The IMS neglected (not by design) to study problem recognition as a part of the managerial process. This neglect appears to have closed the door to an important portion of the managerial process."

Lee and Chastain[9] were the first to pay explicit attention to problem recognition in managerial adjustment. They concluded that empirical findings supported the inclusion of problem recognition as an explicit step in managerial adjustment.

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[7]James Nielson, "Improved Managerial Processes for Farmers," *Journal of Farm Economics*. Vol. 43, December, 1961, p. 1251.

[8]H. R. Jensen, "Summary Statements About the Interstate Managerial Survey." Mimeographed paper presented at meeting of North Central Farm Management Research Committee, NCR-4, Chicago, October 24, 1960, p. 1.

[9]John E. Lee, Jr. and E. D. Chastain, *Problem Recognition in Agriculture*, Agricultural Experiment Station, Alabama Polytechnic Institute, Auburn, Alabama, November, 1959, Bulletin 319. See especially p. 15.

Further, they wrote,[10] "Since the recognition of problems is prerequisite to their solution, and since such solutions are essential to satisfactory adjustment, one can but conclude that satisfactory adjustment by farmers to a changing agricultural environment has been retarded by failure to recognize problems.

Lee and Chastain performed a valuable service in drawing attention to the importance of problem recognition. However, they did not attach probability to any of their inferences. Further, they failed to develop *net* measures of the influence of particular variables as they influence ability to recognize problems. Also, they did not attempt to measure farmers' values or to ascertain the influence of these values upon the degree of success in problem recognition.

The present study is similar to the Lee and Chastain research effort in two ways: (1) It focuses attention upon problem recognition as an explicit step in managerial performance, and, (2) It assumes that certain biographical variables will help explain variations in degree of problem recognition. The present study goes beyond the Lee and Chastain work in that: (1) It views problem recognition as a continuous variable; (2) It uses some measures of farmers' values as well as the usual biographical variables; and, (3) It uses a multiple regression model, which enables the researcher to obtain net measures of relationship and to estimate the degree of correlation among independent variables.

THEORETICAL FRAMEWORK AND MODEL USED IN LAKE COUNTY STUDY

In economics, it is commonly said that "prices allocate resources." This is a useful statement for some economic studies. Following such a statement, a researcher could proceed to predict the regional pattern of agricultural resource allocation in the United States in 1980. As a part of this study, it could be assumed that managers are rational, profit-maximizing, and have perfect information about prices and costs. Such a study could yield useful relationships between prices and the regional allocation of resources. And the study might be the more useful because of the simplifying assumptions made about man.

However, there are important economic problems the nature of which is such that the most useful answers can be obtained if the assumptions about man are not so simple. A study of managerial ability appears to be such a study. The emphasis in managerial ability is necessarily upon "the person." It is a matter of common observation that all farm operators do not perform in the same manner under apparently very similar circumstances. Analysis of the traditional economic variables may raise questions about the person rather than provide answers. Consequently, in this study, it was decided to try to measure several personal characteristics of farm operators. Personal characteristics that are used in the Lake County model

[10] *Ibid.*, p. 33.

are broadly described by the following subsets: (1) Biographical data, (2) Values, and (3) Managerial techniques.

The subset of biographical variables is as follows: X_1 = age of farm operator and X_2 = years of formal education.

Referring to values, it is rather common knowledge that the reaction to an identical stimulus varies among persons. But there is considerable continuity of responses by each person over time. A hypothesis is available to explain both phenomena: To a large degree, responses of each person to stimuli are consistent with the values that he holds. To put it in a slightly different way, the values that a person holds set limits to his behavior. This hypothesis is consistent with the general observation that people do not act unselectively. Thus, a student interested in mathematics is likely to be more receptive to statistics than to a course in Greek mythology.

"Values" are viewed here as being related to attitudes. An attitude is a learned predisposition to react in a certain way to elements of the environment. A value is an attitude that has a particular "weight" or importance attached to it. Thus, when it is found that certain attitudes are more important in a person's conduct of his life than others, something is being observed about personal values.

The broad theoretical framework for this Lake County study includes the assumption that people's values do much to allocate resources. Then, of course, if a price change is viewed as a stimulus, the fact that managers vary in their response to this stimulus is assumed to be due considerably to variation in values of the managers. The variables designed to measure values are as follows: X_6 = value placed upon efficiency and practicality; X_7 = value placed upon hard work; X_8 = value placed upon farming as a way of life; and X_9 = value placed upon security. All these variables will be discussed in some detail later.

