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Variables to predict success: a model of farm families

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Variables to predict success:
A model of farm families

by

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I. INTRODUCTION

A. Background for study

1. Financial success

The topic of financial success has been studied extensively by scholars in many fields for many years. Experts in the business community, economists, sociologists, and psychologists are among those interested in answering the question what makes some people more financially successful than others. Psychological and sociological papers have addressed the personal traits required to make good decisions and to be a good manager while the human capital economists have concentrated on more tangible, demographic measures to explain differences in labor productivity. However, very few interdisciplinary studies have been conducted.

Several studies of financially successful farms were conducted by agricultural economists in the 1960s and then after the farm crisis in the early 1980s. The goal of some economists was to determine which characteristics of the surviving firms differed from those of the failing farms in order to predict which attributes are necessary to survive in the current agricultural market. The attributes they examined were mainly financial and demographic.

In related studies, sociologists examined the reasons

some people are more financially successful than others by examining personal (innate) and environmental differences. Therefore, previous studies lack integration which may contribute to missing variables and a misspecified model of financial success.

This study attempts to unite these two disciplines in a search for the variables which predict financial success of farm families. It is hoped that integrating ideas from both fields will help to better predict and specify the attributes which truly contribute to differing earnings.

2. Defining success

Economic theory traditionally assumes that firms, including farms, will choose the level of output to maximize profit at existing prices. In other words, given a production function, the farm firm will choose the level of input and output on the production function which is tangent to the profit function. This is called the efficient point of production where profit is maximized. Economists would define the farmer who operates on this point as "successful".

However, it is hypothesized that if a farmer is attempting to achieve goals other than only profit-maximization, he may choose a production point where profit

is less but where he is more "successful" in achieving other goals. These other goals may include the desire to enjoy work and to have a pleasant homelife. This behavior, in terms of maximizing utility, may be perfectly rational.

Therefore, if an adequate study of financial success is to be performed, it must be recognized that profit-maximization is only one of several goals that dictates a farmer's actions. One cannot assume in all cases that farmers are attempting to maximize profit. Rather, a farmer may be attempting to maximize his and his family's well-being which incorporates aspects other than profit. If necessary, success may be redefined to incorporate these other goals.

B. Objectives of this study

The primary question this paper addresses is what characteristics make a farm family financially successful. Of secondary importance is to redefine success for farm firms by incorporating psychological measures of happiness as goals of the family. Therefore, the objectives of this study are:

1) to construct a model of the farm firm which allows non-profit maximizing behavior and which incorporates personality variables that are hypothesized to contribute

to financial and familial "success"; and

2) to test the hypothesis that personality variables lend explanatory power to the model of farming success.

II. VARIABLES TO PREDICT SUCCESS--A LITERATURE REVIEW

In order to determine which characteristics predict more successful managers, scholars in many areas of concentration have focused on different variables. Sociologists and psychologists have addressed the personal traits required to make good managerial decisions. Human capital economists have concentrated on more tangible, demographic measures to explain differences in labor productivity.

A review of studies on the predictors of success from a farm management viewpoint will be followed by a literature review of studies on demographic and personality variables which have been used to explain performance.

A. Managerial variables

To measure what variables determine a good manager, the job of a farm manager must be assessed. Boehlje and Eidman (1984) state that there are three components to farm management: planning, implementation and control. During the planning phase, the farmer makes important decisions about what crop or livestock to produce based on expected price of output and farm-specific attributes such as acreage, soil type and facilities available. This is a phase of goal-setting. During the implementation phase,

the farmer performs the necessary deeds to put the plans into action. This is a phase of action. During the control phase, the farmer observes the progression of his work toward the goal and makes adjustments based on outside factors such as weather.

The farm operator is not only a farm manager, but is also a finance manager. Therefore, the studies on financial management and farm management are reviewed below.

1. Financial management

Good financial management aids in the planning and control phases of farm management. Farm managers should take into account the need for four key measures of financial planning. The first financial management practice is the ability to adapt in the face of external shocks. A farm manager has several options. He can keep a low debt ratio to prevent interest rate fluctuations from harming his operation, he can maintain a credit reserve to ensure credit when necessary, he can diversify to spread the risk of output price fluctuations.

Financial flexibility was found to be a key to the success of many farmers during the 1980s farm crisis. Those farmers who had borrowed heavily during the late

1970s found themselves filing for bankruptcy during the 1980s because of skyrocketing interest rates. The higher interest rates were attributed to a tight monetary policy beyond the control of farmers. Most of the literature on the farm crisis stated that failures occurred because of events beyond the control of most farmers and beyond the prediction of bankers, government, and economists. Indeed, Murdock et al. (1988) suggested that the farmers near bankruptcy had the attributes of successful managers but had the misfortune of starting a business during a period of high interest and property costs which was followed by a period of rapid deflation and a decline in prices, values, and business volume. Although it may be argued that timing was important in this case, financial flexibility was also a key to survival.

Schwab (1985) stated that the displaced farmers were not necessarily poor managers. Interestingly enough, a study of farmers displaced by the farm crisis revealed that they displayed personal and farm-firm characteristics that formerly were felt to ensure survival (Bultena et al., 1986). The displaced farmers were the persons who rationally decided to leverage their assets to gain economies of scale, ensure financial competitiveness, and capture the benefits of continued inflation in farmland

values in the 1970s. Although their actions were rational under the conditions of the late 1970s, the lack of financial flexibility proved fatal in the 1980s.

The second management practice is good record-keeping to analyze the farm's operations and to detect where problems may arise. By using records to recognize potential problems in the operation, a farmer may be able to find a solution. For example, a practice as simple as recording the amount and frequency of fertilizer applications and comparing the level of output can help a farmer in subsequent years maximize output with less fertilizer (lower costs). Thus, past financial records can help a farmer analyze what methods worked best in the past in order to control future costs.

Carlson (1988) found that good record-keeping was the only significant characteristic of success in farming as measured by income compared to other variables which farmers themselves deemed important. Such variables which focused on managerial decision-making included forming long-range goals and objectives, evaluating the efficiency of farm enterprises and identifying alternatives in using farm resources to the best advantage.

The third financial management practice is to know how to obtain information quickly and efficiently. Knowledge

about the cost of inputs and the price of outputs is important to obtain maximum profits at minimum costs. Fane (1975) showed that more educated farm operators tend to be cost-minimizers. They performed closer than average to the theoretically estimated point of minimum cost which contributes to higher profits. Johnson et al. (1961) found that one of the key qualities of successful farm management was the ability to acquire accurate knowledge and information quicker and at a lower cost than other managers. It is also helpful to have information to obtain the highest price for output. Information to know when and where to buy and sell, to know what prices are likely to prevail in equilibrium and therefore be able to bargain more effectively all contribute to higher profits.

The fourth financial management practice is important for all types of management. It is the ability to set goals, to plan alternatives, and to organize a methodical means of achieving the goals. As McKenzie (1978) stated, farmers must be able to rationally identify current and possible future problems and to plan for alternatives, to create goals, to search out opportunities and apply them to the current situation using creativity. Pertaining to financial management, forming long-term goals can help a farm operator maximize future profits. For example, he can

decide what percentage of profits should be retained to make purchases that will increase future output. He can also make short-term decisions about the use of credit, the maximum acceptable price for inputs, and other decisons to ensure minimum costs.

2. Farm management

The literature discussing managerial qualities which contribute to success is abundant and varied. Studies have been made by authors in several disciplines including sociology, psychology, economics, and business management. Since the literature is so abundant, only those studies which specifically address farm firms will be mentioned.

Farm management skills aid the implementation phase of the operation. These skills are necessary to take care of day-to-day matters and to also observe progress and watch for potential problems. Such abilities include labor productivity, motivation, experience, multiple skills, and vocational education.

Labor productivity refers to the farmer's ability to work efficiently both physically and mentally. Farm work involves planning and problem-solving. Some mental capacity is necessary which can be aided by experience and education. It also involves physical labor of many

different types, from driving a tractor to hauling materials, from repairing a combine to taking soil samples. Therefore, a farmer must have multiple skills to take care of the necessary tasks.

Not only must the farmer have many skills and be productive at each, but he must also have the motivation to accomplish these tasks. Without a desire to complete the work thoroughly and to the best of his ability, the operator will not work efficiently. This motivation can mean putting forth effort into daily activities, or can be a desire to gain profit as the goal of the farm.

Experience and education are also important for successful farm managers. As in any other work, the more experienced the worker, the more efficient is the worker. Beal (1963) concluded that experience, higher education, the use of advisory services, and entering farming at an early age contributed to success. Experience can be gained from working on a farm as a child. It can also be gained through the experience of others, namely through extension services or upon advice from other farmers. In farming, the operator has access to extension services, a low-cost source of information about technology, marketing, weather and other pertinent material. However, he must be able to take advantage of this information, to assimilate the

useful information and infer how it can be applied to the situation. In order to do so, he must have some background in farming which can come either through experience or through education. Vocational education in agronomy, the sciences, finance, and accounting will help the farmer process the information he receives from extension, booklets, financial reports, and news services.

B. Personality variables

While some qualities which enhance decision-making skills in farm management can be acquired through vocational education or farm-specific experience, others may be innate or learned in other ways. These qualities are related to the personality of the manager.

Sonka et al. (1989) studied the managerial performance of cash grain producers. They found that successful managers controlled operating expenses and prices but suggested that their model which incorporated only financial data would be much improved by including psychological and behavioral variables. Therefore, personality variables may aid in the prediction of successful farm managers.

This section will divide the personality variables between those considered to be innate and those considered

to be learned. The line which differentiates the categories is not fixed based on scientific theory since controversy exists whether each of these variables is indeed genetically transmitted or learned. Rather, the categorization has been made solely to simplify the description.

1. Innate variables

Managerial skills which may be considered to be innate are intelligence, the ability to evaluate, and motivation. These three variables are expected to aid the manager in setting goals which is one step in the managerial decision-making and implementation process.

a. Intelligence

Intelligence or cognitive ability is expected to help a manager identify goals and formulate a means to achieve those goals as well as defining alternatives. Several definitions of intelligence are available and based upon each definition, a different measure of intelligence can be found. Thus, any measure of intelligence is expected to have a problem with measurement error and may indeed be a limiting measure since there are many facets to intelligence.

In order to define intelligence, it must be determined whether intelligence is innate or learned. Many scientists believe it can be considered partially innate and partially learned. A debate continues over the extent to which cognitive ability is genetic or environmental. Some psychologists believe it is determined primarily by environment, others argue that intelligence is almost entirely inherited, and still others take an intermediate position.

In order to separate the effect of genes from the effects of the environment, psychological studies have generally examined the differences and similarities among various blood relatives. For example, to isolate the genetic effects, studies have used monozygotic (identical) twins separated at birth. To isolate environmental effects, studies have looked at adopted children. To date, no definitive answer has been found about the share attributed to environment or genes.

As was mentioned before, the primary limitation of using intelligence in a statistical analysis is its measurement error. Intelligence quotient tests can be biased due to racial or family background effects. If indeed intelligence is partially learned, grade point average may account for some intellectual differences among

people although it too may account for attributes such as motivation. Thus, finding a good measure of intelligence which also isolates its effect from other attributes may be impossible.

b. Evaluation ability

Since this study is interested in a measure of intelligence that helps managers set goals and evaluate a means of achieving those goals, a logical substitute could be to measure the ability of managers to evaluate current situations. Evaluation ability is related to an ability to perceive, analyze, and solve problems. It involves the recognition that a change must be made and the ability to define how the change is to be made. In other words, it is related to goal-setting. With a greater ability to evaluate, it is expected that managers will be better able to set the optimal goal in a given situation. In this respect, evaluation ability is a key to goal-setting.

Specific to farming, McKenzie (1978) discusses the ability to evaluate in terms of the ability of operators to rationally identify current and possible future problems, to plan for alternatives, to create goals, to search out opportunities and to apply them to a current situation using creativity.

The ability to evaluate is key to effective goal-setting. If an operator cannot identify areas in which he can improve operations or cannot identify alternatives under different situations, this means he cannot effectively set goals and define means to reach these goals. So, no matter how much effort he places in the operation, without relevant goals, his effort may be futile.

c. Motivation

Intelligence may help one define a goal and evaluation ability may help a manager determine how best to achieve that goal, but these traits alone do not produce the attainment of the goal. A manager's motivation, or effort and reasons for action, provide the transition between goal-setting and actual performance.

Locke and Latham (1990) discuss three motivational mechanisms involved in achieving goals: effort, persistence, and direction. Effort refers to the intensity of action allocated to a given task. It was found in many studies to be a linear function of goal difficulty such that persons with more difficult tasks to attain exerted an increased amount of effort. Persistence refers to effort maintained over time. It is also a function of goal

difficulty as well as the specificity of the goal. Therefore, studies found that people given a specific task to accomplish that was also relatively challenging exerted effort over a longer period of time. The last measure of motivation, direction, refers to the orientation of a person toward goal-relevant activities. It involves the attention to and effort utilized in achieving a goal and is a positive function of the specificity of that goal. Thus, motivation involves exertion of effort, the persistence of action over time, and the orientation of effort towards a specific end.

One measure of motivation considered important by economists is the motivation to make profit. Economists consider profit to be the chief motivator of firms' actions and assume that every effort is put forth to achieve that end. Studies suggest that there is a positive relation between goals considered as important and actual performance (Baker and Babb, 1984). So, presumably, if a farmer is just trying to get by financially, chances are that he will not gain as much profit as an operator whose chief motivation is profit. Therefore, if we are interested in one measure of success called income, we may look at the desire of the operator to make a profit. A study by Krause and Williams (1971) included a measure of

economic motivation in a regression equation to explain financial success.

2. Acquired variables

Farm management skills which may be learned off-farm may include organization, control, and adaptability. A trait acquired over years is self-esteem. These four variables may help a manager sort and make the best use of information so that good decisions can be made. In other words, these acquired variables, similar to the innate variables, can influence goal-setting and achievement.

a. Organization

Organizational skills are a link between evaluation ability and motivation since good organization helps to define steps leading to the achievement of a goal. Organization can be considered a link because successful achievement of a goal that has been evaluated requires the methodical attainment of several steps leading to this goal. Organization helps to define these steps while motivation ensures actions are undertaken to reach the steps.

In farm operations, a manager's organizational skills may be seen through the records he keeps. The better the

records, the more information the farmer will have to recognize a current situation's similarity to historical situations. The better the records, the greater the requirement that the operator know the details of his operation. Time spent collecting the records allows the operator to assess his situation.

Other studies have recognized that organization is important. A survey of farmers in Idaho revealed that they ranked keeping records and analyzing operations the second most important determinant of farm success (Carlson, 1988).

b. Control

Psychological studies speak of a person's locus of control as the view that external forces are dictating one's fate versus the view that one has control over the surroundings. The first view is called an external orientation and the latter an internal orientation. The locus of control is expected to influence a manager's evaluation skills, goal-setting ability and goal achievement since it can affect his perception of his ability to change a situation. It is believed that persons who exhibit this sense of control will actively search out ways to improve their situation.

Having a sense of control over one's fate may be a

critical factor in farming. To some extent, the farmer is at the mercy of the weather and other outside forces, but not completely. The belief that one has control over one's environment implies an attentive, active, and proactive approach to problems (Mirowsky and Ross, 1989). Economic studies recognize that this trait can significantly affect farmers actions. One study regressed a variable which measured one's internal-external orientation against change in net worth (Krause and Williams, 1971).

c. Adaptability

Adaptability has been defined as the ability to adapt to unanticipated changes in input and output prices and the ability to deal with changing agricultural technology (Huffman, 1991). In a world of great variability in external conditions and prices, the farm manager must be able to face and survive these shocks. For example, the prices of farm outputs can vary widely from week to week and from year to year. If a farm manager had adapted to changing prices while still gaining income, this implies that he had planned alternatives, a key to good financial and farm management. Thus, a manager's ability to adapt to external shocks implies that he has evaluated his situation clearly and had envisioned alternatives during the planning

and goal-setting stage.

Adaptability is also a key to survival in a world of rapidly changing technology. Firms that do not update their operations based on new technological advances are seldom able to keep up with the competitive companies that innovate. Therefore, good farm managers must be able to assess which new technologies will make their operations more efficient and therefore more competive. To innovate, they must be willing to adapt.

