

The Market for E-Commerce Services in Agriculture

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The emergence of Electronic Commerce (defined here as the transaction of business on the Internet) as we know it today has been met with much enthusiasm in some circles. However, little is known about how the attitudes of managers and other personnel interface with the economic reasons for adoption. A standard approach for study of the Internet and E-Commerce has been to evaluate either the reasons for adoption, or profile the participation rates of E-Commerce practices. Neither approach provides real insight into the ultimate concerns that these managers are addressing within their companies (Ernst and Tucker, 2001). For agribusiness firms upstream of the producer, it should be remembered that E-Commerce is not so much a product as it is a method for delivering agricultural inputs. The value of E-Commerce, particularly in rural areas, must be determined in part by observing how it affects the behavior of consumers (i.e. whether it changes the way they transact business) and by how it affects the firm's managerial processes. Ultimately, of course, we are concerned with the success and profitability of firms, although like all studies to date, effects on profits have been difficult to estimate.

Developments in the last decade have successfully adapted the flow of information technology to a wide range of cost-effective applications, producing and marketing agricultural commodities among them. In this paper, evidence of the acceptance of E-Commerce among agribusiness is evaluated, and data on Internet adoption and use from a recent comprehensive survey of mostly small- and mid-sized agribusinesses in Ohio is reviewed. This paper discusses some of the uses and responses to the applications that have emerged.

A majority of agribusinesses surveyed for this study indicate that they are changing the way they think about their business structure thanks to the entrance of E-Business and E-Commerce tactics to the industry. While about half of businesses have taken a proactive stance to E-Commerce by doing such things as setting up a website or buying and selling products online, the other half have more or less decided against the Internet as a tool in their business despite the fact that an Internet presence is likely to be necessary in the future. Many businesses use the Internet to communicate with current and potential customers, as well as with their suppliers. Before these issues are explored, a brief summary of information technology developments and the attending issues of farm structure and policy are reviewed.

Agriculture and Information Technology

An assessment of the market for E-Commerce needs to first recognize the differences in quality and availability of local Internet access and the potential marketing of a product, usually to a farmer. Understanding how E-Commerce could affect agricultural input delivery would greatly benefit participants and policymakers. Computer adoption in the general population continues growing at a steady rate, as does Internet use (U.S. DoC, 2001). Private and public analysts currently project that more than half of all Americans use the Internet. While rural areas lag the rest of the country in Internet adoption and, by assumption, E-Commerce use, Internet penetration in rural areas grew at a 75 percent pace in the 18 months ending August 2000 (U.S. DoC, 2001) and appears to be continuing a similar pace in 2001.

The open access architecture of the Internet, declining information technology costs, and high volumes have resulted in progressive steps forward for the entire marketing system. Parallel changes in the structure of agriculture have also contributed to the popularity of the current generation of information technologies. Chief among the changes is in the need for closer coordination of the supply chain – both upstream and downstream from the producer – and stretching from seed, fertilizer and machinery suppliers, to food processors and retailers. In the traditional farm supply system products moved from the manufacturer to a series of wholesale distributors before reaching the retailer and ultimately the producer. Each link of the chain did most of its business with its neighbors on either side and had little contact with the rest, and markups were added at every step. Developments in information technologies and competition have forced new relationships between and among layers of agribusiness to form a complex web of interaction. In the last decade consolidation and firm growth brought larger agribusinesses to local markets. This, in combination with a general tightening of supply chains, allows opportunities for expansion and increased chances of firm survival, possibly by joining forces with larger agribusinesses. Additionally, the demographic shifts, and declines in rural population in general, make it more difficult for a business to serve the needs of the often remote producer. A related issue is the difficulty in recruiting and retaining qualified people to serve the needs of these producers through a sector that either may be transforming from high-volume input sales with a minimal service component to

low-volume input sales with an emphasis on service.

Farmers have generally been open to adopting information technology, even if they have done it more slowly than the overall population or other industries. Particularly relevant observations come from adoption of technologies that help to manage financial or environmental risk. USDA's annual national Agricultural Resource Management Study, showed 29 percent of farms had Internet access by 1999 and about 15 percent of those had conducted some business (E-Commerce) over the Internet, mostly to purchase crop inputs (Morehart and Hopkins 2000). Retail sales via the Internet are about 1 percent of all retail sales in the American economy (DOC 2001). Although data on the extent of E-Commerce conducted by traditional agribusiness is still limited or speculative, agribusinesses experience with some types of electronic markets is not new. A commercial cotton exchange was established in the late 1970's, and university-run exchanges in beef cattle (and dairy cattle for beef) demonstrated the viability of electronically oriented marketplaces (Sporleder, 1983). However, current electronic markets have features that differ significantly from those early efforts: the open access nature of the Internet; reasonable hardware costs; and the (usually) increasingly low (and declining) cost of access.

