CYBERFARM Gains a Foothold

Steve Sonka and Karen Coaldrake

Those of us who grew up on the farm can well remember the smells and sounds as we went about the chores for the day. In the Midwest, chores meant feeding livestock before school, driving grain trucks at harvest, or flagging down the combine when lunch was ready on the tailgate of the pickup truck. These activities still occur on today's farms, but soon the chores also may include checking weather patterns in Brazil via the Internet, sending e-mail to the local veterinarian when a disease problem hits, or exchanging production maps with a cereal manufacturer interested in the crop. Welcome to the chores of the "Cyberfarm," where the value of information and communication technologies matches the worth of tractors.

Although this may sound like a scenario for some distant future, it is beginning to happen now, as we show in this article.

The Cyberfarm seed in central Illinois

The Champaign County Network (CCNet) Agribusiness Task Force of east central Illinois provides a good example of precision agriculture and the use of the Internet. CCNet was formed in 1993 after Larry Smarr, director of the National Center for Supercomputing Applications (NCSA) at the University of Illinois, challenged the area Chamber of Commerce to become an "on-line community." The Chamber responded with the formation of CCNet and the creation of task forces, made up of local volunteers, to explore educational, health care, business, government, library, and agribusiness opportunities. The authors have been members of the CCNet AgriBusiness Task Force and Coaldrake has served a term as its co-chair.

The CCNet AgriBusiness Task Force was originally formed to create electronic access to support precision agriculture. The group soon broadened its mission to include communication and information management. Of more than 100 agribusiness task force members, approximately 25 percent are producers, 20 percent are from local marketing and input supply firms, 30 percent are from the University of Illinois, and the remaining 25 percent come from area schools, consulting firms, government agencies, and associations. Led by volunteers, members contribute a diverse range of experiences with the Internet, technology, and agriculture. Indeed, in 1994 when the task force was first assembled, very few of the private sector members were on-line, although the majority of them were early adopters of precision agriculture. Today, most of the communication within the task force takes place with e-mail. Although e-mail remains the "killer application" for members, use of the World Wide Web (WWW or Internet) has motivated the AgriBusiness Task Force to create their own vision of the future, Cyberfarm (figure 1).

Cyberfarm is an on-line web site originally created as an electronic community to help meet producer information needs. Cyberfarmers, input suppliers, marketing firms, support services, education, and a cyberdiner make up the electronic community. Each may be called upon by a producer to provide information needs.

Cyberfarmers. The Cyberfarmer Web location provides a place for on-line producers to share farm production information. The original CCNet Cyberfarmer, John Reifsteck, developed his farm home page (figure 2) with images from his personal digital camera, field maps, and security-protected information. Reifsteck believes that information between producers, landlords, bankers, consumers, and others will be easily transferred through Internet technology. Kent Krukewitt, the second Cyberfarmer, developed a "farm report" (figure 3) to describe the ongoing growing season with a restricted information section to communicate with land owners. Maintaining good relationships with landowners is a key management task for farmers in east central Illinois. Krukewitt and his colleagues hope that on-line communication can enhance their ties to existing and potential land owners. At a broader level, these farmers also hope that the "farm reports" and e-mail contact via Internet will break down some of the geographical barriers and stereotypes that exist between citizens in urban centers and farmers.

Input suppliers. On-line information about products, services, and company contacts is maintained by firms marketing genetics, chemicals, fertilizers, financing, feed, precision agriculture services, and other products. CCNet producers hope to develop on-line rela-

tionships allowing them to e-mail sales representatives with product questions, exchange digital images of crop diseases with agronomists, download useful software and upgrades, and access on-line parts manuals.

Marketing. The AgriBusiness Task Force includes representatives of several cooperatives, private elevators, and the Midwest Frito-Lay grain procurement operation. Frito-Lay in central Illinois is now developing an Internet-based system to better communicate information to food-grade corn contract growers. They will receive information on preferred hybrids, delivery schedules, financial accounts, and prices from local grain merchandisers. Local contract producers will be able to access their individual accounts, with the use of a password, and then download information in spreadsheet form which can be used on the home/farm computer (figure 4).

