A DISCRIMINANT ANALYSIS OF BENEFITS

FARMERS RECEIVE FROM FARMING

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ABSTRACT

In farm decision making model development, it is important to have
insight into benefits farmers perceive they receive from farming. These
perceptions ultimately affect decisions that are made. In this study,
farmers' relative importance of benefit values are tested through use of
discriminant analysis to see if the response values are effective in cate-
gorizing farmers.

Discriminant analysis indicated that respondents placed similar
values on many of the benefit factors. It appears that "threshold"
security levels vary between farmers as "sense of security" was a strong
discriminating variable while "increasing security" did not discriminate.
Effective categorization of farmers using such factors as debt load, pro-
fitability measures, acres, tenancy, age, and their benefit response
values was not achieved. This could mean that one decision making model
with a rather simplified structure would serve the needs of many farmers.
This study also indicated that farmers cherish the ability to make their
own decisions. To be effective, agricultural policies must leave decision
making power vested in farmers hands.

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Introduction

Much firm level decision making research by agricultural economists has assumed goals of either profit maximization or cost minimization. These approaches have been with us for some time. As early as the 1930's, farm management research was characterized as aiding farm managers in maximizing the difference between the stream of inputs or costs and the stream of outputs or returns [11]. For many firm level decisions maximizing profit is an important force, but not the only force influencing decision directions.

One of the initial efforts to study the decision making processes of farmers was conducted in the late 1950's on midwestern farmers [6]. More recent studies have also focused on the influence of farmers' goals and objectives in the decision making process [2, 4, 13]. Utility analysis has been another approach used in evaluating farm decision tradeoffs. Lin, Dean, and Moore and Officer and Anderson concluded that utility function models approximate actual behavior better than do profit maximization models but that both models predicted more risky behavior than that which was observed [7].

Recently, theoretical effects of risk and uncertainty on static competitive theory of the firm has received much attention [1, 10, 12]. The basic comparison measure in these studies was profit and/or production and associated uncertainties. Although these approaches present a needed improvement in static theory of the firm, they assume that decision makers are primarily influenced by profit and/or profit variability.

The widespread acceptance of the assumption that farm decisions are made solely on the basis of maximizing economic benefits underscores the limited research relative to the non-economic needs as motivators of decision making. Researchers have devoted much attention to understanding multiple goals and their relationship to the functioning of complex organizations which are represented by large industrial type agricultural structures, but little attention has focused on the multiple goals family farmers are attempting to fulfill. Interest by rural sociologists in the area of decision making has primarily focused on the adoption of new technology and ideas. In their effort to understand farmers' decision making processes they, like economists, have placed most interest on understanding adoption in relation to the goal. Farmers who fail to adopt a new innovation which would increase their income were perceived to be irrational. However, decisions to adopt an innovation could also involve fulfillment of non-economic needs.

Behavioral theory of the firm research is based on the presumption that humans have multiple goals and will seek a satisfactory decision set rather than an optimal set [3, 14]. The decision is the most satisfying given the decision makers goals, information available, management capabilities and alternatives available. These satisfying decisions may be very similar to or quite different from the set that generates the economic optimum.

Several decades ago a psychologist, A. H. Maslow, in a book entitled Motivation and Personality suggested that man seeks to fulfill five needs-- physical, security, social, recognition and self-actualization [8]. Maslow also suggested a hierarchy of importance with the physical and security

needs being the most important followed by social, recognition and self-actualization.

The Maslow scheme is most useful when discussing the family farm structure as opposed to larger non-family structures. Conceptually the farmer's personal needs can be separated from the needs of the farm firm. However, farmers' personal needs or goals undoubtedly influence farm firm decisions. In a complex organization, individual goals interact and are instrumental in shaping the operational goals of the collectivity. However, this is quite different from the family farm in which only one person's or family's goals are instrumental.

STUDY PURPOSE AND PROCEDURE

The purpose of this study was to develop measures of benefits farmers perceive they receive from farming and to determine relationships between the relative importance of these benefits and selected managerial decisions and farm characteristics.

