**ONLINE CASH GRAIN EXCHANGE:
EXAMINING FACTORS IMPACTING THE
LEVEL OF WEBBASED TRADES AND
POTENTIAL FUTURE ADOPTION OF
MOBILE TECHNOLOGY**

by

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ABSTRACT

In the grain industry, producers have sold grain for a long time over the telephone. This thesis suggests significant changes in grain marketing strategies and why other methods of selling grain may help both producers and grain merchandisers be more effective with cash grain transactions. Specifically, the use of web-based applications that allow growers to make, manage and monitor grain offers and use mobile technology for grain marketing solutions.

This thesis evaluates two key technology options for agricultural producers. First, the research evaluates factors that impact traded bushels on Farms Technology's private internet technology trading platform, the Dynamic Pricing Platform (DPP). The second element of the research defines a model which examines likelihood of growers adopting mobile trading technology to increase grain marketing opportunities. A thorough understanding of these two marketing platforms will allow Farms Technology to increase the number of growers opting to use technology to execute cash grain sales, which is financially beneficial to the company.

Results indicate that a number of online variables significantly impact online grain trade, in addition to factors that specifically influence the potential adoption of mobile technology by agricultural producers. Results help quantify many insights which Farms Technology has developed in relation to online grade trading and uncovered future possibilities in the online grade trading industry. Statically significant factors that impact grain traded on the DPP include: acres (farm size), on-farm storage, percent of grain sold over the phone,

offered bushels, and whether or not farmers received text messages. With respect to mobile application adoption, results identified factors that significantly and positively impact the likelihood of mobile adoption, including: farmers with no cell phone, farmers that are currently receiving text messages, farmers owning a smart phone, and customer service rating for Farms Technology by the farmer. Variables that significantly and negatively impacted mobile adoption included: farmers currently selling on the DPP and farmers who believe the online DPP application is too difficult to use.

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CHAPTER I: INTRODUCTION

1.1 An Evolving Online Grain Trading Industry

Many farmers are choosing to use technology to monitor cash prices and set price targets

for grain crops. Until the early 2000s, prices could only be monitored by phone or radio;

and price intraday fluctuations were significantly less than today. Figure 1.1 illustrates

during the combined day and night trading session for September 30, 2008 there was a 39

cent trading range for the December corn price contract.

As the grain marketing industry has evolved so have agricultural producers. An increasing

number of external factors, such as hedge fund investments in commodities, are affecting

the grain marketing industry, and a producer's mentality of "that is the way I have always

done it" is no longer as profitable. Farmers can now use online resources such as the

Dynamic Pricing Platform which is developed and supported by Farms Technology of

Overland Park, Kansas to capitalize on volatile markets while saving time and increasing

selling opportunities.
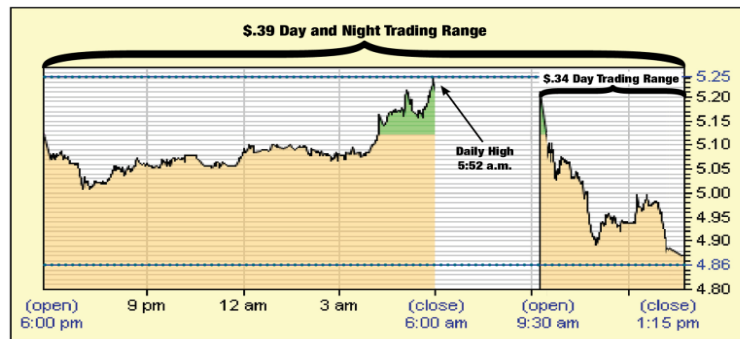
Figure 1.1: Futures Volatility in Corn Market
(*Source*: Farms Technology, 2010)

This thesis focuses on benefits of the Dynamic Pricing Platform (DPP) trading technology solution provided by Farms Technology. The DPP provides agricultural producers the ability to make, manage and monitor firm cash grain offers at their convenience. The solution has been compared to an ATM machine for banks, Travelocity for Airline travelers, or E-Trade for stock investors.

> "*A major benefit for grain buyers is the DPP lets merchandisers provide better service to producers. Price bids are available in a password-protected environment anytime a producer calls in even if it is late at night or very early in the morning. The program keeps track of who is viewing bids, when they are accessing bids, and how often they log on to the bid website. The grain buyer's merchandising department is open 24 hours per day to take offers.*"(Woolverton and Biere 2006, 12)

Since electronic trading was introduced, more global markets trade during electronic overnight trading sessions. Before electronic trading was introduced, open outcry markets were open only from 9:30 am to 1:15 pm. Today, the electronic trading system (Globex) runs simultaneously with the open outcry session, but also trades from 6:00 pm until 7:15 am CST. This has added an additional 13.25 hours of trading time for more market movement. Prior to this change, buyers could more easily manage internal offers or day to day business on a "notepad," given the market only traded approximately 4 hours per day. Another factor driving the increased volatility of the cash market is more involvement from hedge funds investing in commodity futures. According to the Commodity Futures Trading Commission (CFTC) the level of contract positions has increased from 2000 to 2009 (Historical Compressed Commitments of Traders Reports 2010).