Support services. Public agencies provide much information on the Web, but it is often time-consuming to locate, files are not compatible, and interpretation challenges nonexperts. The AgriBusiness Task Force demonstrates the kinds of public information—primarily related to satellite imagery—available and also some of the software available to make better use of the information.

Education. Task force members emphasize that education is on-going from pre-school through adulthood. Here the task force recognizes the growing importance of the Internet as a family resource that provides value across age and occupation (figure 5). Also, distance education is explored as a tool that will enable producers to access experts from around the world through home video conferencing.

Cyberdiner. The CCNet group felt that they needed to develop an on-line site with information relevant to their businesses in Champaign Counry. As a result the Cyberfarm Information Diner (figure 6) was created to take users to crop, livestock, and other information. Although the CCNet AgriBusiness Task Force began with an agricultural motivation, Cyberfarm families now communicate with other family members via e-mail, spouses find information ranging from IRS forms to recipes, and children use information for homework. To address the interests of the family, the CCNet group has created a "Hello Family" area for information from high schools, 4-H clubs, towns, and other sources.

Figure 1. Cyberfarm home page
http://w3.ag.uiuc.edu/INFOAG/cyberfarm

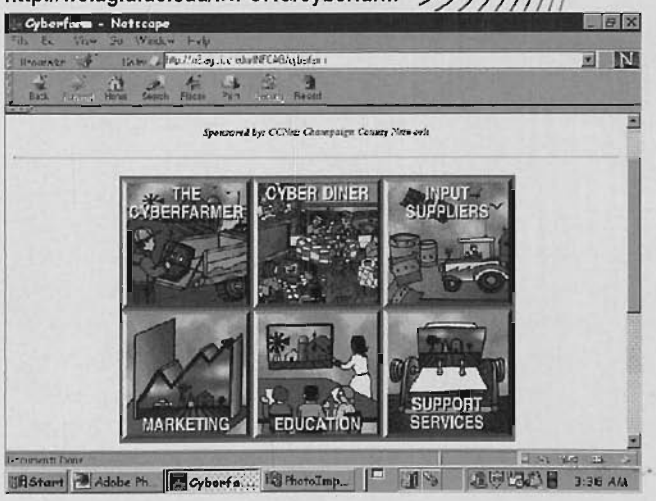

Figure 2. John Reifsteck Cyberfarmer Home Page
http://w3.aces.uiuc.edu/INFOAG/cyberfarm/reifsteck/index.htm

These family and community resources encourage the growth of an on-line rural community, but current communication infrastructures in rural areas often prove inadequate for a Cyberfarm world. However, new approaches, such as high-speed cellular modems, satellite communication technologies, and compression utilities, are becoming available which could make high-quality Internet access a reality to rural areas in the next few years, or perhaps even months.

Forces pushing Cyberfarm's role in agriculture

Only a small percentage of Midwest producers currently use on-line WWW information or precision agriculture. We believe, however, that given improved rural connectivity, the dramatic increase of Internet users in general, and the adoption of precision agriculture, farmers, agribusiness, research and education institutions, and government agencies will use the Web to better communicate with each other.

The availability of improved information and communication technologies is not the sole force driving the emergence of the Cyberfarm. Consumers now demand more accountability from the food system in terms of food safety, environmental responsibility, healthier food attributes, and animal welfare—all attributes that can affect how farms produce food. In response to these demands, food manufacturers will

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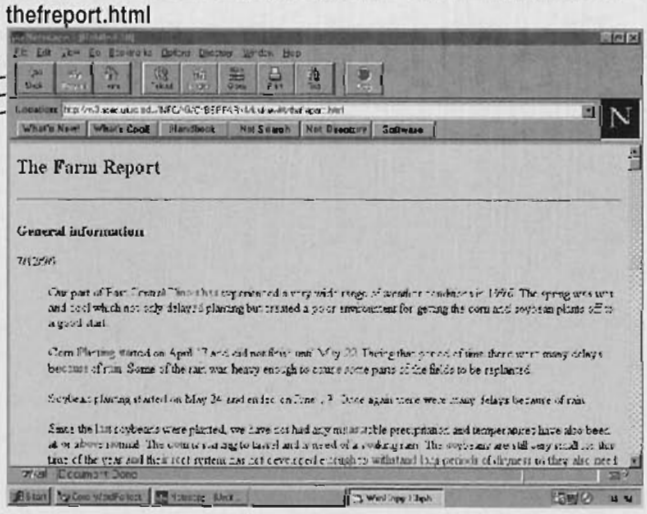
need to better understand and communicate with producers during agricultural production. At the same time, government programs seem to be evolving in a fashion that reduces subsidies and encourages producers to explore alternative means to reduce risk—possibly through market mechanisms that become available with vertical coordination and improved information technologies. Environmental legislation, too, may well drive the use of advanced information technology as pesticide and fertilizer use and waste management practices become more closely monitored and producers incur additional responsibility for recording and reporting practices. Finally, bioengineering may fuel the adoption of information technology as new products designed to meet specific needs become available and need to be more precisely tracked through the agricultural production and marketing system.

