ABSTRACT: Farm management is the art or applied science of organizing and operating a farm firm in a manner that satisfies the goals and objectives of the principles involved. Budgets, linear programming, farm record analysis, game models, and conventional economic models do not provide prescriptive answers, but have been used to enhance management by helping predict the probable outcome of alternative actions by showing the range of possible outcomes from which management can make a choice.

The agricultural industry in the United States, and particularly Corn Belt agriculture, operates in a dynamic environment and is characterized by a rapid rate of change. New technologies are constantly being developed for potential application in agricultural production.

Constantly changing price relationships among products and resource inputs provide the manager with management challenges, including the opportunity to adopt new technology and make changes in production processes. These management challenges are not easily solved, nor are the answers to many of the management questions easily predictable.

A general definition of farm management is given by Suter: "Management is the skillful or judicious use of certain means in order to bring about or accomplish a certain end or ends." (14)

A more detailed and specific definition of farm management is: "Farm management may be thought of as the art or applied science of organizing and operating the farm firm in a manner that satisfies the goals and objectives of the principals involved. To accomplish this objective, management uses the tools provided by production economics tempered by social, psychological, and political forces. In addition, management adapts accounting and business management concepts in the decision-making process."

"The variables involved are production processes (choice of product, level of production, and technology) and prices for the production inputs and the products produced. When you tie this entire set of conditions and variables into a dynamic state with its concurrent risks and uncertainty, you have the basic elements of farm management." (8)

Management (1) perceives problems; (2) gathers information related to them; (3) analyzes the alternative courses of action; (4) makes decisions; (5) implements and carries out the decision; and (6) is prepared to accept the consequences and, as a learning procedure, reviews the results previously attained. The preceding steps in management decision making were first articulated by Bradford and Johnson (1) and include the conventional role of supervisor and coordinator.

Closely related to management is the concept of entrepreneurship, which contains elements of uncertainty and risk bearing. In any production process, and specifically in agriculture with its measure of biological risk and climatic uncertainty, the risk and uncertainty-bearing function is important. The combined management-entrepreneurship concept in agriculture includes the responsibility of gaining control of land, capital, and labor resources and using them to achieve certain goals and objectives, one of which is profit maximization.

Entrepreneurship may be conceived of as that part of management which gains control of resources, accepts the risks and uncertainty associated with the commitment of these resources to a production process, and receives part or all of profits as its rewards. Madden suggest that the usual notion of management profits or management returns may be divided into management wages and entrepreneurial income. (7)

The residual claimant approach to income determination used by accountants contains the usual deductions of market prices for resources and opportunity costs for the labor input of the manager, leaving a surplus that is often called operator's management income. This amount is a return to the operator for his services of coordinating and supervising and for bearing the risks and uncertainties of the business.

Entrepreneurial income may be defined as the operator's management income minus the opportunity cost for the operator's management including supervision and coordination. This idea implies that there is a market price for management and that the surplus, if any, is analogous to pure profit as defined by Knight. Where there is uncertainty (lack of perfect knowledge of future outcomes) in the business enterprise, the entrepreneurship income or profits must be positive, at least over the long run, for the firm to continue to operate.

For decades, agricultural economists have deplored the lack of a cardinal measure of management. They have struggled with the definition and interpretation of the management function. Behavioral con-
cepts, satisficing, and non-economic rewards or value judgments have been used as ways of further identifying and specifying the concept of management and entrepreneurship. All of these concepts and ideas are useful and germane to a discussion of management—a concept that is difficult to define and measure, is unpredictable in performance, and, in some instances, may not be reproducible.

Nevertheless experience in teaching farm management principles to college students and farmers through the University of Illinois Cooperative Extension Service programs in farm business management and farm record analysis has clearly demonstrated that an individual's management skills can be developed and improved. There are many tools that have been used to enhance management, such as: budgets, linear programming, farm record analysis, game models, and conventional economic models. These may be used to help predict the probable outcome of alternative actions. These models do not necessarily give the precise action to be taken, but they can show the range of possible outcomes from which management can make a choice.

