The Computer in Extension Farm Planning

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That ominous giant, the computer, raises its head again! The authors of this article make a case for using that impersonal quick-thinking machine to help the Extension professional be more personal and responsive to the farmer and his management plans. The authors provide a model for the addition of computerized management aids to the farm decision-making process. They just may be describing the job of all Extension professionals in the 1980s.

Can the computer really help the farmer?

Yes.

How?

Recently computer programs (also called models or software) have been developed to help make complex management decisions in commercial agriculture on well-conceived computer equipment (hardware).

But this availability puts Extension administrators, specialists, and agents at a crucial "fork in the road."[1] They must decide the role of the computer in their educational programs for farmers. Further, administrators must decide what role state specialists and agents will have in a system of computerized farm planning aids.

A major question in establishing the Extension agent's role is whether to "take the computer to the farmer" or ask him to "come to the computer." Answers to this basic issue won't be the same in every state.

The challenge to the Extension staff inherent in "taking the computer to the farmer" is much greater than is generally realized.[2]

Candler and others discuss the problems related to developing computer programs to use in farm management Extension. They stress the importance of "clarity, speed, and reliability." In addition, they conclude that the "bottleneck" is the lack of useful computer programs. They argue that once useful programs are available, county agents and other Extension personnel will rapidly adopt them.[3]

Is this true? Partially. But, it's not obvious that once "appropriate software" is available, it will be readily extended to and used by farmer clientele on the scale some previously envisioned. Perhaps the current "bottleneck" may be in the design of an educational delivery system.

Delivery Systems

Extension professionals in farm management have two basic ways of making computer-assisted models available to farmers: *the batch system* and *the individually interactive system.*

With the batch systems, farmers may be brought to the computer in a environment where: (1) a model suited to a management problem is presented, (2) the individual farmer's data are placed on an input form and then on cards, (3) the problems for the group of farmer participants are processed by the computer in a single batch, and (4) the output is returned to farmers at some time later.

When using the individually interactive system, the "computer may be taken to the farmer" by remote computer terminals. Here, the farmer uses a computer program suited to his problem, but receives output in response to his data after only a few moments. Output is instantaneous because input is sent directly to the central computing facility with communications equipment (teleprocessing).[4] In most cases, an Extension agent or specialist will help farmers directly interact with the computer.

If the farmer is brought to the computer via workshops and group sessions with delayed "batch" processing, he usually chooses a specific computer program when he chooses the workshop. Workshops are run by well-trained university specialists and the computer plans are checked before they're returned and discussed with the farmer.

Offsetting these obvious advantages of "bringing the farmer to the computer" are the disadvantages of restricting the farmer to a particular computer program at the time for the workshop, rather than choosing the appropriate program at the time the farmer faces a decision. Also, specialists are necessarily limited in the amount of time they can devote to workshops.

Further, field personnel could become obsolete if they don't move toward computer-assisted education and planning tools.

The bulk of the experience at Purdue is with the "on-campus" batch system. We believe this is also true in most states that have extensive experience with computer-assisted models in Extension farm management. The Michigan State Teleplan System is an example of extensive activity with the remote interactive system.[5]

Special costs, problems, and advantages are involved in interactive delivery systems that are distinct from those of the "batch" approach. Costs of using remote equipment can vary widely depending largely on: type of terminal used, amount of overhead costs charged by the parent central computer system for service and program, data storage, and telephone charges incurrred.

At one extreme, touchtone telephones may serve as a data terminal with voice response at an extra rental of less than $10 a month, while a phone-coupled "teletype" with typed input and printed output may be used at a rental in the range of $50-$200 a month.

Overhead charges for commercial computers may be a few hundred dollars, while university computers may be available to Extension at no fixed

charge. Phone lines may be available to Extension at no variable cost or the phone calls may be in the $10-$15 an hour range.

Delivering Computer Programs to Farmers

Interactive delivery of computer programs, in which the user-student actively participates, has been called "self-learning" or making the best use of a "teachable moment." [6]

As a farmer perceives his problem, he's able to proceed immediately with alternative solutions, and to study cause-and-effect relationships among critical variables. All degrees of workshop versus individual and "batch" versus "interactive" delivery of models can be envisioned.

But, the system described here is limited to the more common contact of an individual farmer and field agent. This involves an interactive computer system providing immediate processing for initial model runs and replans (see Figure 1).

The decision-making process itself is a dynamic one, where farmers are continually working to define their problems, collect and analyze information, and implement decisions. [7] As information is collected to solve one problem, the problem may be redefined. As one decision is made, another decision may become necessary. In the course of defining a problem area, problems may disappear.