Maximizing the decision-making potential of precision agriculture

To maximize the decision-making potential of precision agriculture, farmers need to communicate, manage, and interpret data. The farm actually becomes a multitude of experiments, where performance is measured not only by product, but also by different production packages. In this Cyberfarm world, data from the operations of precision agriculture will be manipulated and shared through online tools with participants in the food chain. Farms and related businesses and agencies will develop new relationships, and production decisions will improve. Precision agriculture can provide the capability to capture large amounts of detailed data on farm operations, but "capturing" is not enough for improved practices. Communicating, analyzing, and interpreting massive amounts of information must accompany data acquisition. The human capital needs associated with the use of advanced information technologies must be considered.

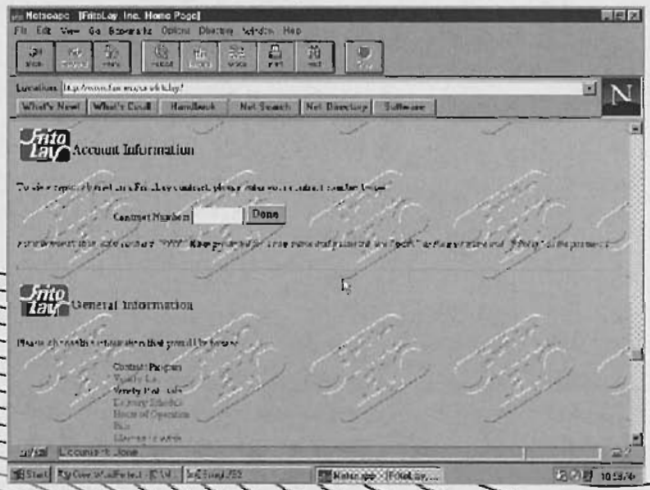
Figure 3. An internet posted farm report
http://w3.aces.uiuc.edu/INFOAG/CYBERFARM/krukewitt/thefreport.html



Cyberfarm and market relationships

The development and use of advanced information technologies introduce new opportunities and new stresses. Today, producers and input suppliers rely heavily on face-to-face contact for product information and performance impressions. In a Cyber–farm world, producers will access information that permits analysis of product performance at specific sites. For example, with sophisticated yield monitoring equipment, hybrid yields can be shown by soil type, chemical application, and fertilizer level. This information, if captured, may be vital for industry research, or, at the minimum, may be critical in the relationship between input supplier and producer. Agribusiness will need to initiate information partnerships to better understand product performance and link to customer needs.

Figure 4. Frito Lay home page
http://www.farmer.com/fritolay/



New partnerships will develop among input suppliers, between suppliers and end users, between producers and end users, and among producers. Once established, partnerships must provide information to aid on-going business development. The masses of information that may become available will also stress the current data processing system of most agricultural organizations, not just individual farming operations. Supercomputing capabilities, including the human expertise required to manage and analyze massive data sets, will become necessary to fully exploit decision-making capabilities. New information technology strategies for decision making must be developed to enhance competitiveness.