There have been several studies done on the adoption of new farm practices by operators. Huffman (1977) proposed a dynamic model of the adoption efficiency of farmers as partially determined by their educational background.

d. Self-esteem

Self-esteem is a respect for one's self and is one aspect of self-confidence. Self-esteem is seen as a variable which can affect not only financial success but also other variables. It is expected to influence financial performance since a manager with more self-esteem will set more challenging goals for himself. Those with lower self-esteem will accept less challenging goals since they may not believe they should attempt more difficult

ones. It is also expected to influence one's ability to evaluate the situation. More confident persons may be more optimistic about their ability to change their situation.

The causality between financial success and self-esteem is difficult to determine. Each one feeds upon the other. As Bandura and Wood (1989) report, self-esteem is affected by prior accomplishments and influences subsequent performance through its effects on analytic strategies and personal goal challenges.

Thus, self-esteem changes one's perception of the world and can therefore affect other variables such as the ability to evaluate as well as financial success.

C. Demographic variables

Economic studies focus on demographic variables rather than personality variables to attempt to measure differences in managerial ability. Specifically, the area of human capital in economics addresses these differences.

A review of human capital literature will be followed by a section on labor productivity which is the focus of human capital literature. Then, the demographic variables will be defined.

1. Human capital literature

Human capital literature often attempts to delineate individual characteristics which contribute to efficiency or earnings differentials. Human capital refers to something which increases the productive capacity of humans (Machlup, 1984). Investment in human capital is believed to enhance the skills, knowledge, and productive capacities of an individual worker. For example, the human capital approach to efficiency postulates that allocative ability is not an innate but rather an acquired skill learned through schooling, by searching for useful information (extension), and in experience from reallocating resources (Huffman, 1977). Therefore, the literature specifically addresses variables which increase the productivity of labor such as the investment in education, vocational training, or health.

Economists prefer to use demographic variables rather than the personality variables for several reasons. First, they most often have less measurement error than some personality variables. Second, they are are more precise variables to ask on a survey. Third, they are easier to interpret than personality variables. For example, in order to test a person's knowledge, it may be more appropriate to base an interpretation on years of schooling

than on an intelligence test. Although neither of these variables is an exact measure of "knowledge", collecting data on years of schooling may be easier than administering intelligence tests. Interpretation of the results may also be easier since it is more understandable to say that one additional year of schooling may be necessary to increase performance by a certain amount rather than achieving one more point on an intelligence test.

In addition to the three reasons above, these demographic variables focus on skills which theoretically increase labor efficiency in economic models. Labor efficiency is then used to explain the differences in performance among managers.

2. Labor productivity and efficiency

In order to explain why variables such as years of schooling and health are expected to enhance labor productivity, the term labor productivity must be defined. Labor productivity refers to the ability of a person to accomplish the most work within a given period of time using given resources. The measure of productivity in economics, efficiency, must therefore be discussed.

In economic literature, differences in earnings are often viewed as resulting from differences in efficiency.

The concept of efficiency in economics is directly related to the idea of productivity or production. It is a measure of how much output can be gained subject to a constraint such as time. For example, while employers are concerned about how many words per minute their secretaries can type, economists are concerned about how much output farmers can produce with a limited value of inputs. Thus, successful farmers are those who are able to get the maximum benefit from limited resources. These resources typically include land, labor, and capital.

There are many ways that productivity can be enhanced. Technology has been the key to increased productivity of workers and economic growth over time. A worker is also said to become more productive with experience because he gains a better knowledge of the production process over time. Therefore, economists have defined several types of efficiency to better examine means of improving productivity. Three types that will be discussed are allocative efficiency, technical efficiency, and market efficiency.

a. Allocative efficiency

Allocative efficiency occurs when a farmer uses all inputs in the production process to their best capacity.

That is, he chooses the correct amount of inputs with respect to the outputs for which maximum profit will be achieved. More formally, Jamison and Lau (1982) state that allocative efficiency refers to a farmer's ability to maximize profit given his production function, the quantity of fixed inputs, and the prices of output and variable inputs. Thus, the farm firm is allocatively efficient if the marginal product of every variable input is equal to the price of the variable output divided by the price of output.

Allocative efficiency also means that operators quickly perceive and respond to changes in economic conditions. Allocative efficiency ensures one is operating on the production possibility curve because it is when the maximum output is gained from a given amount of input (Figure 1).

b. Technical efficiency

The second type of efficiency is technical efficiency. Technical efficiency is choosing the level of technology which ensures maximum output for a given amount of input. Technology influences the shape and position of the production possibility curve. Higher levels of technology are expected to shift it up (Figure 2).

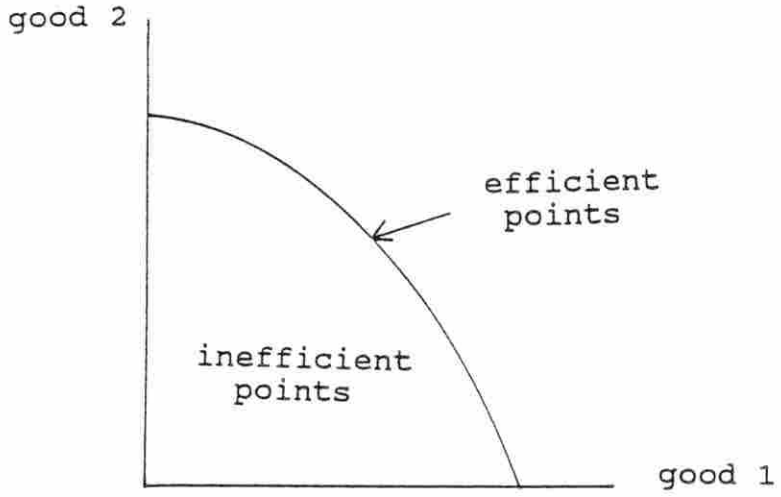

Figure 1. Allocative efficiency

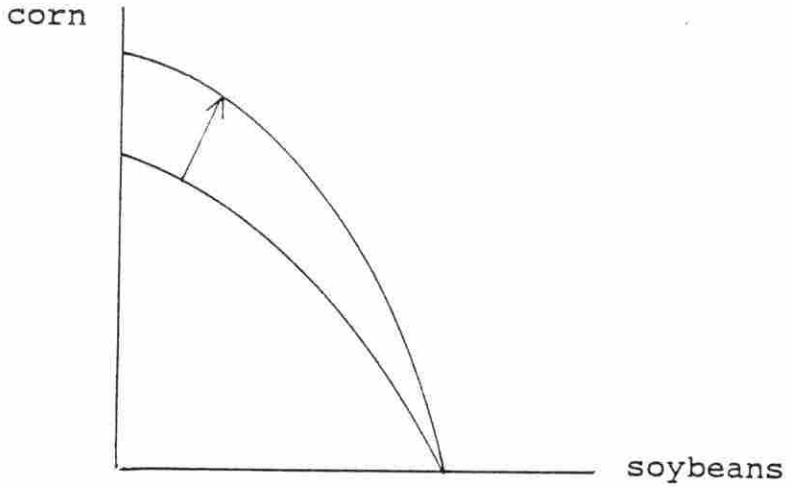

Figure 2. An increase in technology and technical efficiency

If, for example, a farmer uses a hybrid corn seed which is of equal cost to other, less-productive seeds, he will use the same amount of input of seed and receive a higher output. With higher output being the result of new technology rather than better use of existing seeds or other resources, this entails technical efficiency.

c. Market efficiency

Another type of efficiency is market efficiency. Jamison and Lau (1982) define this as the ability to obtain the highest net sale price for the outputs and the lowest net purchase price for the inputs. When not all farmers receive the same input/output prices, this is an indication that imperfect markets exist. To the extent that markets are imperfect, each household will have different access to and different ability to use information. This ability is dependent upon differences in access to information, differences in the ability to use information, and differences in the qualities of the commodity.

3. The demographic variables

Five demographic variables will be discussed below. They are by no means an exhaustive list but are the

variables most frequently analyzed in economics literature. The first variable, education, is the most popular.

a. Education

The most scrutinized variable in human capital literature is education. Investments made in education by the society and by individuals can be substantial. Some human capital studies are interested in calculating if the rate of return to this investment in terms of increased earnings is worth the cost.

Education is hypothesized to enhance all forms of labor productivity of farm managers. Allocative efficiency is obtained through education because it can help the farmer choose the best combination of inputs to achieve the profit-maximizing output level. In the event that more than one output is produced, education enhances a farmer's ability to choose the best outputs for which he will receive the best price.

Education is also expected to influence technical efficiency since it can increase the probability of adopting a new, presumably superior, technology. As Jamison and Lau (1982) state, "education increases the facility and speed with which new skills and techniques can be learned and new alternatives, when judged desirable, can

be adopted and implemented". Thus, education is expected to enhance a farmer's willingness to innovate and adopt to different economic conditions.

Many studies have been done in human capital literature on the differences between farmers who adopt new technologies and those who do not. Rahm and Huffman (1984) found that years of education enhanced the efficiency of Iowa farmers' decision to adopt reduced tillage. Efficiency in this article refers to the adoption of the new technology when it is economically advantageous.

Better educated households are hypothesized to also be market efficient since they know the alternatives, know when and where to buy and sell, know what prices are likely to prevail in equilibrium and therefore be able to bargain more effectively, and to know how to judge quality more accurately. Each of these attributes allows a higher level of profit which shifts the profit function left (figure 3). In a seminal article, Fane (1975) showed that more educated farm operators tend to be cost-minimizers. They performed closer than average to the theoretically estimated point of minimum cost which contributes to higher profits.

Thus, education is believed to improve a farmer's ability to identify alternatives and assess the costs and benefits of each, and also to improve the ability to learn

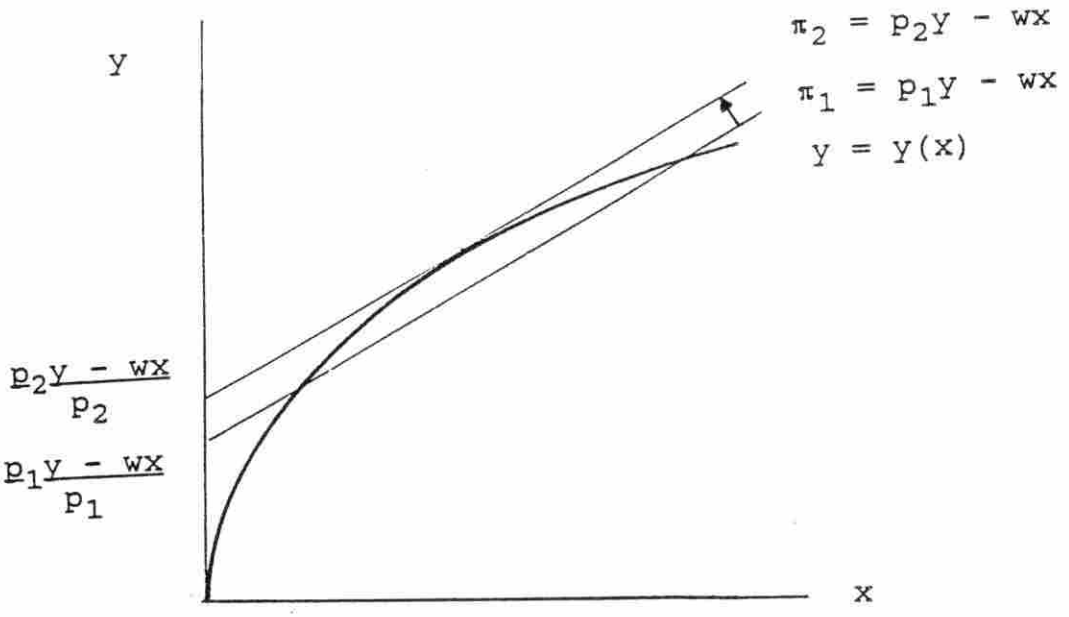

Figure 3. Production and profit functions when higher output prices are received

new skills and techniques to quickly adopt new technology. In other words, education is believed to increase all three types of efficiency by enhancing the operator's ability to foresee and quickly adjust to economic changes.

In regard to farm families, higher education of both the husband (Beal, 1963) and the wife (Barickman, 1985) were found to contribute to the success of the business. It is not only the education of the farm operator which matters, but also that of the spouse. It has long been recognized that joint decision-making of husband and wife

is evident in relatively important managerial matters such as borrowing money, or switching crops, or adopting new technology (Sawer, 1973). This decision-making ability of the spouse can be partially explained by education.

But the key idea is that education can only partially reflect decision-making ability and that even the data used for education, years of schooling, contains measurement error. Years of schooling does not recognize that the quality of education is different at different schools nor that the retained benefits of education are different among individuals. In other words, we cannot measure perfectly what individuals have learned and retained from their schooling. Therefore, like many other variables in this study, education is measured with error.

Economists recognize that education can also be an imperfect measure of other managerial skills such as innovativeness, adaptability, experience, evaluation ability or information-seeking ability. Some researchers have gone to the other extreme by claiming that it is not the education itself that really matters but the unmeasured qualities underlying the educational attainment. For example, Corcoran (1979) goes so far as to say that educational attainment may affect occupational status (the measure of success) first because ability, personality, or

background may influence decisions to complete high school or college and second because occupational status can reflect occupational licensing requirements or other exclusionary devices. Other studies recognize that education is a process where one encounters and solves problems that are progressively more difficult, complex, and subtle (Mirowsky and Ross, 1989). Therefore, schooling nurtures the skill of giving attention, thought, action, and persistence to solving problems. In this respect, education is seen as learning to solve problems in many contexts.

b. Experience

Experience is on-the-job training. It has been measured in many ways for farmers including by age, the use of extension services as a means of obtaining on-the-job training, or growing up on a farm. With some farmers who grew up on farms, experience begins at a very early age. The parents' occupations and family background can therefore be a measure of job experience. For other farmers, the use of extension services substitutes for experience. Using these information services allows a farmer to gather facts from persons specializing in certain areas of agriculture. This situation is similar to

training provided by co-workers in other types of firms.

Experience, like education, is hypothesized to increase all three types of efficiency. However, the effects on efficiency will vary depending upon which measure of experience is being used. If it is measured by age, there may be effects of a life-cycle. Decreases in earnings in elder farmers could partially be explained by a decrease in motivation or other decreases in labor productivity that may occur with age such as health problems. Tauer (1984) found that farmers under 25 were the least productive, those from 35-45 were the most productive, and after 45, productivity began to decrease. In general, most studies concluded earnings increased with age or work experience until age 50 (Behrman et al., 1980). After age 50, workers may decrease their work effort such that productivity declines. Therefore, age can be an imperfect measure of experience.

Another means of measuring experience is to include family background variables. Family background includes such characteristics as race, ethnicity, religion, father's occupation, and living on a farm. Corcoran (1979) states that background affects earnings indirectly through its affect on cognitive skills and education. He admits, however, that background's affect on earnings should occur

through mechanisms other than education and cognitive skills, but he could not identify them specifically.

Although education and experience may complement each other, education has the advantage over experience because it allows abstract decision-making (Huffman, 1991). Indeed, in economies with changing technology, education has the advantage over experience or vocational training since its value does not depreciate as quickly over time.

c. Use of extension services

In agriculture, the search for information can involve the use of extension services. Unlike other professions, farmers have access to costless market and technical information which has been assembled, organized, simplified, and interpreted by agricultural extension personnel (Huffman, 1978). This information, when utilized, is expected to contribute to technical and allocative efficiency.

Like most other variables, the benefit from the use of extension services may be dependent on other variables in this study. A farmer may be required to have a certain background in education or have attained a certain level of experience in order to decipher exactly what information is to his benefit and exactly how best to make use of the

information. Just reading about new tillage practices will not guarantee one understands all that is written nor that it can be put into practice.