Primary characteristics useful for successful electronic marketing include (Henderson): organized and centralized trading; widely dispersed buyers and sellers with remote access; and merchandising based on product descriptions. If the non-price related terms of exchange, such as the logistics of bringing sellers and buyers together, and ways of describing products and concluding transactions are found, then the focus turns to a price-centered negotiation. Market success depends on a high trading volume, reliable grades and standards and reasonable charges.

The benefits of electronic transactions are often trumpeted by those who promote Internet technology. E-Commerce in agriculture could potentially tighten the supply chain and cut marketing margins and transaction costs in ways that benefit smaller, local producers as well as local agribusinesses. It enables a vast array of products to be transacted, usually at a price that is competitive with local retailers. While those efficiency-inducing benefits (if realized) seem real and rather non-controversial, other sources of benefits are much more conjectural as well as controversial. Potential indirect costs of moving to the technology can be described. (An example would be quanti-

fyng the social benefits of E-Commerce or simply Internet access, including the degree to which it continues the viability of businesses in a given community.) Whether it enhances the quality of life in a region or whether higher competition from other agribusinesses on the Internet contributes to a decline in locally available goods or services is an empirical question. Assessing and analyzing these potential indirect costs and benefits is not a part of the scope of this paper, although we recommend their future study.

Ohio Agribusinesses & E-commerce

The Ohio survey set out to document the linkages between firm management and information technology adoption, using data collected as part of a research project sponsored by the Anderson Chair in Agricultural Policy, Marketing, and Trade at The Ohio State University (Ehmke, Ernst and Tweeten). The objectives of the project were:

1. To determine the parameters of the state of affairs, specifically spending and perception patterns of agribusiness in light of the Internet.
2. To identify agribusiness attitudes toward opportunities in marketing and manager perceptions of the relative merits of an E-Commerce strategy.
3. To develop ideas for educational programs by the Department of Agricultural, Environmental and Development Economics at Ohio State and agribusiness associations.

In late July and August 2000, 608 mainly small and midsize agribusinesses headquartered in Ohio were surveyed by mail. The sample was targeted to the membership lists of two agribusiness organizations in the state: one oriented to feed, grain, and crop inputs and services (including consultants or sellers of financial services); the other served the farm equipment industry. While membership in these two organizations is voluntary, we were comfortable that minimal or no self-selection bias exists based on the organizations' overwhelming acceptance by potential member firms. Mailings were targeted to senior management in the company, excluding branch managers to avoid double responses from the same firm. Several design strategies were employed to help maximize responses. Survey instrument and follow-up mailings came from Ohio State and included the signatures of project coordinator from

OSU and executives of the cooperating associations. The survey itself was a six-page booklet containing 279 variables. The survey was followed a week later by a reminder postcard and, later still, a second follow-up mailing to non-respondents.

Agricultural firms are renowned for growing resistance to surveys and, consequentially, low response rates. Although the survey shared the limitations of all mail survey research and the possible biases introduced by the method should always be in the reader's mind, we do not believe that the answers received were unusually unrepresentative or distorted. Overall response rate was 45 percent. List response rates were 39.1 percent for the feed and grain inputs group and 47.5 percent for the machinery organization.

Total Mailing	608	
Total Response	274	45.1 percent
Usable Responses	259	42.8 percent

Questions were in two broad areas. Respondents were first asked about the presence, use and planned use of various information technologies, centering on the use of the Internet. They were then asked about their attitudes toward E-Commerce.

The average agribusiness surveyed employed four to 10 people; had sales of around \$ 5 million; owned an average of 6 computers (3 with Internet access); and had a fax machine, pager, four or five cell phones and sometimes a satellite receiver. About one-quarter of the companies were cooperatives.

Highlights of the survey include the following:

- Of the entire sample, 51.2 percent of firms reported having a website (128 of 259 usable responses to the question). Slightly less (48.2 percent) reported that they have registered a universal resource locator (URL).
- Of those that had a website, approximately 40 percent were selling via E-Commerce. This is about 20 percent of the overall respondents.
- Measured by both annual sales and number of employees, firms with a website were larger than businesses without a website.

