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I am submitting herewith a thesis written by Howard H. Conley III entitled "A Psychological Perspective on the Decision Process of Successful Farm Managers: An Empirical Test of a Satisficing Model." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

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and recommend its acceptance:

Brady J. Deaton

Accepted for the Council:

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Graduate Studies and Research

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A PSYCHOLOGICAL PERSPECTIVE ON THE DECISION PROCESS OF SUCCESSFUL FARM MANAGERS: AN EMPIRICAL TEST OF A SATISFICING MODEL

A Thesis

Presented for the

Master of Science

Degree

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The author dedicates this study to Dinny, his Penelope who has waited so patiently in the north.

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ABSTRACT

The study was designed to develop and test a realistic model of farm management decision making. A general model of decision making comprised decision model that related net farm income, the indicator used for managerial success, as a function of economic resource endowment, the decision criterion and information; a perception of risk model that stated the perceived probability of success to be a function of economic factors affecting that perception; a dynamic learning model that related the results of a previous choice to the perception of alternatives in the next decision.

The theory of achievement motivation was incorporated in the decision model and the learning model to explain choice under conditions of uncertainty and persistence of behavior at a particular choice, respectively.

The data were obtained from a survey questionnaire and 1974 farm records kept by 108 farmers participating in the Resource Management Program. Measurement of the need for achievement, the fear of failure and information were obtained from the questionnaire. Values for economic resource endowment and net income were found in the farm records.

Regression analysis was used to estimate the effect of the resource endowment, the decision criterion and information on net income and to determine the effect of economic factors affecting the perception of risk. The resource endowment explained the largest

amount of variation in net income of any group of variables. Livestock, labor, buildings and credit capital proved significant while land and machinery did not. All but land, machinery and credit capital had the hypothesized positive signs. The decision criterion, while insignificant, was found to have the largest effect, 2638.53, of any variable on net income. The coefficients of the information variables of education, training and information seeking were not significant. Altogether, the independent variables explained 38.4 percent of the variation in net farm income.

The estimation of the perception of risk model was disappointing. Two measures of perceived probability of success were used as the dependent variable in separate estimations. The estimated equations accounted for only 2.5 percent and 3.8 percent of the variation in perceived probability. None of the independent variables were significant.

A Chi-square analysis was used to evaluate the learning model. A contingency table of prior and posterior probabilities of selection of farm plans was devised for those 53 farmers who had altered their original plan. A Bayesian theorem was used to determine the posterior probabilities. The Chi-square analysis showed a significant difference between the probability of selecting a farm plan prior to its implementation and after its alteration. An increase in farm prices took place over the same years as the study. This increase could be the cause of the change in perception of farm plan success. Both learning and increased prices are consistent with the statistical results.

TABLE OF CONTENTS

CHAPTER		PAGE
I.	AN INTRODUCTION TO THE DECISION PROCESS	1
	Classical Decision Theory and Empirical Analysis	2
	Satisficing	5
II.	THE THEORETICAL FRAMEWORK	9
	Overview of the Conceptual Model	9
	The Decision Model	14
	The Perception of Risk Model	15
	The Dynamic Learning Model	26
III.	METHODOLOGY	30
	The Sample	31
	The Perception of Risk Model	32
	The Decision Model	38
	The Dynamic Learning Model	41
IV.	RESULTS AND INTERPRETATION	46
	The Estimated Perception of Risk Model	46
	The Estimated Decision Model	48
	Analysis of the Dynamic Learning Model	53
	General Limitations of the Study	55
V.	SUMMARY AND CONCLUSIONS	57
	Summary	57
	Conclusions	61
BIBLIOGRAPHY		63
APPENDICES		66
VITA		73

LIST OF TABLES

TABLE		PAGE
I.	Sample Calculations when $M_s = 8$ and $M_s = 1$	23
II.	Farmer Response to Preliminary Questions	33
III.	The Decision Model Correlation Matrix	50
IV.	Contingency Table of Prior and Posterior Probabilities . .	54
A-I.	Regression of Resources on Selected Net Income of Plan III[a]	67
A-II.	Correlation Matrix	68

CHAPTER I

AN INTRODUCTION TO THE DECISION PROCESS

> The great decisions of human life have as a rule far more to do with the instincts and other mysterious unconscious factors than with conscious will and well-meaning reasonableness.
>
> C. G. Jung
> Modern Man in Search of a Soul

Risk and uncertainty are important factors in preventing the farmer from making more profitable managerial decisions. Decisions must be made at one point in time that affect the production and revenue forthcoming at a future point in time. "Uncertainty is introduced by technical and technological change, price variation and unpredicatble human action," according to Walker et al. (24.981). This instability confronts the farmer with decisions concerning the operation of his firm that may cause him to forego profits he could have made or sustain losses he cannot afford. He must compromise his desire for a safe financial position with a desire to maximize his returns. The result of his decision will be the net income which his firm earns, the dependent variable in this study.

In order to construct a model of choice that reflects the decisions farmers actually make, this study begins with a brief examination of classical decision theory and empirical studies that critique it. The concept of satisficing is introduced in response to the criticisms of classical theory as guidelines for a general model of choice. Satisficing delineates the qualities of the decision model

presented in Chapter II and is the basis for the objectives of the study, stated at the end of this chapter.

I. CLASSICAL DECISION THEORY AND EMPIRICAL ANALYSIS

Decision models are distinguished by the degree of knowledge of the decision maker. Risky decisions are those made when the outcome of each course of action and the probability of that outcome occurring are known. Decisions under uncertainty are those where the outcome, but not the probability of its occurring, of each alternative choice is known.

Choices under risky conditions are relatively straight forward. The decision maker chooses that course of action which maximizes the expected value of the outcomes. The expected value of any outcome is the sum of all values that outcome can assume, multiplied by the probability of the occurrence of each value, respectively. This can be expressed mathematically as:

$$E(X) = \sum_{i=1}^{n} X_i \cdot P(X_i)$$

where $E(X)$ is the expected value of the outcome, X_i is the value of the ith outcome, and $P(X_i)$ is the probability of that value occurring.

Situations of choice under uncertainty have no such optimal course of action. Selection of a model from the body of decision criteria "depends on the decision maker's psychological make-up, judgement and problem setting" (3:906). Dillon and Heady (3) have reviewed several criteria open to the farmer. The Wald, or minimax, criterion, calls for the selection of the alternative, or course of action, which has

the maximum minimum payoff, or outcome. The Savage regret rule examines the regret that might be sustained once the true outcome is known and the decision maker realizes a greater payoff might have been gained by another selection. The Savage criterion sets out to minimize the maximum regret. The Hurwicz theory provides for the selection of the alternative for which the utility of a weighted average, based on the individual's level of pessimism, of the worst and best outcomes is the greatest. The Laplace principle of insufficient reason leads to the choice of the alternative with the greatest utility when all alternatives are assigned equal probabilities due to ignorance of the true state of nature. The Shackle theory provides for the selection of that alternative because of its minimum and maximum utility and the potential surprise to which an individual feels he can best expose himself.

In reviewing the various decision models, Eisgruber and Nielson (5) suggest there are limits to human capabilities to perceive, process and analyze information. Decisions are made with partial knowledge of the available alternatives. Given human limits of knowledge, it is likely that goals may be less than maximal aspirations.

Dillon and Heady conducted empirical research with a sample of 77 Iowa farmers having a feeder cattle operation to learn the degree of use of the normative Wald, Savage and Laplace criteria in actual farm planning. "We cannot say that the Laplace, Wald and Savage theories played any significant descriptive role in relation to normative payoff matrices for the practical problems. This contrasts with the fact that

in the hypothetical decision problems a majority of farmers did tend to use a Laplace or Wald type approach" (3.924). They attribute the discrepancy between hypothetical and practical use of decision models to (1) the too rigid assumption that the decision maker's goal is profit maximization; (2) their model, a normative one, may be strange to farmers whose use of it was implicit in the construction of the decision problem; (3) calculation difficulties may have occurred in comparing the normative payoffs for each alternative in the hypothetical problem (3:924).

Walker et al. made an examination of the application of decision models to hypothetical problems in formulating farm plans. They noted that the models require the farmer not only to predict the average outcome but the minimum outcome as well. Further, "the amount of knowledge possessed by a farmer and the degree of certainty surrounding his predictions will determine the decision-making procedure which is most appropriate. But the degree of knowledge is no less important than the psychology of the farmer in indicating the type of decision model which is most appropriate for the particular situation" (24:981).

Reviewers of classical decision theories appear in agreement that profit maximization may not be the goal sought, that the amount of knowledge is varied and incomplete, that the use of the models may be unrealistic in the cumbersome calculations required and that the psychology of choice may vary with the individual: "Different decision processes may be called for because of individual differences in the decision maker's personality, experience and resource situation" (5:70).

Eisgruber and Nielson congently point out that with the exception of the Wald criterion, none of the models accounts for the gathering of information and learning. They cite a need for a dynamic decision theory, relating the experience of one choice to the next, where the dynamic aspect is information and learning rather than time (5:70).

II. SATISFICING

Previous work on economic decision theory suggests the inclusion of findings from psychology. In an article reviewing theories of decision-making, Simon (20) considers many of the previously cited exceptions to classical theory. He notes the limits and cost of information gathering and suggests that it be considered as a variable input in the production process. He questions man's ability to choose in a manner prescribed by the normative decision models and points to empirical evidence to suggest that while man can consistently choose the most attractive of simple monetary outcomes, as among lottery tickets, he is much less consistent in more complex choices, such as phonograph records, in distinguishing which is even the most attractive (20:269). Simon suggests that most decision-making businessmen cannot estimate the joint probability distribution of future events and there is no evidence that business forecasting methods make such an estimation. The psychology of human perception and cognition indicates that "the decision maker's information about his environment is much less than an approximation to the real environment. . . . In fact, the preceived world is fantastically different from the 'real' world.

The differences involve both omissions and distortions and arise in both perception and inference" (20:272).

Simon (19) posits a satisficing man, rather than the classical economic man, who sets a goal, an aspiration, and formulates all his choices of alternatives to simple payoff functions which are either satisfactory or unsatisfactory. The satisficer gathers information at a cost and will only seek as much as he needs to secure one alternative that will have a satisfactory outcome. His aspiration level will fluctuate with his degree of success at achieving his goal, so that if successful alternatives are easily found, the aspiration level will rise. If no satisfactory alternatives can be found, the aspiration level will decline. The aspiration level, Simon suggests, "may be subject to an adjustment process that is rational in some dynamic sense" (19:254).

Having hypothesized a satisficer, Simon compares satisficing and maximizing. He notes that satiation of a need or drive, while absent in economics, is central in the theories of motivational psychology. Satisficing behavior would lead one to expect businessmen to attain a certain level of profit, maintain a particular share of their market or level of sales rather than maximizing their profit. Simon offers empirical support for these expectations. Studies have shown that businessmen do use standard cost markups to set prices. Other work has demonstrated, after the Keynesian argument, that the interest rate is not an important determinant of investment decisions. Further studies describe the behavior of businessmen who have responded to a declining share of the market with an effort to increase sales that surpassed

that observed in businesses where market shares were constant or increasing (20:264). To illustrate the prevalence of satisficing as a mode of business behavior, Simon says of his own study, "the empirical evidence on the distribution of firms by size suggests that the observed regularities of size distribution stem from the statistical equilibrium of a population of adaptive systems rather than the static equilibrium of a population maximizers" (20:263).