Production Economics and Management

Production economics, as a specialization within the field of agricultural economics, had its beginning at the beginning of the Twentieth Century. The early work by Spillman, Hayes, Boss, and Warren marked the first formal use of economic principles by research and extension workers to analyze the problems of managing individual farms. These early workers were trained in the fields of natural sciences, but applied the concepts of economics in their work with farm management.

The Marshallian theory of the firm followed later in the early part of the Twentieth Century, and was influential in the development of budgeting work and farm record analysis in farm management during the 1920's and 1930's.

A landmark publication, Hicks' "Value and Capital" (4) appeared in England before World War II, but its impact was not really felt until after the war. The explicit technical relationships that are a part of the theory of the firm were brought out clearly by Hicks. Following Hicks, the work of Earl Heady at Iowa made significant contributions in extending and refining production economic theory for application to farm management problems.

Williams in a recent article relates the problems associated with integrating production economics, farm management, and the application of production economics and farm management to extension educational programs in farm management:

"Production economics, if it has a standing as a discipline, is comprised of principles and concepts that provide for interpretations of the economic relationships existing among resources used in individual firms. Once defined, these principles and concepts should find universal application; if they fail to do so, production economics loses claim to status as a separate discipline. Thus, it would appear that production economics so far has not formalized a set of principles that takes account of differences in motives, behavior, and institutions between different countries or different regions within countries." (15)

Williams then relates farm management to production economics as follows:

"Farm management, by contrast, is an applied discipline that finds its identity in relation to the whole set of established social institutions and to the structure of farming in a given country. It is designed to develop principles that provide understanding of agricultural practice and managerial performance, as an aid to individual farm enterprises, and as a basis for agricultural policy. It links the discipline of production economics and agricultural extension, though it does other things as well." (15)

Williams gives due credit to Earl Heady and Glenn Johnson for their work in developing production economics as an internally consistent logic that defines the systems and conditions for optimum economic use of resources.

However, Williams argues that Heady's contribution to production economics contains the seeds of its own destruction because it abstracts from problems of human behavior and institutions and concentrates on resource inputs and the resultant production function. There is a need for management work to rise above and beyond the constraints exercised by this discipline if management problems in the real world are to be tackled.

Williams does not deny that the information provided by production economics is helpful to farmers. Neither does he deny the importance of the analytical framework which embraces marginal returns, opportunity costs, rates of substitution between inputs and between outputs, etc. But he does expect those persons working in management to be required to interpret these principles to meet the circumstances of farmers as individuals or as groups.

The preceding views articulated by Williams are in concert with the development of farm management work in Illinois during the past 20 years. Production economics provides a valuable tool in helping make management decisions. Economic principles, particularly production economics, are extensively used as a tool to help identify meaningful problems and to identify the important relationships contained in the problem. By use of the economist's favorite ruse, the choice of assumptions, the problem is broken down into manageable proportions so that the decision maker can look at a complex problem in bits and pieces.

Production economics does not provide a prescriptive answer; it simply is the analytical tool that we bring to bear on problems to gain further insight into the possible consequences of alternative actions open to the manager. It is this framework that makes production economics a useful subset of the disciplines which are involved in the practice of farm management as an art and a science.
Behavioral Theories of the Firm

The behavioral theory of the firm, as it is related to management concepts, assumes that the basis of human behavior is the satisficing concept developed by Herbert A. Simon. (13) Cyert and March (2) construct their behavioral theory around the notion that the firm is the basic unit, and that the prediction of firm behavior with respect to such decisions as price, output, and resource allocation is the objective. They place explicit emphasis on the actual process of organizational decision making as a basic focus of their endeavors.