The third and last subset of variables used in the Lake County model can be referred to in general as including specific "management technique" variables. These are as follows: X_3 = degree of contact with county agent; X_4 = extensiveness of use of farm magazines; X_5 = information analyzing index; X_{10} = willingness to use credit; and X_{11} = innovation proneness.

In general it was hypothesized that:

$$P = f\ (X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11})$$

Where:

- P = Degree of problem recognition
- X_1 = Age of farm operator
- X_2 = Years of formal education
- X_3 = Degree of contact with county agent
- X_4 = Extensiveness of use of farm magazines
- X_5 = Information analyzing index
- X_6 = Value placed upon efficiency and practicality
- X_7 = Value placed upon hard work
- X_8 = Value placed upon farming as a way of life
- X_9 = Value placed upon security
- X_{10} = Willingness to use credit
- X_{11} = Innovation proneness

DEFINITIONS AND MEASUREMENTS OF VARIABLES

The Dependent Variable: Problem Recognition

In general, "problem recognition" was defined to mean recognition of situations which, if changed, would probably result in a higher net farm income. An example of a problem would be the situation in which a farm operator is obtaining insufficient output per worker to realize a reasonable net income.

The following question was asked of all farm operators:

> "At present prices, are there some farming changes that might be investigated, to see if your farm income could be increased?"

In addition, four measures of farm organization and management efficiency were used. These were as follows: (1) Corn Yield, (2) Oats Yield, (3) Number of work units per worker, and (4) Crop and power machinery investment per tillable acre. Such measures were used for the following reasons: They are widely accepted as representing factors that cause variations in earnings among farmers in a given year. Previous research[11] indicates that in South Dakota these measures are associated with variations in earnings among farm operators within a given year. It was assumed that a high proportion of the variation in efficiency among the farm operators would be reflected in these measures. It was apparent that these measures would be appropriate to all farm operators in Lake County.

Each of the four measures of efficiency was stated as a ratio, using the county sample mean as the base in each case except for the corn and oats ratios. Here, the base was the mean yield in the east or west part of the county, depending upon the location of each individual farm. The reason for this choice of base is that a significant difference was found between east-county and west-county oats and corn yield.

Thus, for each farm operator in the sample, there were four ratios, each of which was designed to be a measure of efficiency. Each of these four ratios was stated in standard deviation units $\left(\frac{X_1-\overline{X}}{s}\right)$, and then was increased by four to avoid negative signs. Each individual farmer was given a score of 1, 2, 3, 4, 5, or 6 in each of the four ratios according to how much he deviated from the mean in standard deviation units. The total of these four standardized scores was then computed for each farm operator, and rounded to the nearest whole number. The possible range of this variable was then 4 to 24. This series of totals may be referred to as "the efficiency variable."

As mentioned above, each respondent was asked whether at present prices there were any farming changes that might be investigated to see if his net farm income might be increased. If the farm

[11]Charles H. Benrud and Arnold Aspelin, *Farm Business Management Data and Practices in South Dakota,* Economics Department, South Dakota State University, Brookings, South Dakota, May, 1959, Agricultural Economics Pamphlet No. 100, pp. 36-39.

operator responded either "no" or "I don't know," then the total of his four efficiency scores was taken as being equivalent to his degree of problem recognition.

However, if the respondent answered "yes," then he was also asked to indicate specifically what changes might be investigated. If he specified changes that involved any of the four efficiency indicators, then that particular efficiency indicator was increased to 6. This increased efficiency indicator was then added to the other three (whether increased or not). This total was then taken as a measure of the degree of problem recognition.

The Dependent Variable:

The biographical variables used here are defined in the usual way. The variable, age of farm operator (X_1), was expected to have a positive relation to degree of problem recognition. This was on the ground that older farm operators would, on the average, tend to have more experience.

The variable, years of formal education (X_2), was expected to have a positive relation to degree of problem recognition.

The four variables designed to measure values in the problem recognition model require definition, since these variables might not be widely known, and also because the study and application of such value variables are clearly in an early experimental stage.

The definitions of values used here follow rather closely the definitions used by Ramsey, Polson, and Spencer[12] in a research study reported in 1959. In addition, a copy of the questionnaire used by those writers was obtained, and the measurements of values were conducted along similar lines. So, for example, a forced-choice approach was used in the writing of questions used for measuring value variables.[13]

The variable, "value placed upon efficiency and practicality" (X_6), was designed to reflect the habit of being reflective and careful about costs. Thus, for example, a farm operator who placed high value upon efficiency and practicality would tend to keep records in farming. To measure this value, the following four questions were asked of each respondent:

(a) In being a successful farmer, what is most important?