Net Corn Fund Positions

Futures Contracts in Thousands

Legend:
- Index Short
- Index Long
- Non Commercial Short
- Non Commercial Long

X-axis labels: 1/4/2000, 8/22/2000, 4/10/2001, 11/27/2001, 7/16/2002, 3/4/2003, 10/21/2003, 6/8/2004, 1/25/2005, 9/13/2005, 5/2/2006, 12/19/2006, 8/7/2007, 3/25/2008, 11/11/2008, 6/30/2009
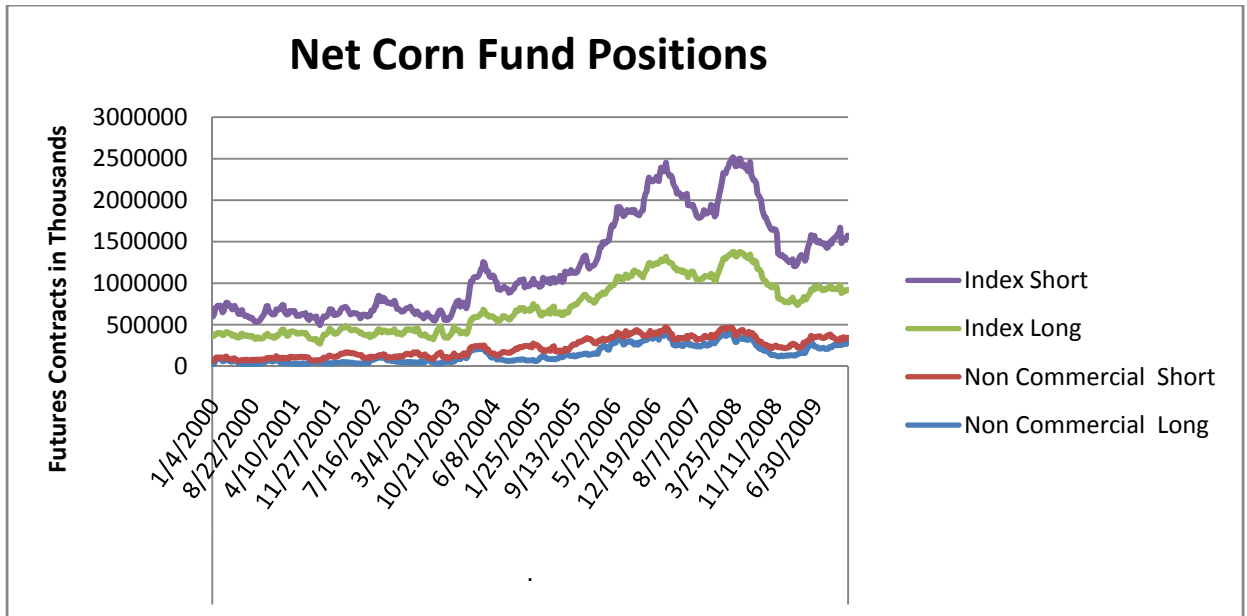
Figure 1.2: Net Corn Fund Positions (CFTC)

Producers are realizing cash marketing opportunities through futures price swings on the

Chicago Mercantile exchange. As shown in Figure 1.2, hedge funds involvement in the

corn market has grown over the past ten year, meaning daily price fluctuations happen

faster and are more unexpected than in the past. With this increased money flow from

hedge funds, farmers must now track weather conditions and crop planting/harvest

progress, as well as the value of the dollar, crude oil prices and other major economic

indexes as producers make grain-marketing decisions.

As global markets continue to expand and technology becomes more widely accepted,

trade volume is shifting from the traditional open outcry model to the electronic model.

According to the CME group, Chicago Mercantile Exchange (2008, p 1-2),

> *"Electronic trading systems have changed the face of the exchange-traded*
> *derivatives industry on a scale that was virtually unimaginable some twenty*
> *years ago. The advantages of electronic trading include ease of access*
> *from virtually anywhere worldwide almost 24 hours a day. This increased*

participation generally has resulted in enhanced liquidity, reduced costs and soaring volumes.'' (Chicago Merchantile Exchange 2008, 1-2).

Figure 1.3 illustrates how trading volume has changed and the pattern of agricultural futures contracts that are traded in the open outcry (Pit) vs. the Globex automated system (CME Volume Reports 2010). Figure 1.3 demonstrates that Globex trades have continued to increase since January of 2008 while Pit trades have decreased over the same period of time. This volume change from the pit to the Globex system has helped Farms Technology by connecting the DPP to other automated computer systems. In other words, Farms Technology has replaced people with technology.
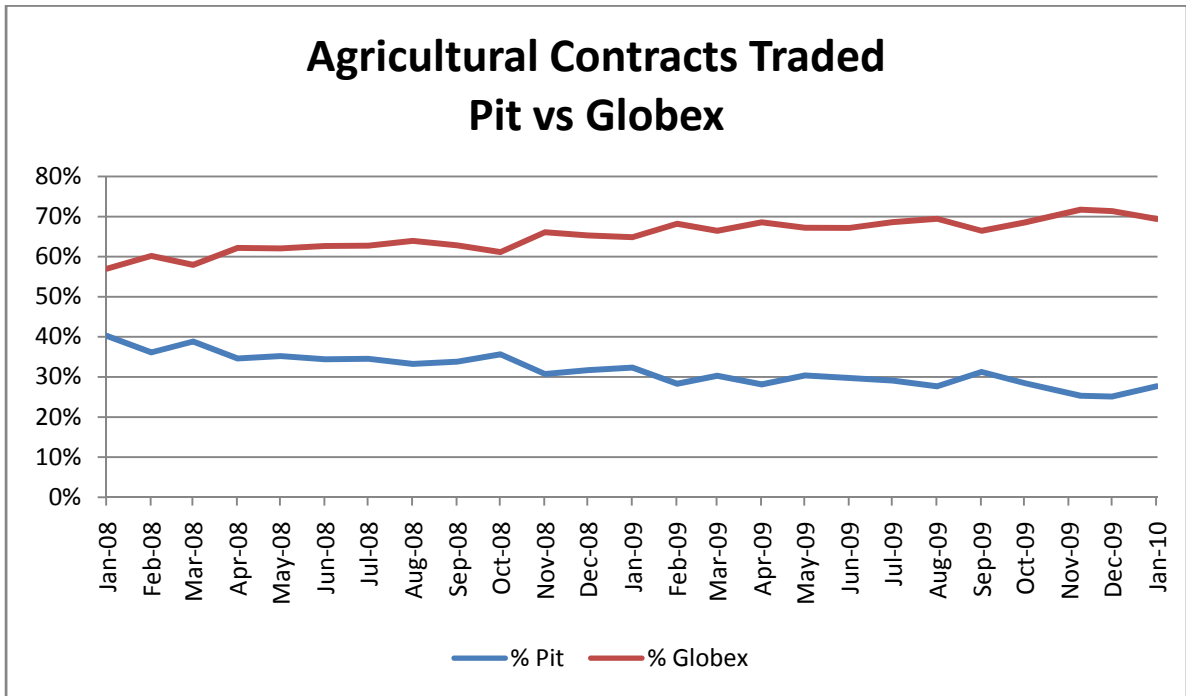

Figure 1.3: Outcry (Pit) vs. Globex (Automated) Trades
(*Source*: CME Volume Reports, 2010)

Farms Technology executes firm offers using the volatility from the futures market. If a pit recorder typed in the wrong number on the floor, it could trigger trades on the DPP system before it was corrected. Now, with a fully integrated electronic trading system, Farms Technology doesn't need to rely on data entry accuracy from a given person. Trades are faster and more accurate using the electronic Globex System.

