THE IMPACT OF TECHNOLOGY ON PROMOTIONAL PRACTICES AND DECISION MAKING: A LOOK AT THE AGRICULTURAL INDUSTRY

GWEN ACHENREINER, University of Wisconsin—La Crosse
CANDICE DYLHOFF, Schweser Study Program

This study examines promotional practices and decision making in an industry faced with vast economic and technological change. An empirical study of agricultural producers found that brand equity plays a critical role in product decisions and, while price is important in selecting a supplier, location is more important when selecting a regular supplier. Adaptation of the Internet and other technology is not occurring as rapidly as might be expected. While it would be imprudent for marketers in the agricultural field, as well as any other rapidly changing industry, to be complacent regarding e-commerce, the importance of traditional marketing and communication methods cannot be understated.

INTRODUCTION

It has always been critical for suppliers, in any industry, to understand their customers and how to best market to them; however, with significant advances in technology over the last two decades, marketers today are faced with many more choices and understanding how customers make decisions and what promotions are expected is more difficult. The agricultural industry, important in the United States and worldwide, is no exception. There are approximately 2.1 million farms in the U.S., with the value of agricultural production exceeding $217 billion and production expenses exceeding $190 billion (USDA-NASS *Agricultural Statistics 2004*). In certain areas such as the North Central states, which account for 37 percent of all farms in the U.S. (USDA-NASS *Agricultural Statistics 2004*), agriculture holds an even more prominent role. While often referred to as farmers, agricultural producers are B2B buyers and sellers, and it is important for any business intending to target this large market to understand how purchase decisions are made and what marketing communications are expected.

The Marketing Management Journal
Volume 15, Issue 1, Pages 46 - 58

Although agriculture production is one of the world's oldest industries, it is an industry, like many others, faced with vast change. A primary concern for agricultural producers over the last ten years has been the sizeable drop in commodity prices due to global competition and the Federal Agricultural Improvement and Reform Act (FAIR), which went into effect in 1996 (Anderson 2001). FAIR lifted longstanding production controls which previously limited the type and quantity of products produced. The idea was that if more agricultural products were produced, prices would decrease, and customers would buy more. This, in turn, would increase demand for agricultural products. In reality, though, agricultural products like food are often necessity products so lower prices did not greatly stimulate demand. As prices paid for agricultural products plummeted, costs associated with agricultural operations continued to rise. The combination of these effects resulted in tighter profit margins or no profit at all. In fact the number of agricultural producers decreased from 6.8 million in 1935 to 2.1 million today (USDA-NASS *Agricultural Statistics 2003*). In some states, like Iowa, it is reported that 40 percent of producers may be forced to give up operations that have been in families for more than a century (Anderson 2001). Agriculture suppliers have been impacted as well. As suppliers have been forced to absorb more

unpaid bills, the profitability and number of suppliers has declined as well. Declining profit margins and the increasing number of farm failures has caused optimism within the industry to wane.

Along with inflation, a second factor driving up costs in the agriculture industry, while promising more efficiency, is the increasing advances and use of technology within the industry. Along with more sophisticated tractors, combines and equipment, many agricultural producers have been adopting newer technologies in weather forecasting, global positioning systems, satellite imagery and biotechnology. Of particular interest in this study is use of the Internet and the role it may play in marketing to the agricultural industry.

IMPACT OF THE INTERNET

There are numerous e-commerce web sites specifically tailored for the agricultural industry and more are being developed every day. Some of the more popular sites include AgWeb.com from *Farm Journal*, @griculture Online (agriculture.com) from *Successful Farming*, DirectAg.com, Acres by American Farm Bureau, XSAg.com, Farms.com, eMerge Interactive, Rooster.com by Cargill, Dupont and Cenex Harvest States Cooperative, VantagePoint Network by Deere and Co., Growmark, Inc. and Farmland Industries, farmdoc.uiuc.edu sponsored by the University of Illinois at Urbana-Champagne, and mPower3.com by ConAgra. Large companies are making sizeable investments in Internet ventures. But what benefits does the Internet provide for busy agricultural producers? What role can it play in the agricultural industry?

Role of the Internet

Source of Information. First, the Internet is a convenient source of formal and informal information. Information can be accessed at any time, any day of the week. Numerous agriculture sites, such as DirectAg.com, provide weather forecasts, crop prices, financial services and other general industry news. The Internet also serves as an informal source of information, bringing together geographically dispersed producers having similar interests. Through chat rooms and email, agricultural producers can discuss productivity or pest control issues with other producers and experts in the field. The Internet allows for social interaction among producers operating in an industry that is fragmented and who are relatively isolated from each other.

Record Keeping and Productivity Models. While the Internet is a general source of information within the industry, newer web sites are more interactive in nature and allow producers to input and store field information. This information can be combined with weather and market data and utilized in sophisticated models to determine appropriate pest control or fertilizer strategies. VantagePoint and mPower3, are two of these web sites designed to help producers increase the productivity of their fields.

Purchasing Supplies. The Internet is a valuable source for purchasing supplies. Savings of up to thirty percent can be achieved by cutting out suppliers and distributors for products like seed, fertilizer and crop protection chemicals (Little 2000). Small and independent producers who don't buy enough volume to qualify for dealer rebates and discounts on their own can combine their purchasing needs with other producers to acquire better rates.

Sale of Products. Agricultural producers have traditionally sold their product within a regional market, sometimes driving several hundred miles in an attempt to gain a better price. This is expensive and time consuming. In contrast, the Internet opens up a global market to producers, even those in the most remote areas. Not only does this allow producers to access better prices for their product at a lower cost, but it also keeps pigs, cows and other livestock better protected from infected animals in traditional auction pens. In addition, smaller producers can aggregate their product to target larger customers they traditionally have not been able to service.