- —keeping records (efficiency and practicality)
- —working hard (hard work)
- —weigh each farm practice against the profit it gives you (efficiency and practicality)
- —staying with practices you have always used (traditionalism)

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

- —how much of a family man is he[14]
- —how efficient he is at farming (efficiency and practicality)
- —how practical his ideas are (efficiency and practicality)
- —how hard he works (hard work)

[12]Charles E. Ramsey, Robert A. Polson, and George E. Spencer, "Values and the Adoption of Practices," *Rural Sociology*, Vol. 24, March, 1959, pp. 35-47.

[13]*Ibid.*, p. 38.

[14]These responses did not scale in the Ramsey, Polson, and Spencer study.

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

—to be practical (efficiency and practicality)
—to keep ties with their parents (familism)
—to spend their money wisely[14]
—to work hard (hard work)

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

—to learn to farm (farming as a way of life)
—to judge every opportunity in terms of long range plans (efficiency and practicality)
—to take the job which they will enjoy the most (enjoy work)
—to take the job which will give them the most income (efficiency and practicality)

There are four possible different responses to each of the four questions. The value suggested by each possible response is stated in parentheses beside the response. A response to question "a" that could be classified "efficiency and practicality" would result in a score of 1 for the respondent, on the particular value. So this variable has the possible range of 0 to 4.

The variable, "value placed upon hard work" (X_7), was designed to reflect the position that goals are to be achieved mainly by hard work.[15] Questions that may elicit a response interpreted as reflecting this value are questions (a), (b), and (c), shown previously, plus one other question:

(e) In being a successful farmer, which do you think is most important?

—education in an agricultural college (belief in science)
—keeping up with new farming methods (belief in science)
—working hard (hard work)
—do the best you can with what you have without going into debt (security)

The range of possible values for this variable was 0 to 4. It was expected that "hard work" as a value would have a negative relation to degree of problem recognition.

"Value placed upon farming as a way of life" (X_8) was designed to reflect the point of view that farming is the best vocation without regard to the financial returns to be obtained. Thus, a farm operator who had a high score on this variable would tend to favor the "family-sized" farm.[16] This variable was measured similarly to the previous two value variables, and its possible range was 0 to 3.

"Value placed upon security" (X_9) was designed to reflect the point of view that in all decisions, highly dependable criteria are to be used, and there is to be extremely little risk taken. A farm operator with a high score on this variable would be expected to avoid debt under most circumstances, and to be late in adopting changes. It was expected that this variable would have a negative relation to degree of problem recognition.

There were five "management technique" variables included in

[15]Ramsey, Polson, and Spencer, *op. cit.*, p. 43.

[16]*Ibid.*, p. 43.

the model. "Degree of contact with county agent" (X_3), was measured as follows: Four questions were asked the farm operator:

1. **In 1960, did you read any newspaper articles, bulletins, or letters from your county agent or listen to him on the radio or TV?**
   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 ☐

A "yes" answer was scored as 1, and a "no" as 0. The range of this variable was 0 to 4. The relation of this variable to degree of problem recognition was expected to be positive.

To measure the variable "extensiveness of use of farm magazines" (X_4), the following set of questions was asked:

1. **Which of the following farm magazines do you receive (subscribe to or exchange)?** [The interviewer read list of magazines shown at bottom of this page.]
2. **How regularly do you read each magazine if received?**

In the final scoring, each farm operator received 0 for each farm magazine that he never read, even if he received it; he received 1 point for each magazine that he reported reading sometimes, and 2 points for each farm magazine that he reported reading regularly. Thus, any farm operator could have obtained a score as low as 0, and as high as at least 10. A positive relationship was expected between this variable and degree of problem recognition.

The variable, "information analying index" (X_5), was measured by asking the following questions:

1. **Do you keep a set of farm records?**
   1 Yes ☐
   0 No ☐

   IF YES:

   Do you study these records for

Do Receive	Don't Receive		READERSHIP Regularly	Sometimes	Never
☐	☐	Farm Journal	2 – ☐	1 – ☐	0 – ☐
☐	☐	Dakota Farmer	2 – ☐	1 – ☐	0 – ☐
☐	☐	Successful Farming	2 – ☐	1 – ☐	0 – ☐
☐	☐	Capper's Farmer	2 – ☐	1 – ☐	0 – ☐
☐	☐	Hoard's Dairyman	2 – ☐	1 – ☐	0 – ☐
Any other FARM magazines?					
☐	☐	----------	2 – ☐	1 – ☐	0 – ☐
☐	☐	----------	2 – ☐	1 – ☐	0 – ☐

the purpose of increasing your income?