Bio-energy has significantly expanded the market for online cash grain trading. By 2009, there were 170 Ethanol plants in operation (Renewable Fuels Association 2009). This gives producers 170 additional demand locations across 20 states for grain (corn) sales that were not available 10 years ago. Regardless of peoples' opinions about biofuels or the future of corn-based ethanol, ethanol plants have changed local markets and opened-up new marketing opportunities for many producers. This new market segment has increased local demand and allowed for increased online customer service applications for grain trading, such as the Dynamic Pricing Platform. With advances in seed and equipment technology, improved farming practices, expanding markets, and higher crop prices, corn production has grown from 11.1 billion bushels in 2005 to over 13 billion in 2009. At the same time soybean production has grown from 3 billion bushels to over 3.3 billion (USDA) National Agriculture Statistics Service. Larger crop yields translate into more grain to market and, therefore, even more potential for online trading.

Increased on-farm storage is impacting producer marketing and increasing the potential for online grade marketing. Typically there is a carry-in market for storing grain and more cash marketing opportunities for producers over a longer period than just harvest.

Producers are opting to pay themselves for storage. Another related logistical change is that more producers now own trucks. Rather than pay an outside firm to haul grain, more producers are opting to pay themselves for this practice. With increased on-farm storage and more transportation options, growers can now market year round and look for selling opportunities based on local demand.

Even with these changes, the online grain market is evolving because of the opportunity made possible with the internet and mobile technology. There is sufficient evidence to suggest internet adoption has increased among farmers and that they are doing more business online (Stenberg et al. 2009).   In addition to cell phones, text messaging and online services, such as twitter and real time markets, are continually being used by more producers. "Rural America has shared in the growth of Internet and in 2007, 71 percent of the rural population used the internet" (Stenberg et al. 2009, p.23). As price transparency increases, producers are looking for technologies and businesses that offer the ability to trade grain with other mediums besides the telephone. According to the USDA, "As broadband- or high speed- internet use has spread, Internet applications requiring high transmission speeds have become an integral part of the "Information Economy," raising concerns about those who lack broadband" (Stenberg et al. 2009, p.22-27). As farmers' income is heavily dependent on grain sales, it makes sense that applications for pricing grain would be utilized in the Information Economy.

With the documented challenges producers face with grain marketing, a key element to this thesis will be reviewing electronic marketing opportunities provided by Farms Technology.

1.2 Purpose Statement

Farms Technology generates revenues by facilitating grain trades via an online web application, the Dynamic Pricing Platform. Trades are defined as a price match between a farmer's flat target price and buyer's basis bid. Given the evolution of online grain trading, the purpose of this project is to examine factors, such as grower demographics, system usage statistics and survey results, that impact agricultural producer' decision-making processes related to trading cash grain on Farms Technology's Dynamic Pricing Platform (DPP) and its potential use as a mobile application. In this regard, the study will achieve two main objectives.

1.3 Research Objectives

The research objectives are:

Objective 1: To determine specific factors that impact producers' volume of bushels traded on the Dynamic Pricing Platform.

There are two primary sources of data that will be collected to examine different factors affecting trading volume. These include:

- *Online Activity and DPP Characteristics*: - Examples include: Number of logins, bushels offered online, bushels traded online and CRM customer calls.

- *Socio-economic and Farm Specific Factors:* - Farm size and other characteristics, internet capabilities and availability, mobile device and abilities, demographic information, online activity, current marketing plan and availability of on-farm storage.

Objective 2: Examine the probability of producers' willingness to use mobile applications (handheld devices) as a method of trading grain compared to online via the personal computer (PC) or over the telephone.

Chapter 2 will provide a review of the literature regarding Internet usage in the United States, farmer grain marketing characteristics and mobile technologies in agriculture. Information is presented about Farms Technology and specifically the Dynamic Pricing Platform product and company strategies. The final literature reviewed will be how the DPP technology can influence efficiencies in the grain marketing industry. Chapter 3, the data and methods section, will outline how the 2009 Farms Technology survey was created, marketed and executed. Data will be summarized in aggregate form and statistical information will be presented. The conceptual model and empirical models used in the study will be presented as well. The models include an online trading model, which is a linear regression, and a mobile application adoption model which is a logistic regression model. Chapter 4 will present results from both model and discuss relationships between the dependent and explanatory variables. Finally, Chapter 5 will conclude with lessons learned from the research and a discussion about marketing opportunities for Farms Technology. In addition, future opportunities for Farms Technology are presented based on results, as well as a review of current company tactics.

CHAPTER II: LITERATURE REVIEW

2.1 Introduction

There is very limited research involving online execution of grain trades via the Internet.

For that reason, this chapter examines several different areas as they relate to this research.

The first focus is on basic internet usage in the United States and its impact on agriculture.

Next, characteristics that impact grain marketing decisions are presented. Then adoption of

mobile technologies in other countries that have helped farmers gain access to information

is presented. Other mobile research reviewed includes usage of mobile smart phones in the

US, but is not limited to agricultural producers. Finally, information about Farms

Technology and the Dynamic Pricing Platform (DPP) software solution will be presented.

This section will include information about the technology, patent and the delivery model

being implemented.

2.2 The Information and Agricultural Economy

The application at the center of this thesis is an internet based application for farmers called

the Dynamic Pricing Platform (DPP). An internet study by the United States Department

of Agriculture (USDA) (2009), on rural America focusing on three areas (rural internet use,

broadband availability, and the social and economic impacts on local communities)

illustrates the importance of the Internet in rural society. The report finds that the Internet

economy has matured and available internet applications are much more useful today than

in the beginning days of the internet. Data in the study comparing counties with internet

access found that those with more access to broadband internet have higher non-farm

earnings and greater access to information. By 2007, seventy percent of rural households

with in-home internet access were broadband configured and rural regions lag in

connectivity by about 14 percent to their urban counterparts (Stenberg et al., 2009). The

report discussed how initially, the Internet in rural America served mainly as a

communication medium in the form of email. Now rural areas are following suit with

urban web usage by finding value in instant messaging, blogs, Facebook and Twitter. In

many cases, rural distances have led to an increase in digital connection points. According

to the USDA, a key driver of rural internet usage is the Internet's ability to disseminate

information quickly and increase farmers' knowledge (Stenberg et al., 2009). The USDA

seems to agree with Beurskens, (2003), that the Internet is very important to the US

economy. Even though the Internet's reach and span is sparser in rural markets, it is

important to those in agriculture.