Agribusinesses surveyed were using the website in simple ways, providing non-interactive information about the industry or the market, or providing links to other resources aimed at presenting a virtual face to the company, with the aim of attracting new customers. Very few provided higher-level options such as account management. Those transacting business online usually (83 percent) only earned revenue from the sale price of the item – rather than from more sophisticated profit streams such as affiliations, advertising, or transaction fees.

Table 1: How agribusinesses earn revenue on E-Commerce transactions

From sale price only	Transaction fees	Advertising fees	Affiliations	Subscriptions	No earnings
83.3%	2.8%	5.6%	2.8%	0%	22.2%

Many managers surveyed indicated that they were concerned with their ability to protect market share within a region. While the Internet may make it possible for farmers all over the world to find out about a tractor dealership, the dealership can only offer services within a small region. Therefore, the incentive for the firm to penetrate their potential market seems particularly strong.

Agribusiness and the Internet

One of the most easily observable indicators of the acceptance of information technology has been the appearance of websites launched by businesses. The Ohio study revealed that 79 percent of agribusinesses had Internet access and about half (51 percent) of the businesses had their own website. Many of those had registered their own unique universal resource locator (URL). While some respondents to the Ohio survey had been buying, selling, or both, online for about two years, many (68 percent) had only started doing so in the year prior to the survey. For comparison, Dunn and Bradstreet have reported that 70 percent of all small business have access, and 38 percent have a website. D& B add that more than half say that the Internet will have no impact on their business. In contrast, Ohio agribusiness managers were clearly of the opinion that E-Commerce will be a requirement for businesses in the coming years. Responses to a number of questions about the long-term effect and importance of the Internet on their business and their

industry indicated a genuine concern for the role that information technology, specifically the Internet, would play in their business. Nearly all Ohio agribusinesses agreed that the Internet was important and would be a part of business plans in the future. Beyond that, the differences among agribusinesses that arose are best illustrated by the current and potential online buying and selling activities (Table 2): 41 percent of the surveyed firms were buying online, and almost all were planning to continue; the other 59 percent were not buying online, and 79 percent of these did not plan to ever start. Similar figures exist for the selling side. It appears that a ‘settling out’ has occurred in which those who have wanted to start E-Commerce strategies have started them, and those who haven’t yet started, are, for the most part, not going to start. That leaves about 12 percent of agribusinesses that have not yet started buying products online, but are planning to start (and 27 percent on the selling side). From that, it is clear that about 53 percent of Ohio agribusinesses are committed to the Internet: they are buying online (or intend to start) and are going to continue. The other 47 percent are either not buying online, or are buying but plan to stop. On the selling side, 48.6 view E-Commerce positively and 51.4 view it negatively. The core of those who view the Internet negatively believe that they do not have a product that can be successfully promoted online and, therefore, are less enthusiastic about the Internet.

Companies widely agreed that competition will force agribusiness to have an E-Commerce presence. Well over half of respondents from all categories agreed or strongly agreed with this. Firms with websites agreed more strongly than those without, and firms that were selling online agreed more strongly than those not selling. The fact that less than half of the firms surveyed have a website and that half of those are selling product online (See Table 3.), suggests that many of these managers responded to the question with an eye to the future. They recognize E-Commerce as an inescapable trend, but one that may not have reached its time for many of the products that they offer, or the markets that they are in.

A small number of companies in the sample will make the jump to the Internet in the near future (the figures indicate that most of the ones that are interested in the Internet have already started). Looking at the intentions of these companies, it is clear that many have no plan to either begin buying or selling online once they make the move. However, those who already

are transacting business via the Internet overwhelmingly report that they will continue. Either they have had favorable experiences to date, or have faith in a successful future. Looking at the selling side of E-Commerce for the Ohio firms found similar observations. Selling products online, arguably more difficult and requiring more of a commitment, was done to less of a degree than buying (23 percent were selling online). The number of companies selling online may double in the future, leaving about half of the businesses without an electronic sales.

Table 2: Agribusinesses buying online and plans to continue or start.

Buying Online?	Yes (41 %)	Plan to continue?	Yes (98%)
			No (2%)
	No (59 %)	Plan to Start?	Yes (21%)
			No (79%)

Table 3: Agribusinesses selling online and plans to continue or start

Selling Online?	Yes (23 %)	Plan to continue?	Yes (91%)
			No (9%)
	No (77 %)	Plan to Start?	Yes (36%)
			No (64%)

Table 4: Types of products sold through electronic commerce.