In addition, like other variables, the search for information may be dependent on other environmental or innate capacities which allow the operator to deduce which information is useful and how the information can be applied to the situation. Such an innate ability can be intelligence or motivation.

d. Health

The health of a farm operator and his spouse will affect the allocative efficiency of the farm as well as the managerial abilities of the operator. A manager in good health will be able to contribute more hours of labor if necessary and will also be able to make better decisions if he is not burdened by his own health problems or those of a family member. As Pitt and Rosenwig (1986) found, changes in the health status of the farmer can affect income by altering the farmer's available time, managerial abilities such as the allocation of resources, or the productivity of work time.

A number of recent studies by Rosenwig have attempted to measure the health status of farm families in developing

countries. For the most part, the wife's education has been a significant factor. Years of schooling of the wife helps predict good health of family members because it is the woman who spends a much larger share of time in household production activities which affect the health status of other family members (Huffman, 1991). Such activities include meal planning for nutrition, avoidance of hazardous activities such as smoking, exposure to drugs and harmful chemicals.

In addition, for farm families in developed nations, years of schooling of the wife or husband may affect the ability to work off-farm and therefore to be eligible for health benefits for the family.

e. Number of children

The number of children is expected to affect allocative efficiency of the farm with respect to the allocation of time by the operator and his spouse as well as the allocation of retained earnings to the farm.

This variable is included in many human capital models because it strongly affects the labor supply of the farm wife who is usually a contributor to the farm business in many capacities. Younger children not of school age detract from the woman's labor supply to a much greater

extent than older children since they are at home and require more attention. Deseran et al. (1984) recognized this factor and found that number of children detract from farming success.

Huffman (1990) confirmed this evidence in his finding that farm income declines with additional young children under age six but did not significantly change with additional older children. These older children may be contributing additional income through their farm labor.

Maret and Copp (1982) state that there is evidence that the contributions of the unpaid farm wives are essential to the economic well-being of the farm. They show that larger farms tend to have wives performing farm work only. The labor supply of the elder children may also contribute to income, however, the role of the children may be lesser in today's world where mechanization has replaced physical labor. Children used to play a much larger role in farm work when farming was labor-intensive. Today, with larger families, the total income available to reinvest in the farm may be lower. Therefore, allocative efficiency is affected in this manner as well.

4. Possible limitations of demographic variables

Although demographic variables may be easy to survey and may have less measurement error than personality variables, there are some limitations to substituting them for personality variables to attempt to explain financial performance. The link between human capital investment and earnings is not direct. Machlup (1984) proposes four intervening "connections": 1) from endowment plus investment to ability, 2) from ability plus attitudes to capacity, 3) from capacity plus utilization to performance, and 4) from performance at selling price (reservation wage) times hours per year to earnings. In other words, a person is born with some qualities and is educated to arrive at a measure of ability. Attitudes such as willpower, discipline and working intensity may be added to ability to attain capacity. Then one must actually take the capacity and utilize it to arrive at performance. This involves the act of doing separate from an attitude such as diligence. Finally, the link from performance to earnings is also difficult to distinguish.

More intuitively, Malchup (1984) states that both schooling and performance can be explained by the same variables: higher intelligence, greater ambition, and more diligence. Therefore, the productivity of workers, which

should affect earnings, depends not only on their ability and the amount "invested" in them, but also their motivation or the intensity of their work (Becker, 1975).

Therefore, as critics of human capital theory argue, the correlation between earnings and investment in human capital is due to a correlation between ability and investment in human capital, or to the singling out of the most favorable groups such as white male college graduates (Becker, 1975). Human capital literature neglects endowment variables which not only may be directly correlated with performance, but may also be indirectly correlated with performance through their effect on human capital variables. For example, a person with a higher-than-average intelligence would be expected to stay in school longer and seek medical attention to a greater extent than the average person. Thus, when comparing the performance of the two, it may be this innate quality which is indirectly affecting the education and health differences and therefore earnings differential.

In this respect, one objective of this study is to include not only the demographic variables as human capital studies do, but also to include the personality variables which may underly the demographic variables. It may be these psychological characteristics which may be missing

from the human capital models causing specification problems. These "omitted" variables can be influencing the coefficients found on the education and extension variables and may also be contributing to a larger error term in the human capital models.

III. THE FARM FAMILY MODEL

A. Objectives of the farm firm

The farm family is a special type of firm since it is both a producer and consumer. Profits earned by the farm business become the source of income of family members which can be spent on consumption goods or reinvested in the farm. In addition, family members are the laborers and the equity-holders. Thus, farm and family finances are often undifferentiated. Indeed, family savings are often placed into the farm and family laborers may receive no income per se. To illustrate, one way farms attempted to cope with the recent farm crisis was to decrease family living expenses (Ekstrom et al., 1987). Therefore, firm and family decisions are interdependent.

The farm firm has multiple goals since it is both a firm and a household (Johnson et al., 1961). A model must therefore be constructed which considers the farm as both.

1. Objectives of the farm as a firm

When viewed as a firm, the objective of the farm family may be one of profit maximization as traditionally modeled by economists. Maximum profits are obtained by producing maximum output with minimum costs of the inputs.

With prices exogenously determined as is usually

assumed under perfect competition, the objective can be written as:

$$\underset{x}{\text{Max}} \quad PY(x) - w \cdot x$$

where P is the price of output,

Y(x) is the production function, a technical relationship between inputs,

w is the vector of input prices, and

x is the vector of inputs.

Profits can be considered at least one goal of the farm family.

2. Objectives of the farm as a household

When viewed as a firm, the farm family may choose to maximize profits. However, if the family is viewed as a household, it may choose to maximize utility. These two objectives may not be compatible at all times.

If the farm family maximizes utility, or a level of happiness, the objective function may be specified with a budget constraint and written as:

$$\underset{x}{\text{Max}} \; U=u(x) \text{ subject to } M = r \cdot x$$

where u(x) is a basket of goods,

M is money income,

r is a vector of good prices, and

x is a vector of goods.

Here, the goal is to get the most goods within a given budget.

If a farm is viewed as a household, considerations other than profit must be modeled into the decision-making process. For example, the decision to purchase a household appliance at the expense of a piece of farm equipment may be made on the basis of a desire to improve relations in the family rather than to receive the highest return-on-investment. This choice is rational. The farm family may decide to forego the return on farm equipment for something which increases their level of utility more. But rather than only giving up other consumption possibilities, they may also be foregoing production possibilities.

If we are to accurately model the behavior of a family farm, it is necessary to understand the goals of the family to determine what makes them happy, to determine what they are actually trying to maximize.

It is hypothesized that the farm firm attempts to maximize not only profit, but also the happiness it finds with work (job satisfaction) and home life (family satisfaction). The farm operator may choose to optimize his job satisfaction by gaining output and devoting time to the farm. Or he may choose to optimize family satisfaction

by obtaining household goods and having non-work (leisure) time to use and enjoy those goods. Or he may choose some combination of these goals.

a. Family satisfaction

A happy home life is an important goal for most people, not only farm families. Many farmers choose to live on farms because they believe the environment provides a better life for their family than living in a city. Indeed, a common response given by farmers when asked why they do not sell their farms and move to gain a more steady stream of income is that they think a farm is an ideal place to raise a family. Farmers also feel tied to the land and believe farming is an ideal occupation.

Studies hypothesize that non-economic considerations, such as the desire to maintain peaceful family relationships, may come into play in economic considerations (Rosenblatt and Anderson, 1981).

Boehlje and Eidman (1984) cite nine possible goals of farmers which are not necessarily listed in order of importance: 1) to maximize profit, 2) to increase net worth, 3) to control a larger business, 4) to avoid low returns or losses, 5) to reduce borrowing needs, 6) to increase family consumption, 7) to increase leisure time,

8) to have a neat homestead, and 9) to provide community service. Four of these nine goals are not related to financial status of the farm. Indeed, the goals of increasing family consumption, increasing leisure time, having a neat homestead, can all be considered as contributions to family satisfaction.

Sociologists hypothesize that the success of a farm firm plays a large role in family relationships. They recognize that there are many sources of tension in farm life which affect the family. Included in these sources of tension are close working quarters, off-farm work which may burden other family members with additional work loads, seasonal variation in work requirements, unpredictable weather, cash-flow problems, requirements of substantial cash investments, a high rate of industrial accidents, and high economic risks (Rosenblatt and Anderson, 1981).

b. Job satisfaction

Job satisfaction, or happiness with one's work, is considered to be a goal of many. For farm operators, working on the farm can be ideal since they are the boss and there is no commute to work.

A study by Johnson and Banker (1991) using 1988 USDA data of 1.7 million farms nationwide showed that the three

most important goals of nine listed were living on a farm or ranch, increasing production per acre or getting better producing livestock, and getting out of debt. The desire to increase production per acre is consistent with increasing efficiency which can be profit-maximizing behavior. But increased production can also lead to job satisfaction since it plays the role of a positive reward for the operator's work.

Bharadwaj and Wilkening (1974) concluded that men have more job satisfaction the more machinery they have and women are more satisfied the more income the husband makes. Therefore, job satisfaction for both farm husbands and wives may depend on objects which make the job easier. Men would have less work with more machinery and women with more income to spend on household appliances if indeed their roles are specialized.

This study concentrates on the job satisfaction of the operator. It has been noted that job satisfaction for some farm operators comes from "the big harvest" and not only the amount of farm machinery.

Job satisfaction can also be theoretically both the cause of and a result of financial success. That is to say, on one hand, that one who is happy with his work can be more productive and therefore more financially

successful. On the other hand, a person who is financially successful may take a more favorable view of his job.

Determining the causality of the relationship between financial success and job satisfaction or family satisfaction is beyond the scope of this study. Rather, it is considered to be one goal of the farm firm to maximize job satisfaction in conjunction with income and family satisfaction.

3. Objectives of the farm as a firm and a household

There is a problem defining "success" or performance for farm operators. Since the farm family is both a firm and a household, one cannot assume in all cases that a farmer is attempting to maximize profit. Rather, they like many families may attempt to maximize income, family satisfaction, and job satisfaction. That is to say that they strive in varying degrees for financial success, an enjoyable job, and a good home life. Therefore, an appropriate model which incorporates all these goals must be constructed.

It must be recognized that these goals are competing for time and other inputs. For example, a decision has to be made if farm profits will be used to purchase household goods (thereby contributing to family satisfaction) or to

purchase farm capital (thereby contributing to future profits). For farm families, the connection between financial and familial well-being may be stronger than that in others since the business is a part of the lifestyle and in many cases, each member has a role to play in the workings of the farm.

This dichotomy between modeling the decisions of farm families as a firm or a household highlights a problem mentioned in the introduction of this paper. If we are to attempt to determine what makes farm firms successful, we must be able to define success or performance. If the farm firm makes decisions as both a firm and a household, we must incorporate achievement of firm and household goals into our definition. Thus, this study defines the idea of success or performance for farm firms based upon their achievement of not only profit-maximization, but also happiness with work and in the home. In this sense, we can redefine utility for a farm operator as a positive function of these "goods". Profit becomes only one of many goods sought by farm operators and is therefore incorporated into the utility function as one argument.

We can model these "goods" as produced by the farm firm. The farm firm must spend time producing output, family satisfaction, and job satisfaction and may also make

use of market goods to achieve these ends. The way in which goods and time are used to achieve the utility level are also determined by the farm family. They must decide how best to allocate their time and resources to achieving these goals. It is hypothesized that each farm family will have different skills which facilitate the transformation of time and goods into output, job satisfaction, and family satisfaction.

B. The role of farm and household inputs

Increasing the amount of farm and household inputs is expected to contribute to the three goals of income, job satisfaction, and family satisfaction. Tangible goods are necessary to "produce" these goals even though the farm household must ultimately contribute its time to utilizing these goods.

Farm inputs are expected to contribute positively to both income and job satisfaction. The greater the amount of farm inputs such as land and capital, the greater the expected farm revenue. Job satisfaction can also be derived from farm inputs indirectly through their positive contribution to output.

Household inputs are expected to contribute positively to family satisfaction. A family may have a happier

homelife if they have household items which permit the family to spend more time together. For example, having more household appliances may allow the family to finish household chores faster so more time can be spent with family members.

Although farm and household inputs are expected to contribute to all three goals, they are hypothesized to be in competition with each other. Family expenditures must be divided between purchasing items for the farm versus items for the home.

C. The role of personality and demographic variables

Traits endowed to an individual may both directly and indirectly affect income, job satisfaction, and family satisfaction. This study will attempt to both measure and include personality and demographic variables as determinants of performance.

Personality and demographic variables are hypothesized to have direct and indirect effects on the farm firm goals. Specifically, they may have effects on farm inputs and farm outputs.

1. Effect on inputs

As the literature review stated, personality and demographic variables have been demonstrated to have effects on labor productivity and managerial decisions. Not only do they affect labor productivity, but also contribute to the efficient use of other inputs such as land and capital.

If personality and demographic variables contribute to the efficient use of inputs and therefore explain differing incomes between farmers, they must be included in the model rather than assumed constant across operators. These variables will be included in the production function in an attempt to eliminate any specification error from which previous studies may have suffered.

2. Effect on outputs

From a theoretical viewpoint, the demographic and personality variables contribute to profit, job satisfaction, and family satisfaction. Their contribution may be direct or indirect and may affect more than one goal. For example, if a farmer has the quality to evaluate and adapt well, he can improve both the technology used by the farm as well as family relations. Thus, a quality which may aid the production of output may also contribute

to the production of family satisfaction.

However, demographic and personality variables may also be correlated with each other. For example, a farm manager may have some qualities which affect his decision to acquire information and to attend school. Such qualities as motivation, a sense of control over the environment, and a sense of ability to accomplish things will affect an individual's willingness to continue education and seek extension services. These qualities will, in turn, affect farm performance.

Therefore, the next sections will examine the hypothesized effect of demographic and personality varibles on the three goals of the farm family: profit, job satisfaction, and family satisfaction. These effects are summarized in Table 1.

a. Education

Education is hypothesized to contribute positively to farm profits for both husband and wife but negatively to job satisfaction for the husband. Education contributes to labor and managerial efficiency which help a farmer and his spouse achieve maximum revenues with lower costs. However, better educated farmers may also tire quickly of aspects of work that are methodical and unchallenging. Therefore,

Table 1. Hypothesized effect of demographic and personality variables on income, job satisfaction, and family satisfaction

	Income	Job Sat.	Family Sat.
DEMOGRAPHIC			
Husband education	+	-	?
Wife education	+	?	?
Husband experience	+	-	?
Use of extension services	+	+	?
Health	+	+	+
Number of children	-	-	?
PERSONALITY			
Intelligence	+	-	?
Motivation	+	+	+
Husband organization	+	+	?
Wife organization	+	+	?
Control	+	+	+
Adaptability	+	+	+
Self-esteem	+	+	+
Evaluation ability	+	+	+

higher education may make a negative contribution to job satisfaction.

b. Experience

Experienced operators are expected to contribute positively to profits and negatively to job satisfaction. Those farmers who have spent more time in their work may become bored and less satisfied with their job. However, operators who have spent much time in agriculture may also be efficient laborors and managers which contributes positively to profits.

c. Use of extension services

Farm operators who use extension services benefit in terms of the financial and technical information available. Better information is expected to contribute positively to profits since it allows more educated decision-making. It is also expected to contribute positively to job satisfaction since information on new technology may help the operator obtain more output.

d. Health

Good health is expected to contribute positively to all three goals. Farmers without health problems will be

able to dedicate more time to work and may enjoy their work more if their health does not interfere with performance. Family satisfaction is also hypothesized to be higher with healthy operators since family members are not burdened with additional stresses when one family member is ill.

e. Number of children

A greater number of children is hypothesized to have adverse effects on profits and job satisfaction. More children means that family income must be distributed to more family members so less may be left to reinvest in the farm business. With greater family members, this places additional stress on operators to make a certain income which may be detrimental to job satisfaction.

The relationship between number of children and family satisfaction can be ambiguous. On one hand, larger families may have to work together more cohesively which contributes to a good environment. On the other hand, larger families may have to forego more household goods which can negatively effect family satisfaction.

f. Intelligence

More intelligent operators are hypothesized to act similar to more educated operators. Greater intelligence

may contribute positively to farm profits because it aids the decision-making skills of managers. However, it may contribute negatively to job satisfaction since more intelligent operators may become easily bored with their work if it is not challenging enough. The effect on family satisfaction is not clear. More intelligent operators do not necessarily have the communication skills necessary to ensure good family relations.

g. Motivation

A farmer's motivation either for profit or motivation to put forth effort is hypothesized to contribute to all three goals, but predominantly to income and job satisfaction.