It is important to understand internet usage within the US, especially as it relates to

agriculture. This information helps in understanding producers' interest in selling via the

Dynamic Pricing Platform. For years, companies have emphasized the importance of the

Internet in agriculture and ways it would help producers. Besides the information

purposes, the value stems from the applications and resources that rural families can gain

from information available online. In research by Beurskens (2003) it is stated, "The

Internet as a distributed information system has the capability to reinforce the current

structure of the US agriculture and food system, and/or to facilitate shifts in the pattern of

structural change," (Beurskens 2003, 22). Beurskens discusses the web and how E-

commerce can help coordinate a fragmented agricultural industry. With the large number

of farmers in the US and the fragmented nature of the agricultural supply chain, Beurskens

suggests internet companies can help to streamline the supply chain.

Many of the societal revolutions produced major structural shifts. Beginning as recently as the 1800's, transportation along improved roads and railroads changed grain marketing. These changes in the economy demonstrated major revolutions for all of society. The next major era of change was the communication era, involving the telephone (Beurskens 2003). Beursken states the Internet and web applications are playing a role in the most recent revolution, the "information revolution." There is no question agricultural industry has suffered many challenges related to customer value creation that other industries have faced. According to Woolverton and Biere (2006) many agricultural internet companies have dissolved.

> *"The dot.com bubble burst in the year 2000. As promising as the prospects seemed for the agriculture/agribusiness internet companies, they were not immune to the crash which followed. Advertising revenues fell toward zero; venture capital funding dried up; revenues were choked off in their infancy. It was not for lack of trying. Struggling firms merged trying to find a combination that would generate enough revenue to pay the bills. Creditors extended payment due dates, reasoning that something in the future would be better than nothing in the present. Employees worked without pay for as long as they were able. Firms maintained websites on the dregs of venture capital funding hoping for a turn-around. But finally, admitting the battles were lost, they pulled the computer plugs, turned out the lights, and locked the doors behind them before limping into bankruptcy court."* (Woolverton and Biere 2006, 8)

Beurskens, (2003) agrees that firms must show true value to the customer. Customers must find value in the services created by companies or the companies will cease to exist. It can be argued that agribusiness is no exception to the rule. When businesses are created, be they web-based or brick and mortar, the business must have value creation. A significant component of Beursken's, (2003) research examines the market segment of buyers and sellers in relation to their access to information. The analysis concludes that markets with

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many buyers and sellers are more transparent than those with many sellers and few buyers of commodities. This is likely one reason that ethanol plants came online in local markets. In these cases, the pricing to local producers became more competitive and transparent. Beurskens (2003) mentions, that in general, producers don't communicate much amongst themselves about their selling strategies. In his estimation, grain elevators or end-use processors have the upper hand in regards to information flow and the ability to monitor market actions of sellers. His point is that producers sometimes are forced to make decisions in a "vacuum" with a lack of information. Lack of information can be associated with incomplete access to markets, basis or news impacting the markets in real-time.

To summarize, the internet provides a positive impact to the agriculture supply chain by centralizing information. Beursken's (2003) concluding comments sum up his view of agricultural technology companies in the US: "Agriculture has not witnessed a dot.com solution that takes advantage of the infrastructure and potential the internet has to offer. What we can safely say is that organizational innovation will result from such an important technological revolution" (p. 28).

2.3 Farmers Grain Marketing Characteristics

Since there is very limited information about farmers who sell grain online, in this section we analyze grain marketing characteristics of producers. While mediums may impact how grain is marketed, it is important to look at some grain marketing practices of farmers in the Midwest. For many growers, the decision to sell grain is one of the most challenging parts of their business. Much of the grain marketing literature is related to farmers' use of forward contracts and how much they sell. Sartwelle et al. (2000) examined a group of

producers from Kansas, Texas, and Iowa in 2000. Their study examined seller

characteristics of those farmers selling grain. Ninety-six percent of the producers surveyed

used cash marketing transactions, 70 percent used forward contracts and 52 percent used

futures and options. Sartwelle et al. (2000) conducted regression analyses examining

factors impacting grain marketing decisions, including acreage, type of operation (grain vs.

diversified livestock), years of experience, risk tolerance, storage options, farm location,

and form of crop insurance. According to Sartwelle et al. (2000), personal and business

characteristics have significant impacts on individual grain marketing practices. Based on

survey results, location does have an impact on types of marketing strategies. Finally, crop

insurance impacts risk management strategies of puts and calls used by different producers.

Factors that impact grain marketing in the Sartewell et al. (2000) study were specifically,

"geographic location, both the absolute and relative size of crop acreage, grain enterprise

specialization, years of farming experience, the use of commercial and on-farm grain

storage, proximity to major grain demand centers, and the use of crop insurance"(p. 110).

Sartwelle et al (2000) goes on to say:

> *"The findings of this study are of practical importance to farmers and*
> *agribusiness, as well as to applied researchers and extension educators.*
> *Agricultural producers may be able to make more objective and profitable*
> *grain marketing decisions as a result of an improved understanding of their*
> *grain marketing practices and tendencies."* (p. 110).

There are ways that the DPP can serve as a tool to help producers meet current challenges

of grain marketing. Since producers admit that grain marketing and profitability are some

of their biggest challenges, what they need is better connection to local buyers, the futures

markets and other efficiencies that come with being connected to market information on-

demand through the internet and mobile technology. With markets moving so quickly and

basis levels constantly changing, the DPP, can help producers have better information,

more transparency of cash prices, and lead to better marketing decisions.

2.4 Literature Review of Mobile Technologies in Agriculture

The majority of research relating to mobile technology in agriculture is conducted outside

the US. As discussed earlier, USDA (2009) indicates many rural areas don't have

broadband capabilities. For this reason, mobile applications may be a viable alternative to

disseminating price information to agricultural producers. In the UK, the use of mobile

technology allows small to medium sized growers access to the global economy (Warren

2004). Warren (2004) conducted a survey of small and medium size producers asking

specific questions related to text messages and mobile devices in 2002 – 2003. Findings

indicated a higher level of producers using text messages and mobile devices than

expected. In the UK, 75 percent of the growers surveyed had cell phones, and of those, 25

percent used their text messaging capabilities. The Internet was used by 50 percent of the

farmers, while only 4 percent had a personal digital assistant (PDA).

In a study by Mittal (2009), mobile phones were used to disseminate information and help

to increase efficiency of fishermen in India. This research showed that even-though

network or computer infrastructure may not be in place, commerce and price transparency

are still options via mobile technology. According to Mittal, (2009), mobile technology

can improve productivity for small farmers and increase the quality of the information.

