COMPUTER EDUCATION PRIORITIES OF FARMERS

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Several authors predicted that microcomputers would have the type of impact during the 1980s that tractors had on farms during the 1940s. Many of these authors also made optimistic predictions that farmers would readily adopt microcomputers (Beasley, 1983; Legacy, Stitt, & Reneau, 1984; Levins & Walden, 1984; Sistler, 1984; Sonka, 1983). A sparse research base, however, makes it difficult to judge the accuracy of these predictions. In this regard, Yarbrough and Scherer (1984) concluded, "...the innovation of on-farm computers is diffusing, although at a modest rate. The rate, however, is about what we should expect of a relatively complex technology" (p. 17). Yarbrough (1987) later concluded that more than half of farmers will never adopt computers.

The knowledge base is also limited regarding the computer education activities farmers desire. Most research about agricultural users of computers has focused on high school and college students, Extension agents, and agriculture teachers (Cantrell, 1982; Hudson, 1983; Mitchell, 1985). However, before agricultural educators can plan educationally sound computer instruction for farmers, accurate baseline information must be generated.

Purpose and Objectives

The problem examined in the study focused on two questions: (1) Which farmers are using microcomputers for what applications? and, (2) What types of computer education activities do farmers desire? The study was designed with four objectives:

1. To develop a discriminant model to distinguish between farmers who are users or non-users of microcomputers.
2. To determine the types of applications farmers are making of computer technology.
3. To develop a discriminant model that will classify farmers on whether or not they wish to participate in computer short courses and workshops.
4. To determine if microcomputer users and non-users want computer short courses and workshops to include similar topics.

Related Literature

A review of research related to the problem being studied is presented to correspond to the objectives of the study.

Computer Use by Farmers: Yarbrough (1987) found that 10-12% of farmers use computers compared to 2% in 1982. He identified several variables that were positively related to the adoption of computers: level of education, size of farming operation, management orientation, and use of (a) traditional farm information sources, (b) specialized and technically competent sources, and (c) computer-based management services. Farmers aged 35-44 were most likely to use computers. Yarbrough (1987) found that a combination of two or more of the above variables produced the strongest tendency to adopt computers.

Kramic (1987), however, found that microcomputer use by farmers was not related to their age, education, years as a farmer, acres farmed, and whether they owned or rented the farm. She found a negative relationship between microcomputer use and gross farm income, i.e. farmers with higher gross incomes were less likely to use microcomputers.

Yarbrough (1987) found that "select" computer users spent seven hours per week using computers. Major applications involved decision-aid programs, recordkeeping, enterprise accounts, and inventories. Less than 25% of farmers used off-farm computer services for recordkeeping, decision aids, and electronic information (Yarbrough, 1987). Few other researchers have studied how farmers are using microcomputers on farms.

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Computer Education Needs: Several researchers have studied the computer education needs of farmers. Bouare (1988) found that Ohio agricultural Extension agents, adult teachers of agriculture, and secondary teachers of agriculture placed the same level of importance on organizing and conducting microcomputer instruction for young/adult farmers. However, for the 1987-88 school year, Bouare found that the adult teachers spent 125 hours (3 weeks) teaching young/adult farmers about microcomputers compared with 20 hours for Extension agents and almost four hours for secondary teachers.

Other researchers have found that computer instruction should be included in future adult education programs. Burhoe and Stewart (1983) found that agricultural educators rated farm business management as their top adult education priority. Topics included in this priority typically involve computers: financial recordkeeping, financial planning and analysis, interpreting financial information, and marketing. Adult and secondary agriculture teachers, state supervisors, and teacher educators all rated management as a higher priority than instruction in animal science, plant science, and agricultural mechanics.

Martin and Omer (1988) found that Iowa young farmers had educational priorities similar to those identified by Burhoe and Stewart (1983). Production records and marketing were the livestock and crop production topics of most importance to Iowa young farmers. Use of computers was ranked last in both of the categories even though instruction about recordkeeping and marketing usually involves computers.

