

Does the Internet Increase Farm Profits?

by

Aaron Smith and Catherine Morrison Paul

Half of California farms have Internet access and 38 percent use a computer in their business.

Using results from a farm-level survey, we find that most farmers who use the Internet for business purposes perceive small, if any, financial payoffs from the Internet.

Computer and Internet use by California farmers decreased in the last two years, according to a recent report released by the USDA. In 2005, 58 percent of California farms had access to a computer, down from 64 percent in 2003. This decline came after steady increases during the preceding decade, and mirrors a similar decline in the proportion of farms with Internet access. However, many farmers use computers and the Internet only for non-business tasks such as e-mail and web surfing, and fluctuations in such personal activities drove the overall declines in use. The proportion of California farms using computers for farm business actually remained constant at 38 percent between 2003 and 2005.

In this article, we show that the average farmer finds few benefits to using the Internet for business purposes. Specifically, Internet purchases generate small cost savings and Internet marketing produces small increased returns. In qualitative terms, only about half of farmers who use the Internet for business perceive that it enhances their competitiveness. Nonetheless we expect the benefits of the Internet to increase in the future as more farm-specific applications develop.

How Much Do California Farmers Use Computers and the Internet?

The proportion of California farmers using computers for farm business increased sharply in the late 1990s, as we show in Figure 1. The proportion then decreased in the early part of this decade before leveling off at about

40 percent, compared to a national average of about 30 percent. Thus, the gap between the business use of computers for California farmers and those in the rest of the country has narrowed since the late 1990s but remains greater than five percent.

Internet use by California farmers also jumped in the late 1990s, but then leveled off between 2001 and 2005, as we show in Figure 2. Nationally, Internet use by farmers increased initially at a slower rate than in California. However, the nationwide rate of increase did not slow down as much as in California, enabling the rest of the nation to catch up in 2005. The proportion of farms with Internet access is now about 50 percent in both California and the rest of the nation, similar to the corresponding proportion for U.S. households.

Farmers' propensity to use the Internet varies by farm size and farm type. The USDA report indicates that farms with total revenue greater than \$250,000 make the most use of the Internet, with 72 percent having Internet access. The proportion drops to 59 percent for farms with revenue between \$100,000 and \$250,000, and 47 percent for farms with revenue less than \$100,000. A comparison between crop and livestock operations reveals little difference in Internet access, but differences do exist by commodity. Cotton and grain/oilseed farms are the most likely to have Internet access, with 59 percent and 56 percent, respectively, having access nationwide. Dairy and beef farms have a lower level of Internet access, with 48 percent and 44 percent, respectively, having access nationwide.

Figure 1. Percent of Farms Using Computers for Farm Business

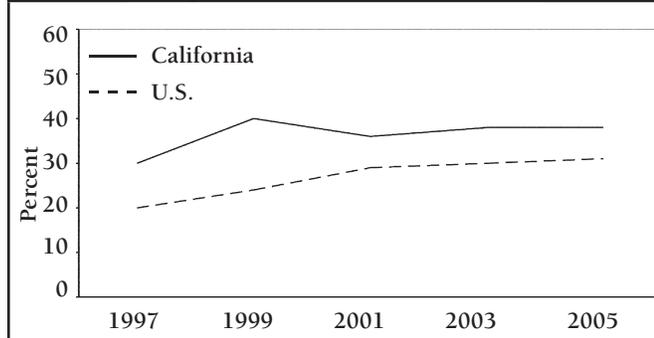
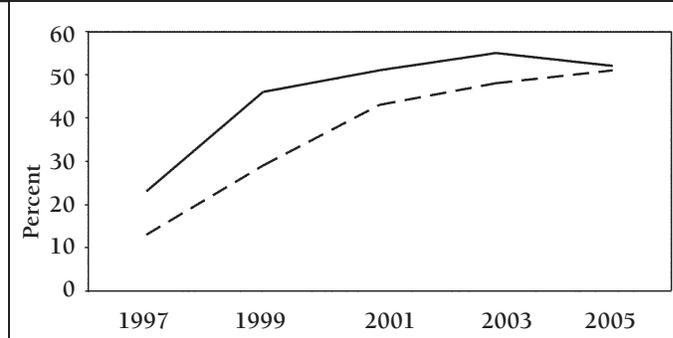


Figure 2. Percent of Farms with Access to the Internet



Why Do Farmers Use Computers and the Internet?

Farmers' use of computers and the Internet for business depends on their anticipated returns in terms of farm performance, and resulting competitiveness and profitability. Such returns could stem from various internal types of computer use, such as better record-keeping, accounting, tax reporting, decision-making and production processes. External Internet uses such as researching and marketing might also generate returns through the accumulation of information with competitive value. The magnitude of returns to the Internet also depends on the intensity of use, e.g., the amount of purchases made or number of tasks carried out through the Internet.

The potential benefits of computers and the Internet have likely increased over time, as their costs have fallen and availability and applicability have risen. For example, direct costs have fallen as the technology has advanced and computer prices have plummeted.