Use of the Internet in Agriculture

Internet Connection. The Internet provides a variety of functions and benefits to agricultural producers. However, according to a report by the National Agricultural Statistics Service only about half of agricultural producers have Internet access (USDA-NASS *Farm Computer Usage and Ownership 2003*). While reported Internet usage statistics vary, with some studies reporting lower usage rates and others reporting higher rates, larger, younger, and more educated producers are more likely to be connected to the Internet.

E-Commerce. Approximately 8 percent of agricultural producers conduct e-commerce transactions (USDA-NASS *Farm Computer Usage and Ownership 2003*) and, again, the producers that buy or sell on-line tend to be larger, younger, and better educated operators. Previous research also suggests that Internet usage and the purpose for which it is used may vary by type of operation. For example, cattle producers are more likely to purchase agricultural products over the net than soybean growers (*Agri Marketing 2000*). Of the producers making e-commerce transactions, over 40 percent report purchasing crop inputs, 33 percent purchase livestock inputs and 25 percent sell livestock via the Internet (Morehart and Hopkins 2000).

Limitations and Concerns with Using the Internet

With the many benefits and uses within the agricultural industry, it is surprising that many agricultural producers are *not* utilizing this tool to better run their business. What may be the concerns driving the reluctance of some producers to utilize the Internet? One may simply be a fear of or lack of interest in technology in general. These are producers who rely on traditional production methods, equipment and record keeping. These producers are not using the Internet for the same reasons they are not using computers. However, prior research suggests that while almost 60 percent of producers use computers, only 48-50 percent use the Internet, and only 8 percent make e-commerce transactions (USDA-NASS *Farm Computer Usage and Ownership 2003*).

Producers who use computers may not be connected to the Internet simply due to the extremely high cost of getting access in rural areas. Telephone lines in most truly rural areas are old, and wireless can cost thousands of dollars. Access is not easy in some areas. Others may be reluctant to use the Internet due to security or privacy concerns. Websites like VantagePoint and mPower3 allow producers to store farm production data and aggregate this data with other farms for predictive modeling purposes. Although the data aggregated remains confidential, producers may be concerned that their fields or techniques could be identified. Likewise, there is always a security concern when financial data and credit card numbers are transferred via the Internet. Related to this, many farm purchases, such as combines or tractors, are simply too large to be paid for with a credit card. Even annual chemical or seed purchases can be quite large, making it more difficult to handle financial aspects associated with the purchase or sale of products over the Internet. Finally the traditional distribution system within the agricultural industry is deeply rooted and based on personal service and interaction with others in the agricultural field.

To summarize, the Internet provides multiple benefits to the agricultural industry and is having a vast effect on the industry even though it has not been readily adopted by a large share of producers. Varying statistics suggest that multiple factors, such as age, region of the country and type of farming operation may be affecting how receptive producers are to utilizing the Internet. When it comes to marketing in a changing industry, suppliers need to better understand not only the role the Internet can play, but also what producers expect and want in terms of marketing communications. While some producers are strong advocates for the Internet, others prefer more traditional communication and marketing methods. In times of

change, marketers need to understand the perspectives, concerns, and wishes of their customers; and, certainly this is going to vary by different segments of the agricultural community.

PURPOSE OF THE STUDY

The purpose of this study, then, is to better understand how to market to producers in an industry that is rapidly changing. What are their perceptions and attitudes toward the agricultural industry as a whole, what attributes are important to them when making purchase decisions, what role does the Internet play in their expectations and purchasing behavior and what type of marketing communications have they come to expect? More specifically the objectives of this study are:

- To examine industry attitudes and concerns and to determine if attitudes and concerns vary by type of operation, income of operation or age of producer.
- To examine attributes important to producers when making purchase decisions and to determine if attribute importance varies by type of operation, income of operation or age of producer.
- To examine computer and Internet usage rates and if they vary by type of operation, income of operation, or age of producer.
- To determine producers' expectations related to marketing communications and if expectations vary by type of operation, income of operation or age of producer.

EMPIRICAL STUDY METHODOLOGY

Sample

The sample consisted of agricultural producers in the North Central states of Iowa and Wisconsin. As mentioned earlier, the 12 North Central states account for almost 40 percent of the nation's farms, and thus, agriculture plays an important, if not dominant, role in the economies of these states. Of the 600 surveys mailed, 140 (23.3 percent) were returned. Farming is the primary source of income for 126 of the respondents (90 percent). The analysis is based on the responses from producers who rely on farming as their primary source of income.

Method

A 4-page questionnaire with a total of 28 questions was mailed to producers along with a postage-paid reply envelope. While no incentive was provided, the study was affiliated with a regional state university and gave respondents a vehicle for expressing their concerns regarding the industry and the agricultural economy.

Independent Variables

Type of Operation. Respondents were asked what they consider to be their primary crop or livestock, with the predominant responses being dairy, beef, hogs, corn, beans, hay, or more likely, two or more of these responses. The analysis was conducted first by looking at each individual type of farming compared with the others. For example, dairy producers were compared to all other producers. Next the analysis focused on livestock producers compared with crop producers and producers who crop farm *and* have livestock. The majority of producers in this study (62.6 percent) crop farm and have livestock, 30.1 percent have livestock only and 7.3 percent crop farm only. Type of operation did not vary statistically by age of producer or income from farming operation.

Income of Operation. Respondents were asked their approximate before-tax annual income from farming operations using the following categories: less than $25,000, $25,000-$50,000, $50,000-$75,000, $75,000-$100,000 and more than $100,000. Since the frequencies were relatively small in some categories, income was recategorized into 3 groups (under $25,000, $25,000-$75,000 and more than $75,000) in further analysis. Approximately 25 percent of the respondents reported gross incomes of less than $25,000; 41 percent reported gross incomes of $25,000-$75,000 and 34 percent reported gross incomes exceeding $75,000.