Several researchers have studied how farmers perceive instruction delivered by agricultural educators. Martin and Omer (1988) found that over 80% of Iowa young farmers had participated in meetings sponsored by the Extension Service. Over 70% were satisfied or very satisfied with the information and services Extension had provided.

Kramic (1987) studied the importance farmers place on the confidence they have in information received from 12 groups or agencies. Meetings and clinics conducted by Extension agents were ranked first in importance and confidence. Programs conducted by Extension specialists ranked third in importance and second in confidence. Programs conducted by governmental agencies such as the Soil Conservation Service ranked second in importance and third in confidence. Young/adult farmer programs conducted by vocational agriculture teachers ranked seventh in importance and confidence.

Methods and Procedures

Ohio's 88,000 farmers were chosen as the target population for the study. A stratified random sample of 400 farmers was drawn to provide a cross-section of farm sizes and enterprises. This sample size provided a 5% sampling error with a 95% level of confidence (Krejcie & Morgan, 1970). Three counties were randomly selected from each of the five Ohio Cooperative Extension Service (OCES) districts. Agricultural mailing list supplied by the 15 OCES county offices provided the sampling frame. The 400 farmers in the sample were randomly selected on a proportional basis from the 15 counties.

A mailed questionnaire and a telephone interview schedule were developed to collect data for the study (Dillman, 1978). A panel of agricultural education faculty and graduate students at The Ohio State University reviewed the questionnaire and the schedule to assess their content and face validity. All panel members were experienced computer users. A pilot test of both instruments was then conducted using members of two Young Farmer chapters (n = 36) located in countries not included in the sample. The attitude toward computers scale on the questionnaire had acceptable reliability (Cronbach's alpha = .92).

The questionnaire was mailed to the sample on March 2, 1988 to collect computer use data. After five weeks, 204 of 400 farmers had provided usable data. As suggested by Miller and Smith (1983), the 150 farmers responding the first three weeks (early) were compared with the 54 responding the last two weeks (late). The groups were not significantly different ($p > .05$) on main farm enterprise, microcomputer use, age, and education. The two groups were significantly different ($p < .05$) on attitude toward microcomputers and plans to secure instruction about microcomputers.

The 39 respondents who indicated on the questionnaire that they used a microcomputer for farm applications were then interviewed by telephone. One of the researchers and two interviewers the researcher trained conducted the 15 minute interviews to collect data about on-farm uses of computers and types of training the user had received.

Findings

The findings are presented according to the objectives of the study.

Characteristics of Microcomputer Users: A comparison of microcomputer users and non-users is presented in Table 1. Microcomputers were used for farm applications by 39 or 203 farmers. Almost half of the 39 farmers had started using microcomputers within the last two years. As shown in Table 1, few differences existed in the main farm enterprises of microcomputer users and non-users. Forty-six percent of users and 41% of non-users were crop farmers. Almost 30% of users and slightly over 35% of non-users were livestock farmers. In terms of farm size, users tended to farm more acres than non-users (637 acres vs. 318 acres).

Three-fourths of farmers who used microcomputers had some college education. However, almost two-thirds of non-users had earned a high school diploma or less formal education. The users were slightly over 42 years old and non-users slightly over 50. Almost 70% of users and 25% of non-users were interested in receiving computer training. Both groups had positive attitudes toward computers but users tended to be more positive.

Correlation coefficients were computed to describe relationships between whether or not farmers used microcomputers and selected factors. Microcomputer use was not related to main farm enterprise (chi square = .62, $df = 3$, $p > .05$). However, the five other variables presented in Table 1 were related to microcomputer use/non-use. Point-biserial correlation coefficients indicated significant relationships ($p < .05$) between microcomputer use/non-use and level of education ($r_{pbi} = .23$), age ($r_{pbi} = -21$), attitude toward computers ($r_{pbi} = .51$), and acres farmed ($r_{pbi} = .29$). Whether or not farmers used microcomputers was also related their plans to enroll in computer short courses and workshops during either 1989 or 1990 (phi = .36, $p < .05$).