Learning costs have also dropped as more people gain familiarity with computers through their use in homes, schools and outside employment. The number of user-friendly applications also continues to rise.

To gain insight into the benefits of computers and the Internet to farmers, we used data from a year 2000 survey of computer and Internet use by Great Plains farm operators. This survey contains much more detailed information on computer use than is available currently for California farmers. The 1,679 farmers in the survey were randomly selected from the membership rosters of the Farm Bureau Federations in Kansas, Iowa, Nebraska and Oklahoma. Responses were received from 579 farmers—a response rate of 34.5 percent. For our analysis we used data for the 517 farmers who had no missing information on the variables of interest.

In this sample, 61 percent of the farmers had a personal computer, which is similar to the California level documented in the recent USDA report. In addition, 43 percent of the farmers said they used a computer for

business purposes and 51 percent reported having a computer that had access to the Internet. A total of 152 farmers (30 percent) used not only their computer, but also the Internet, for business purposes.

Table 1: Benefits for Farmers Who Use the Internet in Their Business

Question	Average	
	% Yes	Dollar Value
<i>Use for information</i>		
Using the Internet to acquire business information has increased financial returns during the past year.	27	
Estimated dollar value of the increased financial returns in 2000.		3,753
<i>Use for purchasing</i>		
Do you use the Internet to purchase goods and services that you use in operating your farm or ranching business?	33	
What is the estimated dollar value of the goods and services that you purchased over the Internet in 2000 for use in operating your farm or ranch?		7,655
In 2000, what would you estimate to be the dollar value of your cost savings from using the Internet to purchase goods and services that you use in operating your farm or ranching business?		1,036
<i>Use for marketing</i>		
In 2000, did you market any of the commodities that you produce or any services using the Internet?	5	
What is the dollar value of the commodities and services that you marketed over the Internet in 2000?		29,071
What was the dollar value of the extra sales revenues that you received in 2000 as a result of marketing commodities over the Internet?		6,188
<i>Overall benefit</i>		
Overall, has using the Internet improved the ability of your farm or ranch to compete in your industry?	53	

Costs and Benefits of Internet Use

Our data captures two direct costs of Internet use: connection and subscription expenditures. The true cost also includes the purchase of the computer and the learning required for its effective use. The average annual cost of an Internet connection for business-related Internet users was \$237. However, 99 percent of business users also used the Internet for personal matters, so the additional cost of connecting to the Internet for business was likely minimal. Most business-Internet users collected information about running their farm from the Internet—141 out of 152, or 93 percent. The average subscription cost for this information was \$10 (including the 129 out of 141 farmers who reported zero costs). The combined direct cost of Internet connection and subscription services to farmers is therefore very low. However, for many farmers the time cost of learning to use the Internet may be large, and thus present the greatest barrier for effective use.

We measure the benefits of the Internet using farmers' estimates of returns. We have quantitative dollar measures of farmers' estimated returns from various Internet applications, and a qualitative (yes or no) measure of whether or not the farmer thought the Internet contributed to farm competitiveness. These perceived benefits varied substantially, and many farmers reported zero returns from Internet use.

Of the 152 farmers who used the Internet for business purposes, only 27 percent reported that information obtained on the Internet helped them increase their financial returns. For these farmers, the increase in average financial returns was \$3,753 (Table 1). Aside from the 27 percent who reported increased financial returns, seven percent collected no business-related information on the Internet and 66 percent used the Internet to obtain business information but reported that this information did not help increase financial returns. Thus, most farmers who obtain business information over the Internet receive no financial benefits. However, the low cost of this information means that farmers also do not incur significant losses from using the Internet to obtain business information.

Of the farmers who used the Internet to make business-related purchases and reported the dollar value of total purchases, average cost savings was \$1,036 (Table 1). Given their average total purchases of \$7,655, this implies an average cost saving of 14 percent. However, only 42 percent of the farmers who made Internet purchases reported cost savings; for these farmers cost savings averaged \$1,836, 23 percent of their total purchases. For the five percent of business-Internet users who marketed their products on the Internet, the average reported increased returns were \$6,188, or approximately 20 percent of the value of the marketed goods. This group contains only seven farmers, which makes it difficult to generalize and also indicates that most of the farmers in the dataset chose not to even try marketing their products on the Internet. Internet marketing opportunities for Midwestern grain or livestock farmers are probably very limited however, and the potential for Internet marketing may be higher in California.

Most farmers did not report a positive dollar value for their financial benefits from Internet use, but 53 percent of the 152 farmers who used the Internet for business reported that Internet use enhanced their competitiveness (Table 1). To explain which farmers found the Internet beneficial in this sense, we used a statistical logit model to predict the probability that farmers believed the Internet helped them compete, based on

various farm and farmer characteristics. We estimated this model only for those farmers who used the Internet for business.

The only farm or farmer characteristic that significantly affects perceived benefits of the Internet is whether the farm is a family farm. The probability that the Internet is deemed beneficial is 25 percent lower for family farms, suggesting that such farmers may have a higher propensity to use the Internet primarily for personal tasks. However, the perceived benefits of the Internet as a business tool seem unrelated to the size of a farm, the age of the farmer, or the education level of the farmer.