Age of Producer. Respondents were asked to circle their age category, using ten year intervals. However, only three respondents were younger than 30 years of age so these respondents were categorized with the 30-40 age group in further analysis. This resulted, then, in 20.3 percent being younger than 40 years of age, 61.8 percent being 40-60 years of age, and 17.9 percent being over 60 years of age.

Dependent Variables

The dependent variables include (1) industry attitude/concerns, (2) attributes important when making a purchase decision, (3) computer and internet usage, and (4) expected marketing communication from suppliers (e.g., medium and frequency). The specific question(s) used to measure or examine each of these variables will be explained further in the findings section.

Analysis

Frequency and cross-tabulation tables were prepared using SPSS. The data was further analyzed using various statistical tests including Chi-square tests, t-tests and analysis of variance procedures.

FINDINGS

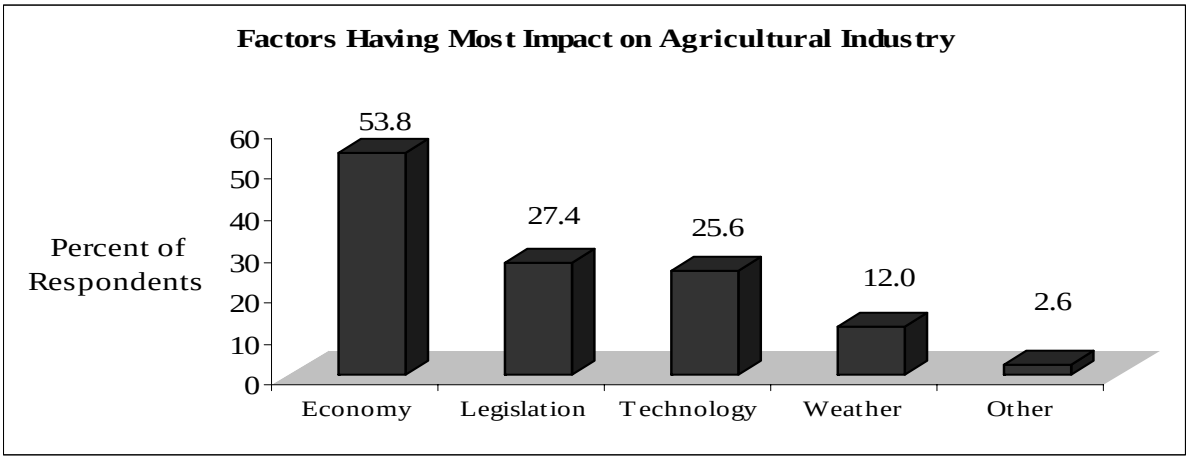
Industry Attitudes

As shown in Figure 1, over half of the producers responding to the survey felt the economy had the most impact on the agricultural industry in the past five years, followed by legislation, technology and weather. Over 20 percent of respondents checked more than one answer, suggesting many believe these factors are all relatively important.

When asked to write any comments, concerns or observations producers have about farming, equipment or the agricultural industry as a whole, the primary concern again relates to the poor economy – low commodity prices and high costs make it difficult to survive. In addition, many feel the government does not provide enough support for producers, especially smaller family-run operations, and thus, large corporations are taking over the agricultural industry. Others mentioned that agricultural production is a difficult life.

As shown in Figures 2 and 3, younger respondents are more likely to cite technology as having a strong impact on the industry and lower income respondents are more concerned with low market prices and high operational costs

FIGURE 1



while higher income respondents are more concerned with the lack of government support, the difficulty of agricultural life, and corporate takeover of the industry.

A Chi-square test was used to statistically examine differences in attitudes by age of producer, income of operation and type of operation. The differences noted are not *statistically* significant.

Attribute Importance in Decision Making

Attributes important to producers in making purchase decisions are summarized in Figures 4-6.

Brand Decisions. When selecting brand, quality of the brand is the most important factor, chosen by almost half of the respondents. Supplier relationship and post purchase service/parts availability ranked a distant second in importance, followed closely by location of dealer and price. This suggests that quality of products or supplies carried is more important to producers than the particular supplier. It implies strong brand loyalty. Attributes important when making a brand decision did not vary statistically by operation type, operation income, or producer age.