The behavioral theory uses the same basic firm unit that is used in production economics, and it also looks at the choice of resources, choice of product, and the quantity of output as does production economic theory.

However, they differ in the basic assumption of rational profit maximization that is inherent in production economics. Rather they substitute the notion of satisficing as the goal or objective of the decision maker. That is, the decision maker will seek satisfactory rather than optimal income solutions to his decision-making problems.

The concept of satisficing has inherent in it the notion of utility and indifference curves derived from consumption theory. The behavioral theory of the household (consumption economics) can be related to the behavioral theory of the firm. Ferber cites three factors or behavioral considerations that would likely effect the objectives of consumers (3). They are: (1) the frequent desire of the consumer to conform in his consumption pattern with those with whom he comes in contact; (2) the forces of habits, customs, and tradition; and (3) the ever-growing desire for security, including both financial and psychological security.

It is not difficult to relate each of these three consumer behavioral concepts to the actions of farmers. The desire to conform may be an important factor that influences decision-makers to adopt a new technology. For example, the innovator, early adopter, and late adopter classifications are frequently used to describe the dissemination of technology among farmers. Also, habits, customs, and traditions are strongly rooted in the actions taken by farm managers when making decisions on the choice of crop, the choice of technology, and many other decisions. The drive for security is related to the manager's attitude toward accepting risk and uncertainty.

Farm management was defined as the art or applied science of organizing and operating the farm firm in a manner that satisfies the goals and objectives of the principles involved. One might argue that if there were a discipline of management by itself, it would involve a blending of production economics, the behavioral concepts of consumer economics, and satisfying concepts from psychology.

Relationships of Financing and Accounting to Management

The traditional controlling mechanism in business firms is the accounting system which measures economic activity. In agriculture, the farm record system may be thought of as the controlling system. In the absence of uniform systems of farm records, the taxing regulations and reporting requirements specified by governmental institutions may serve as a proxy for well-defined accounting principles used in business firms.

Thus, management decision-making, although influenced by production economics and behavioral considerations, also must operate in a business and financial environment which has constraints and regulations modifying economic and behavioral concepts.

For example, the accounting methods used to price inputs or outputs may not coincide with the real world situation. Transfer prices for products produced on the farm, and subsequently used in the production process of another enterprise, are a typical example. This might be illustrated for forage or grain produced and subsequently fed on the same farm in the production of livestock.

How, for example, might a management decision maker evaluate contributions of the grain or forage-producing activity when all of the crop is marketed through livestock? The "transfer price" at which these forages and grains are charged to the livestock enterprise may affect decision processes in the choice of livestock and crop production techniques.

Another example may be the depreciation charges that are specified by tax accounting systems as opposed to the economic service life of the business investment. Others might be the tax shelters for capital assets supported by the accounting system and income tax regulations.

From a purely accounting point of view, increases in net worth of an individual can be achieved only by reinvesting the portion of profits, in excess of withdrawals for consumption purposes, back into the business.

Another form of change in net worth results from the unrealized gains from the appreciation in value of fixed assets in the balance sheet of the firm. In agriculture, land is a major fixed asset owned by agricultural firms. If the taxing system permits all or a part of the increases in net worth generated by appreciation in land prices to escape taxation, this may affect management decisions in the allocation of use of land.

The flow of funds or cash-flow concepts derived from accounting are also involved in a review of management perspectives. The flow of funds statement shows the sources and application of funds for internal use and funds withdrawn for consumption purposes and for investments outside the firm. It seems possible that the profit maximization theory, inherent in production economics, and some of the behavioral considerations, inherent in the behavioral theory of the firm, can be investigated by the use of the flow of funds concept in a historical or longitudinal study. For example, an empirical analysis of the direction of and reasons for shifts in the income and expenditure flows of the farm household complex might provide additional insights into the behavior of farm firms and households. (10)

The flow-of-funds concept also has useful applications as a planning device that could assist with produc-
tion planning by the firm and the implementation of these plans in the real world business environment. Conventional budgets do not substitute for projected flow of funds; rather they serve a complementary function. The projected profit and loss statement and projected balance sheet present the operating plans and goals of the business. The flow of funds statement embodies no production plans of its own, other than matching sources and uses of funds in the planning period.