Table 1
A Comparison of Microcomputer Users and Non-users

Variable	Users N	Users %	Non-Users N	Non-Users %
Main Farm Enterprise				
Crops	17	46.0	65	41.2
Livestock	11	29.7	56	35.4
Crops and Livestock	6	16.2	22	13.9
Horticultural crops	3	8.1	15	9.5
Total	37	100.0	158	100.0
Level of Education				
Less than high school	–	–	19	11.6
High school graduate	9	23.1	84	51.2
Some college	14	35.9	26	15.9
Bachelor's degree	16	41.0	25	15.2
Master's or doctoral degree	–	–	10	6.1
Total	39	100.0	164	100.0
Interested in computer courses/workshops	27	69.2	42	25.6

Variable	Users (N = 39) Mean	Users (N = 39) SD	Non-Users (N = 164) Mean	Non-Users (N = 164) SD
Age	42.2	10.5	50.1	13.9
Acres farmed	636.7	548.2	318.2	307.0
Attitude toward computers (max. = 6)	5.0	.7	3.7	1.0

The five variables in Table 1 that were related to microcomputer use were subjected to a discriminant analysis to classify farmers as computer users or non-users. As shown in Table 2, four variables collectively explained 32% of the variance in whether or not farmers used computers (Wilks Lambda = .68). Attitude toward computers was the best indicator of microcomputer use. This variable explained 26% of the variance (Wilks Lambda = .74) in the dependent variable. The number of acres farmed explained another 5% of the variance (Wilks Lambda lowered to .69). Interest in pursuing computer training and level of education explained the final 1% of variance (Wilks Lambda = .68).

Table 2
Discriminant Analysis Model to Classify Farmers as Computer Users or Non-users

Function Derived	Eigen value	Canon. R	Wilks Lamda	Chi Square	Sig.
Computer User	.47	.57	.68	69.7	.001

Variables Comprising Discriminant Function

Variable	F to Enter*	Wilks Lamda	Stand. Discriminant Coefficient
Attitude toward computers	64.5	.740	.86
Farm size	12.9	.691	.51
Interested in computer instruction	1.8	.684	.57
Level of education	1.2	.680	.35

* df = 1, 181; p < .05; (77.3% of cases correctly classified by the discriminant function).

Microcomputer Applications: Data presented in this section are for the 39 farmers who used computers in their operations. Most of the farmers (22 or 39) had started using computers during the last two years (1987-1988). Fourteen farmers were using IBM or IBM compatibles, another 14 Apples, and the rest a variety of computers. To organize records and save time were the primary reasons the farmers started using computers.

The top five computer applications were accounting, planning, recordkeeping, correspondence, and tax computation. Computer dealers were the principal software vendor for 25 farmers. OCES served this role for three farmers. Primary computer users (persons who entered and analyzed most of the data) included 17 husbands, 9 wives, and 5 other individuals. This was a shared task on eight farms.

Computer Short Courses and Workshops : Seventy of 204 farmers planned to enroll in computer short courses and workshops during 1989 or 1990. To determine which farmers planned to enroll, five variables were explored: acres farmed, age, attitude toward computers, education, and whether or not a farmer used a microcomputer. Point biserial correlation coefficients indicated significant relationships ($p < .05$) between whether or not farmers planned to enroll and their age (r_{pbi} = .29), acres farmed (r_{pbi} = .18), and attitude toward computers (r_{pbi} = .55). Farmers who planned to enroll also tended to be microcomputer users (phi = .36, $p < .05$).

A stepwise discriminant analysis was performed to classify farmers on their interest in computer short courses and workshops. The four variables that were related to interest in computer instruction were included in the analysis. As shown in Table 3, attitude toward computers and microcomputer use were the only variables that entered the model. Attitude toward computers explained 30% of the variance in the dependent variable (Wilks Lambda = .70) and microcomputer use explained another 1% (Wilks Lambda = .69).