Simon agrees with Eisgruber and Nielson on the necessity of a learning property in a model of decision making. It must not be assumed that the environment as known to the decision maker, research on the formation of expectations demands the process of acquiring knowledge about that environment be incorporated into classical decision theory. In doing so, Simon concludes, a model of economic man must reflect his properties as a "learning, estimating, searching, information processing organism" (20:269). Satisficing man, by adjusting his aspiration level and his information gathering to find a satisfactory alternative, does exhibit a dynamic process of learning and information seeking.

Statement of the Problem

How does a farm manager select a specific combination of enterprises and levels of activity to operate his farm? Is he, as classical theory suggests, perfectly rational? Blessed with perfect knowledge? A maximizer of profit? The literature reviewed takes exception to these propositions on an empirical basis. The problem then becomes how does a farm manager makes his decisions and, in particular, how

does a successful farm manager, as indicated by his net income, make his decisions under conditions of uncertainty?

Objectives

The study sets out to construct a decision model, after Simon's satisficing behavior, that explains how farmers actually do make decisions. If man is not perfect in his knowledge and information is both incomplete and costly to obtain, then some understanding of the individual's perception is necessary. If man is not to be led repeatedly to the same alternatives, then a dynamic learning process must be included in the whole of decision making.

Specifically, the purposes of this study were to (1) determine the relationship of information, choice criterion, and resource endowment to net farm income; (2) describe the factors affecting the individual farmer's perception of his alternatives; (3) develop a dynamic model of the learning process that relates the results of an earlier decision to a later one.

Three specific models of decision, perception and learning are developed in Chapter II. Hypotheses are stated so that the models may be tested. The theory of achievement motivation is introduced as the central behavioral concept in explaining the criterion for choice and the process of learning. The empirical models, along with the statistical procedures for testing them, are presented in Chapter III and the results of the estimation using a sample of Tennessee farmers, are shown in Chapter IV.

CHAPTER II

THE THEORETICAL FRAMEWORK

"Would you tell me, please, which way I ought to go from here"?

"That depends a good deal on where you want to get to," said the Cat.

"I don't much care where--" said Alice.

"Then it doesn't matter which way you go," said the Cat.

Lewis Carroll
Alice in Wonderland

Because of the difficulty of interweaving economic and psychological concepts into an easily grasped framework, the conceptual model of farm management decisions is treated on two levels. First is an overview of the model, shown in Figure 1, which attempts to illuminate the interrelated theory drawn from psychology and economics. Second, a more detailed model of farm management decisions, shown in Figure 2, is developed in the body of Chapter II and is the source of the specific models of decision, perception and learning that were tested.

I. OVERVIEW OF THE CONCEPTUAL MODEL

The conceptual model attempts to describe economic decisions as farmers actually make them. Rather than maximizing income, decisions in this model, it is assumed, are made to satisfy a farmer's psychological needs. As shown in Figure 1, the conceptual model states that managerial success, as indicated by net income is determined by (1) a

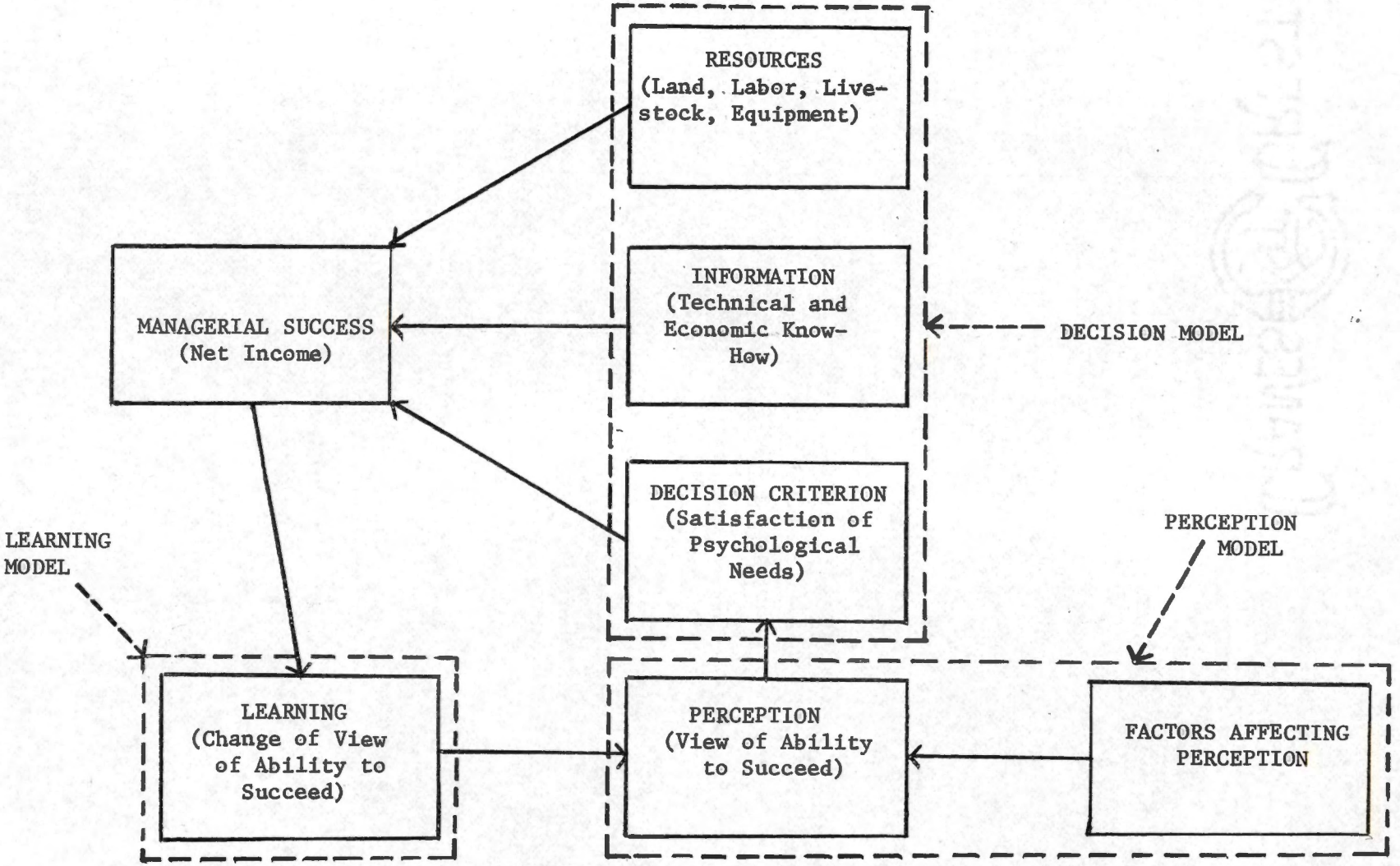


Figure 1. Overview of the conceptual model.

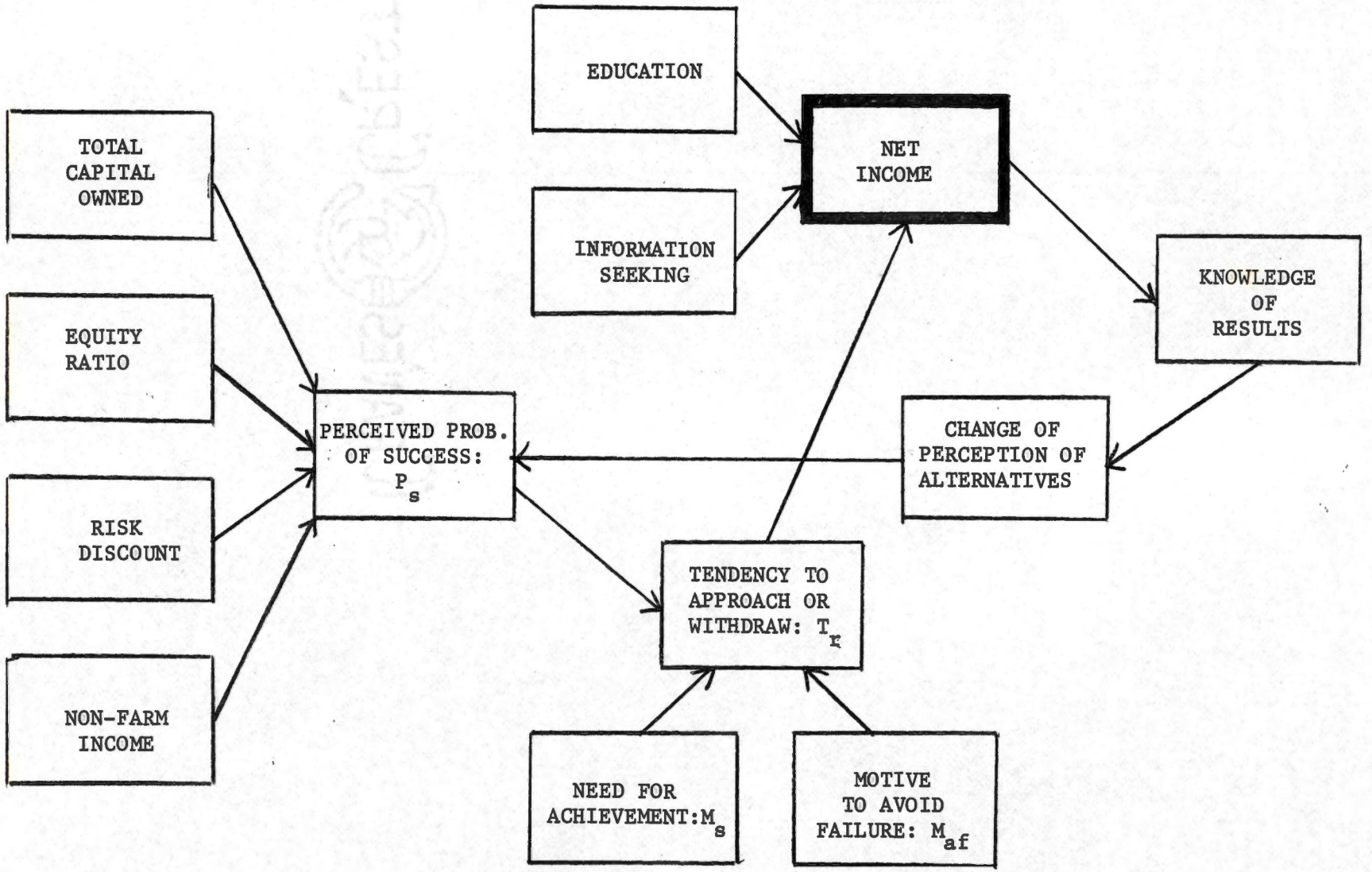


Figure 2. Model of the decision process for farm managers.

farmer's resource endowment, (2) the information he has, (3) his decision criterion, which is dependent upon his perception of the alternative choices, and (4) his learning from the experience of previous choices.