Profit-seeking--the desire for financial success--contributes to output because the operator may dedicate more time and effort to activities that increase his income. Additional income, in turn, will allow the household to purchase more items from which they may derive family satisfaction. More time spent on the farm also means more job satisfaction. However, the causality between motivation and job satisfaction may be difficult to determine.

h. Organization

Good organizational skills of the operator and his spouse are hypothesized to primarily affect output and therefore income and job satisfaction. Better organized operators or their wives keep better financial records and may be more efficient at getting the best price for inputs or their output. Organizational skills also contribute to more efficient management of the operator's time in day-to-day activities.

i. Control

Control is hypothesized to positively affect income and job satisfaction as well as family satisfaction, perhaps to a lesser extent.

A person who has a sense of mastery and control--a person who controls his own fate and takes responsibility for his actions--is more likely to work hard at his job, to enjoy work because he sees the output as a result of his actions, and to have good marital relations because he does not resort to blaming the spouse for his problems.

j. Adaptability

Farm operators who are willing and able to adapt to new situations are expected to contribute to all three

goals of the household. Farms which can adapt to external shocks will be able to increase output and therefore generate additional income. This flexibility contributes to profits and job satisfaction.

Operators who are more open-minded may be less judgmental with family members and may make the home life less stressful, thereby contributing to family satisfaction.

k. Self-esteem

The operator's self-esteem is hypothesized to complement income, job satisfaction, and family satisfaction because a person content with himself is more likely to take a positive attitude toward family members, enjoy his work, and therefore be more productive in work.

l. Evaluation ability

Operators whose skills include the ability to evaluate situations are expected to better attain all three goals of the farm household. If an operator is able to accurately assess problems and effectively solve them, he is expected to have more output and therefore be happier with work. It is also hypothesized that he will be able to more

effectively deal with family problems so home life is better.

D. The model

As the previous sections indicate, a model which attempts to explain farm production or income may be better specified if it includes personality variables as well as human capital and traditional labor/capital arguments.

The primary objective in formulating this model of the farm household was to incorporate new arguments in the utility function as well as personality variables in the production process. As much literature states, the farm household has many goals of which only one is to maximize profit.

In a model presented in Michael and Becker (1973), utility is obtained from commodities which are produced by the consumer unit itself through the productive activity of combining purchased market goods and services with the household members' time. In this way, we can incorporate "goods" such as job satisfaction and family satisfaction. Job satisfaction is produced by the farm operator by making changes in his farming operation (adding or subtracting inputs/outputs) or working fewer hours. Family satisfaction is produced by increasing household

consumption goods or leisure time.

Therefore, the utility function specified in this study will incorporate three variables produced by the family: income (I), job satisfaction (J), and family satisfaction (F).

Each variable is produced by the family members by combining their time with market inputs. Therefore, the utility function differs from the traditional function since market commodities enter the function only indirectly through a productive process initiated by the household.

The farm household is assumed to maximize utility subject to four constraints: a time constraint, a budget constraint, and production constraints on farm and household outputs.

1. The objective function

Household satisfaction or utility is assumed to be a function of income (I), job satisfaction (J), and family satisfaction (F):

$$U=u(I, J, F). \qquad (1)$$

Each argument is produced by the farm family by combining its time with the purchased market goods.

Income is defined here as net income from farm output plus off-farm income minus household consumption. In this

sense, it represents savings of the farm household or some form of delayed consumption measure. It can also be considered as retained earnings from the standpoint of the firm which is a form of delayed investment. Income is theoretically in competition with family satisfaction which is a function of current consumption variables as opposed to delayed consumption variables. The level of income is also a function of an exogenous off-farm wage rate (w), interest rate (i), and debt level (D). Although it may be argued that in reality debt is determined endogenously by the farm firm, it is assumed to be exogenous in this static, one-period model.

Job satisfaction is defined as happiness with work. For some farm operators, job satisfaction comes from "the big harvest", farm output, which itself is a function of the quantity of farm inputs. Therefore, job satisfaction is a function of farm output (Q_f) which itself is a function of farm inputs (x_f) and hours worked on the farm (H_1). The household is assumed to receive high job satisfaction the more the farm output (Q_f) and therefore the more the farm inputs (x_f) and farm labor (H_1). The level of job satisfaction is conditioned upon a given level of equity (Eq), past income (I_{t-1}), and other technological variables (E_j).

Family satisfaction is narrowly defined as marital closeness. A narrow definition is necessary for estimation purposes. This measure is a function of household inputs (x_h), leisure time (L), and given endowment variables (E_f).

Job satisfaction and family satisfaction are also in competition for inputs. Family satisfaction is a function of household inputs (x_h) while job satisfaction is a function of farm inputs (x_f). Given a budget constraint, choices must be made between the purchase of these inputs and the decision to delay purchase (i.e. the decision to produce I). Thus, all three arguments are in competition for the allocation of inputs.

They are also in competition for the allocation of time. Income is gained by hours worked on and off the farm. Family satisfaction is gained by leisure time. Job satisfaction is gained by farm work only.

Job satisfaction and income may not be in direct competition for time since, although job satisfaction is derived from hours worked on-farm (H_1), income is a function of both on-farm and off-farm work hours (H_1 and H_2). Income and family satisfaction are in direct competition for time since the production of family satisfaction relies directly on leisure time available. The competition between job satisfaction and family

satisfaction for time is similar to the competition between income and family satisfaction.

To summarize, the three arguments of the utility function can be written as functions of the following variables:

$$I = i[P, Q(x_f, H_1; E_i), r_f, H_2, r_h, x_h; w, i, D, E_i] \quad (2)$$

$$J = j[Q(x_f, H_1; E_i); I_{t-1}, Eq, E_j] \quad (3)$$

$$F = f[x_h, L; E_f] \quad (4)$$

where

P = price vector of farm output

Q = quantity vector of farm output

x_f = quantity vector of farm inputs

r_f = price vector of farm inputs

x_h = quantity vector of household inputs

r_h = price vector of household inputs

H_1 = hours worked on farm

H_2 = hours worked off-farm

L = leisure hours

w = off-farm wage, assumed exogenous

i = interest rate

D = total debt

I_{t-1} = past income

Eq = equity

E_i = vector of environmental variables affecting income

E_j = vector of environmental variables affecting job satisfaction

E_f = vector of environmental variables affecting family satisfaction.

2. Constraints

As mentioned previously, the arguments of the utility function are in competition for the combined time of the household members. To simplify the analysis, only the time allowance of the operator and spouse will be considered. The first constraint is that of a budget. The income equation is:

$$I = PQ - r_f x_f + wH_2 - r_h x_h - iD. \quad (5)$$

It states that income is gross farm sales minus farm operating expenses plus off-farm income minus household expenses minus interest expense. Combining the definition of income with the income function in equation (2) above, the budget constraint can be written:

$$\{P\ Q(x_f, H_1; E_i) - r_f x_f + wH_2 - r_h x_h - iD\} - I = 0. \quad (6)$$

Since the farm firm produces job satisfaction and family satisfaction, two additional constraints must be added:

$$J[Q(x_f, H_1; E_i); E_j] - J = 0, \text{ and} \quad (7)$$

$$F(x_h, L; E_f) - F = 0. \quad (8)$$

The last constraint states that time is allocated

between farm work, off-farm work, and leisure:

$$T = H_1 + H_2 + L. \tag{9}$$

3. Conditions for utility maximization

A Lagrangian expression for maximizing household utility (1) subject to income (6), production (7,8), and time (9) constraints can be shown as:

$$\begin{aligned} £ &= U(I,J,F) + \lambda_1\{[PQ(x_f,H_1;E_i)-r_fx_f+wH_2-r_hx_h-iD] - I\} \\ &+ \lambda_2\{J[Q(x_f,H_1;E_i);I_{t-1},Eq,E_j] - J\} \\ &+ \lambda_3\{F(x_h,L;I_{t-1},E_f) - F\} + \lambda_4\{H_1+H_2+L-T\}. \end{aligned} \tag{10}$$

The first order conditions for an interior solution are:

$$\partial £/\partial I = U_I - \lambda_1 = 0 \tag{11}$$

$$\partial £/\partial J = U_J - \lambda_2 = 0 \tag{12}$$

$$\partial £/\partial F = U_F - \lambda_3 = 0 \tag{13}$$

$$\partial £/\partial x_f = \lambda_1 P\ Q_{xf} - \lambda_1 r_f + \lambda_2 J_Q\ Q_{xf} = 0 \tag{14}$$

$$\partial £/\partial x_h = -\lambda_1 r_h + \lambda_3 F_{xh} = 0 \tag{15}$$

$$\partial £/\partial H_1 = \lambda_1 P\ Q_{H1} + \lambda 2 J_Q\ Q_{H1} + \lambda_4 = 0 \tag{16}$$

$$\partial £/\partial H_2 = \lambda_1 w + \lambda_4 = 0 \tag{17}$$

$$\partial £/\partial L = \lambda_3 F_L + \lambda_4 = 0 \tag{18}$$

$$\partial £/\partial \lambda_1 = [PQ(x_f,H_1;E_i)-r_fx_f+wH_2-r_hx_h-iD] - I = 0 \tag{19}$$

$$\partial £/\partial \lambda_2 = J[Q(x_f,H_1;E_i);I_{t-1},Eq,E_j] - J = 0 \tag{20}$$

$$\partial £/\partial \lambda_3 = F(x_h,L;I_{t-1},E_f) - F = 0 \tag{21}$$

$$\partial £/\partial \lambda_4 = H_1+H_2+L-T = 0. \tag{22}$$

4. Interpretations

Equations (11) through (13) and (18) can be combined with numbers (14) to (17) and rewritten as:

$$U_I(P_f\ Q_{xf} - r_f) = -U_J\ J_Q\ Q_{xf} \tag{14a}$$

$$U_I\ r_h = U_F\ F_{xh} \tag{15a}$$

$$U_I(P_f\ Q_{H1}) + U_J\ J_Q\ Q_{H1} = U_F\ F_L \tag{16a}$$

$$U_I\ w = U_F\ F_L. \tag{17a}$$

Rewriting (14a) we see that a profit maximizing solution does not hold for this model:

$$(U_J/\ U_I)\ J_Q\ Q_{xf} = r_f - PQ_{xf}. \tag{14b}$$

Assuming the left-hand side of the equation is positive since each element is positive, the factor price of farm inputs (r_f) exceeds their marginal revenue product (PQ_{xf}). But, this result is explained by the fact that the marginal product of x_f is received not only in terms of a gain to U_I through increased output, but also a gain to U_J through increased output. The farm is paying not only for the contribution of farm inputs to income, but also for their contribution to job satisfaction.

Rewriting (15a) we can see an intertemporal consumption-savings tradeoff:

$$U_I\ /\ U_F = F_{xh}\ /\ r_h. \tag{15b}$$

The right-hand side represents a price ratio of household goods (x_h) in terms of the gain to family satisfaction (F_{xh}) and the loss to income (r_h). This equation therefore equates

the ratio of marginal utilities to the ratio of marginal costs of x_h which highlights the tradeoff between utility gained from future consumption (U_I) to the utility gained from current consumption (U_F).

Incorporating (17a) into (15b), we also see that income and family satisfaction are competing for time and not only inputs:

$$U_I / U_F = F_{xh} / r_h = F_L / w. \qquad (23)$$

The ratio of the marginal utilities of income and family satisfaction must equal the ratio of marginal revenue of time. More leisure increases family satisfaction but the tradeoff comes in terms of foregone wage income.

The optimal allocation of the farm household's time as taken from equations (14a), (16a), and (17a) above requires:

$$r_f / w = Q_{xf} / Q_{H1}. \qquad (24)$$

The ratio of the cost of producing Q with x_f to the opportunity cost of producing Q with H_1 must be equal to the ratio of their marginal products. In other words, the marginal products of x_f and H_1 divided by their marginal (opportunity) costs are equal. Thus, the operator is minimizing the cost of farm inputs and the household's labor for a given output level.

The optimal allocation of farm and household inputs (x_f and x_h) combines equations (14a) and (15a):

$$r_h / (r_f - P_f Q_{xf}) = U_F F_{xh} / U_J J_Q Q_{xf}. \quad (25)$$

The ratio of the price of household inputs to the price of farm inputs minus the marginal revenue of farm inputs must equal the ratio of the marginal utility gained by x_h through family satisfaction divided by the marginal utility gained by x_f through a change in output and job satisfaction. Essentially, this equation states the ratio of prices of inputs must equal the ratio of marginal utility gained from changing the inputs. The marginal revenue of x_f is subtracted from the left-hand side since x_f contributes not only to job satisfaction, but also income. In other words, the cost of increasing utility by increasing farm inputs is split between the effect it has on income and on job satisfaction so marginal revenue must be subtracted from the cost of farm inputs.

The allocation of leisure and household inputs in terms of family satisfaction is seen using equations (15a) and (17a):

$$r_h / w = F_{xh} / F_L. \quad (26)$$

The ratio of the cost of household inputs to the opportunity cost of leisure must equal the marginal product of each in terms of family satisfaction. Graphically, this can be depicted as an indifference curve (F_{xh}/F_L) tangent to the price ratio constraint (r_h/w) (figure 4).

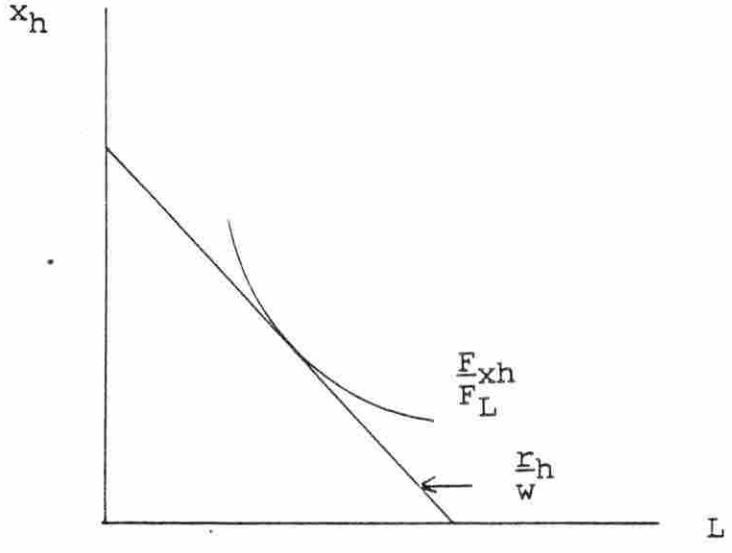

Figure 4. Allocation of leisure and household inputs

E. The seemingly unrelated regression

The first-order conditions can be combined into many different equations where U_I, U_J or U_F are written in terms of each other. The model, therefore, is one where decisions about choice variables (x_f, x_h, H_1, H_2) are made simultaneously in light of the effect on all measures of utility. Thus, the measures of utility cannot be written in terms of only the exogenous variables but are interdependent.

For simplicity, however, the model may be estimated by a system of equations in which the measures of utility are

not interdependent but depend on the same exogenous variables. In this manner, simple statistical procedures may be used in the analysis.