Thus, the entire planning process is highly interrelated. At any one point, a farmer perceives his major problem a particular way. If he seeks help at this time from a well-trained field agent equipped with computer programs, the agent *must* play several key roles:

1. Using his experience, training and knowledge of the individual farmer and the environment in which he operates, the agent must work with the farmer to clarify (and perhaps correct) the definition of the problem.
2. The agent recommends the program from within the library of computer programs that is best suited for the problem at hand.
3. The agent works with the farmer to select data from his operation or from information about similar farms (either through informal knowledge or from structured data banks) that will represent his farm in the program. This may require several tries to adapt the program to the farm and the problem.
4. The agent helps the farmer interpret the computer results and understand the application of those results on the farm.
5. The agent suggests alternative plans of action and ways to test those plans using the same or other computer programs.
6. The agent works with the farmer over a longer time span to help put the plan into action and to suggest when conditions have changed so that new planning is warranted.

This mode of operation for a field agent is basically the same as before computer assistance, but the time frequency required for the first five steps may often be only one

afternoon instead of several days or weeks.

In addition, quantifying the problem permits use of the analytic techniques employed by the computer and may enrich the ensuing plan. In this way, the computer is a powerful tool in the hands of a capable agent.

For this new farmer-agent computer team to be effective, several problems must be overcome.

Problems and Recommendations

Prerequisites and Involvement

The agent's role is crucial in the operation of such a computer-assisted learning process. However, for agents to be willing to involve themselves, two prerequisites must be met:

1. The computer system must be accessible, dependable, and easy

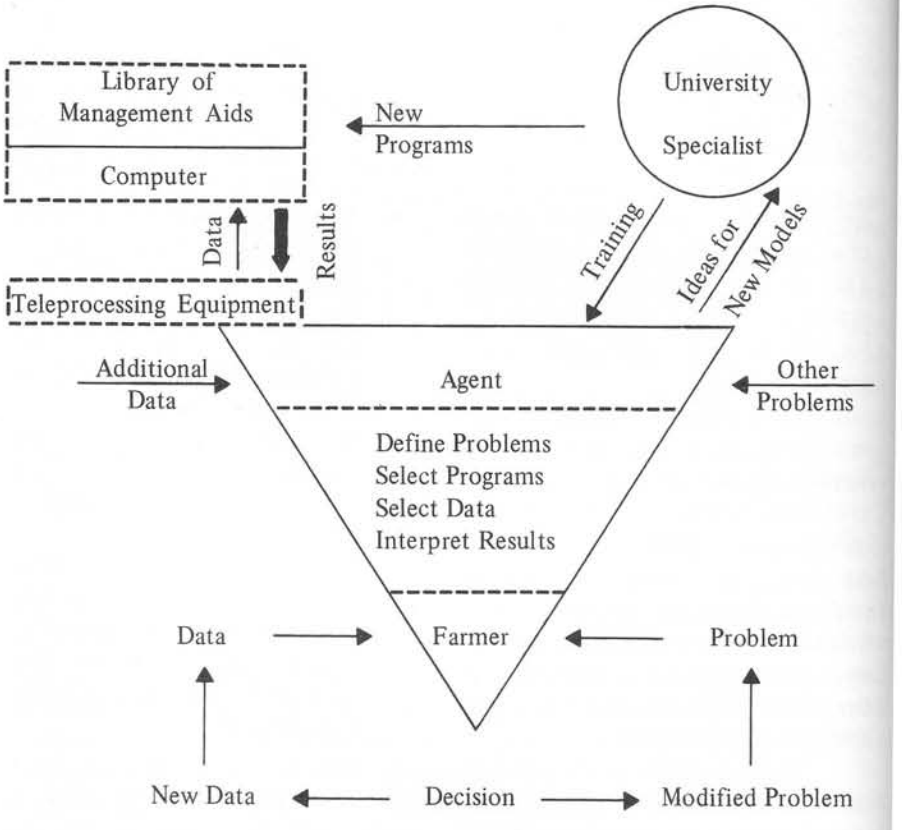

Figure 1. Adding computerized management aids to the decision-making process.

to use. Current computer equipment is capable of fulfilling this requirement.

2. The library of computer programs must be sufficiently large and diverse so that farmer problems suggest a given program and not vice versa. If we view the library as containing all programs on any computer, regardless of its location, then the library is already quite large. In addition, the number of readily available programs is growing rapidly as the staff capable of generating programs enlarges. Thus, the software shortage may be nearly overcome and is, in any case, diminishing.

In most Extension delivery systems, the above are the responsibility of the specialist and cooperating technician.

Some will argue that farmer demand for decision-making education and services also is a prerequisite for agent involvement. But, this isn't necessarily true. Certainly one educational need of farmers is to understand what the computer can do for them, and how much can be expected in benefits for a given level of costs.

Thus, demonstrating the feasibility of using a computer can be a result of agent actions. If all educators waited for student demand, the market for school buildings (and teachers) would certainly be lower!