Essentially, the model states that a farmer uses his economic and technical know-how (Information) to combine his land, labor, livestock and equipment (Resource Endowment) into possible plans of operating his farm. He selects that plan which both challenges him and offers a reasonable chance of succeeding at that challenge (Decision Criterion). The challenge provided by each farm plan he considers is determined by his perception of his ability to operate his farm by that plan to reach that goal he has established for himself (Perception of Risk). As the farmer meets each challenge, over time new goals appear to challenge him further, leading to greater accomplishments in the operation of his farm (Learning). The conceptual model asserts that the persuit of farm management challenges will lead to more successful management. Increasing net income is the measure of managerial success in the study and, as is discussed later in this chapter, money income is an especially useful measure of individual economic achievements. It is a guide the farmer can look to to indicate his level of success.

The overview of the conceptual model is built of three component models that interrelate as illustrated in Figure 1. The decision model states managerial success as a function of economic resource endowment, the decision criterion, and information. It is the dominant conceptual structure that relates the models of perception and learning

to managerial success. In this sense, the perception and learning models are subfunctions of the decision model. The perception model specifies four economic factors thought to affect that perception. The dynamic learning model relates the relative success of any choice to the perception of the alternatives from which the manager must choose in his next decision. The three models combine to explain managerial success in terms of decision, perception and learning.

Net Income: The Dependent Variable

Although the question has been raised as to whether farmers or other businessmen do attempt to maximize their profits, profits are commonly accepted as a measure of success. Indeed, according to Ferguson and Maurice, profit is the only goal "providing a general theory of firms, markets, and resource allocation that is successful both in explaining and predicting business behavior" (6:234). Rather than using profit in the true economic sense, the residual after all factors of production have been paid their return, this study uses net family farm income as an indicator of managerial success. This net income figure is the difference, in farm records, after total costs are subtracted from total revenues, allowing for changes in inventories. It does not include payment to the farmer's labor. It is a readily available indicator to the farmer of his performance in any year and his direction over several years. It is this indicator the farmer may use to judge the soundness of his decisions and relate the results of those decisions to his next choice.

II. THE DECISION MODEL

The decision model is a satisficing model. It focuses on the information and the criterion for choice used to achieve a specific goal. Resources at the farmer's command are also included in the model and discussed in Chapter III. The decision model postulates satisficing choice, information and resource endowment as being causally related to net income.

Information

Information is considered to be a variable factor of production, as Simon suggests. Hess and Miller (9:7) found that knowledge of ones emterprise was positively associated with financial success. Because information seeking should lead to increased knowledge, it is reasoned that it should lead to financial success also. It is assumed that farmers are still making their decisions at a point where increases in information have a positive effect on net income. It may be, however, that some farmers will have an optimal amount of information and any increase beyond that optimum will have a costly and negative effect on net income, a diversion of time from actual operation of the farm. Education is another means of acquiring knowledge and should also affect financial success (See Figure 2). Hence:

Hypothesis 1: The greater the information seeking, the greater the net income.

Hypothesis 2: The greater the education, the greater the net income.

III. THE PERCEPTION OF RISK MODEL

The perception of risk model follows after the Simon assertion that the perceived world is quite different from the true state of nature. To be complete, a model of perception must include psychological and social variables as well as economic variables to explain all the forces internally shaping each farmer's view of the world. In developing the hypotheses to test the perception of risk model, this study does not attempt completeness. Only four variables associated with financial security are specified as the factors affecting perception of risk. This perception is assumed internal to the individual farmer and reflects his perception of his ability to accomplish the challenge of a farm management choice he has made.

The risk involved in the selection of an alternative is defined in this study to be probability of that alternative's failure to attain the goal the farmer has established for himself. Many factors of the farmer's personality will shape his perception of his ability to accomplish his goal. This study assumes that the many facets of personal choice are captured by the farmer's perception of the alternatives. Risk for an individual is defined to be the perceived, or subjective, probability of failure to attain his goal for any alternative considered. The study will further assume that, for any one alternative, the perceived probability of failure, P_f, and the perceived probability of success, P_s, will sum to one, $P_f + P_s = 1$. There are factors that affect the individual's perception of risk for any given alternative. These factors are the subject of the following discussion (See Figure 2).

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Factors Affecting the Perception of Risk

Research by Heady, Hildreth and Dean (8) has shown that the equity ratio, total capital owned to total capital employed, and total capital invested are positively related with total planned investment for a three-year period. The individual's risk discount, the future return he would require to forego a sum of money in the present, expressed as a percent, was negatively related to total planned investment for a three-year period. Further, it was shown that total capital was positively related to a "willingness to take risk" and the risk discount was negatively associated with a "willingness to take risk" (8:1003). It is reasoned that for any alternative, the risk, or subjective probability of failure P_f, will decrease as total capital invested and the equity ratio increase and as the risk discount decreases. Hence:

Hypothesis 3: The greater the total capital invested, the greater the perceived probability of success P_s for any alternative.

Hypothesis 4: The greater the equity ratio, the greater the perceived probability of success P_s for any alternative.

Hypothesis 5: The lower the risk discount, the greater the perceived probability of success P_s for any alternative.

Just as high total capital and a high equity ratio give rise to financial stability, outside income, earnings in dollars to the household from nonfarm sources, would also increase financial stability. This stability would reduce the perception of risk attendant with an alternative, hence:

Hypothesis 6: The greater the outside income, the greater the perceived probability of success P_s for any alternative.

The Decision Criterion: A Return to the Decision Model

The decision criterion embodies satisficing behavior. An alternative is selected on the criterion that it best satisfies the motive to succeed in attaining a specified goal. Satisficing behavior is presented as a maximizing of personal utility based on two psychological drives, the motive to succeed and the motive to avoid failure. Empirical support of the association of the motive to succeed and economic behavior is cited. Further evidence is brought forth to support the argument that the actual criterion for selecting an alternative is formulated from the motives to succeed and avoid failure, the perceived probability of success and the incentive of success.

Johnson (10) has conducted research to challenge the postulate of traditional theory "that firms will discount the uncertainty of the future by accepting a lower certain price in the present rather than a likely but uncertain future price" (10:200). His findings from six studies over farmers from five states in a variety of operations indicate, by a majority preference for a guaranteed contract price greater than the expected price, that farmers are risk takers. According to Johnson, entrepreneurs who prefer risk are not acting irrationally but rather are maximizing their expected utility of some choice (10:203-206) as postulated by von Neuman and Morganstern in their *Theory of Games and Economic Behavior* (23).

Edwards (4), reviewing the work of von Neuman and Morganstern, has argued that a comprehensive model for uncertain decisions should include both utility and subjective probability. He formulated a model which holds that people make decisions to maximize subjectively expected utility (SEU) expressed as:

$$SEU = p_i^* u_i$$

where p_i^* is the perceived probability of obtaining the ith outcome and u_i the utility or perceived value of that ith outcome for any one choice. Edwards further asserts that subjective probability and utility are independent of one another.

Need Achievement: The Motivation Behind Choice

To discuss utility as a function of preference for success, it is necessary to draw on motivational psychology to explain the relationship between an individual's preferences, motivations, and behavior. To this end, the motive to succeed, the need for achievement, has been demonstrated to relate closely with economic behavior. "The theory of achievement motivation," according to Atkinson, "attempts to account for the determinants of direction, magnitude and persistence of behavior. . . . It applies only when an individual knows that his performance will be evaluated (by himself or someone else) in terms of standards of excellence and that the consequences of his actions will be either a favorable evaluation (success) or an unfavorable evaluation (failure)" (1:240). Need achievement is measured by scoring achievement imagery in samples of imaginative writing. In experimental situations,

this writing is elicited through the use of a Thematic Apperception Test (TAT) in which subjects are shown achievement-oriented pictures and asked to write stories describing them.

Any sort of imaginative literature may be used as a source for achievement imagery for measurement purposes. Folk tales, vase motifs and other imaginative literature have been used by McClelland (12) in examining the level of achievement in such societies as Pre-Incan, Peru, Ancient Greece, Medieval Spain, Tudor to Industrial England, and the United States from 1800 to 1950. The historical fluctuation of need achievement in these societies was shown to vary in a close positive relationship with indicators of economic activity such as amount of coal imports, world trade area and patents granted (12:107-157). Similar use of imaginative stories peculiar to their cultures was made to conduct a cross-sectional analysis of societies in the modern world. Again, a significant correlation was demonstrated between the level of need achievement and economic growth, as measured by electric power production (12:63-105).

McClelland compares classical thought on the role of the entrepreneur and the substantiated behavior of need achievers. Entrepreneurs are thought to be risk takers, men who make decisions under uncertainty. They are not gamblers but prefer moderate risks where their effort and ability influences the outcome. Laboratory experimentation has demonstrated the individual high in need achievement does prefer moderate risks and is unattracted by situations of pure chance. The entreprenuer is regarded as energetic and hardworking, seeking new and better means

of accomplishment. High need achievers work harder and better when it counts toward personal achievement. They are less involved with routine tasks but show an increased effort with those endeavors requiring originality and offering more challenge. The eutrepreneur typically bears responsibility for work done and decisions made; he desires both credit for success and blame for failure. Experimentation shows need achievement becomes aroused when personal responsibility is perceived. Knowledge of results is vital to the entrepreneur; he is concerned with profit, percent of the market, size of the firm, the rate of growth. High need achievers are seen to perform significantly better in situations where they receive positive and definite feedback as to their performance. The entrepreneur is associated with the profit motive; personal money income has an important social role as a symbol of achievement and a measure of competence. Money is an index of the level of success, evidence shows, for those having a need for achievement. Finally entrepreneurs are valued for their organizational skills, their ability in long range planning. They consider more alternatives and their consequences and anticipate future possibilities. Need achievers have demonstrated an interest in the future in their TAT stories. They treat time as a precious commodity in short supply and as passing rapidly. Further, in arranging a cooperative effort to meet a task, they prefer experts to friends, an indication of an organizational bent (12:210-239).

In the agricultural sector, Singh (21) undertook an examination of Indian farmers near Delhi. Defining the progressive-traditional

criterion by the adoption behavior of improved production techniques and using the mean yield per acre as the demarcation of successful and unsuccessful farmers, Singh divided his sample into four groups. He found a significantly greater difference in need achievement between progressive-successful Indian farmers near Delhi and all other groups of traditional-successful, progressive-unsuccessful, and traditiona-unsuccessful farmers. Finally, McClelland and Winter (13) have demonstrated that increasing need achievement in businessmen does result in greater economic activity.

To further argue the impact of achievement motivation on decision making, the following summary of situational determinants is presented as a parallel to the procedure described by Nielson" (1) the individual's perception that his action will achieve the goal; (2) the incentive of the activity; (3) the perception of the responsibility for the outcome; (4) explicit knowledge of the results; (5) some degree of risk, the outcome is not certain (1:291).