The timeliness and the trustworthiness of the information are better. Mobile networks are

prominent in India due to high mobile coverage penetration in the market. Fishermen are

using the mobile devices to get price information in real-time. The survey conducted showed that the type of information sent to farmers included free voice messages that included weather, crop advice, market prices, fertilizer prices, and governmental updates. If farmers don't listen to these voice messages immediately, they can pull the information at will. In India, there are significant production challenges and a lack of infrastructure. It is apparent that farmers in India have faster access to information through a mobile medium in a voice mail format rather than the Internet. The report found that the majority of cell phone usage was social, but in some cases production efficiencies are linked to the information relayed via the mobile device. Mobile phones are used to disseminate information because of convenience, time savings and customized content (Mittal 2009).

The Philippines also have research on mobile phone usage in agriculture. Farmers' income is reliant on their ability to sell their product and deal with traders or buyers of their commodities. The basic needs for information are just as important in the Philippines as other parts of the world. Farmers rely on information for selling decisions. According to Labonne and Chase (2009), farmers that acquired cell phones increased their growth per capita consumption from 11 to 17 percent. While this study focused on poverty stricken areas, there are lessons to learn from the study. Information is power, it helps people make better marketing decisions. They did not discuss specific mobile applications, but the ability to have access to basic cell phone coverage.

A study by Mukhebi et al. (2007) of mobile technology adoption in Kenya, specifically addressed how to help poor farmers to access information to deal with marketing products.

As in other countries, those without the ability to access market information are at a disadvantage. The study focused on Kenyan farmers using short message service (SMS) text messages, Interactive Voice Response (IVR) and internet database systems. Like the US, the lack of market information represents a significant impediment to market access, especially for the smallholder farmer. Lack of information substantially increases transaction costs and reduces market efficiency. When markets are not always transparent, there is a demand by the farmer for more price transparency. A specific challenge for grain traders is to provide high-quality, commodity-specific information. They discussed how mobile technology can increase market coordination and cut down transactions costs.

The general lesson learned from Labonne and Chase (2009) can be applied to most agricultural markets in the world. Some of the challenges include the need for more reliable and timely market information and market linkages, which when addressed, will improve the efficiency of the markets and increase the selling power of smaller, less connected farmers.

Data on smart phone usage by agricultural producers is not currently available, so this aspect could not be directly examined. Due to location and other technology adoption issues we can expect adoption by agriculture producers in rural areas to lag behind urban users. According to Butcher (2008) of the Mobile Marketer,

> *"the latest Mobile Market View, a consumer study of U.S. mobile phone users conducted by The Kelsey Group with research partner ConStat, 18.9 percent of mobile consumers now use a Smartphone. Among those surveyed, 49.2 percent plan to purchase an advanced mobile device within the next two years."*

The two main devices in the smart phone industry are the Blackberry and iPhone. Some key functions consumers are performing with smart phones include downloading maps and directions, searching for local producers and services, and connecting to social networks, such as Facebook.

Mobile devices and delivery are not so much about the device, but about the ability to deliver messages faster and more efficiently to producers. Agricultural producers are on the go, they are mobile and they need information sent to them in the right medium at the right time from a trusted source.

2.5 Farms Technology and the Dynamic Pricing Platform (DPP)

Farms Technology has operated in the United States since 2002. Farms Technology provides various grain procurement applications for the grain and farming industries, which include electronic hedging platforms and private and public cash commodity exchanges. These products have been created to automate farmer cash commodity sales directly from the farm to commodity buyers within the United States, mainly in the Corn Belt region. Farms Technology has three core business solutions, the Dynamic Pricing Platform, MarketPoint, and ePit Technology.

Farms Technology, also, offers its flagship product, The Dynamic Pricing Platform, which serves as a private marketplace and was initially introduced with the Jennie O Turkey Store in March of 2003. The DPP is a software tool designed to streamline grain procurement and risk management. It helps in managing multiple offers and makes selling grain less complicated. It enables an elevator the opportunity to automatically procure grain at a

desired basis level when producers' selling price matches the elevators basis bid to execute the trades.

Farms Technology offers an open market place called MarketPoint, branded by Pioneer Hi-Bred. According to the Pioneer public website, MarketPoint is:

> *"a convenient, web-based tool allowing producers to quickly and easily post offers to one or several buyers. Producers also can receive text messages called Active Private Bids (APB) from interested buyers with incoming private bids for your present and future corn production, as well as Chicago Board of Trade (CBOT) commodity futures price updates three times daily. MarketPoint resource uses technology to help you to do a better job staying on top of the best selling opportunities in your local market, in less time. The MarketPoint resource Grain Desk is a one-stop shop for trading corn high in grain quality. All offers and resulting contracts are archived on the site, with every detail logged. This automatic documentation can help keep producers organized and save a lot of time in scheduling deliveries or tax preparation."* (Pioneer MarketPoint® Resource – The Better Way to Market 2010)

The third product Farms Technology provides is the patented software called ePit, (Gary Reding 2008), which is used in both the DPP and MarketPoint environments, connecting several Futures Commission Merchants (FCM).

The ePit process includes (Farms Technology 2008):

1. Monitoring flat price physical delivery commodity offers (cash offers) received from farmers and current futures market prices on a commodities exchange in combination with specific basis information supplied by commodity buyers;

2. Automatically generates cash contracts between the farmers and the buyers; and

3. Creates futures contracts between the buyers and the commodities exchange.

2.5.1 Dynamic Pricing Platform (DPP)

The research in this thesis focuses on the DPP private marketplace for grain producers.

This product is the firm's most mature product and more data is available for researching

this product in regards to factors that influence online grain trade. Furthermore, the lessons

learned in this research can easily be applied to an open marketplace or other areas

involving online agriculture transactions. The DPP is a private market place, that means

one buyer (which could be multiple locations) and many sellers (Figure 2.1). The DPP

procurement software automatically connects to futures exchanges, producers, and buyers