FIGURE 2

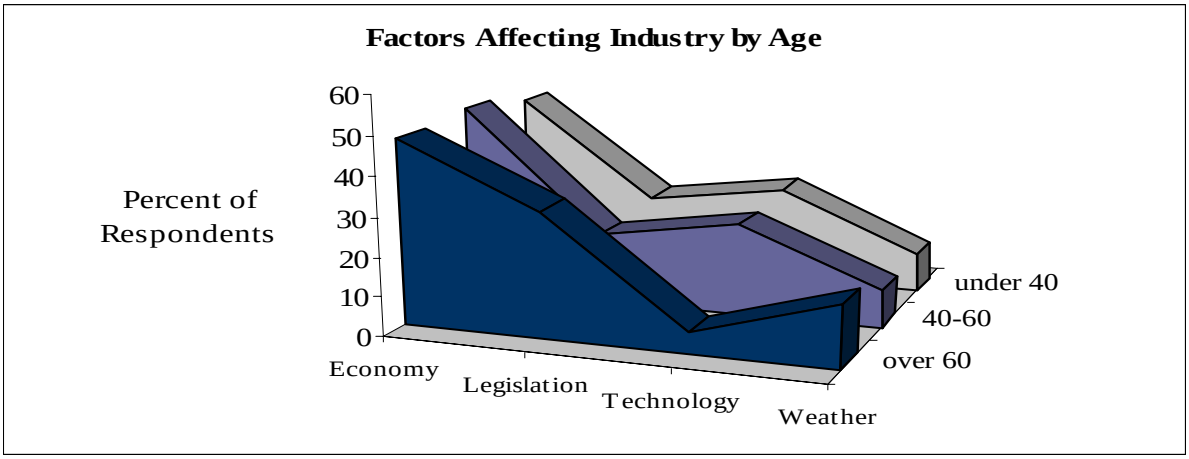


FIGURE 3

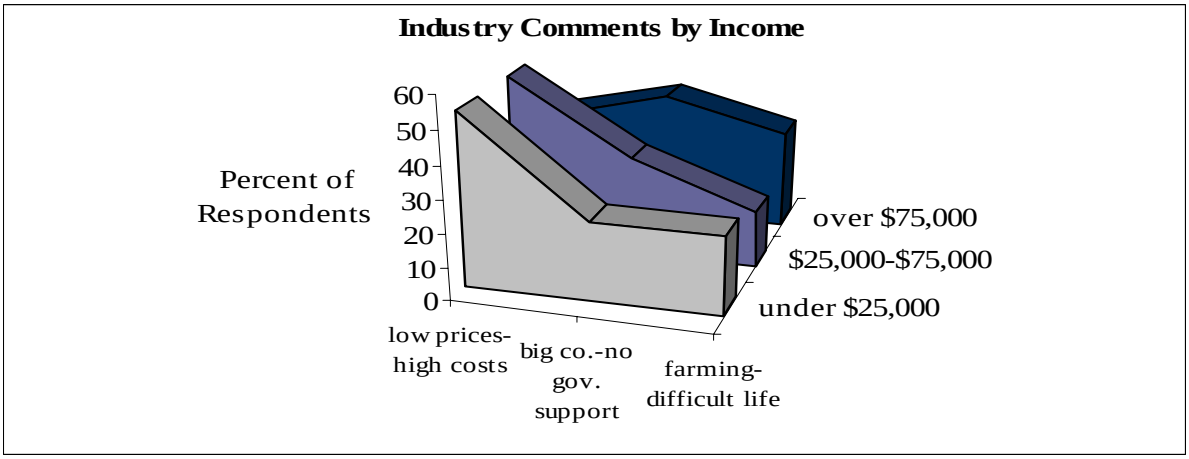
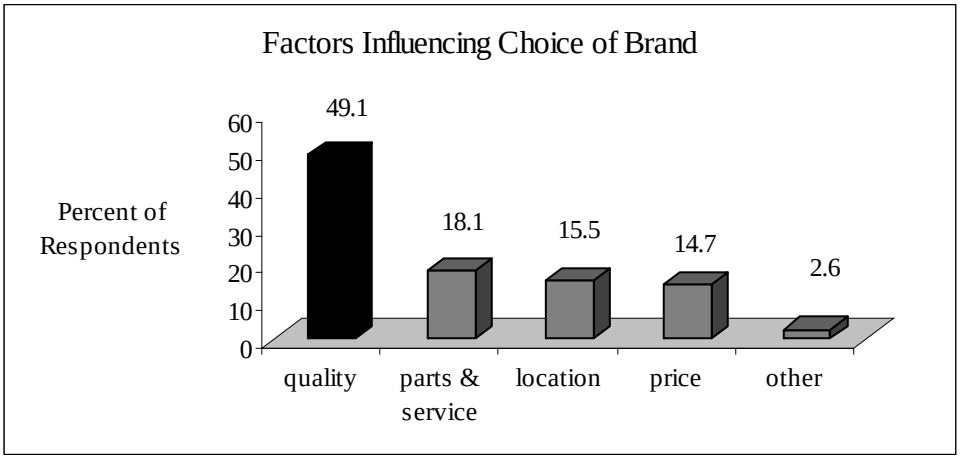


FIGURE 4



Supplier Decisions. When selecting a supplier, product price and post-purchase service are important. Inventory quality, selection and brands offered did not rate very highly, selected by about 15 percent of respondents. This is surprising given that brand quality is rated most important when considering brand choice. Attributes important in selecting a supplier or dealer also did not vary statistically by operation type, operation income, or producer age.

Primary Supplier Decisions. When doing business with a supplier frequently or on an on-going basis, location, selected by two-thirds of respondents, became a much more important attribute than suggested by previous findings (See Figure 6). Having products in stock is almost equally important followed by quality of service and quality of products. Price, which is considered most important when selecting a supplier, is much less important when selecting a supplier with which an on-going relationship is expected.

Attributes important when selecting a supplier for on-going or frequent business did not vary statistically by operation income or producer age. They also did not vary statistically between crop producers, livestock producers or producers who do both. However, there were significant differences in attribute importance when examining individual operation types. For example, relationship with dealer, which received a low response across all producers, is selected significantly less often by beef producers (Chi-square = 5.47; p-value - .02), corn producers (Chi-square = 6.18; p-value - .01) and hay producers (Chi-square = 10.29; p-value - .02), when compared against the average of all other producers. Likewise, quality of products is selected significantly more often by beef producers when compared against the average of all other producers (Chi-square = 5.95; p-value - .02).