The seemingly unrelated regression equation can be written in matrix form as seen in Figure 5. A list of the hypothesized signs of the coefficients are in Table 2.

$$\begin{bmatrix} I \\ J \\ F \end{bmatrix} = \begin{bmatrix} \alpha_0 & \alpha_1 & \alpha_2 & \cdots & \alpha_{28} \\ \beta_0 & \beta_1 & \beta_2 & \cdots & \beta_{28} \\ \gamma_0 & \gamma_1 & \gamma_2 & \cdots & \gamma_{28} \end{bmatrix} \begin{bmatrix} 1 \\ P \\ Q \\ x_f \\ r_f \\ x_h \\ r_h \\ H_1 \\ H_2 \\ L \\ \text{Wages} \\ \text{Interest rate} \\ \text{Debt} \\ I_{t-1} \\ \text{Equity} \\ \text{Education H} \\ \text{Education W} \\ \text{Experience} \\ \text{Extension} \\ \text{Health} \\ \text{Household Size} \\ \text{Intelligence} \\ \text{Motivation} \\ \text{Organization H} \\ \text{Organization W} \\ \text{Control} \\ \text{Adaptability} \\ \text{Self-esteem} \\ \text{Evaluation} \end{bmatrix}$$

Figure 5. The seemingly unrelated regression equation

Table 2. Hypothesized signs on coefficients of the seemingly unrelated regression equation

subscript number	α	β	γ
1	-	-	-
2	+	+	+
3	+	+	-
4	-	-	-
5	-	-	+
6	+	+	-
7	+	+	-
8	+	-	-
9	-	-	+
10	+	-	+
11	-	-	-
12	?	-	-
13	+	+	+
14	+	+	+
15	+	-	?
16	+	?	?
17	+	-	?
18	+	?	?
19	+	+	+
20	-	?	?
21	+	-	?
22	+	+	-
23	+	?	?
24	+	?	?
25	+	+	+
26	+	+	+
27	+	?	+
28	+	?	+

IV. METHODS

A. The survey instrument

Information on 129 farm families was extracted from the 1989 Farm Families and Youth Project directed by Dr. Rand Conger of the Department of Sociology at Iowa State University. The survey was, by construction, directed towards two parent families with a seventh-grade child and at least one sibling. Therefore, the data set is limited to families of at least four members where one child is about 14 years of age. As can be expected, the variability in the parents' ages and the number of household members is not great. Indeed, the group of operators is younger than the average Iowa farmer by about 16 years (Table 3).

Families were recruited through public and private schools in eight contiguous counties of North Central Iowa, a relatively homogeneous area for agricultural production (Figure 6). Names and addresses were obtained from schools in communities of 6500 or less. Potential families were sent a letter explaining the project and were subsequently telephoned and asked to participate. Of the families contacted, approximately 78% agreed to participate (Conger et al., 1991).

Table 3. Operator information and balance sheet

	FFS	Iowa Youth Project	
	1988	1988	1989
Number of respondants	679	139	129
OPERATOR INFORMATION			
Husband education	13.5	13.47	13.5
Husband age	56	40.43	41
Wife education	13.7	13.74	13.8
Household members	2.7	5.05	5
Acres operated	446	487.9	420
Acres owned	242	194.6	177
Primary job farming	n/a	91	88
Grew up on farm	n/a	n/a	118
BALANCE SHEET			
Total Assets	466244	296069	318747
Total Liabilities	103988	139386	141470
Net Worth (Equity)	362256	155673	177278
INCOME STATEMENT			
Gross Income	136609	131932	123221
-Operating Expenses	86100	108242	102355
-Interest	11200	n/a	n/a
Net Farm Income	39309	23690	20866
+Off-farm Income	15967	20490	18236
Income Before Tax	55276	44180	39102
-Unpaid Labor Allowance	20000	20000	20000
Net Before-tax Income	35276	24180	19102
FINANCIAL RATIOS			
Debt-to-asset[1]	0.22	0.47	0.44
Equity Growth Rate[2]	0.10	0.16	0.11
Farm return-on-equity[3]	0.11	0.15	0.12

[1] Calculated as Liabilities/Assets
[2] Calculated as Net Before Tax Income/Net Worth
[3] Calculated as Net Farm Income/Net Worth

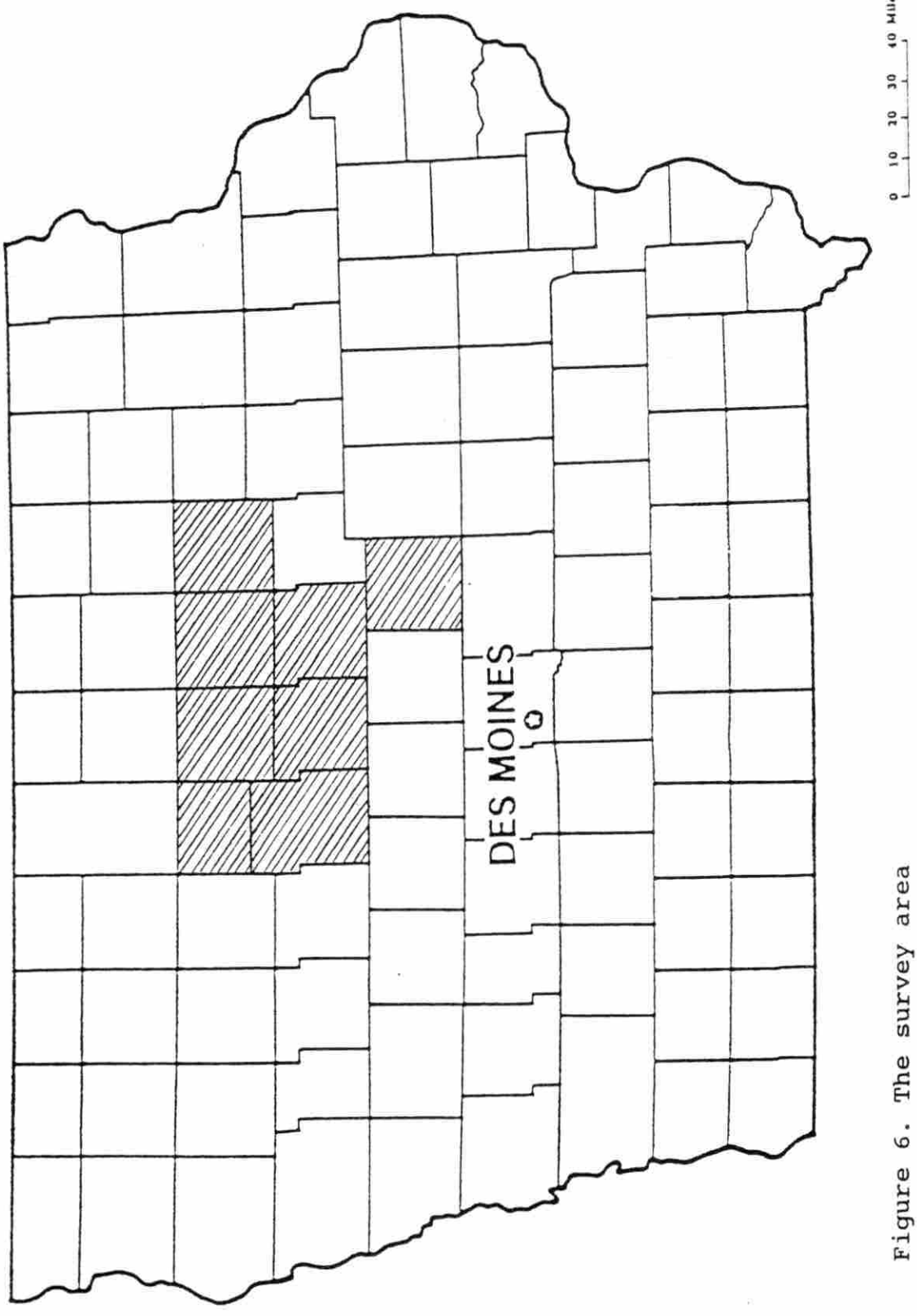

Figure 6. The survey area

At their home, four family members completed a set of three questionnaires given by an interviewer in the Sociology Department. The interviewer visited the home twice for about two hours each time. Each family member was compensated the equivalent of $10 per hour for their time. During the first visit, the interviewer asked questions about demographics, work, and family finances of all members together and then asked questions about family relationships of each member separately. A second questionnaire was given to each family member after the first visit to be completed and turned in during the second visit. The questions on the second questionnaire centered around goals, values, and personality assessment. The second visit was partially videotaped during family discussions about tasks or problems given them to solve by the interviewer. The last questionnaire was also given to each family member at this time.

All data used in this study incorporated questions asked during the first interview and on the second questionnaire completed between visits. Therefore, responses were given within a short time period (1-2 weeks) of each other.

A list of all questions extracted from the survey are in Appendix 1.

B. The data set

1. Demographic variables

Although the financial data was vague and inexact, the data on demographic variables as well as personality traits is abundant. Table 4 lists the statistics for all variables.

Comparing this survey group of operators to those in the Iowa Farm Finance survey taken in 1988, this group is younger than the typical Iowa farm operator by about 16 years and also has about two times as many family members (Table 3).

This result is understandable since the survey required at least four members in the family such that household size must exceed the Farm Finance Survey average of 2.7 and since the survey required that a child of about age 14 be present. Most operators in their mid-fifties, the average age of those surveyed in the Farm Finance Survey, no longer have children in the household. The screening strategy, therefore, attracted younger, larger families.

Regarding education of the operator and spouse, the survey provides a more exact measure of years of schooling unlike the Farm Finance Survey which provides a measure of degree completion. The average years of schooling for both

Table 4. Variable statistics

	Mean	Min.	Max.	St Dev	N
FINANCIAL					
Net Income	39141	-27000	168510	25388	128
Farm Income	20866	-27000	168510	25034	128
Farm Debt	141470	0	1800000	234119	129
Farm Assets	318747	8000	2700000	434216	129
Home Assets	64230	1500	529000	77308	129
Acres Operated	420	0	1780	424	128
DEMOGRAPHIC					
Husband Age	41	32	56	5.2	129
Husband Education	13.5	11	20	1.2	129
Wife Education	13.8	10	18	1.7	129
Household Members	5	4	7	0.8	129
Grew up on Farm	0.9	0	1	0.3	129
Health	0.8	0	1	0.3	129
Ann. Hrs. Farm Work	1863.6	0	6240	1210.8	125
Ann. Hrs. Off-farm	2074.2	0	5200	1453.8	129
Ann. Hrs. Leisure	13546.9	10712	17472	1126.9	125
PERSONALITY					
Family Satisfaction	66.8	40	80	8.3	129
Job Satisfaction	41.9	25	54	5.5	125
Self-esteem	46.8	26	60	5.7	128
Mastery	26.1	17	35	3.7	129
Coping	33.2	21	42	3.4	129
Profit-seeking	20.7	13	27	2.9	129
Control	24.9	14	33	3.0	129
Husb. Problem-solving	76.7	42	96	11.2	129
Wife Problem-solving	76.9	45	97	10.6	129
Husband Organization	47.1	34	63	4.9	129
Wife Organization	47.5	32	61	5.9	129

spouse and operator are however comparable between the groups. The average falls at about the completion of the second year of college for both husbands and wives.

This survey also includes information on the operator's father's occupation. The 1988 survey suggested that 90% of the operators had fathers who farmed as the primary occupation while in 1989, 98% of the operators responded that their families had farmed. This result may help support the view that farmers enjoy farming not only as an occupation, but also as a way of life. As the literature indicates, it may also boost the managerial experience of those whose fathers farmed.

2. Financial variables

Financial data in this survey was limited and not exact. The subjects were asked for figures on income and expenses off the top of their heads rather than from more exact, tax sources. The questions themselves were vague. For example, no questions were asked about depreciation or interest expense and no mention was made when asked about operating expenses whether depreciation or interest expenses were to be included. Therefore, we cannot tell if the operators included these measures in their response for operating expenses.

The bias toward younger, larger families in this survey is manifested in the financial data (Table 3). As may be expected of younger families, the ratio of debt to assets is high. These families are borrowing funds to build the business.

The 1988 mean net income figures between the Farm Finance Survey and the Iowa Youth Project are not strikingly different but the sources of the income are different. Total off-farm income is higher for this survey group while net farm income is lower. Acres operated is higher and yet gross sales is lower for this group. This result may indicate that the younger, less experienced operators are not maximizing the price they receive for their output or that they are not maximizing their yield given their resources. But this statement may be too strong considering the imprecision of this survey's financial data. The differences in net farm income between the two types of surveys may result from the lack of questions about interest expense and depreciation on the Iowa Youth Project survey.

Equity growth rate as calculated by dividing net before-tax income by equity was higher than that of the Farm Finance Survey in 1988: 16% compared to 10%. However, because of the discrepencies in the calculation of income

figures between surveys, this difference may be misleading. Looking at farm return-on-equity as calculated by net farm income divided by equity, the figures betwen the Farm Finance Survey and the Iowa Youth Project are similar.

Therefore, providing that the financial data are not grossly misrepresented, these families, on average, are doing well in farming as seen by comparable equity growth rate and farm return-on-equity ratios, but they have high debt ratios so they are susceptible to interest rate fluctuations.

3. Personality variables

The personality variables were calculated by using responses from several questions. The questions were answered based on a scale or ranking. For example, a question asking "How satisfied are you with farming as a way to make a living" gave a range of responses from 1 to 5 where 1 was for the response "extremely satisfied" and 5 was for "extremely dissatisfied". To calculate a measure of job satisfaction, the response for the question was recoded such that 5 denoted someone extremely satisfied with work and 1 denoted someone extremely dissatisfied, and then added to the responses of other questions which were hypothesized to explain the same trait.

If some questions contained different size scales (i.e., some were based on responses from 1 to 5 while others were based on responses from 1 to 7), the scales were standardized across the trait. No weighting of responses was performed.

The questions composing the personality variables were either taken from previous, well-known studies, were developed for the Iowa Youth and Families Project, or were determined for this study. A list of such questions and the traits they measure are listed in Appendix 1.

Examining the statistics compiled for the personality variables may not be very revealing (Table 5). There is no appropriate standard against which this survey group can be compared. However, there is a statistical method called a reliability test which can be used to determine how consistant the questions are in measuring a trait. This test gives an alpha score as seen in Table 5 which will be discussed in detail in the section on statistical methods.

Another way of examining the personality variables is to plot their distributions. The distributions for family satisfaction and job satisfaction are listed in figures 7 and 8. The figures reveal that responses follow a fairly normal pattern which indicates that the assumption in

Table 5. Scale variables

Variable	# Ques.	Min	Max	Alpha	Description
Family Satisfaction	20	40	80	.8720	Marital closeness
Job Satisfaction	11	25	54	.7816	Happy with job
Self-esteem	12	26	60	.8841	Self-image
Mastery	7	17	35	.7767	Control of fate
Coping	9	21	42	.7852	Handle problems
Husband Organization	13	34	63	.8167	Systematic behavior
Wife Organization	13	32	61	.8440	Systematic behavior
Profit-seeking	6	13	27	.7224	Desire for financial success
Control	7	14	33	.6610	Responsibility for own actions
Husband Problem-solving Ability	14	42	96	.9332	Adaptive and evaluation skills to effectively solve family problems
Wife Problem-solving	14	45	97	.9207	Same as above
Open-mindedness	8	9	39	.4004	Incorporates adaptability