1 Yes ☐
0 No ☐

2. Do you study price outlook information and keep yourself up-to-date on price changes?

1 Yes ☐
0 No ☐

The lowest possible score for any farm operator would be 0, and highest possible would be three, on this variable. A positive relation was expected between the information analyzing index and degree of problem recognition.

"Willingness to use credit" (X_{10}) was measured by using the following question:

1. In your opinion should farmers borrow money for productive purposes, such as to build a new barn, put tile in the ground, etc.?

1 ☐ Strictly against credit
2 ☐ Moderate use of credit is okay
3 ☐ Use credit wherever it will "pay"

The score for the respondent could be 1, 2, or 3, with the lowest score representing nearly complete disuse of credit. A positive relation was expected between this variable and the degree of problem recognition.

Variable X_{11}, "innovation proneness," was measured by asking the following question:

1. 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 farm practices?

5 ☐ Among the first in the neighborhood
4 ☐ A little faster than most of the neighbors
3 ☐ About average
2 ☐ A little slower than most of the neighbors
1 ☐ Among the last in the neighborhood

Responses were scored as indicated above, with the lowest score going to the last adopters. A positive relation was expected between this variable and the degree of problem recognition.

THE SAMPLE

Lake County, South Dakota, was chosen as the sample area. It was considered quite possible that the degree of problem recognition would vary with location within the county. Accordingly, the random sample was geographically stratified according to township. The sample size was 120 farm operators from a county total of 1,172.

THE FINDINGS

The hypothesis was accepted that there was no significant difference in mean degree of problem recognition among the sixteen townships.[17]

The standard error for each regression coefficient is shown in parentheses below the corresponding coefficient. It was found that $R^2 = 0.36577$, not "large," but significant at the 0.05 level.[18] That is, it is con-

[17]Computed F value was 1.17; tabular F, given that $V_1 = 15$, $V_2 = 104$, is 1.77

[18]Computed F value was 5.6223; tabular F, given that $V_1 = 11$, $V_2 = 108$, is 1.87.

The parameters of the full model were estimated to be as follows:

$$P = 16.86707 - 0.04449x_1 - 0.33889x_2 + 0.77414x_3 + 0.12662x_4 + 0.39203x_5$$
$$(0.02356)\quad (0.11838)\quad (0.20954)\quad (0.12460)\quad (0.43932)$$
$$+ 0.46137x_6 - 0.20314x_7 - 0.78424x_8 - 0.38624x_9 + 0.44162x_{10} + 0.41257x_{11}$$
$$(0.25337)\quad (0.33179)\quad (0.43253)\quad (0.41874)\quad (0.48532)\quad (0.34509)$$

cluded that the proportion of variation in degree of problem recognition that is explained by using the above 11 independent variables is real—it is not due merely to a happy accident of sampling. The results of the "t" test are shown in table 1.

Refering to table 1, all signs are as expected except the sign attached to X_2, years of formal education. From this finding it appears that the farm operators with more formal education are less successful in recognizing their inefficiencies. Further light on this and other matters may be shed by the simple correlation coefficients for the full model. These are shown in table 2.

Referring to table 2, it is noted that the simple correlation coefficient between years of formal education and degree of problem recognition is positive but very small and non-significant. The meaning here of course is that this coefficient is so small (0.018) that the relationship as found in the sample data is probably due only to an "accident" in sampling, and really is not true of the population.

Further, those sample farm operators with more education tended to be younger, have more acquaintance with the county agent, and be more oriented toward value, efficiency and practicality. At the same time, they tend to be oriented away from the "hard work" and the "farming as a way of life" values. They are also more prone to innovate. All these relationships are reasonable.