Type of Service	Percent
Feed	8.3
Seed	5.6
Grain	2.8
Crop Services	2.8
Consulting	5.6
Crop Inputs	61.1
Machinery	41.7
Parts	2.8
Breeding Stock	25
Financial	0

Table 5: Methods used to interact with suppliers

Method	Response on a 1 to 6 scale
1. Telephone	5.84
2. Fax	5.07
3. US Mail	4.96
4. Personal visits	3.44
5. E-mail	3.28
6. World Wide Web site	2.56

The scale ranged from 1 (Never) to 6 (Very Often).

Management Challenges of E-Commerce

A full 50 percent of Ohio agribusinesses surveyed said they had reorganized or rethought their business plan because of E-Commerce. We found this to be an unexpected and enlightening indicator of the seriousness with which agribusiness is responding to E-Commerce opportunities. However, many of the businesses that have thought seriously about the Internet have not as yet put up a website. About 30 percent of those companies without a website were concerned enough with E-Commerce to react. What their reaction is, whether it was to buy or sell products online through a third party or to do nothing immediately is not known. Discerning the intent of respondents who claim to be “reorganizing or rethinking” their business plans is difficult as well.

Surveyed businesses reported two principal goals in beginning E-Commerce: 1) increase sales quantity and 2) expand customer service. One of the main assets of the Internet in economic discussions is the possibility of cutting costs in the supply chain. The apparent driving force of some agribusinesses is potential reduction in transactions costs (very clearly illustrated in Henderson, Dooley and Akridge, 2000). However, this was not a reason of any importance at all to the surveyed Ohio agribusinesses. The “reducing transactions costs” response was much more likely to come from a large scale, upper-tier agricultural input seller (e.g. machinery manufacturer or a chemical company). Centralizing sales may be seen by managers to be attractive only for large national agribusinesses. If, in the extreme, the selling function of a local dealer were removed, the dealer might shift the business focus to

providing support service – unpalatable for the many businesses that do not currently have a profitable service side.

Other efficiency gains from E-Commerce may also be perceived by managers to be beyond the reach of smaller firms. Many E-Commerce activities rely on the extensive integration of information technology with traditional production management practices. For example, identity preserved crops require documentation on traditional activities such as crop planting, spraying, harvesting, handling, and storage. Making this information available to customers and potential customers may, indeed, prove to attract a substantial price premium (The Economist, April 17 2001) for those who can manage it. Implementation, however, will no doubt require convincing others in the sector (both upstream and downstream) to participate in the technology initiative as well, and the cost of constructing such a network may be prohibitive for all but the most ambitious and deep-pocketed firms. Firms that feel that the merging of information technology and agricultural production is imminent, but feel that they are unable to lead the movement, may not realize that network membership will have a payoff. Alternatively, they may be playing a waiting game. For them, the most favorable terms of entry may be as a partner with a traditional client one or two steps removed from them in the supply chain.

Half of the Ohio respondents have established a website, yet many think that their product cannot be sold (or apparently promoted) over the Internet. This dichotomy of very proactive sellers and completely unconvinced sellers still leaves a portion of the respondents – those who have not yet gotten around to putting up a website – with management challenges to consider. It is possible that these businesses are waiting for assistance in the Internet process or are governed by a third part. Anecdotal evidence and exploration of agribusiness websites indicates that this occurs. The reason for doing this is clear since it is likely that the company that sets up the system would extract the most rent. A machinery manufacturer would have a natural desire to see that its dealer network is electronically integrated with its own computer network, for instance to track inventory levels or sales. An extension would be to open the network to the machinery buying public to ultimately increase the likelihood of sales. (For instance, machinery manufacturer John Deere & Co. provides server space for each of the John Deere dealerships throughout the United States. This website offers basic information about the dealership

such as its location and contact details. More advanced dealerships add listings of inventory and the capacity to transact business at the site.)