The farm management situation, then, should arouse the need to achieve as it exists in an individual. The level to which it is aroused, the strength to which it directs an individual to a task is described by the Atkinson risk-taking model:

$$T_s = M_s \cdot I_s \cdot P_s$$

where T_s is the tendency to approach a task one might select, M_s is the motive to succeed, P_s is the perceived probability (or expectancy) of success and I_s is the incentive value of success (1:242-258). The tendency to approach may be viewed as the subjectively expected

utility. Interpreting the Edwards' SEU Model, Atkinson considers the utility of the incentive for the success of a particular alternative to be a function of strength of motive and the incentive value of success for that alternative. Expressed as a product:

$$u_i = M_s \cdot I_s$$

A further assumption is made, that incentive values and subjective probabilities are inversely and linearly related:

$$I_s = 1 - P_s$$

It is reasoned that the more difficult, or uncertain, an alternative the greater its incentive value. Litwin (11) has found empirical support for this assumption.

Substituting this assumption, the Atkinson model becomes:

$$T_s = M_s \cdot P_s \cdot (1-P_s)$$

Table I will illustrate sample computations for tasks of various levels of P_s.

The tendency to approach, T_s, is greatest in the area of moderate risk, when $P_s = .50$. It is also evident from Table I that those individuals with high levels of M_s will find moderate risks more attractive than individuals with lower M_s. Thus, if the Atkinson assertion of subjective utility as a product of the motive to succeed and the incentive value is accepted, then need achievers choosing tasks of moderate risks are maximizing their expected utilities.

The motive to succeed does not exist alone however; also to be considered is the motive to avoid failure, M_{af}. Where M_s may be

TABLE I

SAMPLE CALCULATIONS WHEN $M_s = 8$ AND $M_s = 1$

	M_s	P_s	$1-P_s$	T_s	M_s	P_s	$1-P_s$	T_s
Task A	8	.10	.90	.72	1	.10	.90	.09
Task B	8	.25	.75	1.5	1	.25	.75	.19
Task C	8	.50	.50	2.0	1	.50	.50	.25
Task D	8	.75	.25	1.5	1	.75	.25	.19
Task E	8	.90	.10	.72	1	.90	.10	.09

described as the pride of accomplishment, M_{af} may be thought to be the capacity for reacting with shame and embarrassment when the outcome is failure. The result is anxiety and a tendency to withdraw from the situation when confronted with the possibility of failure. It is a negative motivation, a motive not to perform. The strength of withdrawal, of repulsion, T_{-f} of an alternative for an individual may be described by:

$$T_{-f} = M_{af} \cdot P_f \cdot I_f$$

where P_f is the perceived probability of failure and I_f is the incentive value of failure. Here the assumption is made that the incentive value of failure is equal to the negative value of the perceived probability of success:

$$I_f = -P_s$$

This assumption may be understood by thinking of the incentive for failure as a negative value, a disincentive. Failing at a difficult task, when P_s is low, is less discouraging than failing at a simple task, when P_s is quite high.

For an individual in whom $M_s > M_{af}$, the resultant tendency for any one alternative is approach but for one in whom $M_{af} > M_s$, the tendency is avoidance. The resultant tendency T_r may be described as:

$$T_r = M_s . P_s . (1-P_s) + M_{af} . P_{-f} . -P_s$$

$$T_r = M_s . P_s (1-P_s) + M_{af} . (1-P_s) . -P_s$$

$$T_r = [M_s . P_s . (1-P_s] + [-1 . M_{af} . (1-P_s) . P_s]$$

$$T_r = (M_s - M_{af}) . P_s . (1-P_s)$$

The graphs in Figure 3 illustrate the resultant tendencies of choice by individuals of different motivation.

Where M_s leads to preference for tasks whose P_s is near .50, M_{af} leads to preference for tasks where P_s is near 0 or 1. There the tendency to withdraw is the least. It is assumed that the alternative for which T_r is the greatest is the one that will be selected in a situation of choice. The decision may be for the alternative for which the tendency to approach is the greatest or the tendency to withdraw the least.

Alternatives selected because their attraction is strongest, rather than their repulsion the least, should be implemented with more persistence and vigor, thus increasing the likelihood for financial success (see Figure 2, page 11). Hence:

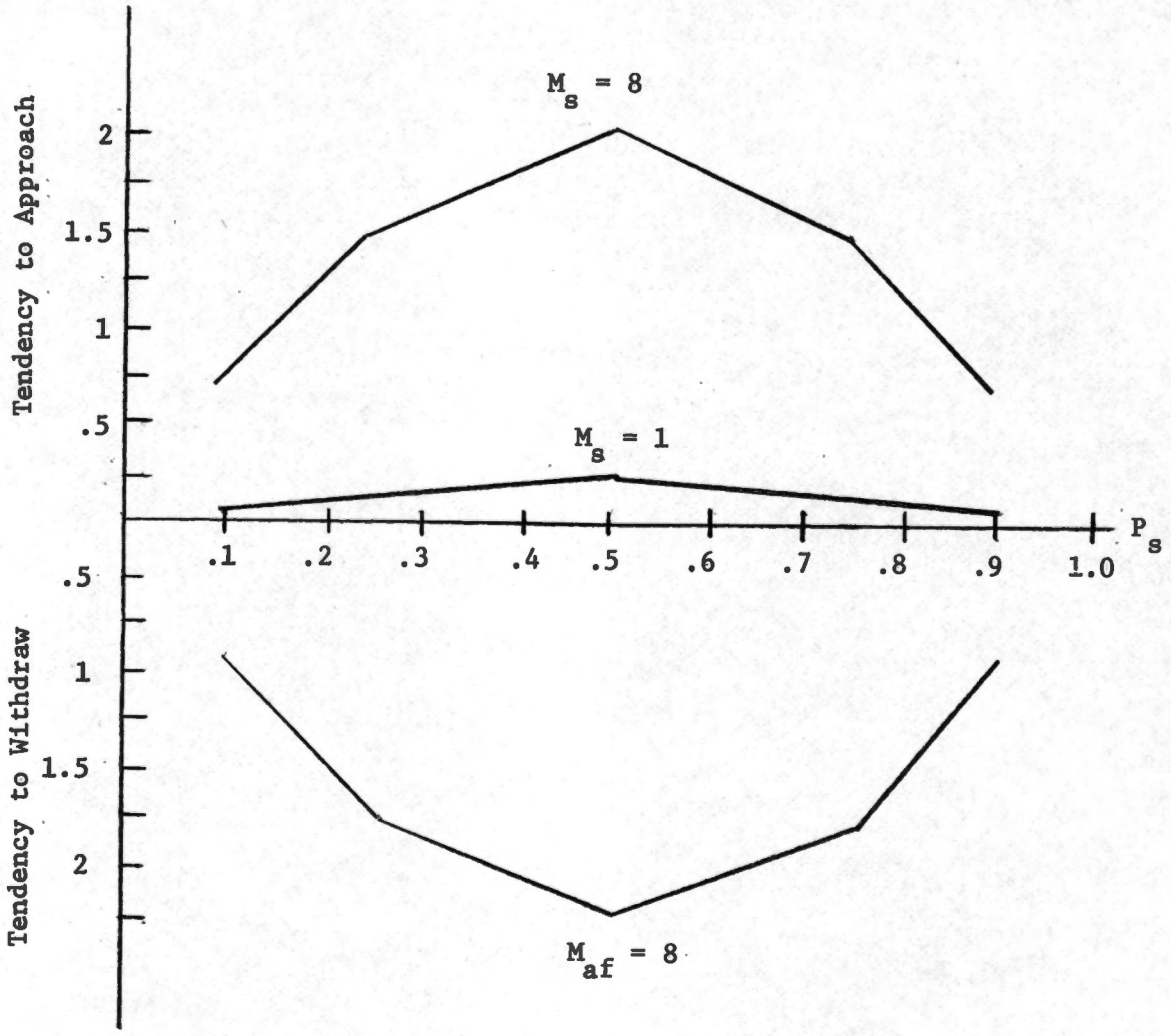


Figure 3. Strength of tendencies to approach and withdraw.

Hypothesis 7: The greater the T_r, the greater the net income.

The theory of achievement motivation explains choice in satisficing behavior by selecting that alternative which best satisfies the drive to succeed in attaining the desired goal. For each alternative facing the farmer, the attraction or utility is determined by his perception of the alternative's likelihood of reaching his goal, the incentive of meeting his goal by means of that alternative and his need to achieve and fear of failure. That alternative for which his attraction is the greatest, the alternative for which he feels the strongest tendency to approach, is the one this criterion demands he select. Theory asserts that the greater this resultant tendency to approach, the greater will be his net income.

IV. THE DYNAMIC LEARNING MODEL

The learning model continues the embodiment of the satisficing model using achievement motivation theory to describe the behavior resulting from experience. Essentially, the learning model relates the farmer's experience from an earlier decision to his perceived probability of success for the alternatives facing him in his next decision. The learning model holds that given sufficient experience to warrant a new decision, the perception of the alternatives will have changed such that relatively successful experience raises the perceived probability of success of the alternatives facing the farmer and relatively unsuccessful experience lowers the perceived probability of success of those alternatives. Achievement motivation, empirically successful in

explaining the persistence of behavior, describes the new choice to be made given the levels of the farmer's motives to succeed and avoid failure, the perceived probability of success of his original choice and the success or failure he observed. His goal may increase or decrease in its difficulty of attainment, as suggested by Simon's satisficing concept.

The theory of achievement motivation is a dynamic one in that it explains the persistence of behavior. Atkinson explains that when $M_s > M_{af}$, repeated success at the selected task raises the perceived probability of success so that $P_{s1} > P_{s0}$ 50, where P_{s0} is the perceived probability of success at the time of selection and P_{s1} is the perceived probability of success in the aftermath of performing the task (see Figure 3). The task becomes less interesting as the tendency to approach decreases. The individual re-examines his goals and alternatives whose P_s appeared less than .50. In light of his success, higher goals, more difficult alternatives, are now perceived higher and a new goal is selected such that its P_{s1} approaches .50. Thus the individual's aspiration level rises. Conversely, repeated failure at a selected task will cause the individual to revalue the P_s to less than .50 and turn his attention to goals which seemed too easy to be attractive before but now have a P_{s1} that approaches .50.

When $M_{af} > M_s$ persistence at a task is quite different. Under dominant fear of failure, repeated failure, when P_s is very low, results in a decreasing P_s and a diminishing tendency to withdraw, T_{-f}. The individual becomes comfortable in his choice. Success, however, increases T_{-f}; the individual feels he has overestimated the difficulty

of the task and is threatened by the challenge. His response is to raise his aspiration level to where P_s is even lower. If the individual has chosen the easiest of tasks, the lowest of goals where P_s is quite high, and succeeds, P_s will increase and the T_{-f} will decrease. The individual is happy to remain with his choice. On the other hand, failure when P_s is very high causes the individual to search for an even less difficult task. If none is available and the individual must choose, theory and experimental evidence indicate he will completely revise his goals to the next most comfortable level and select that which has a very low P_s (1:258). Thus the following hypotheses:

Hypothesis 8: When $M_s > M_{af}$, the greater the success, the more likely a more difficult goal will be chosen.