through a private marketplace business model.
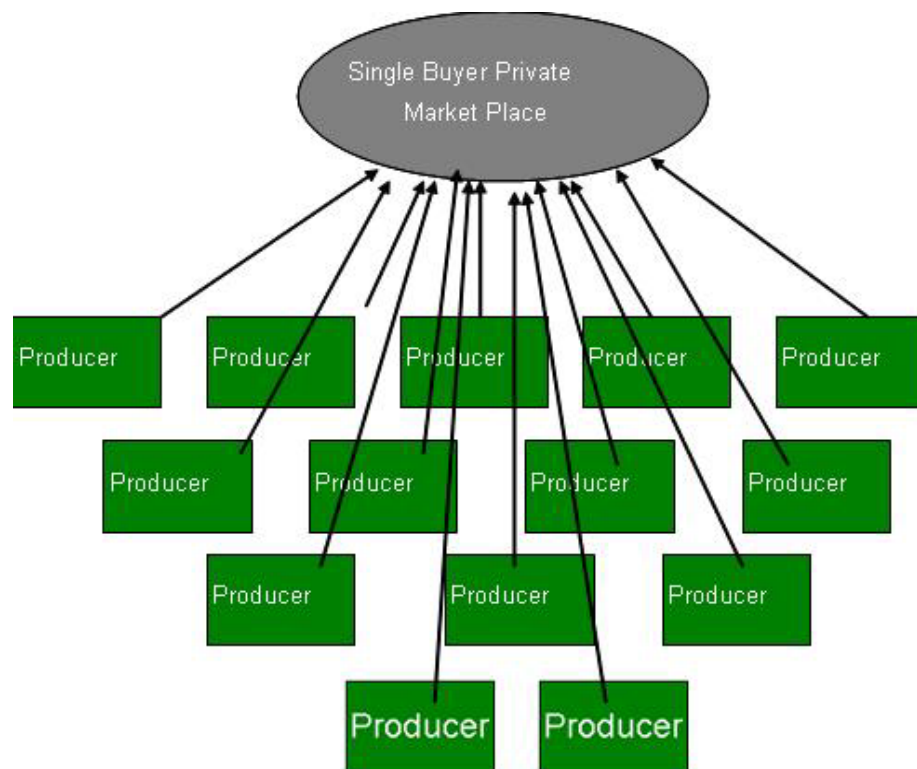
Figure 2.1: DPP Private Marketplace Model

The DPP has been in production since 2003 and is being used by thousands of farmers in over seventy five locations. With this software, buyers choose which sellers they want to allow access into their private marketplace. The approved sellers then have the opportunity to post offers to sell and the buyers decide which ones to accept from the seller. As the offers are accepted, the DPP price match engine monitors the futures price, basis level and growers target price looking for a price match.

2.5.2 Farms Technology Strategies

Farms Technology did not exist ten years ago, but today it adds value for both agricultural producers and grain buyers. It is an example of a blue ocean strategy as presented by Kim and Mauborgne (2005) in their book *Blue Ocean Strategy*. Blue ocean industries tap markets where there is no competition. The challenge with blue oceans is that demand must be created rather than won from others. Survey data and customer interaction shows that Farms Technology's products, once implemented, are a key part of both buyers' and sellers' businesses. The challenge lies demonstrating the value to buyers and/or sellers who have not experienced the value of the DPP.

Since Farms Technology generates profit by executing trades online (defined as a price match between a farmer's flat target price and buyers basis bid and a futures quote) there are different factors or variables that may impact agricultural producers' decision-making as it relates to trading cash grain on the DPP. In the online grain execution business, in order to increase revenue, Farms Technology must continue to grow the total amount of traded bushels. Currently, about 30 percent of growers with access to the DPP actually post grain offers. The rest (almost 70 percent), who have taken time to sign up for the

service, either login infrequently or use the system solely for price monitoring. Furthermore, Farms Technology has observed what they call the "E-Bay effect", which is when a producer makes an offer for the first time. If the offer trades due to market activity, then the producer will most often place additional offers. Past experience has helped Farms Technology create the basic seller transaction model shown in Figure 2.2. This internally developed seller model is the basis for the research around online grain execution. It is the company's belief that growers need to take the first step and sign up for the DPP.
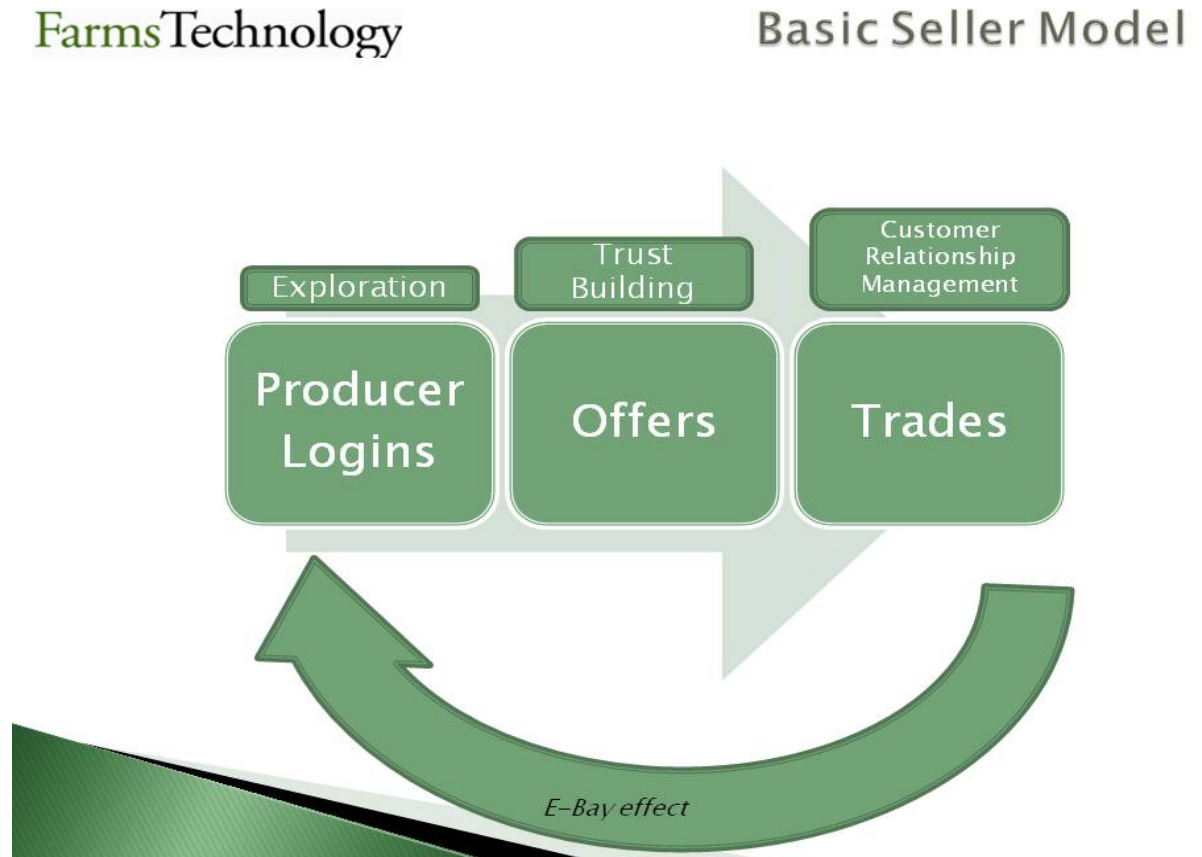