In general in the overall model, it is assumed that farmers' values are more basic than are the management technique variables. In fact, it is assumed that value variables are in part "causes" of certain management technique variables. If this assumption is valid, then

Table 1. Student's "t" Ratio for Each Independent Variable Used in Full Model of Degree of Problem Recognition, Lake County, South Dakota, March, 1961

Variable	Student's "t"
X_1 = Age of farm operator	−1.888[s]
X_2 = Years of formal education	−2.863[s]
X_3 = Degree of use of county agent	3.695[s]
X_4 = Degree of use of farm magazines	1.016
X_5 = Information analyzing index	0.892
X_6 = Value placed upon efficiency and practicality	1.821[s]
X_7 = Value placed upon hard work	−0.612
X_8 = Value placed upon farming as a way of life	−1.813[s]
X_9 = Value placed upon security	−0.922
X_{10} = Willingness to use credit	−0.910
X_{11} = Innovation proneness	1.196

s=significant at the 0.05 level when a one-tailed test is applied. Tabular "t" value is about 1.658 (either positive or negative), for a one-tailed test. Tabular "t" value is about 1.980 for a two-tailed test.

Table 2. Simple Correlation Coefficients of Problem Recognition Model

	Age X_1	Years of formal education X_2	County agent X_3	Magazines X_4	Information analyzing index X_5	Value placed on efficiency and practicality X_6	Value placed on hard work X_7	Value placed on farming as a way of life X_8	Value placed on security X_9	Willingness to use credit X_{10}	Innovation proneness X_{11}	Degree of problem recognition P
X_1	1.000	−.290 ss	−.078	−.171	−.208 s	−.307 ss	.177	.283 ss	−.052	−.108	−.262 ss	−.290 ss
X_2		1.000	.204 s	.143	.044	.312 ss	−.277 ss	−.184 s	−.104	.071	.231 s	.018
X_3			1.000	.353 ss	.188 s	.185 s	−.100	.072	−.245 ss	.067	.244 ss	.409 ss
X_4				1.000	.254 ss	.098	−.200 s	−.012	−.148	.255 ss	.223 s	.301 ss
X_5					1.000	.052	−.182 s	−.017	.094	.325 ss	.279 ss	.254 ss
X_6						1.000	−.458 ss	−.124	−.045	.150	.131	.290 ss
X_7							1.000	.198 s	.095	−.307 ss	−.269 ss	−.236 s
X_8								1.000	−.294 ss	−.084	−.054	−.158
X_9									1.000	−.039	−.073	−.097
X_{10}										1.000	.263 ss	.236 s
X_{11}											1.000	.284 ss
P												1.000

s=Significant at the 0.05 level (larger than 0.180).
ss=Significant at the 0.01 level (larger than 0.238).

A reduced model was developed, and the following least-squares equation was obtained:

$$P = 17.15887 - 0.05634x_1 - 0.29585x_2 + 0.95867x_3 + 0.48588x_6 - 0.65858x_8 + 0.91510x_{10}$$
$$(0.02260)\quad (0.11564)\quad (0.19072)\quad (0.23168)\quad (0.41100)\quad (0.43723)$$

farm operators who have more acquaintance with the county agent and are more inclined to innovate take these positions partly *because* they hold the value orientation, efficiency and practicality. But further, a significant relationship was found between years of formal education and three of the four value variables included in the model. If formal education affects values then it may have a positive effect upon problem recognition through its influence upon values.

The signs of all relationships as shown in table 2 are as expected, and provide an internal indication of validity of the variables that were used.

Table 3. Student's "t" Ratio for Each Independent Variable Used in Reduced Model of Degree ot Problem Recognition, Lake County, South Dakota, March, 1961

Variable	Student's "t"
X_1 = Age of farm operator	−2.493s
X_2 = Years of formal education	−2.558s
X_3 = Degree of use of county agent	5.026s
X_6 = Value placed upon efficiency and practicality	2.097s
X_8 = Value placed upon farming as a way of life	−1.602
X_{10} = Willingness to use credit	2.093s

s=significant at the 0.05 level when a one-tailed test is applied. Tabular "t" value is about 1.658 (either positive or negative) for a one-tailed test. Tabular "t" value for a two-tailed test is about 1.980.

Again, the standard error for each regression coefficient is shown in parentheses below the corresponding coefficient. In this case, $R^2 = 0.33231$, which is significant at the 0.05 level.[19]

The results of the "t" test applied to the regression coefficients are shown in table 3.

In table 3, all signs are the same as found in the full model.

Khalili,[20] using the Lake County data, found that on the average, the maximum degree of problem recognition was 17, and that this was achieved at the age 38. Since the curve fitted was a parabola open downward, the maximum degree of problem recognition is of course an absolute maximum, not a relative maximum. It might be expected

[19]Computed F value was 9.37; tabular F, given that $V_1 = 6$, $V_2 = 113$, is about 2.18, at the 0.05 level.