Hypothesis 9: When $M_s > M_{af}$, the greater the failure, the more likely a less difficult goal will be chosen.

Hypothesis 10: When $M_{af} > M_s$, the greater the success when a simple goal is chosen, the more likely the goal is to be maintained.

Hypothesis 11: When $M_{af} > M_s$, the greater the failure when a difficult task is chosen, the more likely the goal is to be maintained.

Hypothesis 12: When $M_{af} > M_s$, the greater the success when a difficult goal is chosen, the more likely a more difficult goal will be chosen.

Hypothesis 13: When $M_{af} > M_s$, the greater the failure, when a simple goal is chosen, the more likely the individual is to leave the industry.

The Atkinson model of risk-taking behavior follows in the form of Simon's satisficing model. Aspiration levels are subjectively determined and alternatives considered to attain the aspiration are evaluated in terms of being satisfactory or not, the evaluation being their perceived probability of success. Persistence at reaching the desired goal yields information as to one's capability and to the difficulty of the goal. Learning takes place and goals are revised and new alternatives are considered. After each round of processing information, which, in a complex task such as operating a farm, may be continuously taking place, new alternatives will be considered for their expected utility and one selected which maximizes that utility.

CHAPTER III

METHODOLOGY

"What is the use of a book" thought Alice, "without pictures or conversations?"

Lewis Carroll
Alice in Wonderland

In designing the approach of research to test the theory developed in the previous chapter, a quality of realism must be incorporated so that the results afford both valid and relevant interpretation. The experience of Dillon and Heady (3) with the discrepancy between hypothetical and practical decision problems emphasizes the necessity to avoid contriving a situation of choice if meaningful results are to be obtained.

The Tennessee Valley Authority's Resource Management (or Test Demonstration) Program (RMP) makes the analysis of a realistic decision possible. Participants in the program must be fulltime farmers. They have received the benefit of consultation with a Resource Management Agent to improve the operation of their farm. Given a set of resources at the farmer's command, the agent details the farm plan in present operation (Plan I) and formulates another plan to maximize the farmer's net income over a six year period (Plan II). The farmer then describes the farm plan that he is willing to follow for the next six years (Plan III) and agrees to supply the Resource Management Program with annual farm records. In return, the participating farmer receives

assistance in the management of his farm and a subsidy on fertilizer purchases. This study analyzes the decision regarding farm plan in light of the theory discussed in Chapter II.

I. THE SAMPLE

To remain as close to the time of decision as possible and yet have a full year's (1974) operation data under the elected Plan III, 117 participants, 45 of whom had joined the program in 1973 and 72 of whom had joined in 1972, were chosen for the sample. These farmers were located in 48 Tennessee counties in the Tennessee River Valley that reaches from Eastern Tennessee to the mid-western portion of the state. The geographical variation accounted for a wide variety of farming operations from tobacco and mountainside cattle grazing to cotton and orchard enterprises. Soliciting response to the survey questionnaire showed that one of the participants had passed away, one was no longer planning to farm due to physical impairment, one had quit the program, two had become part-time farmers and three refused to respond to the questionnaire. Another participant was removed from the sample because he had lost two herds of beef stock to tuberculosis in the last two years. Misfortune of this proportion was thought to have an unrepresentative effect on the individual's managerial performance. These reductions left 108 individuals in the sample.

Preliminary Questions

To provide latitude for responses concerning his choice of farm plans that might not fit the model, each farm manager was asked at

the outset of the interview his reasons for participating in the program, why he chose the particular plan he had and whether he had altered that plan and, if so, how? As presented in Table II, 72 percent indicated they enlisted in the program to seek assistance or as a result of having sought the county agent's advice. Only 13 percent stated they selected the particular farm plan they did to maximize profit or efficiency. These statistics lend support to the assertion that farm managers may not be maximizers and considered new information, in the form of assistance, as a means of increasing their net income. Forty-three percent indicated they had changed their plan to increase the level of activity and 5 percent indicated they had decreased the level of activity.

II. THE PERCEPTION OF RISK MODEL

The perception of risk was tested by a multiple regression procedure that stated perceived probability of success as a function of economic factors thought to affect that perception. The perceived probability of success, P_s, of the chosen net income for Plan III was the dependent variable. The model was used to evaluate hypotheses 3, 4, 5, and 6.

Measuring P_s

Two methods are used to measure the P_s of the chosen net income for Plan III. The first, P_{s1}, is a direct inquiry as to the farmer's subjective estimation of the probable success of his farm plan to attain his net income goal. Each farmer was asked on the survey

TABLE II

FARMER RESPONSE TO PRELIMINARY QUESTIONS

Reasons Stated for Joining Resource Management Program

Reason	Percent
Fertilizer Discount	14
Assistance/Improvement	50
Record Keeping	3
Agent's Recommendation	22
Other RMP Farmers	6
Other	5

Reasons Stated for Choosing Farm Plan They Are Following

Reason	Percent
Agent Recommended	6
Continuation of or Suited to Previous Operation	50
Increase/Maximize Profit/Efficiency	13
Improvement Over Present Plan	5
Most Practical/Best Suited to Resources	17
Other	7

Deviations from Selected Plan

	Percent
Unchanged	51
Increased	43
Decreased	5
Changed	2

questionnaire how many years out of ten he expected his farm plan to attain his net income goal.

The second estimation of P_s was made by means of a statistical procedure. McClelland has measured individual's P_s for a chosen task by computing the sample mean for the level of difficulty chosen and equating the mean level of difficulty with a probability of success equal to .50. The individual probability of success was then equated with the deviations from the sample mean of the level of difficulty of his chosen task (12:213). McClelland defends this method by claiming that when an individual has had experience at the task for which he is being asked to select alternative ways of performing it, the perceived probability of success is a very realistic approximation of the actual probability of success (12:223). Both measures are used to account for the individual's subjective perception and an experienced perception that approximates reality.

Determining the value of the second measure of perceived probability of success, P_{s2}, was not easily done. In effect each farmer had not only his own net income goal, stated in Plan III, but a set of alternative ways of achieving his goal unique to him. Each farmer's resource endowment determined the range of net incomes that could be produced. To emulate McClelland's use of individual deviations from the sample mean to determine P_s, some method of aggregation of varying endowments and chosen net incomes was needed. A multiple regression procedure was used to effect the aggregation.

Selected net income of Plan III was considered to be a function of the resource endowment at the time of choice; the model can be expressed mathematically as:

$$NI_3 = a' + b'_5X'_5 + b'_6X'_6 + b'_7x'_7 + b'_8X'_8 + b'_9X'_9 + b'_{10}X'_{10}$$

where NI_3 = the net income for Plan III,

X'_5 = machinery, as valued in the RMP application,

X'_6 = land, as valued in the RMP application,

X'_7 = buildings, as valued in the RMP application,

X'_8 = livestock, as valued in the RMP application,

X'_9 = labor, as valued in the RMP application,

X'_{10} = credit capital, as valued in the RMP application.

The formulation of Plan III included a summary of resources the farmer had available to achieve the desired net income. These data were used to estimate the model for predicting chosen net income from a stock of resources by means of a multiple regression procedure. Monetary values were used for all resources except labor, which was measured in hours available per year, family and hired. Machinery and equipment, buildings, fence and improvements were estimated at their annual depreciated values. Land values were determined by the farmer and the RMP agent and lay between agricultural and market values. Livestock values were calculated, allowing for size and age, on an average over a period of several years to even out the market price variation. Credit capital reflected the amount of capital for new investment the farmer was willing and able to borrow to achieve the net income of Plan III. Results of the estimation procedure, in which resource variables explained

62.8 percent of the variation of chosen net income for Plan III, may be found in Table A-I.

To estimate a value for P_s, it was necessary to determine the distribution of net income the farmer could have selected given his resource endowment. This was accomplished with the use of the estimated regression equation for selected net income using predicted net income, $\hat{NI}_3$, as the mean of the distribution and the standard error or prediction, $s_{\hat{NI}_3}$, as the measure of the dispersion. Once the distribution was estimated, the probability of success, P_s, was equal to the probability of obtaining a net income equal to or greater than the selected net income NI_3.[1]

This procedure implicitly states that the expected or mean net income for each set of resources is the alternative for which $P_s = .50$ and that a selected net income greater than the expected has a value of P_s less than .50.

Factors Affecting the Perception of Risk

The perceived probability of success, P_s, was stated as a function of economic variables associated with a willingness to take risk and total planned investment. Mathematically, the model takes the form:

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[1] A t-statistic, $t = NI_3 -- \hat{NI}_3/s_{NI_3}$, was used to estimate the probability of obtaining a net income equal to or greater than the selected net income, NI_3. P_s is equivalent to the area cut off in the upper tail of the t distribution by the t-statistic, in the usual manner of significance tests.

$$P_s = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4$$

where X_1 = the risk discount,

X_2 = the equity ratio,

X_3 = total capital owned,

X_4 = non-farm income.

Data from the 1974 Resource Management Records and responses to the questionnaire are the sources of values for the economic variables specified in the perception of risk model.

The risk discount was estimated by asking the amount of money a respondent felt he must receive in six years, the duration of RMP participation, to forego a thousand dollars in the present. The return above the initial sum was divided by six and that amount expressed as a decimal fraction of the principal one thousand dollars. This method was selected over a standard discounting procedure because it appeared to be the method overtly used by most farmers when replying.

The equity ratio, measured as the ratio of capital owned to capital invested in the farm operation, was taken from the farm manager's statement of his farm operation at the time the decision for Plan III was made.

Total capital owned at the time of the decision was taken from the statement.

The value of non-farm income was that response to the inquiry into outside income received by the household in 1974.

III. THE DECISION MODEL

The more general hypothesis concerning net income as a function of resource endowment, resultant strength of tendency, T_r, to approach or withdraw from an alternative, and information was also tested by a multiple regression procedure. The model was used for evaluation of hypotheses 1, 2 and 7. A statement of the regression equation follows:

$$NI_{74} = a_2 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + b_{11}X_{11} + b_{12}X_{12} + b_{13}X_{13} + b_{14}X_{14} + b_{15}X_{15} + b_{16}X_{16} + b_{17}X_{17}$$

where NI_{74} is 1974 net farm income,

X_5 = machinery, as valued in 1974 RMP records,

X_6 = land, as valued in 1974 RMP records,

X_7 = labor, as valued in 1974 RMP records,

X_8 = livestock, as valued in 1974 RMP records,

X_9 = buildings, as valued in 1974 RMP records,

X_{10} = credit capital, as valued in 1974 RMP records,

X_{11} = education,

X_{12} = training,

X_{13} = information seeking,

X_{14} = the resultant tendency, T_r

X_{15} = 1 if a dairy operation, 0 otherwise,

X_{16} = 1 if a beef operation, 0 otherwise,

X_{17} = 1 if a hog operation, 0 otherwise.

The 1-0 variable for general farming operations is excluded for statistical reasons.

Because net income will be the result of more than just the decision process and information, resource variables are included in the equation to net out the effect of wealth and scale of operation and to avoid bias in the regression due to omitted variables. The 1-0 variables for type of farm operation are included to capture the effect of different operations on net income, including the commodity price differences for 1974. Taken over the long run, natural calamity and price variation may be viewed as the random disturbance term in regression analysis which has an expected value of zero.