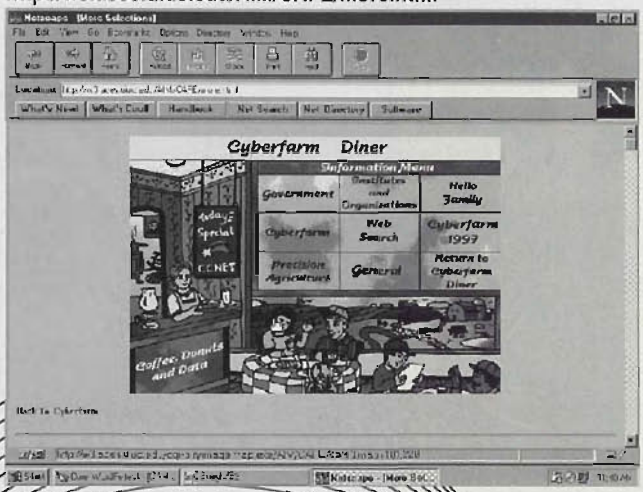
Improved producer communications

Although the number of agricultural input suppliers and marketers with an on-line presence has literally exploded over the past years, it is disappointing to see that many of these Web sites provide corporate advertising rather than strategic communication tools and information. For example, many WWW sites do not have useful e-mail links to agronomists, sales representatives, or others within the company who can provide service at the local Cyberfarm level. Many sites do not have search features that tailor information to a producer's interest. To fully exploit the potential of electronic communications, these tools must be used to provide targeted information for each trade partner.

The challenge is on

The potential for an information- and communications-intensive Cyberfarm offers tremendous opportunities for the agricultural system, while challenging the system with new forms of information transfer and market relationships. We do not expect all of agriculture to quickly "morph" into an on-line world dominated by farmers at keyboards, satellite images, and no person-to-person contact. We do suggest that as the number of farmers declines and the size of farms increases, producers will demand access to product specialists rather than local sales representatives, and time will become an even more valuable commodity. Information must be current, easy to access, and not limited by geographic borders or the hour of the day. Available technologies, such as the Internet, fit well with these needs of evolving Cyberfarmers. We suspect that *some* face-to-face contact will be replaced with e-mail, visits to new customers may be preceded by examining the producer's home page on the World Wide Web, and product selection will be driven by site-specific performance results.

Figure 6. Cyberfarm Information Diner with Hello Family Area
http://w3.aces.uiuc.edu/AIM/CAFE/more.html



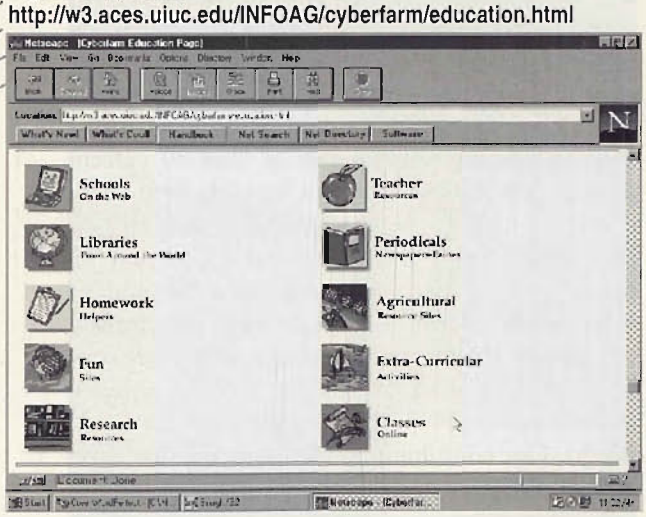
This article began with a discussion of new chores on the Cyberfarm. There also will be new chores for the food and agribusiness sector as companies begin to struggle with resource management issues that result from improved communications and information technologies. Today, few producers utilize the Internet for their precision agriculture operations. However, these early adopters, like those in the CCNet AgriBusiness Task Force, offer valuable insights for those interested in the kinds of information and communications resources that will be needed in the future. One of the immediate challenges is to identify or develop individuals with the technical skills and creativity to visualize how to use these tools in a competitive environment.

Perhaps this challenge is best illustrated by a question that came from a seasoned communications department manager for a major agribusiness firm. He asked, "What if we get 30,000 e-mail messages from our farmer customers?"

We challenge, "What if you don't?"

Cyberfarm is currently being registered as a trademark by the Champaign County Network (CCNet) in east central Illinois.

Figure 5. Cyberfarm educational sites
http://w3.aces.uiuc.edu/INFOAG/cyberfarm/education.html



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