

The Farm Information System: New Thoughts
on an Old Subject

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The farm record keeping system has always been an important tool for the farm manager. Its uses are many. It is a record of where the farm has been, what has been profitable in the past, and what the cash flow needs have been over previous production years. It also can provide information for forward planning when decisions are made about enterprise expansion, contraction, or simply which enterprises should be included in the current production year. In recent years there have been new advances in information communication systems, computerized data processing systems, and imaginative new computer assisted management decision aids which can enhance the farmer's records, making it a much more complete source of information for farm planning and control.

It has been suggested that we are on the verge of a business management revolution that will be as important to the future of agriculture as were the introduction of animal power and the subsequent shift to mechanical power and chemical techniques in their own times. The adoption of information processing technology may be speeded by the current structural change toward fewer and larger farms. Profit margins are narrowing. Modern farms make greater use of manufactured inputs, especially machinery and equipment. The result is a greater capital requirement per farm. Because much of this capital has been provided by increased use of debt financing, the vulnerability of the present day farmer to price and yield variability has been heightened. There are also a variety of new data sources now available for access by the farm manager at reasonable prices. The ability of the farmer to access, store and process this data for decision analyses can enhance the quality of decisions made. Additionally, more information is being

demanded by federal agencies such as the Internal Revenue Service and by lenders and other business contacts. A complete farm information system can lessen the cost of providing this information. The bottom line is that only those farmers who can control costs and productivity and who can quickly and accurately appraise marketing options will remain profitable. Information processing is likely to be key to this ability.

There are many reasons why this topic is extremely relevant for current discussion. Even though information management has long been an important activity of the successful manager, it is becoming more important in today's world. The technology to collect and analyze data is emerging quickly. Only in the decade of the 1970's was a computer technology economically feasible for real time collection and processing of data in small businesses. This development allows availability of much greater quantities of data to the manager, and the ability to analyze larger quantities of data with more sophisticated analytical procedures than ever before possible.

What is a Management Information System?

The concept of a management information system (MIS) is nothing new. Clearly, managers have always used information when making decisions. This information has varied greatly in the source of data and the method by which data have been processed into information useful in the decision process. Over time, as markets have become more important and as the production process has become more complex, larger amounts of information have been required to make the decision process more precise.

To pursue this further, let us consider the definitions of

information and data. Data are basic facts, not known with certainty, and frequently measured with a degree of imprecision. We observe many items of data on a daily basis as we read the newspaper or go about our farm activities. We may record many of these data items into our farm records. For instance, individual financial transactions or today's milk production for an individual cow are data.

On the other hand, information is data that has been processed so as to be meaningful to the manager. By processing data on milk production and feed consumption for all cows in the herd, information can be produced about the cost per one hundred pounds of milk produced or the herd average milk production over a period of time. Similarly, individual financial transactions can be summarized into cash flow and income statements or a balance sheet. These provide useful information for the farm manager, the farm lender, or others.

Information is truly an input in the production process. The degree of information available modifies the way in which all other inputs are combined in the production process given the decision maker's particular objectives. For instance, information about the likely weather patterns over the crop growing season may influence the choice of crop to be grown, choice of a long season or short season variety, or the fertilization, plant population, chemical treatment and other cultural practice best suited for the anticipated weather conditions. It is this interaction of information with the production and marketing activities of the business which gives value to information.

Because data must be collected, stored, retrieved and processed

into meaningful information in order to be useful to the manager, it also comes at a cost. We must also recognize that information has a definite, limited useful life. Weather information that cannot be considered prior to selecting and planting a crop enterprise has probably lost a sizable portion of its value.

The information needs for decision making lead to systems for data collection, storage and processing. These systems vary greatly in degree or formality, data sources, methods of analysis, and ways that information is used once processed. A system is a set of interrelated parts with a single purpose. A management information system involves a number of components or activities for the purpose of providing information to the management function. These activities include:

1. the collection of data
2. permanent storage of the data for recall later use
3. the processing of the data into useful information

The parts or components of this system may include both human or manual activities and computerized or automated activities. These activities may be coordinated by the farm manager, or by several individuals, including farm workers, accountants, consultants, or others.

