

# Changing Computer Use in Agriculture<sup>1</sup>

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## **Abstract/Description:**

Farmers continue to expand their use of computers. Financial accounting remains the most often used computer task. The Internet has become an important tool for farmers, one which they evaluate highly. Use of the Internet for information collection and transactions processing are important determinants of farmers' computer use and computer usefulness evaluation.

Over the past decade information options available to farmers have changed substantially. During this period the Internet has developed to provide a rich mechanism for electronic communication, and electronic commerce has emerged in the past two to four years. In 1991 less than one third of U.S. farmers were using computers (Batte et al., 1995). At that time the primary farm business uses of the computer were business financial accounting, correspondence, and crop and livestock record keeping. During the same period, the use of computers by individuals and small businesses has grown dramatically. The U.S. Department of Commerce estimates that in 2000 about 54 percent of the U.S. population used a computer at least occasionally. The use of the Internet by individuals has increased 20 percent annually since 1998 (U.S. Department of Commerce). This begs the question: Has farm computer usage followed a similar trajectory, and how important has the Internet become as an information source and a mechanism for transactions?

The research results reported here are based on statistical analysis of a survey mailed to a random sample of 2,500 Ohio commercial farmers (sales greater than \$40,000 annually) in March and April of 2003. The response rate was about 50 percent, with 1,001 respondents who were actively farming and completed the survey. Gross sales for the sampled farmers averaged \$179,472. About 20 percent had sales of \$250,000. Operator averaged 54.7 years of age. Most farm operators had a high school degree, and 36 percent reported some college education or a college degree. About 34 percent of farm operators worked off farm year-around, and just over 9 percent worked seasonally off the farm. Fifty-seven percent of the farmers worked full-time on the farm.

Farmers were asked if they used an office computer in any aspect of your farm business. Just over 44 percent indicated computer adoption (Table 2). This is up from 32.1% in 1991 (Batte et al., 1995). Adoption rates varied significantly with farm size. For farms with gross sales of less than \$250,000 (80 percent of farms), adoption rates were 40.3 percent, but for larger farms, adoption averaged more than 61 percent. Adoption varied with operator age. Farmers younger than 50 years of age were significantly (at 0.01 probability level) more likely to have adopted than older farmers. Adoption rates also varied with operator education level. Farmers with some post-high school education reported 67.3 percent adoption versus about 32 percent adoption for farmers with a high school or less education level.

Farmers were also asked to give an indication of the number of hours of computer usage per month. The sample average was 16.4 hours per month (Table 2). This is up somewhat from the estimate of 14.8 hours given by a comparable sample of Ohio farmers in 1991 (Batte, et al., 1995). Larger farms reported significantly (0.01 probability level) more computer use hours; 24.7 hours per month, versus 13.1 hours for smaller farms. There was no statistically significant difference in the number of hours of computer usage by operator age or education levels.

In order to assess farmers' perceptions of the usefulness of the computer as a tool of business, they were asked to rate on a scale of one (no improvement) to five (very much improvement) the extent to which the computer has improved the business by either saving time or providing better information. The mean response for all computer

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<sup>1</sup> Presented at the InfoAg 2005 Conference, July 19-21, Springfield, IL. Salaries and research support provided by State and Federal funds appropriated to the Ohio Agricultural Research and Development Center, The Ohio State University, and by the VanBuren Program of Farm Management.

adopters was 3.5 (Table 2). Average usefulness score increased with gross sales (significant at the 0.01 probability level), and was significantly higher (.05 level) for farmers with post high school educations relative to those with high school or less education levels.

Table 2. Computer adoption, computer usefulness and computer usage levels by various farm and farmer characteristics.

Measure	Percent of Sample	Computer Adoption Percent	Hours of Computer User per Month	Computer Usefulness <sup>a</sup>
Full Sample		44.4	16.4	3.5
Gross farm sales				
\$40,000 - 249,999	79.7	40.3 ***	13.1 ***	3.4 ***
Over \$250,000	20.3	61.4	24.7	3.8
Age of operator				
50 or Less	40.4	52.7 ***	15.0	3.5
51 and over	59.6	39.2	18.2	3.5
Education level of operator				
High School Graduate or Less	63.8	31.5 ***	16.9	3.3 **
Post High School Education or Degree	36.2	67.3	16.4	3.6

a Farmers were asked to indicate the extent that the computer has improved the business by either saving time or providing better business information. A five-items scale was used, where:

1 = Not at all, 5 = Very Much

\* One, two and three asterisks indicate a difference in the means for the two groups that is significant at the 0.10, 0.05 and 0.01 probability levels, respectively.