A linear form was chosen for the decision model for the sake of simplicity. The study had no reason to expect a curvilinear relationship. Given the difficulty and crudeness of the psychological estimates, specification trials seemed unwarranted.

Estimation of the Decision Criterion

The Atkinson model of risk taking discussed in Chapter II, $T_r = (M_s - M_{af}) \cdot P_s \cdot (1-P_s)$, utilizes standard psychological instruments to measure both motives to succeed and avoid failure.

The need for achievement, M_s, was not measured by the Thematic Apperception Test in this survey because the time and complexity of its administration does not lend itself well to field survey techniques. A sentence completion version of the TAT developed by Morrison (14) was used. Using a sample of Wisconsin farmers, Morrison found a correlation of .33 between the sentence completion and TAT scores.

Eight incomplete sentences were given to each farmer interviewed who completed them in any manner he wished. The sentences were scored for achievement imagery by two judges according to the criteria developed by Neill and Rogers (15).

M_{af}, the motive to avoid failure, was measured by a twenty-item version of Taylor's Manifest Anxiety scale (22 and 2). This estimates an individual's general anxiety level.

Measuring P_s as described before, the probability of obtaining a net income equal to or greater than the selected net income for Plan III, the Atkinson model became operational and the value of T_r was calculated for each observation.

Estimation of Information

Theoretically, the information variable was broken into information seeking and education. Measurement of education from possible sources, however, necessitated a further division into formal education and field training. This disaggregation was made to resolve the inequality of comparing a year of schooling with attendance at an extension meeting.

Education was measured by the number of years of formal education. Training was valued at the number of extension meetings, or "field days," the respondent had attended in the past year.

Information seeking was a composite score of the frequency of gathering information from various sources. For instance, a score of 1 to 7 was awarded for the number of times a farmer sees his county

agent for technical production advice in a year. Other sources of information mentioned in the questionnaire were the Resource Management Agent, business associates (bankers, buyers, salesmen), the study of farm records, price outlook information and various farm magazines.

Estimation of Resource Endowment

The resource endowment variables of machinery, land, labor, livestock, buildings and credit capital are identical to those independent variables in the Plan III net income regression equation used to determine P_s. The six resource variables were measured as described before but in the decision model, values from 1974 Resource Management Program records were used.

IV. THE DYNAMIC LEARNING MODEL

As explained in Chapter II, the theory of achievement motivation is very useful in explaining the persistence of behavior. Hypotheses 8 through 13 postulate what behavior can be expected under different strengths of motivation to succeed or avoid failure, under experience of success or failure and for different choices of the initial task. Embedded in these hypotheses is the underlying postulate that given sufficient experience to warrant a new decision, the individual's perception of the alternatives will have changed. Having succeeded at the original choice, the alternatives will appear less difficult than before. Having failed, the alternatives will appear more difficult. This change of perception holds whether need for achievement or fear of failure is the dominant motivation. When the former prevails, the

individual decides for the alternative where the tendency to approach is greatest. When the latter rules, that alternative for which the tendency to withdraw is the least is elected. Hypotheses 8 through 13 are condensed to reflect this change of perception as the learning process:

> Hypothesis 14: If the farm manager has had sufficient experience to change his farm plan, then the perceived probability of success, P_s, of his initial choice will become greater when he is successful and will become less when he is unsuccessful.

It is assumed that the P_s of a newly selected alternative will approach the value of P_s for the original choice. This assumption may be understood by examining the Atkinson model in the second decision, the selection of a new farm plan. The farmer will make his choice again on the same criterion used for his original selection of farm plans: he will choose that alternative for which the resultant tendency, T_r, is the greatest. Because his motivations to succeed and avoid failure remain constant and only the values of P_s may change, the formulation of $T_r = (M_s - M_{af}) \cdot P_s \cdot (1-P_s)$ indicates that similar values of T_r must have similar values of P_s.

The learning model empirically tests the change of perception, hypothesis 14. Because it is impossible to test the change of probabilities for all alternatives facing the farmer, the learning model examines only the change of the probability of the originally selected farm plan. This change is analyzed by comparing two distributions. The first is a distribution of any particular net income for Plan III being

selected by a farmer; the second is a distribution of probabilities of any particular net income for Plan III being selected by a farmer having had sufficient experience to change his farm plan. These are prior and posterior probabilities, respectively. Experience is continuously gained from operating a farm and has a continuous affect on the farmer's perception of his alternatives. Theory suggests, however, that only those farmers who had made a new decision, by changing their farm plans, would have necessarily altered their perception of the alternatives. For this reason, only the 53 farmers who stated they had changed their farm plan in Table II (page 33) are used in analyzing the learning model; they are the only ones in the next time frame of the decision process.

Estimation of Prior Probabilities

The distribution of prior probabilities, the probability of a particular net income for Plan III being selected, is distinct and separate from his perceived probability of success, P_s. Because each farmer had a unique operation and resource endowment, his selected net income for Plan III could not be compared directly with an equivalent net income of a second farmer with a different set of resources. As a basis for comparison, the selected net income for Plan III, NI_3, was expressed in standard errors of prediction, $3\hat{NI}_3$, from his expected net income, $\hat{NI}_3$. This range of standard errors was divided into fourteen discrete intervals, from +6 to -6, of a single standard error of prediction and the frequency tabulated. The prior probability of a farmer selecting any interval of net income, $P(NI_3)$, was computed by

dividing the frequency of that interval, $f(NI_3)$, by the sample size, 53.

Estimation of Posterior Probabilities

The distribution of posterior probabilities was formulated in two steps. First, a frequency distribution of joint occurrences was compiled, then a Bayesian model was used to estimate the posterior probability from the prior probability and the joint probability.

The joint occurrences of this second frequency distribution was the selection of a new net income, NI', for the altered farm plan having selected a particular net income for Plan III, NI_3. This new net income, (NI'), was the projected net farm income indicated by each of the 53 farmers for their new farm plans. NI' was also tabulated in fourteen discrete intervals of standard errors of prediction from the expected net income of Plan III. The probability of a farmer selecting any new net income, P(NI'), was again equal to the frequency within the interval, f(NI'), divided by the sample size. To calculate the joint probability of a farmer choosing any new net farm income having selected a net income for Plan III, $P(NI':NI_3)$, the probabilities for each occurrence are multiplied together:

$$P(NI':NI_3) = P(NI_3) \cdot P(NI':NI_3)$$

Having determined the joint probability and the prior probability, the study used a Bayesian model to compute a posterior probability, or the probability of a farmer selecting a net income for Plan III having observed sufficient results to change to a new farm

plan, $P(NI_3:NI')$.[2] The Bayesian model can be expressed as:

$$P(NI_3:NI') = P(NI_3) \cdot P(NI':NI_3) / \sum_{i=1}^{n} P(NI_{3i}) \cdot P(NI':NI_{3i})$$

To evaluate hypothesis 14, the distribution of prior and posterior probabilities were compared to determine their independence. The standard procedure for such a comparison is the Chi-square test. A contingency table pairing the prior and posterior probabilities was used to compute the Chi-square statistic. Recommendations call for an expected frequency of at least five in each cell of the contingency table (7). A 2 x 7 table was used to meet this requirement.

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[2]The study used projected net income (NI') in lieu of actual observed results for the following reason. The study was unable to determine when the decision to change the farm plan had been made. Because 72 farmers were in their third year and 45 were in their second year, it was difficult to point to any specific monetary result as the factor prompting the decision to change. The farmer's projected net income for 1975 was assumed to best represent the observed result.

CHAPTER IV

RESULTS AND INTERPRETATION

"Contrariwise," continued Tweedledee, "if it was so, it might be; and if it were so, it would be; but as it isn't, it ain't. That's logic."

Lewis Carroll
Through the Looking Glass

I. THE ESTIMATED PERCEPTION OF RISK MODEL

The perception of risk model was estimated with two alternative measures of P_s. The first (P_{s1}) used the subjective estimation of each farmer of the frequency of his farm plan's success in a ten-year period. The second (P_{s2}) used individual deviations from the example mean, as determined by the Plan III net income regression on resource variables (page 35). The estimated equations with the standard errors of the coefficients in parentheses follow:

$$P_{s2} = .495 + .266X_1 + .026X_2 - .00000047X_3 + .00000139X_4$$

$$(.125)\quad (.192)\quad (.165)\quad (.0000063)\quad (.00000402)$$

$$R^2 = .025 \qquad F = .649$$

$$P_{s1} = .783 + .076X_1 - .095X_2 + .00000055X_3 + .00000164X_4$$

$$(.067)\quad (.117)\quad (.084)\quad (.00000031)\quad (.00000383)$$

$$R^2 = .038 \qquad F = .946$$

The estimated P_{s1} model accounted for 3.8 percent of the variation in perceived probability, but was insignificant at the .10 level. The coefficient of total capital owned was significant at the .10 level.

The coefficient may be interpreted as a .055 increase in perceived probability of success caused by an additional $100,000 in total capital owned. The coefficient of nonfarm income was insignificant at the .10 level but of the hypothesized positive sign. Coefficients for both the risk discount and equity ratio were not significant at the .10 level nor showed the hypothesized sign. Only the intercept, which may be viewed as the mean effect of the omitted variables was significant at the .01 level.

The P_{s2} estimation explained only 2.5 percent of the variation in perceived probability, the equation itself was not significant at the .10 level. Coefficients of the equity ratio (X_2) and nonfarm income (X_4), though not significant at the .10 level, did show the hypothesized positive effect on perception of risk. The coefficients for the risk discount (X_1) and total capital owned (X_3) were neither significant at the .10 level nor of the hypothesized sign. Again the intercept was significant at the .10 level.

It is difficult to infer much meaning from the two equations because of their extremely weak explanatory power. Both are incomplete specifications of all the determinants of perception. Neither includes social or psychological determinants. The assumption that all facets of personality that shape a choice are contained in the concept of perceived probability of success may be too all-embracing. A question of measurement and scaling is involved. A dollar evaluation and a self-ranked scaling of planned investment and willingness to take risk, respectively, was related to total capital owned, the equity ratio and the risk discount (8). While it is logical to postulate a positive

relation of subjective probability of success to planned investment and willingness to take risk, and hence the hypothesized relations with total capital owned, the equity ratio and the risk discount, a statistical comparison may not confirm this relationship.

II. THE ESTIMATED DECISION MODEL

The decision model, estimated by the regression analysis, follows below. Variables for resource endowment, the decision criterion and information were regressed on 1974 net farm income, the indicator for managerial success, to yield the equation:

$$\hat{NI}_{74} = -4721.09 + .21X_5 = .05X_6 + 1.55X_7 + .35X_8 - .11X_9 - .47X_{10}$$

$$(6694.34) \quad (.14) \quad (.03) \quad (.46) \quad (.12) \quad (.05) \quad (.14)$$

$$+ 2638.53X_{11} + 208.43X_{12} + 107.07X_{13} - 42.45X_{14} + 5797.13X_{15}$$

$$(2345.28) \quad (448.66) \quad (508.65) \quad (140.6) \quad (3988.05)$$

$$- 3256.35X_{16} - 5323.66X_{17}$$

$$(4337.07) \quad (5525.22)$$

$$R^2 = .384 \quad F = 4.50 \quad D.W. = 1.913$$

The estimated equation explained 38.4 percent of the variation in net income and was significant at the .0001 level.