There are several characteristics of information as needed in the farm decision making process. These include:

1. accuracy
2. completeness
3. relevancy
4. timeliness
5. conciseness

Accuracy refers to the correctness of the information. If data measured for feed consumption or milk production are not accurate, then information about cost of milk production or herd average milk production is not correct. Completeness refers to the inclusion of all information required in the decision analysis. For instance, correct calculation of cost of milk production can be made only if all sources of cost are measured and recognized in the calculation. Relevancy relates to the appropriateness of the information for a particular decision. Herd production statistics are useful items of information. However, such herd level measures may not be highly relevant for such decisions as individual cow culling or disease treatment. Timeliness reflects the fact that information must be available at the time a decision is to be made. Information that is not timely does not have great value. Finally, conciseness refers to the ability of the manager to find and retrieve the information when needed. If too much needless data are maintained, retrieval of the data may be difficult in that it is much like "finding a needle in a haystack".

To further explore the potentials that information system technologies hold for agriculture, let us systematically explore the functions of management, and itemize those areas for which high payoff exists for additional information. The management function can be divided into three processes:

- 1 Planning
- 2 Implementation
- 3 Control

Planning is an organizational function, involving long-run strategic decision making such as selection of the most appropriate

enterprises, production technologies, and method of resource control. When completing the planning function, the manager assembles and analyzes a large amount of data from a variety of sources. Data may arise from the firm's accounting records, from historic price series, technical coefficients from manufacturers or agricultural engineers, or from a variety of other sources. Because long term relationships are required, available data are likely to contain much uncertainty. Analysis procedures will need to incorporate sensitivity analyses to allow the manager to make judgements about the reliability of the projected outcomes of decision alternatives.

Implementation involves operational decision making, much of which may be short run in nature. Examples of decisions made may include dairy herd ration selection, breeding programs, sequencing of activities, and market plan implementation. Analyses of implementation decisions involves a mixture of long and short run considerations. Information concerning current resource restrictions may modify implementation of the long term plan. Data available in the farm record will be key in making decisions about implementation of enterprise expansion/contraction or building plans.

The Control process involves establishing standards of performance, comparison of these standards to actual performance, and in the event that actual performance is not up to standards, to recommend modification of the plan to improve performance. The control process, then, is a continuous activity, where both long run (planning) and short run (implementation) decisions are evaluated.

The farm information system must service all three processes of management. This calls for a diversity of data, processing techniques and control devices. Portions of the system must be formalized while other parts will remain informal. For instance, it is difficult to imagine a farm business that should not have a formalized record keeping/accounting module in the MIS. On the other hand, one source of long term price information could be consultation with "experts": The use of marketing consultants, informal discussions with extension specialists or information gleaned from farm magazines may fall into this category. This portion of the MIS is not highly formalized, and the information may not be highly quantified. However, it well may be a satisfactory source as a basis about which long term decision analysis can begin, and with sufficient sensitivity analysis, serve as a sound basis for those decisions.

The process of planning, implementation and control is a continuing process. The role of information in this process can be presented as a feedback cycle. In this cycle, data is gathered and processed into information useful for the planning function. Based on this information, decisions will be made which are expected to best meet the objectives of the manager. Once the decision is made, it must be implemented, a process that may take several days, months or even years. Once the decision is implemented, for instance a new milking facility is built, data will need be measured relative to the performance of the plan. If the performance is not judged to be adequate, then this data should be used to prescribe a modification of the plan.

What system is right for you?

To this point, we have recognized that information has value because it can allow better decisions to be made regarding the use of other farm production inputs. We also have recognized that information comes at a cost. This cost may involve a cash expenditure or it may simply be the time commitment of the manager or others in the business. When choosing an information system that is best for the farm, these costs and benefits should be compared.

The concept of economic justifiability is useful when considering changes in the farm information system. A system is said to be justifiable if the value of the system, that is the increased quality of decisions made, time saved, and the like, is greater than the cost of creating and operating the system.

The cost of an information system typically include the ownership costs of the system components, the time commitments of operating the system and any costs of acquiring data from commercial sources. The ownership costs will include the annual cost of the system, interest cost of the investment, and maintenance costs. If these components are anticipated to last for several years, then it is the depreciated or annual costs which should be used in the analysis. As the system becomes more complex, it is likely that the time commitments for learning to use the system will increase. This is a cost and must be recognized as such. Finally, the annual costs of accountants, record association memberships, or data acquisition should be included.