Why then are agents reluctant to become involved with computer programs? Most likely, fear of the unknown. We're sure that the computer itself is little understood by the "noncomputer" individual. But, many laymen don't understand electricity, or the telephone, or a jet-engined aircraft, but all are frequently used. Agents can get to know the computer programs better by just using them.

However, trying this new concept requires communication between program designer and agent about what's needed, and between agent and computer for the data to be used.

This new communication pattern requires that the program-builder and agent meet at some midpoint. *The builder must use terms already in the agent's vocabulary, as much as possible, and the agent must learn a few key terms from the world of teleprocessing and computer programming.*

The second major problem an agent faces, once he's determined to use computer programs, is to locate the appropriate program and use it. Here the specialists concerned with generating programs have frequently not completed their task. Besides getting the computer programs written, it is at least as important to create:

1. An appropriate index of available programs.
2. Descriptions of the programs.
3. Detailed instructions and training manuals for each program.
4. Brochures and popular press articles explaining these programs to farmers.

If Extension and research specialists will accept these additional tasks as part of their initial assignment in constructing a workable computer-assisted, decision-making system, they can expect to be much more successful.

Agent Training

Clearly, agents and others need three basic types of training to use an interactive delivery system effectively:

1. Procedures for operating teleprocessing equipment–touchtone telephones or teletype equipment.
2. Instructions on how to use models relevant to the agent's area of work, including input requirements and interpretation of results.
3. In-depth study in the given agent's subject-matter area.

These training needs are listed in order of difficulty, with the first being most trivial. Training in use of models is much easier if the agent first understands the subject matter. Thus, the crucial need is for the agent to be well versed in the concepts and practices of his specialty area. Once proficiency has been achieved there, the additional training needed to understand and use programs and the mechanics of using a computer terminal can be learned much more easily than has generally been expected.

An agent who has mastered his subject matter is likely to be more successful with computerized decision aids. Working with a farmer to provide input data and interpret results may require more insight and breadth of understanding than many agents are accustomed to.

Once the necessary training has been achieved, the adoption of computer aids can greatly improve the efficiency and effectiveness of both agents and specialists.

Summary

With the rapid development of computer software and the availability of relatively inexpensive remote terminals (teleprocessing equipment), many states are trying to increase the role of computerized decision aids in Extension work. Much attention has focused on the remote interactive system for Extension agents to more effectively educate farmer clientele.

An effective delivery system for the computerized decision aids is the key to effective use of these aids. Specialists, as well as agents, must fulfill their role in the farmer-clients dynamic decision-making process. Although this requires some minimum acquaintance with the computer and teleprocessing equipment, agent roles wouldn't greatly different from the past.

Traditional agent roles of *analyst, advisor, advocator,* and *innovator* are all embodied in the dynamic process. Further, as Gallaher and Santopolo stressed, "an agent's success in each role derives particularly from his technical knowledge and background experience in subject matter areas."[8]

We feel the merits of a remote, interactive computer system for agent-client problem solving are numerous. However, there are several unanswered questions:

1. What are the costs and benefits of using computerized decision aids versus the traditional methods of problem solving?
2. Can Extension personnel meet the demands of a remote, interactive, delivery system?
3. What ultimate role should Exten-

sion seek in the use of computer-assisted techniques?

Administrators, researchers, and Extension professionals must study and resolve these and related issues before computers are used extensively in farm planning education.

Footnotes

1. Buel F. Lanpher, ed., *Inventory of EDP Programs: Used in Agricultural Extension* (Washington, D.C.: Extension Service-USDA, 1973). This reference lists over 400 programs of various types available for use by Extension personnel.
2. Reed D. Taylor, ed., *Computer Satellites in Agriculture* (Columbus, Ohio: Ohio State University, 1972).
3. Wilfred Candler, Michael Boehlje, and Robert Saathoff, "Computer Software for Farm Management Extension," *American Journal of Agricultural Economics*, LII (February, 1970), 71-77.
4. Computing equipment is available in portable models that would permit the use of digital computing equipment without the use of teleprocessing equipment.
5. Stephen B. Harsh, "Computer Terminals as a New Approach to Extension Education" (Paper presented at the Midwest Regional Agricultural Outlook Conference, University of Illinois, Urbana, Illinois, August 16, 1972).
6. Duane Erickson (Comments at Teleplan Users Meeting, Chicago, Illinois, August 2-3, 1972).
7. R. J. Rades, "Farmer Reactions to Selected Operations Research Models" (Unpublished Ph.D. dissertation, Purdue University, Lafayette, Indiana, August, 1972).
8. Art Gallaher, Jr., and Frank A. Santopolo, "Perspectives on Agent Roles," *Journal of Cooperative Extension*, V (Winter, 1967), 223-30.