Figure 2.2: Seller Transaction Model

Following sign up, growers will go through the three phases of the online trading process, which include exploration, trust building, and customer relationship management. As producers are looking online, there is an event that causes them to make their first offer. The first offer is usually the hardest offer to make. Once an offer is posted, the producer monitors the offer and then many times, market movements cause the offer to trade. We call the first trade, the "E-Bay effect" referring to an experience of selling on E-Bay for the first time. Internal Farms Technology data shows that once a producer makes an online trade and sees the simplicity of it, they will continue to make more and more offers on the DPP. The research in this thesis will help Farms Technology more clearly define this model and understand other variables impacting online trading.

In addition to factors impacting online grain trade, Farms Technology must continue to look toward other Blue Ocean opportunities. It is the goal of this research to evaluate mobile possibilities for agricultural producers desiring to trade grain through other mediums. Trading grain via the web is a Blue Ocean concept, something that did not exist ten years ago. That being said, there are other companies that are offering similar but more basic services and it is for this reason that we must continue to create additional value for customers in areas in which there is no competition. Blue Ocean strategies do not last forever. As firms move toward solutions that mimic what the Dynamic Pricing Platform currently does today, Farms Technology must continue to move into future Blue Oceans or untapped opportunities. That means exploring options that do not exist today which will give producers the ability to trade on mobile devices and explore other future revenue generating options.

2.5.3 DPP Efficiency Gains and Inefficiencies of Alternative Trading Regimes

It is important to understand a basic business flow of how grain trades and how the telephone method works, which can be inefficient in certain situations. Farms Technology recognizes that when producers are willing to take the market price, or be "price takers" the fastest way to complete a trade is by using the telephone. The DPP is most widely used by those producers that want to get more out of the market than it is offering right now and choose to set target prices, in other words be "price-makers".

Figure 2.3 demonstrates the different methods in which grain can be traded. The **left side** of the diagram demonstrates a situation in which a grower calls a buyer and a hedge is completed over the telephone. This business flow shows there could be as many as five phone calls for just one grain transaction. On the **right side of the diagram** notice Farms Technology has replaced phone calls with servers and systems, significantly reducing trade inefficiencies.
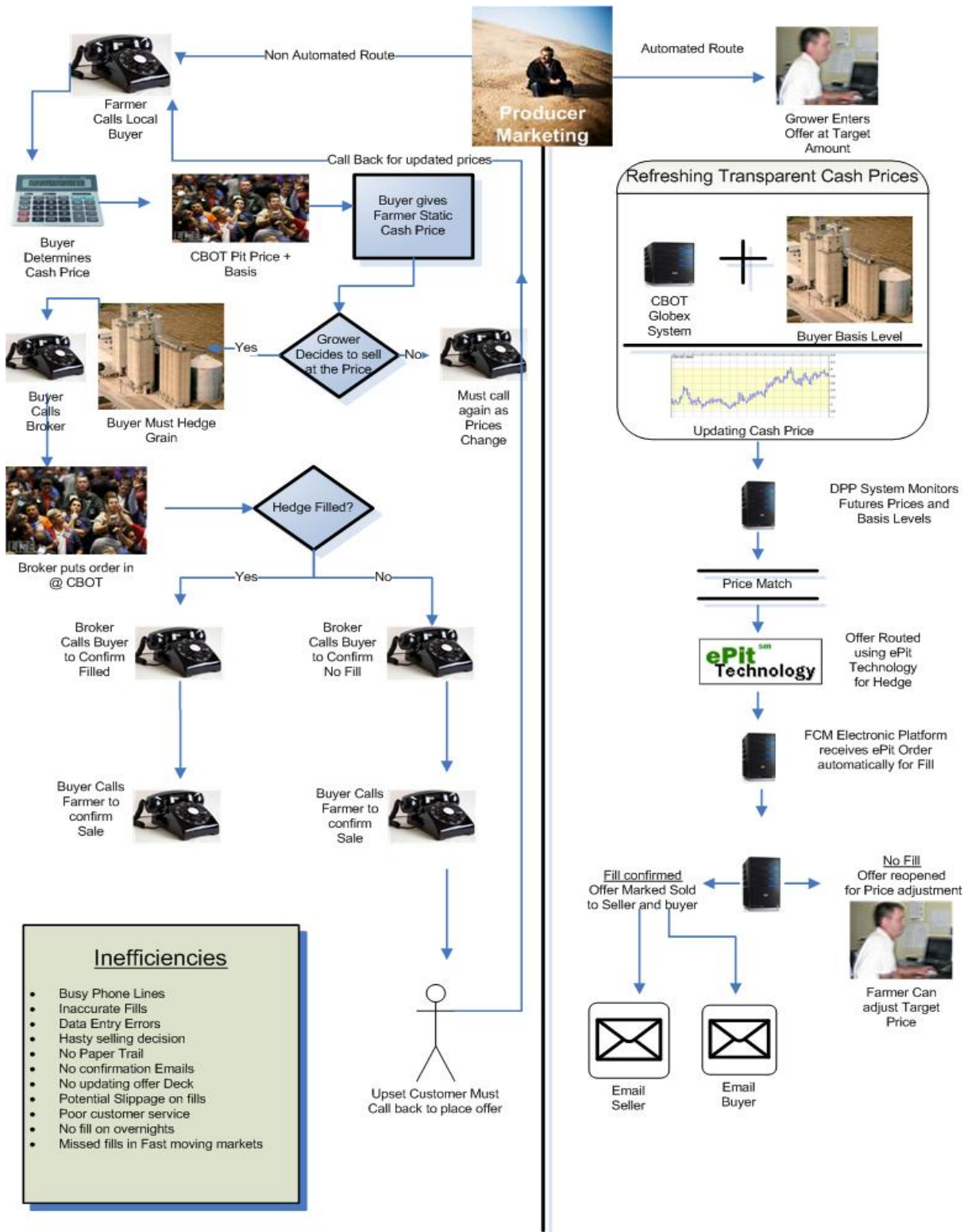
Figure 2.3: Grain Trading Model Comparison

Computers work faster and more efficiently than people when it comes to trading on grain markets. When a producer's largest sale of the year is on the line, they want the most up-to-date accurate information they can get. The automated cash grain sales process is a way to save time, reduce errors, and increase win/win situations between buyers and sellers.