The economic resource variables, machinery (X_5), land (X_6), labor (X_7), livestock (X_8), credit capital (X_9), and buildings (X_{10}), proved the most significant of any group. The signs of the coefficients for land, credit capital and buildings were negative, contrary to reasoning, and the values for machinery and land were not significant at the .10 level. A multicollinear relationship with other economic

resource variables was judged to be a cause of this distortion of coefficient signs and significance levels.

Multicollinearity was indicated by the extraordinarily high correlation coefficients (shown in Table III), between .531 and .670 for machinery and .306 and .531 for land, relative to their correlations with net income, .278 and .054 for machinery and land respectively. Statistically, a multicollinear relationship between two independent variables yields biased and inefficient estimates of the coefficients which can cause overestimation of the standard errors of the coefficients and their consequently insignificant t tests (17).

Another source of negative coefficients may be the relatively high debt position of many of the farmers in the sample. This is indicated by the negative coefficient of credit capital (-.11) and the mean equity ratio (.74; s.d. = .281). A combination of large interest payments and a poor year, resulting from weather or price misfortunes, have left a number of farmers, 50 percent of whom own 74 percent or less of their enterprises, with negative incomes. In this sample, the mean effect of increasing credit capital one dollar was to decrease net income 11 cents. The use of credit to purchase capital inputs in the farm operation can explain the negative coefficients of land and buildings as well. Investment of an additional dollar in land or buildings had a mean effect of decreasing net income by 5 cents and 57 cents, respectively.

The resultant tendency to approach or withdraw, the decision criterion, had a large coefficient (2683.53) with a positive sign as

TABLE III

THE DECISION MODEL CORRELATION MATRIX

N = 108	Machinery	Land	Labor	Livestock	Credit capital	Building	Resultant tendency	Education	Training	Information seeking	Dairy	Beef	Hogs	Net income
Machinery	--	.531***	.617***	.518***	.670***	.627***	.033	.141	-.069	.137	.331***	-.185*	-.203**	.278***
Land		--	.422***	.331***	.306***	.445***	.112	.216**	.058	.189**	.117	.025	-.107	.054
Labor			--	.620***	.760***	.579***	-.061	.105	-.091	-.015	.403***	-.190**	-.117	.403***
Livestock				--	.709***	.593***	-.029	.144	.013	.050	.545***	-.144	-.040	.395***
Credit capital					--	.547***	-.043	.092	.000	.128	.329***	-.207**	-.060	.299***
Building						--	.02	.178*	-.056	.051	.343***	-.154	-.170**	.091
Resultant tendency							--	.186*	-.095	.171*	-.010	.033	.080	.029
Education								--	.063	.026	.048	-.029	.134	.054
Training									--	.171*	-.010	.033	.081	.029
Information seeking										--	-.040	.053	.208**	.051
Dairy											--	-.332***	-.258***	.433***
Beef												--	-.146	-.168*
Hogs													--	-.111
Net income														

*Significant at .1 level.
**Significant at .05 level.
***Significant at .01 level.

hypothesized. This indicates a substantial effect on net income. The resultant tendency did prove insignificant at the .10 level, however. Speculation as to the cause of the insignificance, particularly in light of the empirical support in the psychology literature cited in Chapter III, leads to the examination of the variables involved in calculating the resultant tendency, T_r.

$$T_r = (M_s - M_{af}) \cdot (1-P_s) \cdot P_s$$

The values of P_s lie between 0 and 1 with a mean of .515 and a standard deviation of .435, indicating two-thirds of the sample have a probability of success between .080 and .950. The remaining third lies in even greater extremes. The implication is that the method used to estimate the perceived probabilities of success, as described in Chapter III, may be too all-embracing in the range of economic data used.

Perhaps the crux of the insignificance of the resultant tendency variables lies in the measurement of need achievement, M_s. The values of M_s varied from 0 to 23 with a mean of 10.37 and a standard deviation of 4.843. The most troubling question concerns the validity of the eight-sentence completion instrument used to measure need achievement. As mentioned in Chapter III, this instrument developed by Morrison had a .33 correlation with the standard instrument for measuring need achievement, the Thematic Apperception Test (TAT). It is the TAT that is the foundation for the empirical support cited in Chapter II. The correlation coefficient, R = .33, between the two measures may be transformed by taking its square to compute an R^2 = .109 which may be

interpreted as the sentence completion test explaining 10.9 percent of the variation in the TAT.[3]

None of the information variables, education (X_{12}), training (X_{13}), or information seeking (X_{14}), proved significant at the .10 level, thought, with the exception of information seeking, the positive signs were as hypothesized. Because reasoning both in the literature and in this study strongly dictates the inclusion of information into any process of decision, there is temptation to conclude that the indicators do not reflect the passage of information as it is used in farm management decisions. This may be best explained in light of the process of farm plan selection. Fifty percent of the farmers indicated that the farm plan they were following was chosen because it was a continuation of or suited to their previous operation (Table I, page 23). This suggests that little new information was required to operate the plan presently in use and hence was not reflected in the response to the questionnaire. The negative, thought insignificant, coefficient suggests farmers might be gathering information at a cost to net income. Statistically, a single information variable might be significant were it possible to group measures of education, training and information seeking into one variable. While it could reduce the standard error of the coefficient, grouping is difficult to effect. Some transformation

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[3]The correlation coefficient for correlational analysis and simple regression analysis, when observations are standardized form is calculated by the same formula.

$$r_{xy} = \sum_{i=1}^{n} Z_{xi} Z_{yl}/N \text{ (7:497-502).}$$

must be devised to compare, for instance, a year of education with biweekly advice from the county agent.

The dummy variables for dairy, beef and hog operations were not significantly different from the omitted dummy variable for a general farming operation. The negative coefficients of all except the variable for dairy operations suggest that conditions for all but milk production were not favorable in 1974, relative to general farms.

Tests for both heteroscedasticity and autocorrelation (17), both violations of the Best Linear Unbiased Estimate assumptions and common econometric problems, were performed. No significant indication of either was found.

III. ANALYSIS OF THE DYNAMIC LEARNING MODEL

Evaluation of the learning model was made by comparing the distribution of prior probabilities to choose a net income for Plan III, $P(NI_3)$, to the distribution of posterior probabilities to choose a net income for Plan III, $P(NI_3:NI')$. This study hypothesized that if learning had taken place, the likelihood of individuals choosing a particular goal net income in Plan III would be different from and independent of the likelihood of individuals choosing that same net income having made a choice and observed sufficient results (1975 projected net income, NI', to warrant a new decision. To test that independence a Chi-square statistic was computed from the contingency table shown in Table IV. Expected frequencies are shown in parentheses.

The Chi-square statistic of 47.044 is significant at the .001 level, indicating that the distributions are from independent populations.

TABLE IV

CONTINGENCY TABLE OF PRIOR AND POSTERIOR PROBABILITIES

	Prior	Posterior	Row Total
1.0 - .40	0 (6)	12 (6)	12
.39 - .20	0 (10)	20 (10)	20
.19 - .13	14 (10	6 (10)	20
.129 - .090	11 (7)	3 (7)	14
.089 - .060	12 (9)	6 (9)	18
.059 - .040	9 (5.5)	2 (5.5)	11
.039 - .000	7 (5.5)	4 (5.5)	11
Column total	53	53	106

$X^2 = 47.044$ d.f. = 6 $X^2_{6,.001} = 22.458$

To conclude that the populations are independent is to support the hypothesis that having experienced sufficient results to warrant a change in the organization of the farm, learning has occurred to the effect that the perception of probability of success is different from what it originally was. Inspection of the contingency table indicates that the distribution of posterior probabilities is more heavily weighted in the intervals of greater probability than is the distribution of prior probabilities. This is consistent with the finding that 46 of the 53 who indicated that they had changed their farm plans had increased the level of activity.

IV. GENERAL LIMITATIONS OF THE STUDY

Apart from the questions of measurement and validity and the adequacy of the indicators already raised as contributing to the insignificant relationships of several independent variables, there exist two limitations: the single year of economic data and the homogeneity of sample data used in this study.

The economic data were taken from the available records of the most recent year, 1974. A single year was used in order to have the most recent economic data to reflect the psychological characteristics measured in the survey questionnaire. The decision model was specified to include variables to account for the effect of different farming operations (X_{15}, X_{16}, X_{17} for dairy, beef, and hog operations, respectively). Variations in weather and price were thought to be located in the random error term and have an expected value of zero over the long run. Nevertheless, it would be preferable to have economic data over several years to reduce the variance of the dependent variable, net income. For the 1974 data, net income had a mean value of \$7,691.23, a standard deviation of \$1,744.90 and ranged from -\$39,678 to \$87,227. Many of the responding farmers were observed to have large negative net incomes, presumably an occurrence of the year and not representative of long run performance.

The sample may suffer as a whole from homogeneity in its motivational profile. While there is great range in net incomes, there is less variation in the need achievement scale: the entire range of scores lies within three standard deviations. The sample as a whole may be unrepresentatively similar, relative to all farmers, in its need

for achievement. Fifty percent of the farmers elected to take part in the Resource Management Program for the purpose of assistance and improvement (Table I, page 23). As cited in Chapter III, need achievers prefer experts to friends when attacking a problem. The counsel of their extension agent named by 22 percent as their reason for joining is also evidence of sought professional advice indicating inclusion in a homogeneous achievement group. The detailed record keeping required by the RMP furnishes the knowledge of results also valued by need achievers as cited in Chapter III.

If the suggestions of homogeneity is founded, then little significance can be expected to be observed in any statistical analysis. There will be only marginal discrimination on such variables. Indicative of this possibility is the insignificant correlation (.093) of need achievement scores with net income figures.

CHAPTER V

SUMMARY AND CONCLUSIONS

"Tut, tut, child," said the Duchess. "Everything's got a moral if only you can find it."

Lewis Carroll
Alice in Wonderland

I. SUMMARY

The literature reviewed on classical decision theory was shown to have shortcomings on an empirical basis. Questions were raised as to whether economic man is perfect in his knowledge, consistently rational in his choices, able to make the statistical calculations required of classical decision criteria, maximizing in his behavior. The objectives this study undertook were to construct a realistic decision model, describing how farmers actually make choices, that included information as a factor of choice, a perception of risk model that would explain the individual's perception of alternatives, and a dynamic learning model that would relate the experience of a previous choice to the perception of alternatives for the next choice. The psychology of motivation was employed to explain the individual's economic choice in terms of his need for achievement, his perception of the probable success of his alternatives and the persistence of his behavior in meeting an economic goal.

In order that the decisions employed to test the models be realistic rather than contrived, a sample of 108 farmers in the

Resource Management Program was used. These farmers, located in 45 counties of the Tennessee River Valley, had made decisions concerning the farm plan they would follow as part of the Resource Management Program.

