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## MANAGEMENT DECISIONS FOR ALTERNATIVE AGRICULTURE

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Several definitions of "alternative agriculture" are presently in use. In a recent report on farming alternatives in New York state, Miller et al. identified three definitions as follows:

The alternative label has connoted a broader context than [farm] diversification, implying not only examination of nontraditional crops but also experimentation with new or alternative types and systems of agriculture ranging from organic production techniques to more intense production and marketing procedures (Estest and Ingram).

"Alternative" . . . [is] defined as any agriculturally based activity not traditionally considered as a predominant activity. It is important to distinguish "alternative" in this sense from alternative farming systems (organic, natural, etc.) although they certainly may be a limited subset of the alternative opportunities available (Goodwin).

We use the term alternative agriculture to refer to adoption of production methods designed to use fewer purchased inputs, selection of unconventional farm enterprises, and diversification of enterprises and uses of family resources, including combining agricultural and nonagricultural enterprises under the same ownership or management (Babb and Long).

A common element among these definitions is that alternative agriculture can involve unconventional production methods such as use of fewer purchased inputs and it is management decisions associated with this aspect of alternative agriculture that I will focus on today.

For example, there seems to be particular interest currently in production practices which involve decreased use of agricultural chemicals. This interest among researchers, consumers, program leaders, policymakers, and farmers is not new but may be more prevalent now than perhaps ever before. My perception is that much of the non-farmer interest in unconventional production practices is a result of environmental and food safety concerns. Farmer interest may be based on similar concerns in addition to perceived economic incentives.

The motive underlying interest in unconventional production practices is important because unconventional can mean so many different things -- some of which involve "business as usual" in a management decision-making sense and some of which do not. It is my feeling that some of the most publicized, scientifically interesting, and promising directions of alternative agriculture such as low input agriculture are also cases which may be most likely to benefit from an alternative approach to management decision-making.

Today, I will first review production management decision-making and particularly Cooperative Extension's contribution to production management information and education. Second, I will discuss the appropriateness of common management decision-making tools for a class of unconventional production practices. Finally, I will be so bold as to suggest a direction for support of management decision-making in alternative agriculture that might provide a reasonable course for Extension and researchers to pursue in the years ahead.

### Decision-making in Conventional Production

Management decisions in agricultural production can be and often are based on various methods including intuition, randomization, analysis, habit, and combinations of these methods. Different decision-making methods can require different kinds and amounts of management information. For example, management based on habit may require relatively less information for decision than the other methods while the relative information requirements of the remaining decision techniques is less apparent.

Cooperative Extension, universities through classroom training and, in some instances, state departments of agriculture have been important proponents of analytical decision-making in agriculture; that is, they have been advocates of management decisions based on systematic evaluation of agricultural production choices to determine the best choice with respect to an objective. Management decisions based on individual farm-level analysis are typically advantageous in that the likelihood of a favorable outcome for the decision-maker is greater than that of other choice techniques. Not only has Extension provided extensive technical information on various production practices but has also provided information and education specifically for application of analysis to production management decisions. For example, enterprise specific cost and return data have been developed and dissemi-

nated to farmers by Extension for many agricultural enterprises. Instruction in recordkeeping methods and information processing techniques such as budgeting, break-even analysis, and marginal analysis has also been available to farm managers through Extension. In addition, detailed applications of basic analytical methods have been designed to assist in specific management decisions such as those, to provide a recent example, that are related to multiple peril crop insurance.

Particularly during recent years, analysis of farm production decisions utilizing computer methods has been encouraged by Extension. Computerized spreadsheet programs and other more specialized computer software have been incorporated in Extension's efforts to popularize analytical decision techniques in agriculture. The contribution of Extension to efficient management decisions in agriculture has been an important one. Information for production management decisions associated with conventional production practices is available and efforts to improve it are constant. Though the ultimate goal of fine-tuned analytical decision-making in agriculture may never be fully achieved, Extension's efforts to better facilitate analysis of production choices by farm-level decision-makers can be expected to continue to improve and particularly to improve as the availability and acceptability of computer technology on farms becomes more widespread.

In a nutshell, agricultural researchers and Extension have developed an information/education base and delivery system which provides an analytical capability for many farm-level management decisions associated with conventional agricultural production. Few may be entirely satisfied, as is always the case, with the information base and the efficiency of management decision techniques which result. Even so, much progress has been made and more is expected, the record of success is evident, and any existing departures from efficient management decisions brought about by limitations in Extension management education should not be allowed to detract significantly from the record of accomplishment.

### Decision-making in Unconventional Production

As mentioned previously, an unconventional production practice can refer to many different things ranging from a simple, though perhaps very important, discrete change in production method to a fundamental revision of production practice. For example, halting irrigation in mid-August for cotton production in California's Imperial Valley is an unconventional production practice which may have important consequences for successful pest management in that region. However, it is important to note that implementation of such a practice does not significantly add to the burden associated with production management decisions. Implementation of a pest management strategy designed to minimize or eliminate use of pesticides generally, on the other hand, may require addition of numerous carefully timed production decisions in conjunction with extensive environmental monitoring and, if pursued vigorously, may increase the level of complexity of management decisions by an order of magnitude.