Technical Challenges of Information Technology and the Internet

Data from the Ohio survey shows management clearly considers E-Commerce important enough to consider reorganizing or rethinking their business plan; and pervasive enough that 26 percent of businesses report that their suppliers want access to their electronic inventory records. Half of those same managers, however, do not feel confident that they know enough about the Internet to know its role in their business. Even more concern should be raised about the plans those managers are making (or not), even with their lack of knowledge. Despite reporting a lack of plans for managing technology related to the Internet, almost all agribusinesses surveyed indicated they would be maintaining websites using their own staff. Even though those businesses plan to use their own staff, about half of businesses without websites didn't believe they had the expertise to do the work. Additional conflict is seen in the focus of these firms' new spending on information technology: training, personal computers and web site development; very little spending on consultants or outsourcing, despite that lack of expertise. Budget ("Excessive costs of establishing a web site"), ranked ninth out of 11 possible reasons firms had not established a web site. More often it was because of a perceived lack of market opportunity or the simple fact that the company simply hadn't gotten to it yet. If these managers are firmly of the opinion that the Internet is an important and relevant part of a their future competitive strategy, then why have relatively few businesses taken the basic step of establishing an online presence? Barely a third of the firms studied had set up any kind of technology plan or budget to deal with the fixed costs of their increasing dependence on information technologies. Of businesses that already have websites, for example, most money has been spent on computers, without building complementary human and physical capital assets. Fixed budgets for continuation of E-Commerce activities are not widespread either. This is a managerial problem faced in the early adoption of computer technology within many sectors – one that must be eliminated for economic success.

Conclusions & Discussion

Responses to the Internet by agribusiness may vary broadly. On the one hand there are those who consider themselves at least somewhat insulated from any threats the Internet places before them due to some virtually unalterable aspect of their particular business, such as remote geographic position or a product with no competition. For many of the rest of the firms surveyed who were more aggressive consumers of the technology, rapid growth in Internet and E-Commerce use over the last five years has given them little time to interpret the situation and adopt a strategy. It should also be noted that this same rapid growth makes E-Commerce and E-Business practices very hard to study in the context of long-run business planning. The raw technology that runs the Internet continually improves, decreases in price, and becomes more accessible. Most agribusinesses now have capacity within reach for a viable E-Commerce strategy. However, since most of the Ohio firms studied indicated a preference to perform all the tasks associated with the Internet in-house, many find that they do not possess the necessary human capital required, and will face a steep learning curve. Many firms have also found the costs of running an E-Commerce venture very expensive when pursued alone.

Given that nearly half of agribusinesses believe that there is no point in buying or selling products online and, for those that do, there will be a period of time in which competitive pressures from the Internet (which both groups acknowledge), will come to the fore. The apparent management confusion about whether or not to develop an Internet strategy, as clearly indicated in the Ohio survey of agribusinesses and similarly among all small businesses, requires further analysis.

Many of the issues faced by E-Agribusinesses are the same as those faced by firms in other sectors and similar to changes brought by other new agricultural technologies (Hooker, Heilig, and Ernst, 2001). However, characteristics of the agricultural sector and its participants present some inherent impediments to the implementation of E-Business practices, including E-Commerce. Agribusiness' resistance to changing business practices, commitment to tradition, and lack of familiarity with information technology are critical concerns. Place, industry structure and participant demographics are also constraining factors. Despite the Internet making the "place utility" offered by a business largely irrelevant, traditional market reach in E-Agribusiness may well be

maintained if the delivery functions do not exist to handle bulk commodities or unique (e.g. fresh) product attributes. On the input side, issues related to handling and servicing machinery or crop inputs continue to be an impediment to widespread E-Commerce adoption. Much of this relates to service quality uncertainty on the part of buyers.

The leading “new” element that E-Business adds to the agribusiness environment is speed and dynamics (Hooker, Heilig, and Ernst, 2001). Therein lies a potential impediment to E-Agribusiness. At first glance, it may be assumed that agricultural markets move at a rapid pace. However fast the traditional commodity trading environments may appear to be, they are driven by demand and supply dynamics that are in many ways predictable. Internet markets, on the other hand, add less predictable factors of changing information technology and broader market regions for more players of varying sizes and experiences. The rapid process shifts that ongoing evolution in E-Business technology brings are alien to traditional agribusiness. Attitudes toward change on the part of individuals involved in agricultural management, and a lack of information technology skills and initiative, may make the concepts of rapid development and deployment of new business models centered on information technology harder for agricultural firms than for businesses in other industries (Ernst and Tucker, 2001).

Agriculture also has some unique constraints related to information technology itself. Internet connectivity is still a greater problem in rural areas and small towns where agribusiness is. The cost of interacting with the rest of one’s supply chain via a broadband connection, for example, will typically be higher the further the firm is away from a big city. Inconsistency of information technology deployment across regions also creates constraints within an increasingly integrated global industry. As responsiveness and speed of business are critical to the success of E-Agribusiness, any technical constraints are impediments to the growth of the industry. At the same time, farmers have been somewhat slower to adopt computer and Internet technology than the average American. Some of this is related to place. Some is related to age (older individuals adopt computing more slowly) and personality traits that resist spending additional time inside doing record keeping. Each of these aspects make challenges facing agribusinesses unique and, therefore, require further analysis.

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