To summarize, the attributes important to producers when making a purchase decision varied, depending on the question asked. When selecting a product, brand quality is very important suggesting brand loyalty and the importance of building brand equity. When selecting a supplier, though, the quality and selection of brands in inventory is not rated as highly. This discrepancy in findings could be explained if the respondent is making a decision among suppliers known to carry desired, or acceptable, products and brands. Price is the most important attribute when selecting a supplier; however, this became a less important attribute when an on-going relationship with the supplier is expected. This implies that price may play a more important role for major, or one-time, purchases such as farm equipment. Location and having products in stock may be more important for products purchased frequently or for unplanned purchases. Quality of service rated

FIGURE 5

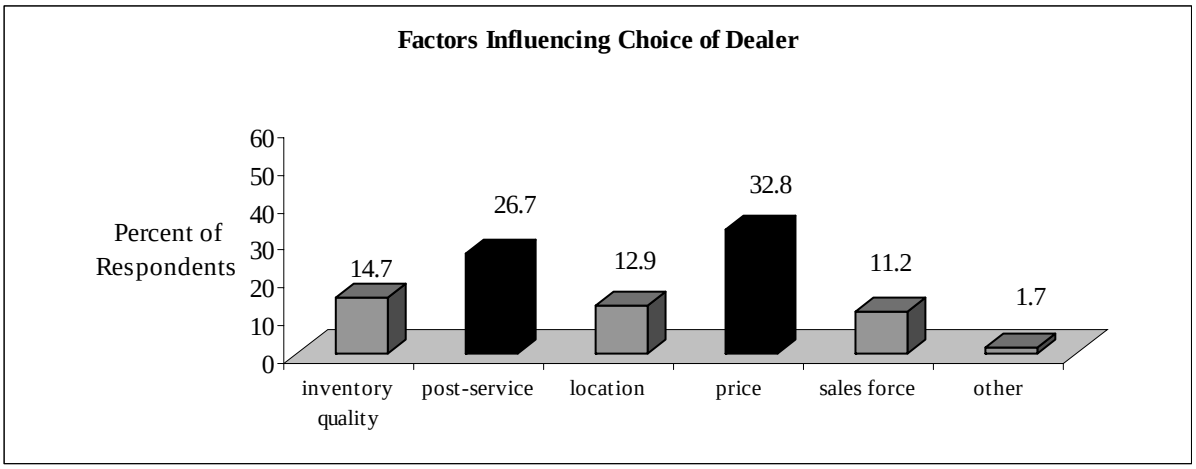
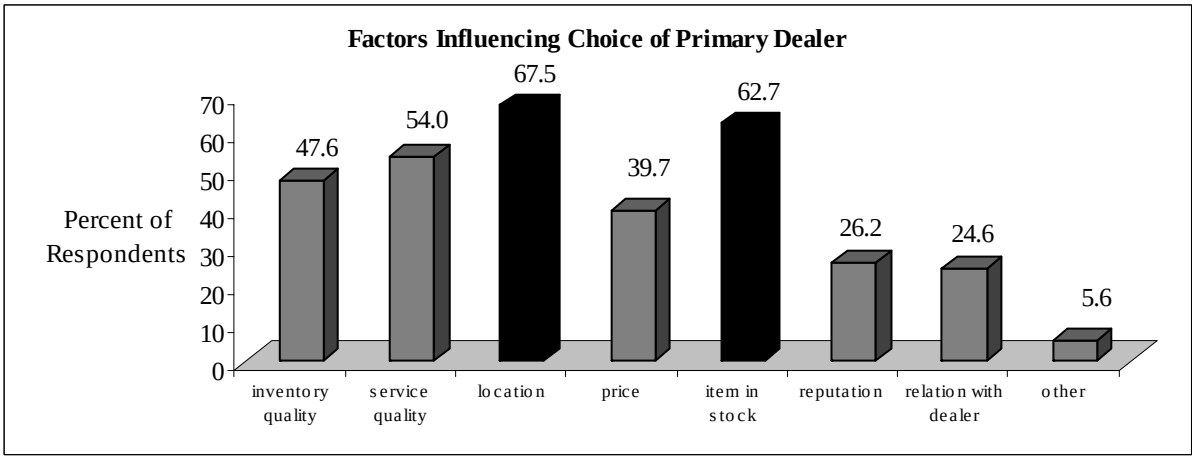


FIGURE 6



highly in both supplier questions, but is less important in the brand question. This suggests that quality of service becomes a decision factor, if the brands/products carried are considered acceptable.

Location. Location is an important attribute when selecting a regular supplier. Over 70 percent of producers will drive 50 miles but less than a third will drive 100 miles. As shown in Figures 7 and 8, the distance producers are willing to drive varies statistically by producer age and type of operation. Younger producers are willing to drive significantly further for supplies than older producers (Chi-square = 23.06; p-value - .001) and crop producers are willing to drive further than livestock producers (Chi-square = 11.71; p-value - .07), probably due to the high price of equipment and the degree of product differentiation. Commodity products, like soybeans, are not worth an extensive search whereas a $100,000 tractor with a global positioning system is worth the effort necessary to find a lower price.

Computer and Internet Usage

Computer Ownership. Approximately 61 percent of producers in this study own a computer and ownership did not vary by producer age or operation income. As shown in Figures 9 and 10 though, computer ownership varied significantly by type of operation with dairy producers, for example, being more likely to own a