To gain insight into factors influencing the farmers decision making process, twenty-nine cash grain farmers were surveyed via telephone. A cash grain farmer was defined as one receiving 50 percent or more of his/her farm income from cash grain sales over the years 1973-1977 inclusive. Farmers selected were Missouri Mail-In-Record (MIR) cooperators. The interviews were conducted by the director of the MIR Program.

Farmer respondents were asked to place values on a pre-selected list of benefits they receive from farming. Unfortunately a low value does not allow definite determination of whether the respondent perceived the farm as contributing little to the benefit or that the respondent just did not value the benefit highly. However, this is not a major problem for our

present concern as past perceived benefits typically become future goal expectation guides. Therefore, measures of both the perceived importance of the goal and how much the farm might assist the respondent in achieving the goal would be helpful.

The survey procedure allows respondents' value systems to be analyzed in terms of what is important to them. Values as opposed to attitudes tend to be much more enduring. Both attitudes and values, however, pose problems for decision making research since farmers' behavior is the result of their values and attitudes plus the impact of other social, economic and psychological factors--all interacting at a given time under a given set of conditions. The optimum method would determine which are the most important factors impending on the individual during the time period a decision is to be made as well as the importance of those factors with respect to a particular type of decision. It is realized that determining the importance of farmers' perceived benefits as a proxy for goals the farmer hopes to achieve from farming will not explain all behavior. Nevertheless, the proposition is that over a long time span such a measure will be highly related to some managerial decisons.

One measure of the benefits farmers receive from farming was developed by attempting to operationalize Maslow's need hierarchy. Respondents were asked to distribute 100 points among the five items listed in Table 1. The distribution would then reflect each item's perceived contribution to the importance of benefits received from farming.

A second measure of multiple benefits farmers receive from farming was developed from literature focusing on sociology of work and ararian ideology as it relates to economic and non-economic benefits from jobs [5, 6, 9].

With this measure the respondent was asked to assign a value to each of 10 items reflecting how each compared in importance to the base item "provides opportunity to be my own boss". The base item was assigned 100 points. Data in Table 2 lists the items and the mean values assigned to each item.

Discriminant analysis was utilized to test if the farmers' responses could be used to classify them according to selected characteristics. If it can be concluded that response values for selected groups were significantly different, then decision making models should be structured to account for those differences. If response values are not significantly different, then one modeling approach would be sufficient for all decision makers irrespective of the grouping. Discriminant analysis was completed using grouping classifications (farm firm comparisons) such as level of fixed assets; average acres of cropland; percent growth in total assets; mean percent return to capital and management; percent fixed assets to total assets; changes in crop technology; total acres owned; total acres rented; and total acres in operation.

RESULTS

Data in Tables 1 and 2 indicate the relative perceived importance (total samples' mean values) of the selected benefits to the respondents. Both measures suggest that the opportunity to make decisions, indicated by three benefits--be my own boss, enjoy selling through the free market system and perhaps allows me to express myself, was perceived to be quite important. Both sets of benefits were also consistent in suggesting that income and security received about equal weight and were about twice as important as the social and recognition items.

Discriminant analysis is used to test whether the relative importance

of benefit measures may be utilized to categorize farmers. In Tables 3 and 4 categories are listed from the smallest to the largest for each discriminant variable. For example, when categorizing farms by the "fixed assets in 1977" category "C_1", represents those nine farms with the lowest level of fixed assets in 1977. Values in the "% of category correctly specified" column respresent the percent of farms correctly categorized into the pre-selected groups. For example, using "fixed assets in 1977", 41.4% of all farms were correctly categorized. Category 1 had 33.3%, category 2 had 50%, and category 3 had 40% correctly categorized. Discriminant variables are listed in their order of inclusion by a stepwise procedure which selects those variables best classifying farmers into particular groups. When "no discriminating variables" appears it indicates that the response values for the benefits received from farming are not sufficiently different between groups to enable categorization of respondents. For example, farmers with a high mean percent return to capital and management assigned the same values to the benefits received as those with a low percent return to capital and management (Table 3).