The most important determinants of farmers' perceived returns to Internet use involve how it is used in the business. Farmers who make purchases on the Internet are not significantly more likely to find that Internet use improved their competitiveness. However, using the Internet to get information on input pricing or agricultural commodity markets each increased the probability of finding the technology useful by about 30 percent.

Gathering other types of information from the Internet did not seem to help farmers compete. For information on weather, this may be because close and low-cost substitute sources exist in the form of newspapers and radio. By contrast, information on commodity markets and input prices are less readily available from other sources. Obtaining information on agricultural policy or technical characteristics of inputs also does not seem to enhance competitiveness, perhaps because such information is difficult to use in production decisions and so is gathered more out of curiosity.

The number of years using the Internet for business is also associated with a higher probability of greater perceived returns. This result could indicate a learning effect; farmers find the Internet more useful as they spend time using it and discover where the benefits lie. Alternatively, it could indicate that farmers simply continue to use the Internet for business if they find it useful.

Conclusion

In this article we explore farmers' use of computers and the Internet. Only about half of the farmers in our Great Plains data who use the Internet for business believe that it has increased their competitiveness, and even fewer report positive economic returns. This limited perception of the technology's contribution to farm

performance may be partially explained by its general-purpose attributes. Because the purchase of a computer is a fixed cost, and Internet access is typically priced at a flat rate, business and personal use may be too intertwined to distinguish effectively. If a farmer already has a computer with Internet access for personal use, the marginal cost of performing some business applications on the Internet is close to zero. Such a farmer is therefore more likely to use the Internet to gather, for example, business-related information even if the financial benefits of this information are negligible. This argument applies equally well to California farmers, for whom overall computer-use rates do not differ substantially from the rest of the country (Figures 1 and 2).

Perceived benefits of Internet use for farm business will likely increase as more farmers move up the learning curve, as the technology becomes more pertinent to farm business, and as new applications and services become available. For example, voice over Internet Protocol (Voice over IP) will eliminate long-distance charges, and wi-fi wireless networks will permit mobile Internet applications on the farm. Such applications will be particularly useful in helping the industry to track produce from planting to the store. Further research tracking these changes and better identifying and distinguishing both business and non-business benefits of farm Internet use seem particularly important for understanding how the technology might change farm production processes and competitiveness in the future.

For more details on the use of computers and the Internet in agriculture, the authors recommend the following reading:

Smith, A., W.R. Goe, M. Kenney, and C.J. Morrison Paul, "Computer and Internet Use by Great Plains Farmers," *Journal of Agricultural and Resource Economics*, 29(3):481-500, 2004.

USDA National Agricultural Statistics Service Report, "Farm Computer Usage and Ownership," available at <http://usda.mannlib.cornell.edu/reports/nassr/other/computer/>.

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(Continued from page 4)

North American Agriculture: \hat{E} Assessing NAFTA at 12 \hat{E}

Friday, January 13, 2006 \hat{E}

Sacramento Hilton, 2200 Haryard Street
tel 916-922-4700 \hat{E}

AGENDA

8AM: *Registration and continental breakfast*

9AM: *Welcome and Introduction,*
David Zilberman, UCB

9:15: *Assessing NAFTA, CAFTA, and the FTAA. \hat{E}*
Chair, Philip Martin, UCD \hat{E}
Gary Hufbauer, Institute of International
Economics
Discussants, Ann Harrison, UCB
Rob Feenstra, UCD

10:15: *Coffee break*

10:30: *Trends in Specific Commodities*
Chair, David Zilberman, UCB
Canada-U.S. Trade, Colin Carter, UCD
Mexico-U.S. Trade, Steve Zahnheiser, USDA
Discussant, Roberta Cook, UCD

12PM: *California in the 21st Century \hat{E}*
Lunch with Dan Walters, Sacramento Bee \hat{E}

2PM: *NAFTA's People Impacts \hat{E}*
Chair, Colin Carter, UCD \hat{E}
Mexico-U.S. Migration, Ed Taylor, UCD
Impacts of Mexican Migration, \hat{E}
Philip Martin, UCD
Discussant, Alix Peterson Zwane, UCB

3:30: *Coffee break*

3:45: *What Can Agriculture Expect from Doha?*
Jason Hafemeister, Director for WTO
Agricultural Negotiations,
U.S. Trade Representative's Office \hat{E}

4:30PM: *Adjourn \hat{E}*

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The registration fee is \$75, which includes meals and conference materials; registrations received will be acknowledged with receipts and conference materials. If you would like to participate, please send a check made payable to UC Regents before December 13, 2005 to: \hat{E}

Philip Martin
Dept. of Agricultural and Resource Economics
UC Davis
1 Shields Ave
Davis, CA 95616

Rooms can be reserved at the Sacramento Hilton at the special rate of \$84 plus tax, by using the UC-Giannini Group, code SDA. Rooms must be reserved by December 20, 2005.

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For additional information on the conference and the registration process, visit the Giannini Foundation Web site at \hat{E}
<http://giannini.ucop.edu>. \hat{E}