FIGURE 7

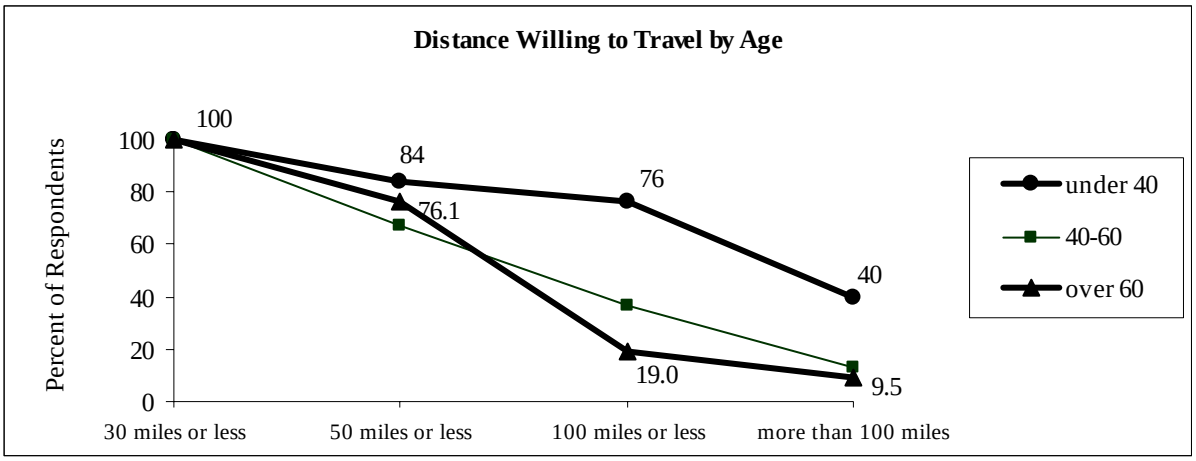
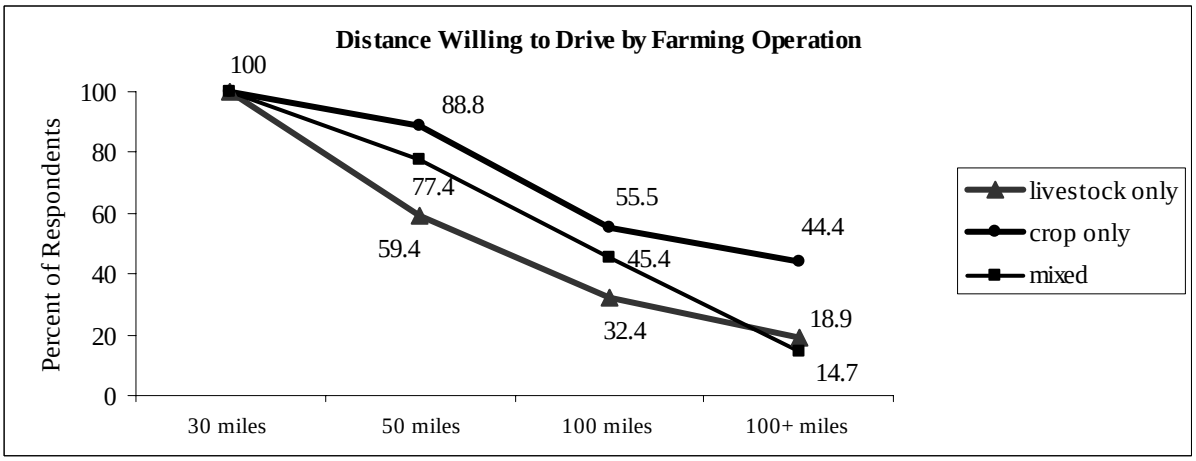


FIGURE 8



computer (Chi-square = 3.6; p-value - .06) and beef producers being less likely to own a computer (Chi-square = 5.04; p-value - .03) than other operations. Likewise, when operations were categorized as crop, livestock or mixed, livestock producers were statistically more likely to own a computer (Chi-square = 7.59; p-value - .02).

Internet and e-mail Usage. Only 39.2 percent of producers in this study use the Internet, with 27.5 percent using it daily-weekly and 11.7 percent using it monthly or more rarely. Similarly, 35.0 percent of producers use e-mail with 19.2 percent using it daily-weekly and 15.8 percent using it monthly or more rarely. Surprisingly, Internet and e-mail usage did not vary by operation, even though computer ownership did. Internet and e-mail usage also did not vary by producer age or operation income.

Marketing Communications

Frequency of Contact. Producers in the agricultural field rarely receive promotional offers from regular suppliers, with over half being contacted two or less times a year. More specifically, 20 percent report *never* being contacted, about 14 percent were contacted annually, 23 percent were contacted semi-annually, 34 percent were contacted quarterly and less than 10 percent were contacted monthly