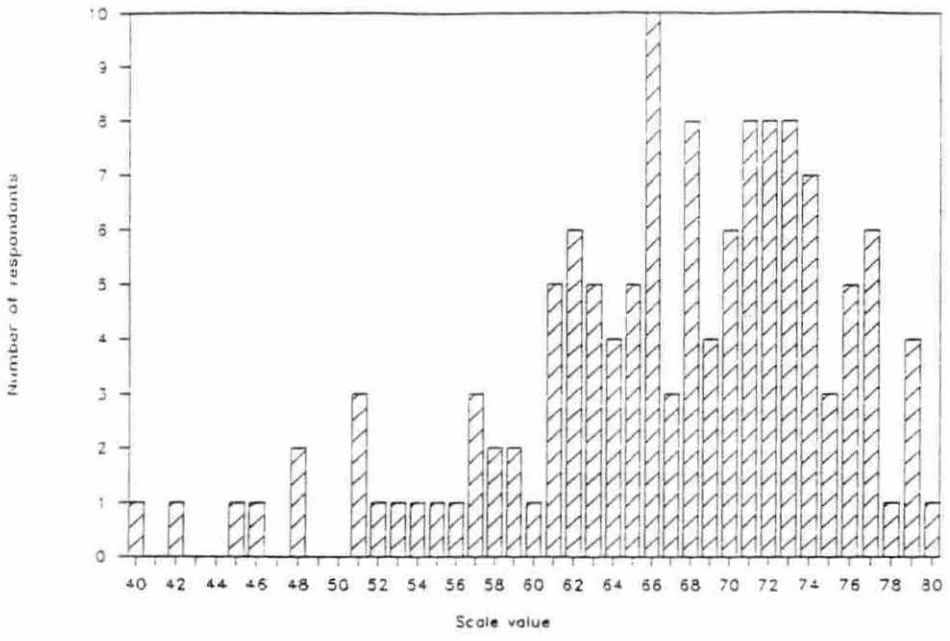

Figure 7. Family satisfaction

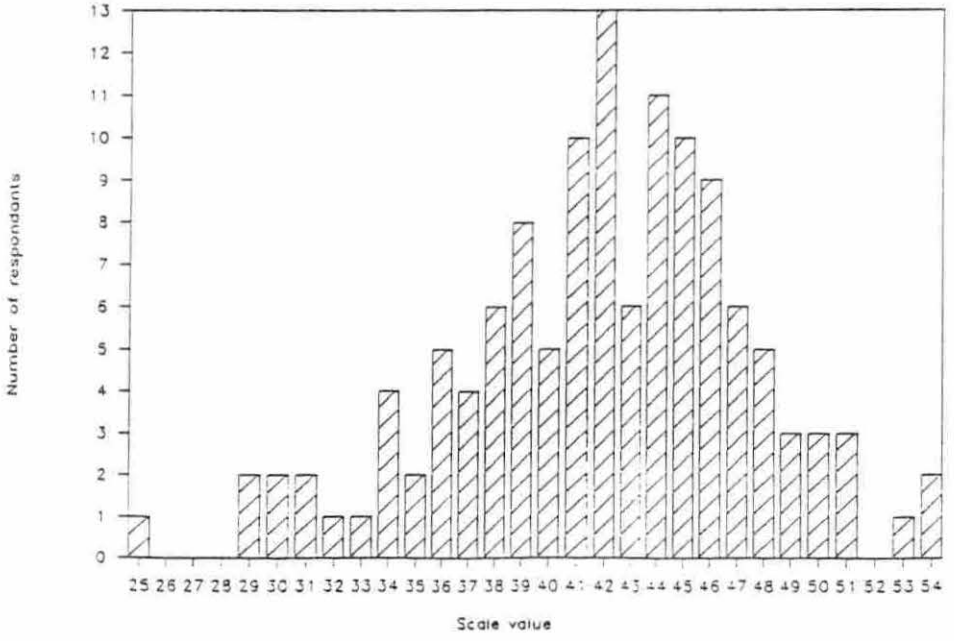

Figure 8. Job satisfaction

regression analysis of normally distributed dependent variables should not be violated.

C. Estimating the model

The model was specified as a simultaneous equation since decisions about resource allocation to achieve the goals of profit, job satisfaction, and family satisfaction are interdependent. It would therefore be advisable to estimate the model with a seeminly unrelated regression equation, however, the limitations of the data set do not allow this type of estimation. The variables available in the data set are listed in Appendix 1. Data on inputs, factor prices, output prices, and many other variables do not exist. Therefore, as many other econometric analyses in human capital economics have done, I shall estimate production functions for each argument in the utility function. Future research could attempt to gather the information necessary for estimating the model described above.

In order to determine to what extent the demographic and scale variables affect the arguments in the utility function, it was hoped that three translog production functions could be estimated. Using this type of production function specification has an advantage over

other models since it allows the interaction of variables and it also has the advantage over assuming a Cobb-Douglas model since it relaxes the assumption of a unitary elasticity of substitution. However, the small number of families and the large number of variables prevented its use due to lack of degrees of freedom. Therefore, three unrestricted log-linear production functions were estimated.

1. Measuring arguments in the utility function

a. Profit

Studies have used various types of financial measures to determine financial status. Some studies have used the debt-to-asset ratio as the determinant of financial stress of farms (Lines and Zulauf, 1985; Murdock et al., 1988). However, the debt-to-asset ratio may depend upon the stage that the business is in at the time. For example, a farm just starting would be expected to have a high debt-to-asset ratio since the farmer may have just purchased land and equipment. The debt-to-asset ratio tells us nothing of the size or income of the farm.

Still other studies have used other measures. Sonka et al. (1989) used a measure of economic profit (profit net of interest on capital and unpaid labor) as the dependent

variable in a logit model to determine managerial performance of cash grain producers. Krause and Williams (1971) used change in net worth (equity) as the dependent variable. However, this variable may be biased toward large farms.

Other studies such as the one done by Deseran et al. (1984) use net income as the dependent variable to determine success. The problem with using net income is that the size of the farm may help make inefficient farms look better than those smaller, successful farms with less sales. One way to solve this problem of size is to use return-on-equity which is the ratio of net income to net worth.

Therefore, this study uses the financial variable return-on-equity to represent income in the model since it is a measure of profit holding farm size constant. Return-on-equity typically captures the production and financing aspects of management since it measures how efficiently the operator utilizes his available resources. In this manner, larger farms which may actually be less efficient will not bias the results as may occur if only income is used as a proxy for financial success.

Two measures of return-on-equity will be used in this study. However, because of the incomplete financial data

available, return-on-equity cannot be calculated as is traditionally by dividing net income after taxes which includes depreciation (a cash flow) by net worth. Rather, return-on-equity is measured in this study as before-tax-income divided by net worth. The measure of before-tax-income is simply calculated by subtracting operating expenses (which may include or exclude interest expenses) from gross sales and then adding off-farm income of both husband and wife.

When return-on-equity is calculated by including off-farm income, it is being assumed that off-farm income is being used to generate equity. This assumption may be justified in many cases since off-farm income is typically used to supplement farm income, to pay back farm loans, and to meet other farm expenses. In addition, when farmers report the market value of their debt and assets, farm and home assets may not be distinguished. Therefore, the measure of equity may also include home assets which may be difficult to separate from farm assets.

A second mesure of return-on-equity will also be used. Farm return-on-equity will be calculated as farm income divided by net worth. In this manner, it is assumed that only farm income is being used to generate equity which is used by only the farm and not for family consumption goods.

No financial measure is a foolproof predictor of success. Any cross-sectional data can give a biased view of financial success. As Sonka et al. (1989) found in an eight-year time study of cash grain producers, few were consistently high performers. Indeed, 70% of producers ranked in the top quarter at least one year while 70% ranked in the bottom quarter at least one year. This phenomenon is a reflection of the volatile income found in agriculture.

For the purposes of this study, however, we may assume that over time, good managers will have relatively more successes than less adept managers. The basic relationships between personality traits and performance should therefore still appear.

b. Job satisfaction

Job satisfaction measures the extent to which the farm operator enjoys his work. This study uses an additive scale variable developed for this analysis. The scale responses of eleven questions asked of the husband which attempt to discover how happy he is with his job as a farm operator were added together for a total score. A list of these questions is in Appendix 1.

Responses ranged in value from 25 to 54 and the mean

was about 42. Higher values are indicative of higher levels of reported happiness with the job. The distribution of this variable may appear skewed toward the right as seen in Figure 8 indicative that many operators are very happy with their work. This result supports the belief that farmers, although subject to fluctuating income, enjoy working on a farm for the most part.

c. Family satisfaction

Family satisfaction is narrowly defined for this study as a measure of marital closeness. Family satisfaction attempts to measure the positive and negative characteristics of social interactions to determine if a satisfying, healthy relationship exists between the spouses.

This study uses an additive scale variable to measure the operator's and spouses satifaction with their marriage. This scale was designed for the Iowa Youth Project as the result of studies done by Kessler et al. (1985) and Rook (1984) that were designed to tap the positive and negative characteristics of social interactions. It is derived in part from Rook's (1984) work on the problematic aspects of social interaction. Therefore, the variable combined the responses of husband and wife. The scale responses of a

total of 20 questions were summed. Ten questions were asked of each the husband and wife as seen in Appendix 1.

The advantage of reporting the responses of more than one person is that the additional opinion can strengthen an accurate description on the part of each respondant. One partner may be satisfied with the marriage and the other not happy. Thus, I have combined the responses of both husband and wife.

Responses ranged in value from 40 to 80 with a mean of about 67. Higher values are indicative of a higher reported level of marital closeness. A distribution skewed to the right also appears here as seen in Figure 7. This survey group therefore appears to have overall good marital relationships.

2. Measuring production function arguments

a. Farm and household input variables

Ideally, to measure farm and household inputs in this model, a measure of annual purchases on these inputs would be desirable. However, since the survey was constructed before the model, the most accurate information available about these inputs was total farm assets and total household assets. Therefore, a flow variable would have been prefered, but a stock variable was available.

For farm inputs, the reported market value of all farm assets was used to approximate the value of farm capital inputs. Total acres operated was used as a measure of land value. To measure labor inputs, the annual hours reported by the operator and his wife to work on the farm was used.

In the case where total output or "the big harvest" was used as a regressor for job satisfaction, a measure of gross sales was calculated.

For household inputs, total value of home assets which included the value of the home, cars, appliances, and so forth was used to approximate household goods. Annual hours of non-market time of both the husband and wife were used to approximate leisure time.

b. Demographic variables

Many of the demographic variables could be measued, but not without error. Education of the operator and his spouse was approximated using years of schooling. Years of schooling is not an exact measurement of learning since it does not contain information about how much knowledge was retained nor about the quality of education received.

Experience is approximated using two variables. A question in the survey asked how long the husband had been working at his job. This question was not explicit enough

about whether the husband was responding about work in farming or perhaps off-farm. Therefore, other variables were considered. The two chosen variables are age of the operator and a dummy variable if the operator grew up on a farm. Both measures were deemed necessary to use since age did not give an idea of when the farmer began working on the farm. It is hoped that the growing-up on a farm dummy can help fill that gap.

The use of extension services could not be approximated using anything in the survey. It would have been acceptable to use information about how many farm journals were purchased or about how often extension services were contacted but none was available.

The operator's health was approximated by a dummy variable based on a question asking if the operator had any physical limitations. In this manner, physical limitations are expected to affect labor productivity which is what we are attempting to measure by health.

The number of children is approximated by household size. The variability of household size is not great in this data set since the minimum amount of household members to be eligible for this survey was four: two parents and a minimum of two children.

c. Personality variables

The main problem with using personality variables in a statistical analysis is because they are subject to measurement error. This measurement error occurs in two parts. First, because the individual scale questions are imperfect measures of a portion of the trait. Second, because the combination of questions used may not fully explain the personality trait to be measured. The Methods section will discuss one statistical procedure called a reliability test which is used to determine the accuracy of the questions in measuring the trait. In this way, we can analyze the second source of measurement error listed above.

The method of summing the responses to several questions to measure a personality trait is used in many sociological studies. Although the resulting variable is discreet, it may pose no more problems than demographic variables which are also discreet. In other words, for statistical procedures which assume continuous variables, the range for most personality variables should be large enough to work with these variables without attempting to make corrections.

In this study, the scale questions that comprise one trait have been standardized. In other words, all

questions which are summed have the same range of potential responses.

Discussed below is the way each personality trait was measured. A detailed list of questions which comprise each trait is in Appendix 1.

1. Intelligence As the literature review emphasized, a measure of intelligence is difficult to pinpoint. There are several intelligence tests which measure specific areas that define intelligence. Therefore, this study will concentrate on one narrow aspect of intelligence which is particular to the decision-making process, the ability to evaluate and solve problems. This ability is a measure of information processing which is a function of intelligence.

Intelligence will be approximated by two variables. One which measures the problem-solving ability of the husband and the second measures the problem-solving ability of the wife since she participates in major decisions. The trait in this study added two variables called effective and destructive problem-solving as developed by Dr. Rand Conger for the Iowa Youth Project. The problem-solving variable describes if the person takes a positive approach to family problems by listening (perceiving), coming up

with alternatives (analyzing) and eventually solving the problem effectively.

2. Motivation Motivation will be approximated by the desire of the operator to become financially successful. The variable measures the extent to which an operator believes earning money is important. The scale variable was developed for this study and will be entitled profit-seeking.

3. Organization A measure of the organizational skills of both the husband and wife will be approximated. The spouse in many instances contributes to decison-making or actually keeps the records and so should be included in any analysis.

A scale variable entitled conscienciousness as constructed by Costa and McCrae (1985) will be used to approximate organization. The questions compiled to measure this trait involve determining the extent to which each person has methodical behavior. It is assumed that more methodical behavior is complementary to greater organization.

4. Control The operator's sense of control over his environment will be approximated by three different scale variables entitled mastery, coping, and control.

Mastery measures one's feeling of power or control over the environment. It is a belief that one's actions can affect the future. The questions comprising this variable are well-founded in sociological literature and were developed by Pearlin et al. (1981).

Coping was developed as the opposite variable to one called vulnerability as introduced by Costa and McCrae (1985). It is defined as the ability or desire to act under pressure. The trait, therefore, entails both the willingness to act and the ability to act under stress.

The third variable, control, refers to the opposite of a feeling of helplessness. It measures a belief in an internal locus of control, which is an expectation that outcomes of situations are contingent upon actions or choices rather than on external forces such as luck, fate, or chance. The scale was developed by Mirowsky and Ross (1983). While these three variables are strongly related, they imply subtle differences.

5. Adaptability A scale variable called open-mindedness was developed for this study to measure one

aspect of adaptability or willingness to innovate. Unfortunately, the questions extracted from this survey were not well-suited to measuring this trait as will be discussed in the statistical methods section. Not much improvement was made when questions were deleted. As a result, this variable was dropped from the final analysis.

6. Self-esteem Self-esteem describes one's self-image. The variable used in this study has been taken from the popular Rosenberg (1965) scale which has proven to be a consistent measure of this trait.

Table 5 lists the personality variables used in this study. A statistical method called the reliability test was used to determine if the questions used to measure the trait complement each other and if the responses given to the questions are varied. The score from the reliability test is entitled an alpha score. The alpha coefficient will be discussed in detail in the statistical methods section. According to the table, all personality variables except open-mindedness have fairly high alpha scores. Therefore, we can be more confident that measurement error due to the questions' imperfect measurement of the trait is low.

D. Statistical methods

1. Reliability test

This statistical test was performed on SPSSx to determine if the questions chosen to describe personality traits such as self-esteem could be used to accurately represent that trait. A reliability coefficient derived from the statistical test demonstrates whether a test designer was correct in expecting a certain collection of items to yield interpretable statements about the individual differences (Cronbach, 1951). In other words, the coefficient indicates if a group of questions fit well together and that a good range of responses exists. The large range of responses is necessary because they delineate the differences within a group of people.

Lee Cronbach (1951) proposed such a coefficient:

$$\alpha = \frac{q}{q-1}\left(1 - \frac{\sum_i V_i}{V_t} \right)$$

where q is the number of questions, V_t is the variance of test scores, and V_i is the variance of item scores after weighting. Thus, α estimates the proportion of the test (trait) variance due to all common factors among the items (questions making up the trait) (Cronbach, 1951).

The value of α ranges from zero to one where a higher score, similar to an R^2 goodness of fit test, indicates

higher reliability of the group of questions.

The scale variables used in this analysis all had fairly high alpha coefficients (Table 5). High coefficients are desired but need not approach a perfect scale to be interpretable (Cronbach, 1951). Therefore, all variables were included in the analysis except open-mindedness which had a very low coefficient of 0.4004. It was determined that the questions making up the scale called open-mindedness were not accurate measures of the trait and so it was dropped. Future studies could compose better questions about the willingness of individuals to accept new technology rather than ask about a willingness to accept persons and objects of differing cultures or backgrounds.

A substitute variable to open-mindedness was sought. A measure of subjective risk-taking was considered but then decided against since the variable could be based on only one question for which an irregular distribution was found.

2. Regression analysis

The remainder of the statistical work was produced using the Statistical Analysis System (SAS) version 6.06 on the mainframe computer at Iowa State University. Although our model may be best estimated by a simultaneous equation

method, three different unrestricted production functions were estimated because of the limitations of the data set size. Namely a limited sample size restricted the available types of production functions to be estimated.

A translog production function could not be estimated because of the large number of regressors and restricted produciton functions also would have limited the degrees of freedom. Therefore, simple, Cobb-Douglas unrestricted functions were the most likely candidates. The estimated equations are listed in Table 6.

Table 6. Production functions to be estimated.