Although the computer (hardware) is a necessary investment when adopting computer methods, it is the application software that is the ultimate tool demanded. Table 3 reports a number of applications of the computer and the percentage of farmers who report using each application. Financial record-keeping was the primary computer task in 1991 (Batte et al., 1995), and remains so today.

Table 3. Frequency of use of various computer applications and percent of farmers indicating each as one of three most important applications on this farm.

Application	Percent Reporting Use	Percent indicating as one of three most important applications <sup>a</sup>
1. Keeping financial records	89.1	76.7
2. E-mail	76.3	31.7
3. Keeping production records (crop or livestock)	75.5	49.1
4. Word processing (correspondence)	75.5	28.0
5. Accessing the Internet for other information	73.0	38.2
6. Commodity price tracking on the Internet	55.1	29.8
7. Computerized tax computation/filing	33.1	9.0
8. Online banking or bill paying	28.6	5.3
9. Buying farm inputs over the Internet	26.4	4.3
10. Online trading of stocks, bonds or other financial investments	16.5	1.9
11. Filing regulatory reports (e.g., pesticide use)	15.6	0.9
12. Selling your farm products over the Internet	12.7	0.6
13. Online trading of agricultural commodity contracts (futures/options)	9.2	0.0

a Farmers were asked to indicate the three applications that were most important for the management of the farm business.

The rapid development of the Internet, particularly since 1997, has expanded farmers' access to information and computer-based management tools. Seventy-six percent of farmers with computers reported use of e-mail services. About 55 percent of computer-using farmers reported price tracking on the internet, 29 percent performed online banking or bill paying, 26 percent reported the purchase of farm inputs using the Internet, 16 percent traded stocks, bonds or other financial instruments online, 13 percent sold farm products over the internet, 9 percent reported online trading of agricultural commodity contracts, and 73 percent use the internet to access information other than that listed previously. This last category is probably dominated by farmers' use of Google and similar searches for a broad array of information.

Farmers were asked to evaluate the 13 applications listed in Table 3. In particular, they were asked to identify the three most important applications for their farming business. The percentage of farmers who reported each item is shown in the right-most column of Table 3. Financial recordkeeping was the most frequently reported item, with 77 percent of farmers indicating this as one of the three most important applications on their farm. This was followed by production recordkeeping, accessing the Internet for general information searches, e-mail and commodity price tracking on the Internet. When all Internet-based tasks are grouped together (e.g., applications 2, 5, 6, 8, 9, 10, 12, and 13), Internet-based applications are identified as one of the three most important computer tasks by 73.5 percent of computer-adopting farmers.

Although the previous discussion suggests important relationships between computer adoption (or use) and farm size, operator age, education and off-farm employment, these univariate comparisons may greatly overstate the true relationships among these variables. For instance, although a strong relationship is apparent between farm size and computer adoption, larger farms are usually operated by people with greater formal education and a lower average age. Multivariate statistical techniques were used to examine the relationship between computer adoption (or use) and several explanatory variables. This approach allows the partial impact of each explanatory variable to be estimated. Following are some of the major conclusions arising from these analyses:

- Computer adoption
  - Increased with increased farm size (sales) and higher operator education.
  - Younger farmers were significantly more like to adopt the computer.
  - Adoption percent was higher on farms that were more reliant on leased land, and less adopted by livestock farmers.
  - Farmers who worked year-around away from the farm were more likely to adopt a computer for the farm business. This supports the hypothesis that farmers often are introduced to this technology by off-farm employment, and subsequently adopt the technology.
- Computer usage (hours)
  - Larger farms spent more hours using the computer.
  - Livestock farmers spent significantly less time with the computer than did farms without livestock.
  - Farmers who reported that important uses of the computer included gathering information from the internet or making transaction using the internet spent more hours with the computer each month.
- Computer usefulness evaluation
  - Computer usefulness evaluations rose with increased farm gross sales
  - Diminished with increased age of the operator,
  - Were higher for farmers who used the computer for financial or production recordkeeping or who gathered information from the internet.

For more detail, a full report is available at the following sources:

Batte, Marvin T. "Changing Computer Use in Agriculture: Evidence from Ohio". Computers and Electronics in Agriculture Vol 47 (2005): 1-13.

Or online at:

<http://aede.osu.edu/resources/docs/pdf/T4UCN5GF-KKXK-DC2O-5ISLC5WTUZ7FQE3I.pdf>

### References

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