FIGURE 9

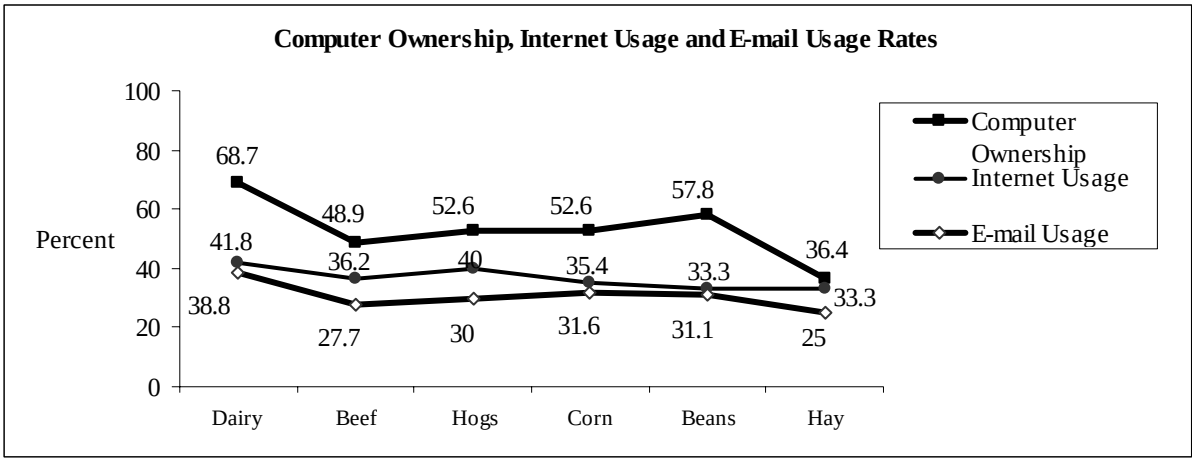
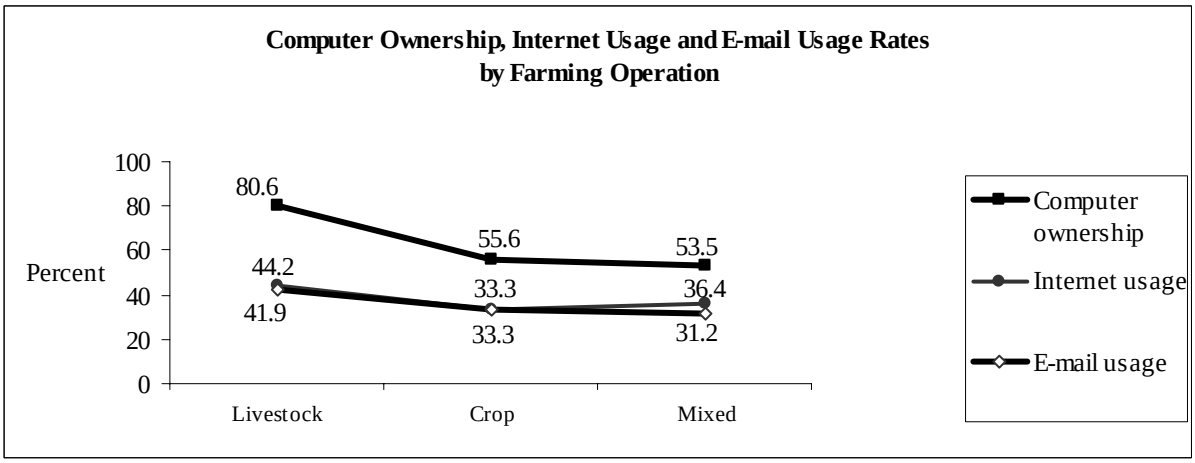


FIGURE 10



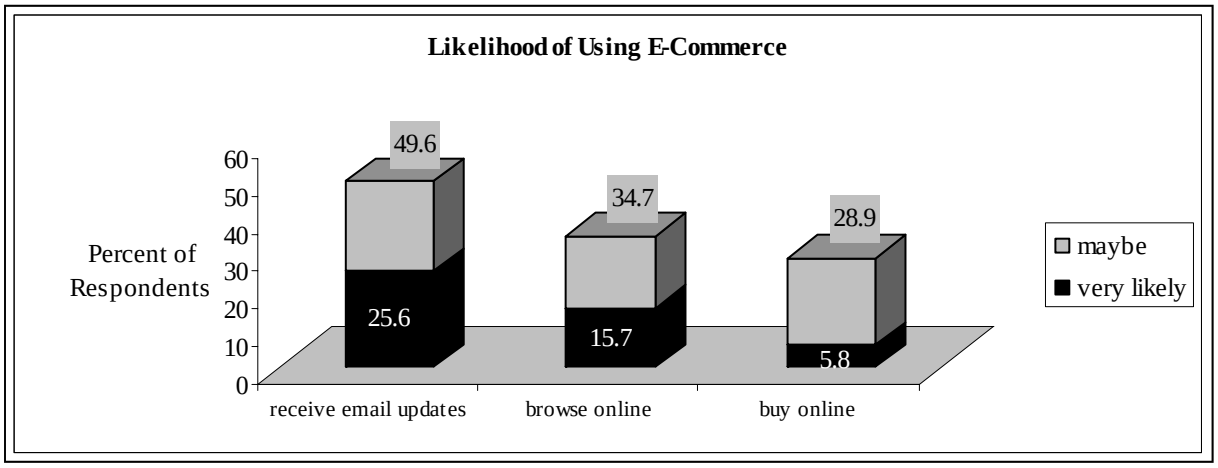
Preferred Method of Contact. In regard to ongoing or existing transactions, almost 80 percent of respondents prefer to be contacted by telephone, 16 percent prefer a personal visit (common in rural areas) and less than 5 percent chose e-mail or fax as a preferred method of contact.

Most Frequently Used Method of Advertising. When looking for a product or supplier, producers typically rely on newspaper advertising (chosen by over 80 percent of respondents) or word-of mouth (chosen by 14 percent of respondents). Less than 5 percent of respondents selected radio, billboards or the Internet as their most frequently used advertising medium.

Likelihood of Using E-Mail and Internet for Marketing Communication. As shown in Figure 11, about half of the producers in this study might request a monthly e-mail update or newsletter from a regular supplier, about 35 percent might view products on-line, and less than 30 percent might make agricultural purchases online, with less than 6 percent being very likely to conduct e-commerce transactions. These findings suggest that producers in general are not very receptive to e-commerce; however, e-mail could be a cost-effective means of advertising and communication.

Based on Chi-square tests, frequency of contact, preferred method of contact, use of advertising, and likelihood of using e-commerce did

FIGURE 11



not vary statistically by producer age, operation income or operation type.

DISCUSSION

The purpose of this study is to better understand how to market to producers operating in an industry faced with vast change. The empirical study focuses on agricultural producers in the North Central states of Iowa and Wisconsin where agriculture plays a more significant role in the economy than other areas of the United States. More specifically, the study examines producers' attitudes toward the industry, attributes important in making purchase decisions, usage of technology including computers, the Internet and email, and producers' expectations regarding marketing communications given the numerous advances in technology and communication over the past two decades.

While the literature, along with the study reported here, suggests that younger producers are more likely to utilize technology and are more likely to mention technology as having a significant impact on the industry, the primary concern in the agricultural field relates to the poor economy. Low commodity prices and high costs have made it difficult for producers to survive. Many feel that the government is not providing enough support for producers and large corporations are taking over an industry that was once dominated by small family-run operations.