Computer Education Priorities: Data presented in Table 4 show that 70 of the 204 farmers planned to pursue computer short courses and workshops within two years. Slightly over 62% of farmers who used microcomputers (27 or 39 farmers) and 25% who did not (43 of 165 farmers) planned to seek instruction. The top instructional priority for users and non-users concerned incorporating computers

Table 3
Discriminant Analysis Model to Classify Farmers on Their Interest in Pursuing Computer Short Courses and Workshops During 1989 or 1990

Function Derived	Eigen value	Canon. R	Wilks Lamda	Chi Square	Sig.
Interested in Courses	.44	.56	.69	67.6	.001

Variables Comprising Discriminant Function

Variable	F to Enter*	Wilks Lamda	Stand. Discriminant Coefficient
Attitude toward computers	78.9	.70	.89
Computer Use	2.4	.69	.22

* df = 1, 183; p < .05; (75.1% of cases correctly classified by the discriminant function).

into a records system. However, because the two groups provided different rankings for the 10 topics presented in Table 4, users and non-users have different computer education priorities. Topics ranked 2nd-4th for users were types of available software, how to interpret data, and how to use available software. The 2nd-4th ranked topics for non-users were general uses of computers, computer terminology, and how to interpret data.

Table 4
Topics Farmers Want to Learn Through Computer Workshops and Short Courses*

Topic of Interest	Users (N = 27) N	%	Rank	Non-users (N = 43) N	%	Rank	All Cases (N = 70) N	%	Rank
Farm records systems	19	70.4	1	31	72.1	1	50	71.4	1
Types of software available	15	55.6	2	25	58.1	4	40	57.1	2
How to interpret data	15	55.6	2	25	58.1	4	40	57.1	2
Microcomputer terminology	12	44.4	6	25	58.1	4	37	52.9	4
General uses of microcomputers	9	33.3	7	27	62.8	2	36	51.4	5
How to use software packages	13	48.2	4	21	48.8	7	34	48.6	6
Selecting computer equipment	9	33.3	7	23	53.5	6	32	45.7	7
How to use spreadsheets	13	48.2	4	17	39.5	8	30	42.9	8
How to use databases	9	33.3	7	15	34.9	10	24	34.3	9
How to use computer networks	5	18.5	10	16	37.2	9	21	30.0	10

* Spearman's rho = .44, df = 9, p < .05.

Conclusions

The percentage of farmers included in this study who use computers is slightly higher than what Yarbrough (1987) found, i.e., versus 10-12%. Factors identified in this study were related to microcomputer use tend to parallel the findings of Yarbrough (1987) study (attitude toward computers, farm size, interest in computer instruction, and level of education).

Farmers are interested in receiving computer instruction as evidenced by the number of users and non-users who plan to participate in workshops and short courses. Educational programs must be targeted to microcomputer users and non-users because they want to learn about different topics even though both groups have the same number one training priority (farm records). Attitude toward computers is the best indicator of whether or not farmers use computers and if they plan to enroll in computer courses and workshops.

Implications for Agricultural Educators

Microcomputers present new challenges for agricultural educators because a large segment of the farm community are interested being educated about the technology. In additional, farmers apparently need two levels of computer education. Farmers who do not use microcomputers desire introductory level instruction while users want to learn about more advanced topics. Further, research cited in this study indicates that farmers value and will participate in programs delivered by Extension professionals and vocational agriculture teachers. However, the findings of this study suggest that agricultural educators are not involved to a large extent in delivering computer educational activities.

Agricultural educators must determine what roles they are to play and which approaches are most effective in educating farmers about computer technology. Perhaps a more fundamental issue to consider is whether or not agricultural educators are committed to and have the resources to deliver educational programs of sufficient quality and depth to meet the computer education needs of the farm community.

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