[20]Amir Khalili, "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," unpublished M.S. thesis, South Dakota State University, 1965, pp. 33, 35, and 43. The following equation was obtained:

$$P = 11.5508 + 0.2959X - 0.00392X^2$$
$$(0.16372)\quad (0.00168)$$

where P refers to degree of problem recognition and X refers to age.

The standard error of each coefficient is in parentheses immediately below the respective coefficient. Both coefficients are significantly different from zero at the 0.05 level (one-tailed "t" test).

that degree of problem recognition would continuously increase over the active life of the farm operator, implying that the most important variable affecting problem recognition is experience. But if the parabola fitted by Khalili represents the relationship accurately, then for one thing, experience does not appear to be a dominating variable here. However, it must be kept in mind that the Lake County data are not time series in which individuals were asked the same questions at different points in time. The data are based on answers given by 120 farm operators at one point in time. An assumed characteristic of human values is that in general they do not change rapidly over time. Therefore there may not be reason to assume that the younger farm operators will have the same values as the older ones have, when they reach the same age. To put it another way, it may be that the "younger generation" has a different set of values than have the older ones, and that for the most part they will keep them. Then, if a curve were fitted to their degree of problem recognition over time, it would start at a high level and might increase continuously.

In general, perhaps years of experience would have a positive influence upon problem recognition *provided* they were accompanied by certain values. For example if a farm operator were oriented toward efficiency and practicality, it would seem that with increasing years of experience, he would improve his management techniques. But years of experience along with, say, a high valuation upon farming as a way of life, would not be expected to lead to especially improved management techniques.

An estimate of the average relation between net income and degree of problem recognition was made by Khalili.[21] By the least-squares method, he obtained the following equation:

$$Y = 743.96410 + 323.23204\,P \quad (74.57393)$$

where Y refers to net income, and P refers to degree of problem recognition. The regression coefficient is significant at the 0.01 level, as is also of course the correlation coefficient. However, the correlation coefficient is only 0.37059, and so $r^2 = 0.13734$, a small number even though it is significant. However, its apparent smallness is not surprising since a manager must do more than recognize problems. Also, its smallness is consistent with the argument that a measure of income should not be used as a measure of managerial ability.

HIGHLIGHTS AND SOME IMPLICATIONS

The degree of problem recognition was selected as an indicator of managerial ability. It was recognized that such a measure, no matter how accurate, would not reflect the whole of managerial ability. But the whole of managerial ability would be exceedingly difficult to measure, partly because this variable has not been defined to the satisfaction of

[21] *Op. cit.*, p. 32.

the theorist. Therefore, the decision was made to try to measure one element that affects many other elements in the decision-making process.

Problem recognition is very much a cognitive activity, as defined in this study. But the *measurement* of this variable has involved some *results* of management. Therefore this Lake County study has not succeeded in measuring problem recognition purely as a behavioral variable. Perhaps the study should be faulted on this ground.

Much effort was expended to develop a measure of problem recognition that could be regarded as a continuous variable, thus making an orthodox multiple regression model plausible. The model then yielded more refined relationships than were possible in the study by Lee and Chastain. More specifically, some *net* relationships were now measurable.

Three subsets of independent variables were used in the multiple regression model. These are as follows: (1) Biographical variables, (2) Value variables, and (3) Managerial technique variables. The value variables were assumed to be more basic than the managerial technique variables.

Lee and Chastain[22] found that older farm operators were least inclined to perform management activities such as keeping records. The Lake County data do not contradict these findings. However, inclusion of value variables in the model resulted in the inference that older farmers in Lake County held different values than did the younger farmers. Age may be even more vague as an explanatory variable than had previously been suspected. It may also be a misleading variable, if used in a model unaccompanied by value variables. The younger farm operators of 1961 may not hold the same values as their older fellow farmers did in 1961, when they themselves are in their sixties. They may in fact continue to hold values that are conducive to a high degree of problem recognition.

However, older farm operators who hold strongly to values that are not conducive to a high degree of problem recognition appear to be in a very difficult position. Both their age and their lack of education leave them with few or no alternatives to farming. They may be low in both income and wealth. But they tend not to see their county agent for help, or read farm magazines for help, or analyze information themselves with the goal of increasing their incomes. They appear to be beyond the help of traditionally operated adult education programs.

[22] *Op. cit.*, p. 1.

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