For return-on-equity of farm and off-farm income:

$$ROE = B\ x_1^{\beta 1}\ x_2^{\beta 2}\ x_3^{\beta 3}\ x_4^{\beta 4}\ x_5^{\beta 5}\ x_6^{\beta 6}\ x_7^{\beta 7}\ e^{\beta 8 x 8}\ e^{\beta 9 x 9}\ x_{10}^{\beta 10}\ x_{11}^{\beta 11}\ x_{12}^{\beta 12}\ x_{13}^{\beta 13}\ x_{14}^{\beta 14}\ x_{15}^{\beta 15}\ x_{16}^{\beta 16}\ x_{17}^{\beta 17}\ x_{18}^{\beta 18}\ x_{19}^{\beta 19}\ x_{20}^{\beta 20}$$

$$(\ln ROE + 1.5) = \ln B + \beta 1 \ln x1 + \beta 2 \ln x2 + \ldots + \beta 8 x8 + \beta 9 x9 + \beta 10 \ln x10 + \ldots + \beta 20 \ln x20$$

For job satisfaction:

$$JOBSAT = A\ x4^{\alpha 4}\ x10^{\alpha 10}\ x13^{\alpha 13}\ x14^{\alpha 14}\ x17^{\alpha 17}\ x21^{\alpha 21}$$

$$\ln JOBSAT = \ln A + \alpha 4 \ln x4 + \alpha 10 \ln x10 + \ldots + \alpha 21 \ln x21$$

For family satisfaction:

$$FAMSAT = G\ x1^{\gamma 1}\ x2^{\gamma 2}\ x4^{\gamma 4}\ x7^{\gamma 7}\ x14^{\gamma 14}\ x18^{\gamma 18}\ x20^{\gamma 20}\ x22^{\gamma 22}$$

$$\ln FAMSAT = \ln G + \gamma 1 \ln x1 + \gamma 2 \ln x2 + \ldots + \gamma 22 \ln x22$$

Where,
x1 = market value farm assets
x2 = market value home assets
x3 = total acres operated
x4 = husband age
x5 = husband years of schooling
x6 = wife years of schooling
x7 = number of household members
x8 = dummy variable: 1 if operator grew up on farm, 0 otherwise
x9 = dummy variable: 1 if operator had health problems, 0 otherwise
x10 = annual hours worked by husband and wife on farm
x11 = annual hours worked by husband and wife off-farm
x12 = self-esteem
x13 = mastery
x14 = coping
x15 = husband's organizational skills
x16 = husband's profit motive
x17 = control
x18 = husband's problem solving ability
x19 = wife's organizational skills
x20 = wife's problem solving ability
x21 = gross sales of farm goods
x22 = annual hours of non-work time for husband and wife

V. RESULTS AND DISCUSSION

The results of fitting production functions of the natural logs of return-on-equity, job satisfaction, and family satisfaction are in Table 7. The first fitted function in each heading includes all the variables so the coefficients may be compared between equations. The second fitted function drops some independent variables which were correlated with other independent variables. These variables were chosen as the result of performing a correlation analysis as seen in Appendix 2.

In the case of both return-on-equity equations and the family satisfaction regression, the second set of equations are fitted to the model in this study. The third equation in the case of job satisfaction is fitted to the model in this study.

A. Results for return-on-equity

Two variables for return-on-equity, the measure of profits, were regressed. Since return-on-equity can be negative, the dependent variables have been transformed by adding 1 to each to make all values positive such that the natural log could be calculated. Therefore, the magnitudes of the estimated coefficients are less meaningful but the signs of the estimates are still valid. Comparing the

Table 7. Fitted log-linear production functions[1]

	Ln (ROE + 1)		Ln (Farm ROE + 1)	
R^2	0.5749	0.5529	0.2789	0.1854
F	6.289***	7.730***	1.779**	1.953**
n	113	116	112	115
Intercept	3.06	4.92*	1.61	1.02
	(1.04)	(1.91)	(0.82)	(0.69)
Ln Farm Assets	-0.28***	-0.25***	-0.12***	-0.08***
	(-6.00)	(-6.32)	(-3.97)	(-2.93)
Ln Home Assets	-0.06	-0.05	-0.04	-0.03
	(-1.65)	(-1.30)	(-1.41)	(-1.06)
Ln Acres Operated	0.03		0.07***	
	(0.77)		(2.89)	
Ln Husband Age	-0.21	-0.28	-0.04	-0.07
	(-0.62)	(-0.87)	(-0.19)	(-0.33)
Ln Husb. Education	0.61	0.61*	0.08	-0.04
	(1.60)	(1.72)	(0.32)	(-0.21)
Ln Wife Education	0.23	0.28	-0.12	
	(0.68)	(0.83)	(-0.52)	
Ln Household Size	-0.09	-0.12	0.14	0.00
	(-0.35)	(-0.50)	(0.81)	(0.02)
Grew Up On Farm	0.15	0.20	0.25***	0.23***
	(1.14)	(1.61)	(2.82)	(2.84)
Health	-0.05	-0.04	-0.02	-0.00
	(-0.40)	(-0.29)	(-0.23)	(-0.05)
Ln Farm Labor	-0.10*	-0.11**	0.01	0.04
	(-1.93)	(-2.31)	(0.25)	(1.31)
Ln Off-farm Labor	-0.00	-0.00	-0.01	
	(-0.11)	(-0.17)	(-0.40)	
Ln Leisure				
Ln Self-esteem	-0.59		0.03	
	(-1.13)		(0.09)	
Ln Mastery	0.80**	0.82***	0.20	0.35*
	(2.26)	(3.03)	(0.84)	(1.95)
Ln Coping	0.49		0.05	
	(1.00)		(0.16)	
Ln Husb. Organize	-0.79*	-0.90**	-0.60**	-0.52**
	(-1.77)	(-2.28)	(-2.06)	(-2.00)
Ln Profit-seeking	0.22	0.16	0.25	0.22
	(0.76)	(0.56)	(1.27)	(1.23)
Ln Control	0.46		0.22	
	(1.50)		(1.10)	
Ln Hus. Problem-solving	0.08	0.04	0.12	0.11
	(0.31)	(0.15)	(0.69)	(0.73)
Ln Wife Organize	0.40	0.29	0.14	
	(1.15)	(0.87)	(0.59)	
Ln Wife Problem-solving	-0.53*	-0.54**	-0.28	
	(-1.98)	(-2.08)	(-1.61)	

[1] Estimated using ordinary least squares. T-statistics are in brackets

* denotes significant at the 10% level
** denotes significant at the 5% level
*** denotes significant at the 1% level

Table 7 (cont.).

	Ln (Job Satisfaction)		
R^2	0.4261	0.4078	0.3409
F	3.394***	3.374***	4.655***
n	117	118	120
Intercept	2.76***	3.07***	2.76***
	(3.12)	(3.56)	(4.50)
Ln Farm Assets	-0.01	0.00	-0.01
	(-0.86)	(0.13)	(-0.76)
Ln Home Assets	0.01	0.01	0.01
	(0.76)	(0.66)	(0.54)
Ln Acres Operated	0.00	0.02	
	(0.25)	(1.48)	
Ln Husband Age	-0.07	-0.13	-0.10
	(-0.70)	(-1.32)	(-0.96)
Ln Husb. Education	-0.02	-0.05	-0.07
	(-0.14)	(-0.42)	(-0.72)
Ln Wife Education	-0.17	-0.15	
	(-1.57)	(-1.40)	
Ln Household Size	-0.11	-0.11	-0.10
	(-1.35)	(-1.34)	(-1.34)
Grew Up On Farm	0.05	0.05	0.02
	(1.14)	(1.24)	(0.56)
Health	-0.05	-0.05	-0.05
	(-1.31)	(-1.26)	(-1.37)
Ln Farm Labor	0.02	0.03*	0.01
	(1.11)	(1.77)	(0.93)
Ln Off-farm Labor	0.00	0.00	
	(0.18)	(0.17)	
Ln Leisure			
Ln Self-esteem	0.20	0.18	
	(1.42)	(1.31)	
Ln Mastery	0.26**	0.26**	0.33***
	(2.58)	(2.54)	(4.20)
Ln Coping	-0.07	-0.06	
	(-0.50)	(-0.44)	
Ln Husband Organize	0.17	0.2	
	(1.33)	(1.51)	
Ln Profit-seeking	-0.02	-0.01	-0.05
	(-0.25)	(-0.17)	(-0.56)
Ln Control	0.00	0.00	
	(0.05)	(0.01)	
Ln Hus. Problem-solving	0.05	0.07	0.07
	(0.64)	(0.81)	(1.03)
Ln Wife Organize	-0.15	-0.19*	
	(-1.41)	(-1.74)	
Ln Wife Problem-solving	-0.04	-0.05	
	(-0.54)	(-0.57)	
Ln Gross Sales	0.03*		0.03**
	(1.76)		(2.36)

Table 7 (cont.).

	Ln (Family Satisfaction)		
R^2	0.7479	0.7201	0.7207
F	14.831***	24.007***	26.277***
n	120	124	123
Intercept	0.59	-0.22	-0.25
	(1.07)	(-0.27)	(-0.30)
Ln Farm Assets	0.00	0.00	
	(0.44)	(0.29)	
Ln Home Assets	-0.00	-0.00	
	(-0.09)	(-0.03)	
Ln Acres Operated	-0.00		
	(-0.23)		
Ln Husband Age	-0.06	-0.07	-0.06
	(-0.92)	(-1.03)	(-0.98)
Ln Husb. Education	0.05	0.03	0.03
	(0.62)	(0.49)	(0.56)
Ln Wife Education	-0.05		
	(-0.72)		
Ln Household Size	0.01	0.03	0.04
	(0.16)	(0.76)	(0.80)
Grew Up On Farm	-0.00	0.01	0.01
	(-0.06)	(0.24)	(0.21)
Health	0.03	0.02	0.02
	(1.29)	(0.78)	(0.78)
Ln Farm Labor	0.00		
	(0.13)		
Ln Off-farm Labor	-0.00		
	(-0.06)		
Ln Leisure		0.06	0.06
		(0.75)	(0.73)
Ln Self-esteem	-0.14		
	(-1.55)		
Ln Mastery	0.11*	0.04	0.04
	(1.74)	(0.83)	(0.86)
Ln Coping	0.13		
	(1.38)		
Ln Husband Organize	-0.10		
	(-1.23)		
Ln Profit-seeking	-0.01	-0.02	-0.02
	(-0.23)	(-0.33)	(-0.31)
Ln Control	-0.01		
	(-0.12)		
Ln Hus. Problem-solving	0.52***	0.48***	0.47***
	(10.15)	(10.44)	(10.50)
Ln Wife Organize	-0.03		
	(-0.40)		
Ln Wife Problem-solving	0.41***	0.40***	0.41***
	(7.91)	(7.90)	(7.93)
Ln Gross Sales			0.00
			(0.36)

fitted production functions for both measures of return, the variability explained by the equations for return-on-equity (ROE) which includes off-farm income is greater than that of farm return-on-equity (FROE) as seen by the higher R^2 estimates.

A few points should be made. First, concerning the inputs, home assets made a negative contribution as hypothesized and acres operated made a positive contribution as hypothesized for both ROE and FROE. However, farm assets as a measure of farm inputs contributed significantly but negatively to both. This result was not anticipated. One possible explanation is that these farmers are highly indebted for these assets such that interest payments on these assets are detracting from their income. Or perhaps these farms have too many assets for the size of their operation, an indication of capital inefficiency. Yet a third explanation is plausible. Viewed in conjunction with the positive sign on acres operated which includes both owned and rented land, assets which are rented are bringing farmers a positive return while owned assets are less productive.

Since acres operated was correlated with farm assets, it was dropped in the second equations for both ROE and FROE. Neither the sign nor the significance level of the

coefficients on farm assets changed.

Husband's age has a negative sign. Rather than contributing to efficiency via experience, age may reduce labor efficiency and income because the operator loses motivation over time. Operator's education has a positive sign for both ROE and FROE but also a significant coefficient for the second ROE equation. Therefore, husband education may be contributing proportionately more to off-farm income than farm income.

Contradictory signs for wife education can be seen across three equations. While wife years of schooling increases ROE, it decreases FROE although none of the coefficients is significantly different from zero. Therefore, similar to husband education, wife education may increase off-farm income and therefore ROE.

Although it was hypothesized that household size detracts from profit, the positive coefficient for FROE indicates that larger household sizes, meaning more children in this case, may actually contribute to farm income. This may be the case when children help with farm work and are less demanding of the farm wife's time.

Experience in the form of growing up on a farm contributes significantly to FROE and shows a positive sign for ROE as well. These results are as expected. Health

also has the anticipated sign. Since health was a dummy variable where one indicated good health, a negative coefficient means that poor health detracts from income.

Farm labor did not contribute significantly to FROE, contrary to expectations. Even more surprisingly, farm labor coefficients for ROE were significantly negative which was also contrary to expectations. However, this result can be explained. Spending less time farming means that there is more time to spend off-farm. The off-farm salaries may be contributing more to net income than farm income such that spending time on the farm is less lucrative. Unfortunately, the coefficients for off-farm income are not significantly different from zero in any case so this interpretation cannot be confirmed.

The personality variables were all hypothesized to contribute positively to ROE and FROE. Mastery, coping, control, profit-seeking, husband problem-solving ability, and wife organization all follow the hypothesized pattern. Self-esteem, however, has contradictory signs across income measures. Operator's self-esteem has a positive coefficient for FROE but a negative one for ROE. This negative coefficient cannot be explained.

Several personality variables were highly correlated (Appendix 2). Self-esteem, mastery, coping, and control

were all highly correlated. As a result, only one of these variables, mastery, was kept in the final equation for both ROE and FROE. The coefficient for mastery in the final equations, therefore, became more highly significant.

Contrary to expectations, husband organizational skills and wife's problem solving ability both contributed negatively and significantly to ROE and FROE. More methodical operators have lower returns perhaps because they may pay attention to areas of operation that are less important to profits. Wife's problem-solving ability which characterizes solving family disputes, may not be the best measure to approximate problem-solving in the work environment. Therefore, the negative signs may be explaining other behavior.

B. Results for job satisfaction

The job satisfaction equations have low explanatory power as seen by the R^2 estimates although this may be expected in cross-sectional data. The numerical value of coefficients is difficult to interpret. Stating that increasing job satisfaction by a percentage point means increasing the score on the added questions by one percent. Therefore, the interpretations will be limited to discussing the signs and significance levels of the

coefficients.

There appears to be a positive relationship between having the means to attain farm profits and job satisfaction. For example, there are positive coefficients on home assets, acres operated, growing up on a farm, and farm labor. The coefficient for farm assets is very close to zero. Indeed, gross sales is a significant contributor to job satisfaction. However, the statement that job satisfaction is caused by higher gross sales may be inaccurate since causation was not tested.

The other demographic variables--age, education of operator and wife, household size--all contribute negatively to job satisfaction as expected. While an operator's education may help contribute to profits, more educated operators may be less challenged with farm work and may therefore be less happy with their work. Health has a negative coefficient which is difficult to explain.

The most notable of personality variables is mastery which significantly contributes to all job satisfaction equations. Willingness to take responsibility for one's actions allows an operator greater happiness with farming. This result is consistant with expectations and indicates that the operators who enjoy farming most are the ones who believe that their actions control their destiny and may

therefore take active roles in achieving goals.

Operators who believe profits and money are important tend to be less satisfied with farming. This result may be seen by the negative coefficient on profit-seeking. Perhaps the attraction to farming comes mainly from other aspects of farming such as living on a farm.

In the last equation which fits the model, gross sales is a positive significant coefficient as expected. Therefore, the "big harvest" may make the operators happier with their work. Viewing gross sales in combination with the positive coefficient on acres operated in the first equation, one can conclude that larger farms with greater output may cause more job satisfaction. This result is consistant with expectations and substantiates the sociological belief that positive feedback results in higher satisfaction with performance.

The model hypothesized that time spent on the farm would also contribute to job satisfaction. The results indicate that farm labor's contribution to job satisfaction is not significantly different from zero in the last equation although it is positive. But a question remains whether job satisfaction may actually be causing farmers to put more hours into farm work.