In summary, production economics, behavioral theories of the firm, and financing and accounting relationships are inherently involved in a discussion of management perspectives. With a field of study as broad and involved as management, it is not surprising that it is researched by a wide range of investigators; yet no one has come up with a body of management science adequate in scope, yet internally consistent, to satisfy many unanswered questions concerning management and particularly its application to agriculture.

Research in the Management Factor

A brief review of some of the more significant studies of the management factor in the United States is appropriate at this point. F. J. Reiss undertook one of the early studies of management performance of farmers. (12) He had at his disposal a large number of Illinois farm records and attempted to relate measures of financial success from these records to characteristics of successful farmers. The implicit assumption was that performance would serve as a proxy measurement of managerial ability.

Reiss concluded that the financial measures from farm records were not a good proxy measurement of ability for three reasons: (1) they are measures after the fact and therefore require historical experience before any prediction can be done; (2) they reflect fortuitous circumstances as well as gains or losses outside the control of the manager; and (3) they measure residual outputs which are a function of the factor mix which, in the calculation of the residual income measures, were usually rewarded at market price or opportunity cost rather than at their marginal productivity. Similarly, quantity and proportion of factors used may be beyond the control of the individual farm managers.

In the decade of the 1950's, a regional project called the "Interstate Managerial Survey" (IMS) under the leadership of Glenn L. Johnson investigated, through an empirical study using farm surveys, the managerial processes of midwestern farmers. (5)

Nearly 10 years later, a second major Midwest regional project was activated and officially designated "The Identification and Measurement of Managerial Ability and Its Affect on Resource Use in Farming." Several universities contributed to this research work.

The justification for the study was stated as follows: "Efforts to measure the productivity of land, labor, and capital of farming regularly disclosed divergences between farms in income and efficiency that cannot be explained in terms of the quality and quantity of these resources. Therefore, interest has turned to studying the ability, performance, and goals of the person or persons responsible for decisions that serve to allocate the resources on the farm." (6)

A summary of the work of this research committee is published in "The Management Factor in Farming: An Evaluation and Summary of Research." (6) The researchers agreed that (1) a well-developed theory was not available for use in identification and measurement; and (2) such a theory could not be developed without aid from other behavioral disciplines namely, sociology and psychology.

In attempting to define the management factor in agriculture, the investigators were quickly confronted with the frustrating questions of (1) what are we measuring — management ability, management potential, or management performance (or all three?), and (2) what should we be measuring?

The cooperative research undertaken by this committee looked at many facets of management. Noteworthy of their accomplishments was the formulation of a model of management credited to James Nielson (Fig. 1).

It describes a manager as possessing a biography of past experiences, drives and motivations, and capabilities which produce managerial behavior or processes which in turn produce an outcome or managerial success. The model is completed by appropriate feedback from the outcomes or managerial success to reformulation and modification of drives, motivations, capabilities, and biography.

Managerial success is the function of managerial behavior which in turn is the function of a whole complex of activities including biography, motivation, and capability constraints of the individual.

This model is helpful in understanding the complex nature of the management process. However, it leaves us with a dichotomy. Should

![Diagram](image)

A model of the farm manager as designed and presented by Nielson. (11) (Fig. 1)
agricultural economists be studying and investigating the antecedents (biography, motivation, capabilities) or should they be looking at the managerial processes that are used in making the decisions? It is our view that both should be done.

If an action program is designed to improve the managerial capability of farmers in a short period of time, then extension and educational activities must concentrate on the latter and provide farmers with tools to aid in making managerial decisions and with improved procedures and processes for evaluating alternatives and arriving at choices.