Today, I am focusing attention on management decisions for unconventional production practices which are of the latter type; that is, practices which may necessitate extensive changes in production technique and which thereby introduce additional management complexity. My reasons for focusing on these cases are (1) existing management information/education program developments of Extension probably provide relatively adequate analytical decision support for unconventional production practices which avoid fundamental alterations in technique and (2) much of the interest I perceive in alternative agricultural production is in implementation of unconventional production practices which may significantly add to the burden of production management decisions; that is, practices which will exchange potentially undesirable aspects of conventional production methods along what may be a steeply ascending trade-off curve with respect to management decision complexity.

Our experience with integrated pest management (IPM) provides an example of an unconventional production practice that illustrates both the trade-offs that may be involved in exchanging management complexity to achieve an objective and approaches for coping with these trade-offs. Pesticides introduced after the second world war were integrated into agricultural production as other post-war "modern conveniences" were integrated into everyday living. Disintegration of pesticides and agricultural production, on the other hand, is apparently much more difficult to accomplish because convenience and/or productivity may appear to be at stake. In some cases, lowered expectations and/or increased riskiness of outcomes may occur. Even when risk-reward trade-offs for properly implemented IPM technologies are comparable to conventional practice, convenience from a management standpoint may be lacking. Habits must be replaced with choices and the choices must often be made well in order to maintain the level of productivity to which we have become accustomed.

IPM decision strategies can involve very detailed monitoring and decision procedures which must often be implemented as a whole in order for the procedures to be effective relative to conventional pest control practice. The obstacle presented by management decision complexity may be a serious one for IPM adoption even when the properly implemented technology is known to be effective. Experimental demonstrations that a particular IPM strategy when properly implemented is as effective as a conventional one or a number of so-called farm success cases with respect to application of a technology may only shed light on a portion of a decision-maker's concerns. Obviously, the innate riskiness of a production practice interacting with transitory elements of an ecosystem is an important management consideration; however, the number and complexity of management decisions required to implement the strategy may also be important if there is risk of mistaken decisions which can affect outcomes. It may be the case that managers have many production and marketing concerns and may find sacrificing very convenient production management strategies acceptable only when the alternative is known to be substantially superior to conventional production practices from an economic perspective and when the perceived sensitivity of outcome to management error is small.



And how has the traditional emphasis of Extension management information/education fit into IPM decision-making? Few question the desirability of Extension's emphasis on the need for the management function and record-keeping, the basic economic principles of decision-making such as marginal analysis, analytical tools such as budgeting for diagnosing problems and planning, and the focus on the rudiments of choice under uncertainty and risk in agricultural management decisions. However, the impact of this emphasis in terms of IPM decision-making has not been entirely clear.

The increased number of decisions and complexity of decisions that can be affiliated with an IPM strategy has not seemed to lend itself to individual analytical management decisions at the farm-level. Extension IPM has focused on providing pre-packaged management strategies to the farm-level rather than emphasizing the virtues of individual farm-level analysis based on management education. One possible explanation is that which Hall notes in a recent article on IPM decision-making. He observes that "it is difficult enough for Ph.D. agricultural economists and entomologists to develop these (analyses) . . . much less expect that each farmer will do so."

### Extension Support of Management Decision-making for Alternative Agriculture

From a purely conceptual standpoint, all production management decisions based on analysis can involve substantial complexity. However, from a practical point of view, impressive productivity levels have been achieved with conventional production practices while maintaining a tolerably difficult analytical basis for farm-level management decisions. Purchased agricultural inputs, in particular, may contribute substantially to the robustness of conventional production practices with respect to the amount of detail that must be incorporated in management decisions. For example, chemical pesticides provide for rapid adjustment to pest problems when the need arises and this flexibility may permit numerous pest management mistakes with little cost.

Unconventional production practices, and especially those involving reduced or eliminated agricultural chemical use, may in some instances provide for less tolerance of a lack in management precision with regard to outcomes. An unconventional production practice developed to function in concert with an ecosystem may be capable of providing for impressive productivity when implemented with precision. However, the extent to which productivity is tied to the level of detail involved in production management decisions may be less clear but may also be a crucial aspect with respect to widespread adoption and successful implementation of the practice.

For the case of unconventional agricultural practices which require an increase in both the number and complexity of management decisions, the vulnerability of the practice to management error is important information with respect to Extension programming in management. If an unconventional practice is as forgiving regarding management decision-making as conventional practice, then the traditional Extension information/education

dichotomy may provide for adequate farm-level analysis of management decisions. If, on the other hand, the outcome of an unconventional production practice is found to be highly sensitive to precision in management decisions, then Extension may best serve its clients through an alternative management approach. In this regard, the approach of Extension IPM may provide a useful direction. Investment in research to develop specific pre-packaged management strategies associated with an unconventional practice may provide useful Extension information products and facilitate successful transition to unconventional practices.

### Summary

- Unconventional production practices can involve an increased number of production management decisions relative to conventional practices and therefore can increase the risk of management error.
- Extension's traditional approach to management information/education may not provide sufficient analytical capability to the farm-level to support management decision-making for unconventional production practices for cases where these practices are very sensitive to the quality of management decisions.
- Preparation of sophisticated research and Extension pre-packaged management strategies for unconventional production practices may be a better approach for supporting decision-making in alternative agriculture.

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