Receiving recognition was the item appearing most frequently in discriminant analyses using the list of five benefits (Table 3). Receiving recognition as being successful (X_{20}) was a discriminating variable for most categorizations involving assets and land. It was a discriminating variable for categories involving average acres of cropland; % growth in total assets; % fixed assets to total assets 1977; % total acres rented; and total acres in operation. Increasing income (X_{18}) was the second most frequently appearing discriminating variable in this set. It was especially important whenever farms were categorized using asset calculations such as

TABLE 1:   ITEMS, VARIABLE NUMBER, MEAN VALUES AND RANK ORDER FOR FIVE

ITEM MEASURE OF BENEFITS RECEIVED FROM FARMING

Item	Value	Rank Order
Be Own Boss X_{16}	37.2	1
Increase Security X_{17}	21.2	2-3
Increase Income X_{18}	21.2	2-3
Develop Friendships X_{19}	10.9	4
Receive Recognition X_{20}	9.5	5

TABLE 2:   ITEMS, VARIABLE NUMBERS, MEAN VALUES AND RANK ORDER FOR THE

ELEVEN ITEM MEASURE OF BENEFITS RECEIVED FROM FARMING

Item	Value	Rank Order
Doing Something Worthwhile X_{21}	118.7	1
Be Own Boss (Base Issue)	100.0	2
Provides Good Income X_{22}	97.7	3
Selling Through Free Market X_{23}	95.7	4
Sense of Security X_{24}	93.5	5
Work Outdoors X_{25}	92.5	6
Can Express Myself X_{26}	86.5	7
Meet Fellow Grain Producers X_{27}	59.0	8
Family Tradition X_{28}	51.2	9
Receive Recognition X_{29}	48.8	10
Identified as Grain Producer X_{30}	43.2	11

TABLE 3: DISCRIMINANT ANALYSIS FOR THE FIVE FACTOR BENEFITS RECEIVED FROM FARMING

# In Category			Factor	Discriminant Variables	% of Category Correctly Specified			
C_1	C_2	C_3			C_1	C_2	C_3	Total
9	10	10	Fixed Assets 1977	X_{18}	33.3	50	40	41.40
9	10	10	Average Acres Cropland	X_{20}	66.7	30	40	40.20
9	10	10	% Growth in Total Assets	X_{20}, X_{18}	77.8	50	22.2	62.07
9	10	10	Mean % Return to Capitol Management	No Discriminating Variables				
9	12	8	% Fixed Assets to Total Assets 1977	X_{18}, X_{20}	66.7	41.7	50	51.70
9	10	10	Total Acres Owned	No Discriminating Variables				
9	12	8	% Total Acres Rented	X_{20}	22	66.7	37.5	44.80
9	10	10	Total Acres in Operation	X_{20}	22	60	50	64.80
19[a]	10	---	Crop Technology	X_{16}, X_{18}	50	80	---	60.00
10[b]	9	---	Why Changed Technology	X_{19}	90	27.3	---	57.00

[a] Category C_1 represents those that changed technology and C_2 those that did not change.

[b] Category C_1 represents those that changed technology to reduce risk and C_2 those that did so to increase income.

fixed assets 1977; % growth in total assets; and % fixed assets to total assets as well as for changes in crop technology.

Increase security (X_{17}), was never a discriminating variable which leads to the conclusion that values assigned to increase in security were equivalent for all respondents. Because attitudes toward an increase in security are shown to be equivalent and important, one increase in security model may serve the needs of most cash grain farmers. Similarly, be your own boss (X_{16}) was a discriminating variable for only one factor--that of differentiating between those that changed and didn't change tillage technology. Developing friendships (X_{19}) entered as a discriminating variable only when analyzing why farmers changed tillage technology. In model development, a single specification of these variables would appear to be adequate as respondents place similar values on the benefits.

