

# programmable calculators in extension

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Can farmers use computer technology—programmable calculators—to help make decisions and keep records? Will there be a time lag between this idea's introduction and its adoption by a large number of farmers?

Earl Fuller suggests that its adoption will follow a pattern similar to the adoption of other innovations in agriculture.<sup>1</sup> If so, it may be 20 years before computers are used by most farmers.

## What This Technology Can Do

Before I describe the experiences of Extension's project to introduce the programmable calculator to southwestern Virginia farmers, let's take a closer look at this form of computer technology.

There are already many programs available for programmable calculators capable of analyzing livestock rations, evaluating alternative farm enterprises, estimating machinery costs, and analyzing fertilizer requirements.<sup>2</sup> Several land-grant universities are actively involved in producing programs for programmable calculators. Iowa State University and Cornell have the most extensive program libraries, with over 100 agricultural programs they make available to subscribers.

Most calculator programs are simple to use. They perform complicated analyses using a minimum of data from the farmer. Prerecorded programs can be easily customized to meet the needs of individuals. New programs are easily "written" by recording the sequence of keystrokes used to solve a problem on an ordinary calculator.

With programmable calculators, a farmer can do routine analysis in the privacy of his/her home. This means he/she can obtain more timely information for decision making since

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he/she doesn't have to wait until he/she can get an appointment with an agent.

The combination of timely results and simple programs provide a better opportunity for "results interaction."<sup>3</sup> Results interaction allows the user to examine the sensitivity of his/her results using slightly different data. For example, several feedstuffs can be compared in formulating rations, alternative financing arrangements can be examined, or different machinery complements may be compared without the farmer feeling he/she's imposing on an Extension agent's time and goodwill or without incurring a fee for computer time.

### **Extension Agent's Use**

Programmable calculators can help Extension agents, too. The image of Extension agents is enhanced as they expand their analytical capability and effectiveness by using, demonstrating, and training farmers to use programmable calculators, as well as being a source of programs.<sup>4</sup> By exposing farmers to the benefits of data processing on the farm, additional farmers might become interested in using more Extension programs contained in systems such as CMN or AGNET (for recordkeeping and whole farm planning). The programmable calculator can thus serve as a stepping stone to the adoption of more sophisticated computerized management techniques.

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### **Virginia Project**

Before 1979, little had been done by Virginia Extension to inform farmers and agribusiness people of the applications of programmable calculators. However, it was felt Extension could be effective in shortening the length of time it takes for farmers to incorporate programmable calculators into their management programs. So, three Extension agents from southwest Virginia were selected and trained to operate a programmable calculator. The agent training included the use of prerecorded programs contained in modules and on magnetic cards and an introduction to writing programs.

They were then asked to select farmers from their region whom they believed could learn to use a programmable calculator. The farmers selected were taught the basic functions

of the calculator keyboard and how to use the card reader and agricultural module in two evening sessions.

All the participants were loaned a programmable calculator, an agricultural module, a set of programs prerecorded on magnetic cards, and a list of additional programs that could be obtained from project leaders at Virginia Tech.

### **Slow Use**

Initially, all the farmers and Extension agents were enthusiastic about learning to use a programmable calculator. However, after six months, only two farmers and two Extension agents were using their calculators on a regular basis. All 4 had gone to college for at least 4 years and were between 20 and 39 years old. Only one of these active users, a farmer, had no prior experience with computers.

Four other farmers and an Extension agent developed some proficiency in using a programmable calculator, but weren't using it regularly by the end of the project. These participants had attended college for 2 to 4 years, had some previous experience with computers, and ranged from 30 to 59 years old.

Of the three farmers who weren't able to use a programmable calculator after six months, one had a high school education, while the others had completed college. Two of these farmers lacked any prior experience with computers, the third had used a computerized recordkeeping service. This group of farmers ranged from 40 to 59 years old.

### **Program Sources**

It was felt that the agricultural module provided the easiest access to programs when learning to use the calculator, but that its programs usually didn't suit the needs of farmers in the project. The farmers preferred programs outside the agricultural module such as the programs distributed by Iowa State University and Cornell because they conformed closely to the steps the farmer used in making decisions. A single source of programs doesn't seem feasible due to the unique demands of individual farmers. Much software must be developed or customized at the local level by universities or private firms.

### **Results**

Several farmer participants had trouble understanding how their data were processed by the calculator. For example, while the participants were aware of the net energy system for balancing rations, most had never used it on their farms because of the complexity of its formulas. Rations that were precisely balanced by the calculator frequently differed from those currently being used by farmers.

This posed a dilemma: Should a ration balanced by little-understood formulas replace a ration balanced with easier-to-understand formulas, tables, or rules-of-thumb methods? This supports Walker's contention that farm management principles must be taught, or retaught, at the same time the farmer is learning to use a programmable calculator.<sup>5</sup> The adoption of new management techniques is slowed by the farmer's reluctance to abandon old methods that have been successful for new methods he/she may not fully understand.

Farmer participants appeared to have trouble integrating the programmable calculators with their management program. By the end of the project, only two of the farmers were using the calculators on a regular basis. Four other farmers who could operate a programmable calculator didn't use it except when prompted by a project leader's visit. The results of analyses made in the presence of project leaders were occasionally incorporated into decision making, particularly in the formulation of rations. All of the farmer participants were reluctant to experiment with new programs from the program library on their own.

### **Need for Training**

Farmers participating in this project were enthusiastic about learning to use a programmable calculator to improve their management skills, but they needed help in learning to use the tool. The format of two hours of group training followed by periodic visits with individual users wasn't enough for most participants.

In addition, proficiency is self-generated. If the farmer is to learn to use a programmable calculator, he/she must take a few hours to experiment with the calculator on his/her own. At the end of the project period, all of the participants indicated a need for more training.

Programmable calculators can be a powerful tool for farm managers. Their low cost and simplicity provide an excellent way for farmers to begin to incorporate electronic decision making into their management programs. Extension agents should be prepared to help their constituents learn to use programmable calculators and help them obtain suitable programs.

### **Footnotes**

1. Earl Fuller, "Extension's Role in the Delivery of Computer Systems to Farms and the People Who Run Them," in *Programmable Calculators and Minicomputers in Agriculture*, Ernest Bentley, ed. (Blacksburg: Virginia Polytechnic Institute and State University, 1980), pp. 59-68.

2. James M. McGrann, "The Role of Programmable Calculators and Minicomputers in Agriculture," in *Programmable Calculators and Minicomputers in Agriculture*, Bentley, ed., pp. 20-32.
  3. Eddy L. LaDue, "Impact of Alternative Remote Access Computer Systems on Extension Programs," *American Journal of Agricultural Economics*, LX (February, 1978), 135-39.
  4. R. A. Hinton, *Programmable Calculators—Microcomputers: Their Agricultural Applications*, Staff Paper No. 79-E-73 (Urbana: University of Illinois, 1978).
  5. Harold W. Walker, "Interfacing Research and Extension in Information Delivery Systems: Discussion," *American Journal of Agricultural Economics*, LX (December, 1978), 921-22.
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