There are a variety of information systems from which the farmer may choose. These will vary substantially in the degree to which

they are formalized and the degree to which they are automated. The choice from among these systems will depend largely upon the managers particular needs. These systems can be categorized into:

1. manual systems
2. professionally assisted manual systems
3. computer assisted systems

The manual system may be perfectly suitable for a wide variety of farmers. These systems can vary greatly in their complexity, ranging from a "shoe box" filled with financial and physical records to elaborate single or double entry accounting records for financial transactions and a well developed herd health and production record system. The key to the value of these systems is again the amount of information that the manager can derive from the system in a timely manner for decision analysis. The shoe box type system should be avoided. The reason is that the data usually cannot be summarized quickly and accurately typically is not well used by the manager for decision making. With little additional effort, this same data could be stored in a record book which has been organized to allow categorization of income and expense measures by enterprise and to facilitate calculation of important performance measures.

Some farmers may desire to move to a professionally assisted manual record system. This might involve the use of an accountant, membership in a farm record keeping association, or participation in a program such as a dairy herd improvement record system for physical production records. The benefits to such a system arise from increased accuracy and better summarization of information for future decision making. Although there will be costs arising from

enrollment in these systems, one must realize that there will likely be less time commitments by the manager.

The third category is the computer assisted record system. The computer in this case is simply a different media on which to store the records. One must be cautioned that computerization itself is not the desired end result. This step is useful only if it provides increased accuracy, completeness of data, or timeliness in the analysis process. One should be aware that there is a wide variety of computer record keeping programs available. Some of these are not well designed, and may in fact be inferior to a well design manual system. However, a well designed computerized record system does offer some major advantages to the manager. The chief advantage of a computerized system arises from the speed of the computer. Even though the manager should probably anticipate that the time commitment of record keeping will be just as large with the computer as with a manual system, the amount of time required to summarize data for decisions can be greatly reduced. A well designed computer record system should allow the manager to produce summary statistics such as cash flow statements or profitability analyses within minutes. This increased timeliness can have substantial value if a decision must be made quickly.

The computer may also be useful for a variety of decision analyses within the business. For example, computer software currently exists for such purposes as least cost ration calculation, cash flow budgeting, enterprise budgeting and the like. To the extent that these decisions can utilize data from the farm record system, substantial time and accuracy advantages can be realized. Also, technologies are rapidly emerging which allow the

computer to automatically collect data for the farm record. As an example, computerized systems are currently available for dairy which can allow automatic identification of cows, measuring and recording milk production for each cow, automatic feeding of the cow, and perhaps the identification of cows in the herd which may be in the early stages of a mastitis infection. This data, once in the system, can be used for a variety of uses such as modification of the individual cow's ration or for breeding or culling decisions.

The life cycle of a system

Once a farm information system has been developed, it should not be considered as permanent. The information needs of the manager have and likely will continue to change. The information system should be flexible enough to allow for future needs. When it eventually reaches the point that it can no longer meet those needs, the manager must be prepared to replace it.

The life cycle of a system may be categorized into the following stages:

1. Recognition of needs
2. Solution of basic needs
3. Growth
4. Obsolescence
5. Replacement

When designing the system, the manager must identify all information that the system should provide. If individual cow performance measures are important, then the system must allow data to be recorded and summarized for each cow unit. If the manager desires profitability and performance measures to be calculated for

sub-units within an enterprises, for instance for various landlords or tracts of land, then the system must allow these units to be identified and records maintained accordingly. When the system is designed, it should meet all of the basic needs of the manager.

The growth stage refers to the modification of the system to accommodate new information needs which the manager may realize. This may entail recognition of new enterprises, new types of analyses required, or new data sources. The system is simply being expanded to do more for the manager.

At some point, the system may not be sufficient to meet all of the needs of the manager. When this point is reached, the system is said to have entered the obsolescence stage. Obsolescence may require that the manager begin to use auxiliary systems to supplement the main information system. At some point, the system may become so obsolete that a new, replacement system will be needed. Reasons to replace or redesign the farm information system include:

1. Inability to provide timely information
2. Costly or inefficient procedures in the system
3. High error rate
4. Inability to accommodate growth
5. Information provided is not sufficient for decision purposes

Replacement will need to occur when the value provided by a new system is greater than the cost of adopting the new system.

Summary

Information does have value to the manager if it can improve the quality of decisions made and increase the profitability of the overall business. The collection, storage and processing of data

into information does come at a cost. The manager must balance the costs and benefits when choosing the system to be implemented on the farm. The information system must provide a wide variety of information, and should serve all three functions of management; planning, implementation and control. To be most beneficial to the manager, the system should provide information concisely, in a timely fashion, and the information provided should be accurate, complete and relevant to the particular decision under consideration. Finally, there are a wide variety of systems available, ranging from very simple manual systems to elaborate computerized systems with automated data collection functions. The correct choice from among these will depend primarily on the needs and abilities of the individual manager.