The decision model held that managerial success, as indicated by net income, was a function of resource endowment, the decision criterion, and information. A regression analysis of the model explained 38.4 percent of the variation in net income. The resource endowment variables of labor, livestock, credit capital and buildings, all significant at the 5 percent level, had a partial effect on net income of $1.55, $.35, $.11, and -$.17, respectively. Multicollinearity was thought to be a cause of the insignificance of variables measuring machinery and land as well as the negative coefficient of land, credit capital and buildings. A second source of those negative coefficients was considered to be the high debt positions of many farmers whose substantial interest payments in an unfavorable year left many with negative net incomes.

The decision criterion variables, the resultant tendency to approach or withdraw formulated from the motives to succeed and avoid failure and the perception of an alternative's probability to succeed, was not significant at the 5 percent level. The insignificance was attributed to measurement difficulties in the perceived probability of success and need achievement variables. No support for Hypothesis 7 was found in the empirical analysis.

The information variables, education, training and information seeking, were insignificant at the 5 percent level, thus not supporting

Hypotheses 1 and 2. It was noted that 50 percent of the farmers were continuing their previous farm plan under the Resource Management Program, an indication that new information was not necessary to their choice of farm plan. The negative coefficient of information seeking raises the possibility that farmers in this sample may be of a point of seeking information at a cost to net income. Grouping the three indicators into one information variable was considered a possible solution.

None of the dummy variables for dairy, beef and hog operations were significant at the 5 percent level, indicating there was no significant difference between these and general farming operations.

The perception of risk model undertook to explain the individual's perception of his farm plan's likelihood of attaining his goal net income as a function of economic variables associated with willingness to take risk and planned investment: the equity ratio, the risk discount, total capital owned and non-farm income. Two models were estimated by a regression procedure. The first used a subjective estimation on the part of each respondent to determine perceived probability of success, the second employed a statistical approach to measure perceived probability. Neither model was significant at the 5 percent level, the first accounting for only 2.5 percent of the variation in perceived probability, the second explaining 3.8 percent of the variation. None of the economic determinants of perception of risk were significant at the 5 percent level. Both models were unacceptable in explaining the factor affecting perception of the alternatives, and did not support Hypotheses 3, 4, 5 and 6.

The dynamic learning model attempted to complete the explanation of managerial success over time by linking the results of a previous decision to the perception of alternatives at the time of a new choice. Substantiation of this change of perception provides empirical basis for achievement motivation theory to predict the persistence of economic behavior of farm manager decision in terms of the individual's motives to succeed or avoid failure, and his relative success at the initial choice.

To test the learning model, 53 farmers who indicated they had changed their farm plan were used. A prior probability distribution of choosing the original plan having had sufficient experience to change farm plans was obtained with the use of a Bayesian theorem. The two distributions were compared for independence by a Chi-square analysis. The distributions were found to be significantly independent at the 5 percent level. These results are that perception of the alternatives had occurred as a result of sufficient experience to change farm plans. The study would like to further conclude that this change was due to learning, as stated in Hypothesis 14. There is, however, the confounding trend in American agriculture of expanding foreign markets and farm incomes occurring at the time of this study, 1972 to 1974. It is difficult to distinguish between the hypothesized change of perception due to learning and the change of perception due to improved farm prices.

II. CONCLUSIONS

Methodological difficulties in measuring need achievement, perceived probability of success and information variables make a conclusive test of the perception and decision models very difficult. The sample may be too small in size and too homogeneous in nature. The variance of the economic data appears quite large because of the data's collection from only one year. Despite these limitations, the decision model explained 38.4 percent of the variation in net income and was significant at the 0.05 level. The obvious weakness of the perception of risk model has several possible causes. As an incomplete specification, omitting psychological and social variables altogether, the model did not attempt to explain all the variation in perception of risk. Measurement of perceived probability by the statistical approach, P_{s2}, might not have provided for other psychological elements that shape the choice made by a farmer for his farm plan.

The weakness of the perception of risk model, while thwarting the completion of the entire conceptual model, does not preclude the use of the model under need achievement theory. Estimates of the motives to succeed and avoid failure may be made, the resultant tendency to approach determined and net income predicted within some confidence limits. The success or failure in reaching the goal net income may be observed. Use of the Bayesian theorem and the substantiated learning model to predict the posterior probability of success will permit achievement motivation theory to suggest what new behavior, what new goals, what new alternatives may be expected. The

finds sufficient empirical support in the literature for the relevance of the application of need achievement theory to economic behavior. This study presents an original synthesis of motivational psychology and economic theory to explain economic choice.

There remains considerable room for refinement of the model. New research should address itself to developing improved methods for estimating need achievement and perceived probability of success under field conditions. A new model of perception must be formulated. A tighter conceptualization is needed. Investigation into the realm of social psychology and social perception should be made to determine variables that explain preferences in choice imputed to the perception of probability of success that were not explicitly accounted for by the model. New functional form and new social psychological variables may yield better results. Increased support for the refined model may be obtained by enlarging the sample size and the time period over which the data is gathered.

Policy implications are difficult to draw from research as basic as this study and when results do not completely support theory. Benefit may be realized by the extension service bringing new awareness to farmers of decisions made on the farm and the psychological forces that affect them. Positive effects on net income may be realized by increasing the need for achievement in the individual farmer. McClelland and Winter (13) have devised a training program for this purpose. Its evaluation has shown significant increases in economic activity by those taking part. Where an individual's fear of failure is so dominant no training will help, perhaps the results of further work will facilitate his exit from the industry.

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APPENDICES

APPENDIX A

TABLE A-I.

REGRESSION OF RESOURCES ON SELECTED NET INCOME OF PLAN III[a]

N = 108	B values	Standard error	Level of significance	R^2	F value	Significanc
Intercept	514.63	1554.38	.741	.628	28.36	.0001
Machinery	.20	.06	.001			
Land	-.01	.02	.404			
Buildings	.04	.05	.463			
Livestock	.18	.05	.000			
Labor	1.27	.38	.001			
Credit capital	.08	.04	.067			
	R^2 = .628		F = 28.36			
	D.W. = 1.737					

[a]Dummy variables for dairy, beef, hog and general farming operatio were omitted from the regression equation because their inclusion did not make a significant difference at the .05 level in the mean square errors. The ratio of MSE for the six and nine variable models is 1.25 with .02 an 98 degrees of freedom. It is less than $F_{120,120,.05=1.35}$.

TABLE A-II.

CORRELATION MATRIX

	Machinery	Land	Buildings	Livestock	Labor	Credit Capital	Net Income
Machinery	--	.345***	.535***	.637***	.523***	.124	.679***
Land		--	.562***	.561***	.360***	.336***	.401***
Building			—	.603***	.466***	.152	.532***
Livestock				—	.468***	.128	.679***
Labor					--	.224**	.603***
Credit Capital						--	.246***
Net Income							--

*.10

**.05

***.01

APPENDIX B

TWENTY ITEM VERSION OF TAYLOR'S MANIFEST ANXIETY SCALE

Instructions

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is true or false as it pertains to you personally. Circle "T" if you feel it is *true*; circle "F" if you feel it is *false*. Work rapidly; first impressions are usually the most valid.

1.	I have periods of such great restlessness that I cannot sit long in a chair.	T	F
2.	I have sometimes felt that difficulties were piling up so high that I would not overcome them.	T	F
3.	I am happy most of the time.	T	F
4.	At times I think I am no good at all.	T	F
5.	I sometimes feel that I am about to go to pieces	T	F
6.	I am more sensitive than most other people.	T	F
7.	I shrink from facing a crisis or difficulty.	T	F
8.	Life is a strain for me much of the time.	T	F
9.	I am certainly lacking in self-conficence.	T	F
10.	I am not unusually self-conscious.	T	F
11.	I cannot keep my mind on one thing.	T	F
12.	I feel anxiety about something or someone almost all the time.	T	F
13.	I am a high-strung person.	T	F
14.	I find it hard to keep my mind on a task or job.	T	F
15.	I am inclined to take things hard.	T	F

16. I frequently find myself worrying about something. T F

17. I believe I am no more nervous than most others. T F

18. I work under a great deal of tension. T F

19. I am usually calm and not easily upset. T F

20. I certainly feel useless at times. T F

Scoring

One point is scored for every *true* response for all items but 3, 10, 17, and 19 where one point is scored for every *false* response.

APPENDIX C

MORRISON'S NEED ACHIEVEMENT EIGHT SENTENCE COMPLETION INSTRUMENT

The next part of this interview is designed to challenge your imagination. I am going to read you the firs few words of a sentence; your task will be to complete the sentence. Speak your thoughts as they come to your mind.

a. I manage because _____
_____

b. The ideal man is _____
_____

c. I felt most dissatisfied with _____
_____

d. Most of all I want _____
_____

e. I used to daydream about _____
_____

f. A farm manager today should _____
_____

g. To increase the efficiency of this farm one must _____
_____

h. A small farm is _____
_____

Scoring

Score "0". *Unrelated Response* (Other goals than *n* Ach)

a. Freedom, independence, patriotism, democracy, citizenship, power, leadership, dominance.

b. Material affairs such as health, profit, price prosperity, wealth, acquisition, ownership, security, material comfort, debt, selling, taxes, other.

c. Association, affiliation, response, familism, fellowship, sex.

d. Ethical, religious, spiritual, altruistic.

f. Nonevaluated performance.

g. Other.

Score "1". *Implicit Achievement-Performance*

a. Newness of moderness concern.

b. Meticulousness and efficiency concern.

c. Intensity, eagerness, perserverance, industry, or ambition concern.

d. Knowledge concern.

e. Size and quantity concern.

f. Performance difficulty concern.

g. Other.

Score "2". *Explicit Achievement-Performance*

a. Explicit achievement-performance goals indicated by such key words as: bad, good, excellent, better, best, worst, worse, success, fail, win, lose, progress, advancement, get ahead, fall behind, keep up, improve, fine, nice, wonderful, ideal, beautiful, well, poor, might, wrong, alright, OK, average, mediocre, proper, challenge, competent.

b. Unique accomplishment goals.

c. Other explicit achievement-performance goals.

Score "3". *Need for Achievement*

a. Examples of key words indicating need for achievement are: need, desire, want, try, strive, etc.

VITA

Howard H. Conley III was born in Norfolk, Virginia on November 27, 1947. Repeated moving at the behest of the life insurance industry took his family further south to Savannah, Georgia and Birmingham, Alabama before finally leaving them in the southern New England town of Greenwich, Connecticut. He was educated in that city's schools and graduated from Greenwich High School in 1966. The following September, he matriculated at Wesleyan University at Middletown, Connecticut. His last semester before graduation, he drove a school bus past a dairy farm every day. In June of 1970, he received a Bachelor of Arts degree in Psychology and three days later entered the Peace Corps with an assignment to develop the dairy industry in India, a task which he completed in September of 1972.

In September of 1974, he entered Graduate School of the University of Tennessee at Knoxville and received a Master of Science degree in Agricultural Economics in August of 1976.