Management Aids for Farmers

Farm record programs, as an extension teaching method and management aid, had their beginning in the United States at the turn of the 20th century. Farm record systems are familiar to agricultural economists and have been used for over 50 years ago. Although there is nothing unique or academically sophisticated about comparative analysis of records, it has stood the test of time and has been accepted by farmers. This alone is compelling evidence of its value as a management aid to farmers.

Forward planning and budgeting are also widely accepted. However, forward planning can mean many things. The planning applications for which record data can be used are many and varied in their scope and developments. Financial planning is one example. The business activities of the farm business can be reflected in a projected cash flow. Farmers and credit agencies find that this useful financial planning device can be readily predicted by using historical records as a starting base.

Budgets that evaluate alternative production plans or specify a profit-maximizing plan of action are best described as projected modifications of the profit-and-loss statement derived from accounting records. Budgeting methods, independent of a record system are also widely used as a management aid. The conventional partial budget, whole farm budget, break-even analysis, and many other budgets with varying titles are familiar to agricultural economists and have been for over 50 years and will not be explored here.

However, the application of computer technology to aid in budget applications is a recent development and deserves recognition, although it is not widely used by farmers. In principle, cost minimizing and profit-maximizing linear programming models are easily adapted to farming problems. Many reasons may be offered to explain the slow expansion of computer-assisted management planning. The biggest problem is related to problem specification. The individual farmer has unique problems that are not easily meshed with general programming models and the generalized data used in these models. The professional time and costs required to develop a model specific to individual problems have restricted the linear programming method to teaching demonstrations and "bench mark" solutions.

Preliminary work at the University of Illinois with generic linear programming models that are adapted by computer codes to be specific for individual use shows promise of overcoming the cost problem.

Lack of access to computer terminals is another handicap. Experimental efforts with the use of telephone terminals and time-sharing computers are under way for a wide range of computer budgeting problems and information retrieval applications. With a telephone in the farmer's office, he has access to a computer, which provides answers by voice response. His questions are limited to a small number of computer models that are on file in the computer. The main focus of this work is on communication with computers as a management aid, supplemented by specific computer budgets using generalized data coefficients.

Another computer-assisted technique is non-optimization budgeting, often called simulation, where the "what if" questions may be answered. Several universities have experimental programs using this technique. The method shows considerable potential, but the computer algorithms are costly to write and limited to generalized data coefficients.

One salient feature is present in the use of all of management aids, namely the role of a management consultant or farm management extension personnel to assist the farmer in the management steps of problem identification, selection of information (data) to use in the analysis, and interpretation of the budgeting results to the specific problem that is being analyzed.

If the services of the management consultant are not made available, the alternatives are: (1) to train the farmer decision-maker in the use of records, budgets, and computer methods (a formidable and lengthy task) or (2) at least in the immediate future, to forego the significant progress
that can be made by the application of management aids to improving management performance of our farm operators.

**Summary and Conclusions**

Management has many perspectives; its goals and objectives are strongly influenced by intra-personal characteristics. Management is expected to have a social conscience. Decisions made by managers are expected to satisfy a set of personal goals and objectives. At the same time, such decisions must achieve goals and objectives consistent with the goals of the economic system in which the individual farm firm operates.

Agricultural economists have a responsibility to interact with the decision-making processes on farms. To be most effective efforts should be concentrated on two areas. One is concerned with management education programs and the development of management aids for use by individual decision-makers. Extension education programs in farm management should provide effective programs in this area. The second area involves the development of national policies and programs that will provide the needed incentives so that actions of individual decision-makers will bring about the desired changes in the agricultural economy.

An understanding of the management decision processes, behavioral characteristics, and goals of farmers is a prerequisite for effective work in these two areas.

**References**


**RECENT AGRICULTURAL ECONOMICS PUBLICATIONS**

**Agricultural Economics Research Reports (AERR)**

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