A definitive conclusion about the causes of job

satisfaction may not be justified. While gross sales, mastery, and farm labor seem to play important roles, the limited explanatory value of the equations seems to indicate that other variables should be included in a regression analysis. Perhaps a value of income should be included in future analyses. In addition, there may be a problem with causality in these equations. Future studies may want to perform causality analyses on job satisfaction and such variables as farm labor, mastery, and gross sales.

C. Results for family satisfaction

Although the explanatory power of the three family satisfaction equations is high as seen through high R^2 values, only two variables are significant in all equations. They are the problem-solving ability of both the husband and wife. A husband and wife who have effective problem-solving skills will also be happier with their marriage. Mastery also contributes significantly in the first equation.

However, these results do not substantiate the model in this study. Neither home assets nor leisure time are significant contributors to family satisfaction as hypothesized. The coefficient for home assets is very close to zero so it is difficult to say whether a positive

or negative contribution is made. Similarly, the farm asset coefficient is zero so it is difficult to tell if it adds to or detracts from family satisfaction as hypothesized. Leisure makes a positive contribution as hypothesized.

Older operators in this study expressed less marital happiness. Perhaps this result can be discussed in light of the fact that the older operators may have been married for more time so the partner may be taken for granted more frequently and reported marital happiness is less notable.

Household size contributes positively to family satisfaction contrary to the hypothesis that more children detract from time the couple can spend together and from resources spent on consumption goods. Perhaps a larger family size requires that more time be spent together as a family which may indeed contribute to family satisfaction.

An operator's good health contributes to family satisfaction as hypothesized. Good health may mean that the family has one less worry.

The coefficients on farm and off-farm labor are not significantly different from zero so it is difficult to determine if they detract from family satisfaction as expected.

The husband's and wife's organizational skills, self-

esteem, sense of control and profit-seeking all contribute negatively to family satisfaction. Control, wife's organizational skills and profit-seeking were shown to positively affect income which was hypothesized to indirectly lead to greater family satisfaction through the amount of home assets. However these variables may represent goals and attitudes which are not conducive to marital happiness.

Mastery contributed significantly to family satisfaction in the first equation. However, when the variables that were correlated with mastery were removed, mastery was no longer a significant variable. This result may have occured since self-esteem had a large negative coefficient which became incorporated in the coefficient for mastery when self-esteem was dropped from the equation.

The two variables which significantly contribute to both ROE and family satisfaction are mastery and wife problem-solving ability. It was hypothesized that other measures of income such as farm inputs would play a greater role in family satisfaction than was estimated in this study. Perhaps these results can be attributed to the limited measure of family satisfaction chosen. If a more comprehensive scale measure can be devised in the future, it may yield more satisfactory results.

VI. CONCLUSION

The primary objective of this study was to determine which variables cause financial success for farm families. This study included both demographic and personality varibles to attempt to answer the question about which factors make some farm managers more successful than others. The secondary objective of this study was to redefine success to incorporate goals other than that of financial success. In this manner, a model of the farm family with several objectives could be estimated.

The search for demographic and personality variables which contribute to financial success proved fruitful. The results showed that demographic and personality variables did play a significant role in explaining the variability in ROE and FROE. For ROE which included off-farm income, the husband's years of schooling and sense of mastery made significant positive contributions. The husband's methodical behavior and the wife's problem-solving ability, on the other hand, made significantly negative contributions. In addition, for FROE, the measure of experience, growing up on a farm, contributed significantly while the husband's methodical behavior made a significant negative contribution here as well.

Therefore, for these measures of profit, personality

and demographic variables did add explanatory value to the equation of financial success.

But, traditional financial variables were also important in explaining financial success. Land made a positive contribution to farm finances as hypothesized. However, labor and capital as measured in this study made negative contributions to the financial well-being of farm families. Although this result may attest to the incomplete financial data, a definitive answer to the question what makes some farm families more financially successful than others has yet to be answered.

The only conclusion that can be drawn from the ROE and FROE results is that adding new variables boosted the explanatory value of a model of financial success. One implication, however, is that models which attempt to explain financial performance should avoid assuming managerial traits constant across operators.

The second objective was to redefine success for farm families and to model behavior based on this new definition. Although the model was constructed, it could not be measured properly. Ideally, it should have been estimated by an equation which allows income, job satisfaction, and family satisfaction to be interdependent. In addition, the low sample size limited the choice of a

production equation to estimate.

Thus, future studies may be conducted by attempting to estimate a simultaneous equation model as described in this study. A greater sample size is necessary to estimate this type of model. In addition, more precise financial questions should be considered. These questions could involve using tax forms to get accurate numbers on income, depreciation, interest, and the value of other farm expenses.

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APPENDIX 1. VARIABLES IN THE STUDY

FINANCIAL

Income and net worth information
- Market value farm assets (includes land and machinery)
- Total liabilities
- Gross sales including government payments
- Total farm operating expenses
- Husband and wife total off-farm income

Scale of operation
- Number of acres owned and operated
- Number of acres rented and operated

DEMOGRAPHIC

Education for husband and wife
- Highest grade of education completed or enrolled in currently

Number of Household Members
- How many people live in your household

Experience
- Age of husband
- Operator grew up on farm

SCALES

Family Satisfaction = Marital Closeness Scale (a=.8720)
Scale was adapted from items developed by Kessler et al. (1985) that were designed to tap the positive and negative characteristics of social interactions. It is derived in part from Rook's (1984) work on the problematic aspects of social interaction. The scale for this study was that of husband and wife closeness added together so a total of 20 questions were summed.

- How much can you trust your spouse
- How much do you feel your wife makes too many demands on you
- How much does (s)he show concern for your feelings and problems
- How much would you say (s)he understands the way you feel about things

- How much does your husband insist on having his own way?
- How much does your spouse expect more from you than he/she is willing to give?
- How much do you avoid talking about certain things because of how (s)he might react
- How much does your spouse act as if he/she is the only important person in the family?
- How much can you depend on your spouse to be there when you need her/him
- How much does your spouse make you feel tense while you are around him/her

Job Satisfaction (a=.7816)

This scale was developed for this analysis. It comprises 11 questions asked of the husband which attempts to discover how happy he is with his job as a farm operator.

- How satisfied are you with farming as a way to make a living
- If you had to opportunity, how likely is it that you would leave farming to pursue another line of work
- How happy are you with this job
- Would you agree that this job involves the kind of work that matches your education and your experience
- Would you agree that this job allows you to use your skills and abilities
- Would you agree that this job involves the kind of work that you like to do
- I have skills from training or experience that I would like to use but can't in this job
- I am overqualified for the work that I do
- A person with my experience or training should be in a different job
- Sometimes I wonder whether my education and experience could be put to better use in another job
- How satisfied are you with farming as a way of life

Self-esteem (a=.8841)

A score of self-image as determined by Rosenberg (1965). Two additional questions are added which did improve the statistical alpha score for this sample.

- I feel that I'm a person of worth, at least on an equal level with others
- I feel that I have a number of good qualities
- All in all I am inclined to feel that I'm a failure

- I do things as well as most people
- I feel I do not have much to be proud of
- I take a positive attitude toward myself
- I am satisfied with myself
- I certainly feel useless at times
- I wish I could have more respect for myself
- At times I think I am no good at all
- Sometimes I feel completely worthless
- I often feel inferior to others

Mastery (a=.7767)

Scale adapted from Pearlin et al. (1981) which gives an idea of one's feeling of power or control over the environment such that one's actions can affect the future. A person who does not believe fate controls his actions.

- There is really no way I can solve some of the problems I have
- Sometimes I feel that I'm being pushed around in life
- I have little control over the things that happen to me
- I can do just about anything I really set my mind to
- I often feel helpless in dealing with the problems of life
- What happens to me in the future depends mostly on me
- There is little I can do to change many of the important things in my life

Coping (a=.7852)

Scale called vulnerability is used as the opposite of coping to determine if an individual can make good decisions under pressure.

- I feel capable of coping with problems
- I often feel helpless and want someone else to solve my problems
- I keep cool in emergencies
- When I'm under a great deal of stress, sometimes I feel like I'm going to pieces
- I can handle myself well in a crisis
- It's often hard for me to make up my mind
- When everything goes wrong, I can still make good decisions
- I'm pretty stable emotionally
- Too often, when things go wrong, I get discouraged and feel like giving up

Organization (a=.8167)

Under the scale called conscientiousness. A measure of organization since it attempts to get at qualities of systematic or methodical behavior.

- I keep my belongings neat and clean
- I'm pretty good about pacing myself so as to get things done on time
- I try to perform all the tasks asssigned to me conscientiously
- I have a clear set of goals and work toward them in an orderly fashion
- I work hard to accomplish my goals
- I am not a very methodical person
- I don't like to waste my time daydreaming
- I waste alot of time before settling down to work
- Sometimes, I'm not as dependable or reliable as I should be
- When I make a committment, I can always be counted on to follow through
- I never seem to be able to get organized
- I am productive and get the job done
- I strive for excellence in everything I do

Profit-seeking (a=.7224)

My scale which incorporates questions from scales on conventional values, self-servingness, and money devaluation.

- Financial success does not interest me
- Is it important to own your own home
- Is it important to have a great deal of money
- Is it important to have a good paying job
- To what extent do you accept the goal to have economic prosperity, being financially well-off
- To what extent do you accept the goal to be wealthy, extremely well-off, rich

Control (a=.6610)

Using the Mirowsky and Ross (1989) control scale to give a sense of resigning one's self to fate/luck or taking control of fate.

- I am responsible for my own successes
- My misfortunes are the result of mistakes I have made
- I am responsible for my failures
- Most of my problems are due to bad breaks

- I have little control over the (bad) things that happen to me
- The really good things that happen to me are mostly luck
- There is no sense planning a lot. If something good is going to happen, it will

Problem-solving Ability (a=.9332)

Scale incorporating both "effective" and "destructive" problem-solving skills as constructed by Rand Conger for the Iowa Youth Project.

- How often does your husband listen to your ideas on solving problems
- How often does he just seem to get angry
- How often does your husband have good ideas about how to solve the problem
- How often does he agree with you about how to solve the problem
- How often does he criticize you or your ideas for solving the problem
- How often does he ignore the problem
- How often does he show a real interest in helping solve the problem
- How often does he consider your ideas to solve the problem
- How often does he have poor ideas to solve the problem
- How often does he seem uninterested in helping solve problems
- How often does he refuse, even after discussion, to work out a solution
- How often does he blame others for the problem
- How often does he insist that you agree to his solution
- How often does he compromise or change his point-of-view to help solve the problem

Open-mindedness (a=.4004)

My own scale incorporating questions from scales on agreeableness, and values.

- I believe that laws and social policies should change to reflect the needs of a changing world
- Once I find the right way to do something, I stick to it
- I believe that the different ideas of right and wrong that people in other societies have may be valid for them
- I often try new and foreign foods

- I believe that loyalty to one's ideals and principles is more important than open-mindedness
- I consider myself broad-minded and tolerant of other people's lifestyles
- I'm hard-headed and tough-minded in my attitudes
- I think that if people don't know what they believe in by the time they're 25, there's something wrong with them

Health

- How much do health problems keep you from doing the activities most people routinely do?

APPENDIX 2. CORRELATION ANALYSIS

	Farm assets	Home assets	Acres operated	Husband Age	Husband Education
Farm assets	1.00				
Home assets	0.04	1.00			
Acres operated	0.68***	0.07	1.00		
Husband Age	0.37***	0.27***	0.22**	1.00	
Husband Education	0.07	0.31***	-0.00	0.04	1.00
Wife Education	0.21**	0.10	0.16*	0.12	0.46***
Household Size	-0.07	-0.15*	-0.07	-0.09	-0.16*
Grew Up on Farm	-0.07	0.01	-0.01	-0.04	-0.03
Health	-0.01	-0.13	-0.01	0.04	0.04
Farm Labor	0.26***	-0.21**	0.36***	0.06	-0.03
Off-farm Labor	-0.34***	0.14	-0.45***	-0.20**	0.03
Leisure	0.16*	0.06	0.19**	0.21**	0.02
Self-esteem	0.11	0.16*	0.15*	-0.02	0.07
Mastery	0.10	0.31***	0.19**	-0.00	0.02
Coping	0.13	0.26***	0.06	0.03	0.14
Organize	-0.02	0.14	0.11	-0.11	0.08
Profit	0.16*	0.13	0.13	0.12	0.02
Control	0.20**	0.11	0.12	0.02	0.23**
Husband Problem	0.07	0.04	0.16*	0.01	0.12
Wife Organize	-0.04	0.14	-0.03	-0.01	-0.05
Wife Problem	0.01	0.14	0.14	-0.15*	0.13
Gross Sales	0.79***	-0.07	0.76***	0.09	0.01

* denotes significant at the 10% level
** denotes significant at the 5% level
*** denotes significant at the 1% level

	Wife Education	Household Size	Grew-up on farm	Health	Farm Labor
Farm assets					
Home assets					
Acres operated					
Husband Age					
Husband Education					
Wife Education	1.00				
Household Size	-0.09	1.00			
Grew Up on Farm	0.04	-0.01	1.00		
Health	0.07	0.11	-0.02	1.00	
Farm Labor	0.10	0.03	0.01	0.05	1.00
Off-farm Labor	-0.04	-0.12	0.02	-0.03	-0.66***
Leisure	-0.04	0.12	-0.04	-0.03	-0.22**
Self-esteem	0.03	0.08	-0.05	-0.12	-0.05
Mastery	0.07	0.08	0.00	-0.17*	-0.04
Coping	0.07	0.03	-0.03	-0.16*	-0.20**
Organize	-0.06	0.02	-0.00	0.00	-0.01
Profit	0.02	-0.01	-0.03	0.05	-0.09
Control	0.15	-0.06	0.01	0.01	-0.03
Husband Problem	0.02	0.04	0.01	-0.10	0.04
Wife Organize	0.17*	-0.30***	0.09	0.00	-0.02
Wife Problem	0.08	0.15*	0.02	-0.12	0.01
Gross Sales	0.18**	0.04	0.05	-0.02	0.42***

	Off-farm Labor	Leisure	Self-esteem	Mastery	Coping
Farm assets					
Home assets					
Acres operated					
Husband Age					
Husband Education					
Wife Education					
Household Size					
Grew Up on Farm					
Health					
Farm Labor					
Off-farm Labor	1.00				
Leisure	-0.59***	1.00			
Self-esteem	-0.07	0.03	1.00		
Mastery	0.02	0.02	0.61***	1.00	
Coping	0.03	0.17*	0.67***	0.44***	1.00
Organize	0.02	-0.03	0.46***	0.32***	0.38***
Profit	0.05	0.03	0.05	0.15*	0.15*
Control	0.01	0.04	0.35***	0.41***	0.27***
Husband Problem	-0.11	0.10	0.23***	0.09	-0.03
Wife Organize	0.23***	-0.29***	0.08	0.15*	0.02
Wife Problem	-0.00	-0.02	0.16*	0.22**	0.07
Gross Sales	-0.51***	0.22**	0.14	0.12	0.11

	Organize	Profit	Control	Husband Problem
Farm assets				
Home assets				
Acres operated				
Husband Age				
Husband Education				
Wife Education				
Household Size				
Grew Up on Farm				
Health				
Farm Labor				
Off-farm Labor				
Leisure				
Self-esteem				
Mastery				
Coping				
Organize	1.00			
Profit	0.30***	1.00		
Control	0.09	-0.04	1.00	
Husband Problem	0.18**	-0.12	0.05	1.00
Wife Organize	0.22**	0.23***	-0.01	0.22**
Wife Problem	0.08	0.04	0.12	0.31***
Gross Sales	0.11	0.13	0.14	0.12

	Wife Organize	Wife Problem	Gross Sales
Farm assets			
Home assets			
Acres operated			
Husband Age			
Husband Education			
Wife Education			
Household Size			
Grew Up on Farm			
Health			
Farm Labor			
Off-farm Labor			
Leisure			
Self-esteem			
Mastery			
Coping			
Organize			
Profit			
Control			
Husband Problem			
Wife Organize	1.00		
Wife Problem	0.09	1.00	
Gross Sales	-0.03	0.11	1.00