The U.S. Department of Agriculture reports that about half of agricultural producers have Internet access with only about 8 percent of producers utilizing the Internet for e-commerce transactions (USDA-NASS *Farm Computer Usage and Ownership 2003*). This study of producers in the North Central part of the United States found that 61 percent of producers own a computer, 39 percent have Internet access, and 35 percent use email. While it is commonly thought that younger, better-educated and larger operators are more likely to adopt electronic technology (e.g., *Agri Marketing* 2000; Little 2000; Morehart and Hopkins 2000; Peterson 2000; Hartke 2001), the differences were not significant in this study. Previous research also suggests that livestock producers are more likely to make Internet transactions than other farming operations (*Agri Marketing* 2000). The findings from this study do not wholly support this conclusion. While computer ownership in this study is significantly higher for livestock-only producers, Internet usage is not. Further research is necessary to explain this anomaly -- why different studies have different findings related to Internet usage by age of operator, size of operation and type of operation. It could be that there are regional differences affecting the outcome of various studies. Most agricultural

operations in the U.S. raise only one type of crop or livestock and cope with the "super-farm" concept fairly well. Due to the hilly terrain in the region in which this study was conducted, it is difficult to do high acreage crops resulting in a larger number of respondents with mixed farming operations than is typical throughout the country.

In an attempt to better understand how to market in the agricultural industry, producers were asked what attributes are important when making purchasing decisions. When selecting a product, brand quality is most important suggesting the importance of having a strong brand name, one that is well known and has an excellent reputation. Manufacturers and suppliers should build awareness and equity in the brands they carry. When selecting a dealer, price is the most important attribute. When selecting a *primary* dealer, though, one in which the producer plans to do frequent or on-going business, price becomes less important and location and having products/parts in stock are more important. Location, while important to all producers, is perceived as less of an advantage by younger producers. These buyers, along with being more cognizant of technology, are also willing to drive further. Thus, enticing a younger producer to be a loyal customer is a more difficult task. When providing service for equipment, which may have been purchased hundreds of miles away, having products and parts in stock is critical. Getting the job done fast is most important. As one respondent said, "Down-time will make the nicest producer really mean."

What role does the Internet play in marketing communications? The findings from this study suggest that, despite its numerous benefits, the Internet is not taking over the agricultural industry. The majority of respondents still prefer traditional marketing methods. They rely on newspapers and word-of-mouth advertising when faced with a purchase decision and prefer telephone or personal visits for on-going communication with suppliers. Only 16 percent of respondents said they are "very likely" to view products on-line and only 6 percent are "very likely" to make purchases on line. The findings from this study are very similar to and support previous research suggesting that only about 8 percent of all agricultural producers are making e-commerce transactions (USDA-NASS *Farm Computer Usage and Ownership 2003*).

While adaptation and regular usage of the Internet and other communication technology by producers may be slower than expected, it would be imprudent for marketers in the agricultural field to be complacent regarding e-commerce. The Internet provides numerous advantages in an industry forced to cut costs in order to survive. Use of electronic technology provides a viable means for agricultural suppliers to interact with customers and suppliers at a reasonable rate, both in terms of cost and time. Agricultural suppliers should proceed slowly, though, given that the majority of producers in this study still prefer traditional marketing and communication methods. Rather than replacing traditional methods, electronic communication and transactions should run parallel providing customers with, simply, another alternative. Given the fact that current contact with customers by agricultural suppliers appears to be quite low and the cost-effectiveness of electronic technology, marketers should design promotional campaigns enticing customers to use technology. While customers may be reluctant to make e-commerce transactions, the findings in this study suggest that close to half are at least somewhat receptive to using technology as a means of communication. Agricultural marketers should start by simply providing information, updates or newsletters via email or the Internet. This will increase contact with customers and will serve to increase customers' familiarity and comfort with electronic technology. Next customers should be encouraged to shop or browse on-line. A given product could be featured in each monthly update along with a link to the company's on-line catalog. Finally, as a third step, inducements or promotional offers should be used to encourage customers to purchase on-line.

While the importance of personal service and face-to-face interaction with others in the agricultural field cannot be understated, the Internet is a tool that is slowly revolutionizing the industry. Rural Internet access is still very expensive and slow. Wireless technology will leapfrog traditional hook-ups once its price drops, much like it will in developing countries. As costs associated with this technology drop and globalization continues to grow, usage will increase dramatically because today's producer must be incredibly savvy and frugal to survive.

REFERENCES

Anderson, Maren (2001), "Unfair to Small Producers," *Dollars and Sense*, September/October, 9.

Anonymous (2000), "Producers Test Swift E-Commerce Waters," *Agri Marketing*, 38:9, 42-46.

Hartke, Debby (2001), "Producers Still Prefer Print, Gallup Study Shows," *Agri Marketing*, 39:4, 74-75.

Little, Darnell (2000), "Old MacDonald Has a Web Site," *Business Week*, May 15, EB82-EB88.

Morehart, Mitch and Jeffrey Hopkins (2000), "Briefs: Technology: On the Upswing: Online Buying and Selling of Crop Inputs and Livestock," *Agricultural Outlook*, September, 4.

Peterson, Thane (2000), "E-I-e-I-e-Farming," *Business Week*, May 1, 202.

U.S. Department of Agriculture, National Agricultural Statistics Service (2004), *Agricultural Statistics 2004*, Chapter 9, Tables 9.2, 9.4, 9.39.

_____ (2003), *Agricultural Statistics 2003*, Chapter 9, Table 9.7.

_____ (2003), *Farm Computer Usage and Ownership.*