As expected, the ten benefits from farming analysis provided better discriminant analysis classifications. Two variables, allows me to express myself (X_{26}) and gives me a sense of security (X_{24}) were important discriminating variables (Table 4). Although increase in security, from the set of five benefits received from farming, was not a discriminating variable, a sense of security from this set was quite important as a discriminating variable. Cash grain farmers therefore, had little variation in values they gave to increasing security, yet differed on the values they assigned to a sense of security. There appears to be some threshold security level that the cash grain farmers perceived. Decision making models appear to need threshold security levels that can be varied between producers.

Other variables that entered the ten variable discriminant analysis quite often were like to be identified as a grain producer (X_{30}), provides

TABLE 4: DISCRIMINANT ANALYSIS FOR TEN FACTOR BENEFITS RECEIVED FROM FARMING

# In Category			Factors	Discriminant Variables	Percent of of Group Correctly Specified			
C_1	C_2	C_3			C_1	C_2	C_3	Total
9	10	10	Fixed Assets 1977	$X_{27}, X_{24}, Y_{29}, X_{23}, X_{30}, X_{26}, X_{22}$	78	30	70	58.60
9	10	10	Average Acres Cropland	No Discriminating Variables	0	0	0	0
9	10	10	% Growth in Total Assets	$X_{21}, X_{24}, X_{22}, X_{26}, X_{27}, X_{30}, X_{25}$	88.9	81.8	77.8	82.80
10	11	8	Mean % Return to Capital and Management	X_{22}, X_{26}, X_{24}	50.0	72.7	75	65.50
9	12	8	% Fixed Assets to Total Assets 1977	$X_{27}, X_{24}, X_{30}, X_{23}, X_{29}, X_{26}$	88.9	75	50	72.40
9	10	10	Total Acres Owned	$X_{27}, X_{30}, X_{24}, X_{29}, X_{23}, X_{22}, X_{26}, X_{28}$	66.7	90	60	72.40
9	12	8	% Total Acres Rented	$X_{30}, X_{24}, X_{21}, X_{26}, X_{22}$	66.7	58.3	75	65.50
9	12	8	Total Acres in Operation	$X_{26}, X_{24}, X_{29}, X_{21}$	44.4	80	70	65.50
19[a]	10	-	Crop Technology	X_{30}, X_{28}	80.0	100	---	86.60
10[b]	9	-	Why Changed Technology	X_{23}, X_{24}	60.0	81.8	---	71.40

[a] Category C_1 represents those that changed technology and C_2 those that didn't change.

[b] Category C_1 represents those that changed to reduce risk and C_2 those that did so to increase income.

good income (X_{22}), and the opportunity to meet fellow grain producers (X_{27}).

SUMMARY AND CONCLUSIONS

In model development for managerial decision making, it is important to have insights into benefits farmers perceive they receive from farming. These benefits affect decisions farmers make. These perceived benefits, while they effect decisions, are not necessarily common to all farmers. This paper evaluated some of those benefits and their differences.

Farmers have a strong feeling toward being their own boss and doing something worthwhile. They have a high regard for that feeling of accomplishment. Economic considerations of security, income and the free market are also important.

To be effective government programs must keep decision making power vested in farmers' hands. If not, they will most likely decide against the program. However, this conclusion is not that clear cut. Security and free markets are also important, especially for the younger producers. Government programs may increase security while simultaneously divesting some of the decision making freedom. For example, acres of a respective crop may be limited if price support payments are to be received.

Individuals working closely with farmers must realize the benefits farmers receive from being their own boss, and doing something worthwhile. Consultants and extension people alike can aid in the decision process by gathering data, discussing ideas, etc., but farmers want the feeling of being their own boss. Successful consultants will need to be skillful in advising farmers while not extracting decision making power.

Discriminant analysis indicated that cash grain farmers have similar values for three benefits; being their own boss, increasing security, and developing friendships. These variables were important and should be included in a model aimed at decision making. However, the modeling procedure would need only one approach for each variable.

Comparing results of the five benefit and ten benefit response values shows that "sense of security" was a strong discriminating variable. It appears that threshold security levels vary between cash grain farmers. Farmers place similar values on increasing security above those threshold security levels and therefore similar modeling techniques are in order for increasing income beyond those levels.

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