After looking over the information flows in Figure 2.3 the following trading inefficiencies that result from the phone method are more recognizable. These include:

1. *Busy phone lines* - If a buying location only has one buyer, they can only provide full service to one customer at a time. There feasibly may be 50 to 100 customers at a time that would benefit from being able to connect with a buyer, but they are not able to do so with a one phone line limitation.

2. *Inaccurate hedges* - When the markets are moving quickly, a buyer not connected with ePit may have offers written on a piece of paper or in an excel spreadsheet. If they don't have time to call or submit their hedges, the business can lose significant money or have an upset farmer.

3. *Data entry errors* - Due to decentralized systems or handwritten notes, offers or hedges can be inaccurate. Once again, the business can lose money or accounting challenges can begin to mount. In this situation both buyers and sellers can be penalized for not having an automated system in place.

4. *Hasty Selling Decisions* - When growers hear the markets are up or down may they call the local buyer (just about the same time as all the neighbors) to check prices or possibly sell. Many times emotion comes into play for this selling decision as

compared to sticking with a marketing plan by letting the system execute the target price automatically.

5. *Lack of Documentation* - When verbal trades are done over the phone, both buyers and growers lose the paper trail, email updates and proper system for tracking offers and trades. Usually contracts come in the mail several days later, but there is no automatic email generation triggered by a trade.

6. *Lower Quality of Customer Service* - If the markets are making major moves and a producer can't get through on the phone, there is no system for making offers and executing trades. Buyers can lose business and rapport with sellers.

7. *Automatic Hedges on the Overnights* - Without ePit technology buyers are at risk of not being able to change basis and update offers. Farmers also lose the ability to change prices during the night session without the DPP.

The DPP provides a solution that addresses these issues - when grain companies choose to offer the DPP,

> *"Producers are no longer placed on hold during periods of heavy call volume. Grain buyers do not need to hire additional workers to handle peak load volumes. The DPP expands the capacity of buyers and also handles 'back office functions.' It provides electronic documentation of offers and fills as well as position - how much has been purchased and when it will arrive."* (Woolverton and Biere 2006, 12)

Technology provides efficiencies to markets, and agriculture is no different. When phone calls and sticky notes are replaced by time stamped order entries and computers/servers are monitoring every tick of the market, there are increased efficiencies, less data entry errors and an overall better customer experience.

2.6 Concluding Remarks

Even though there is limited data on US farmers selling commodities through a web application, the information and data compiled in this chapter helps provide some understanding about the future of the online grain trading industry. There is value added by internet companies in the U.S. More producers are adapting to internet and associated technologies. Regardless of conducting e-business or not, firms must add value to the supply chain to be successful. Since so many farmers sell cash contracts, the ability to have additional marketing mediums in the future, which execute marketing strategies, is a necessity. Farms Technology will play a role in the use of online and mobile technologies. There is evidence from other countries relating the success of mobile technology adoption, resulting in greater market penetration and price transparency for making better selling decisions for producers. The objective of this compiled research is to help understand how the Dynamic Pricing Platform can continue to execute cash grain sales competitively in the United States and further help both agricultural producers and grain merchandisers.

CHAPTER III: DATA AND METHODS

3.1 Introduction

The goal of this chapter is to present the data and methods used to analyze the data. Two

models are examined: (i) an online trading model examining farmer variables impacting

traded bushels via the Farms Technology private internet technology trading platform, the

Dynamic Pricing Platform (DPP) and (ii) a mobile application technology adoption model

exploring the likelihood of growers adopting mobile trading technology to increase grain

marketing opportunities. Two types of data are used to capture producer behavior

regarding online grain trades on the DPP and potential adoption of a mobile DPP

application. Data sources include survey data examining producers' trading preferences

and farm characteristics, as well as DPP usage data that helps to understand how producers

currently use the DPP system.

3.2 Data

The two sources of data include survey information from DPP users during the winter of

2009 and system data from Farms Technology's internal database over the last year.

3.2.1 Survey Data

On a yearly basis, typically during November and December, Farms Technology conducts

a grower survey to get customers' perspectives regarding the e-trading platform to market

grain online. This activity is used to gauge the previous year's performance and to help

prioritize development initiatives for the upcoming year. In previous annual surveys, most

of the questions asked were related to a general underlying topic. For instance, in 2007, as

the night markets were gaining more momentum and growers interest in night-time cash-

grain trading was increasing survey questions focused on that were added to the survey.

The complete 2009 survey is provided in Appendix A. The primary objective of the 2009 survey was to understand the differences in DPP usage among user and their perceptions concerning the possibility of a mobile trading application. In addition, there was an increased focus on learning more about customer demographics including: age, education, and grain commodity marketing challenges. In previous surveys, there was no demographic information collected; therefore Farms Technology opted to use range formats in the 2009 survey. To improve participation, we opted to not directly ask about a grower's age, but broke the question down into ten year increments. This convention was followed for other questions that may be sensitive for producers, as well. From past experience, customers are sometimes more willing to share data in ranges, compared to actual numbers, making the data more reliable, while less precise.

A particular focus of the 2009 survey was the perceptions concerning mobile device usage and what producers want on their mobile handheld devices in relation to grain marketing and trade. While the firm has noticed major increases in text message adoption, there is more to mobile usage than pushing text messages to growers. Farms Technology is currently crafting its future strategy to mobile usage. The mobile data collected on the survey may help understand more about what type of customer is adopting mobile technology and the demographics that could be targeted.

As an incentive to complete the survey, Farms Technology held a drawing for a $100 prize. Even though it is a small incentive, this monetary award helps increase survey participation. While customers seem to appreciate the monetary award, they also have influence over future development of the Dynamic Pricing Platform. Producers enjoy

sharing their success stories, ideas for new features, and other feedback. The survey

provides Farms Technology hundreds of facts and opinions to help better understand its

customer base.

While Farms Technology offers two trading platforms, only active DPP users with valid

emails or users that logged into the DPP system during the survey timeframe had the

opportunity to take the survey. The survey was posted online on November 15, 2009 via

the DPP homepage. On November 17, 2009, a survey announcement was emailed to all

DPP users. 3609 emails were sent, of which 105 bounced back as invalid addresses. A

second e-mail reminder was sent on December 9, 2009, in conjunction with a USDA

Report announcement. The last communication was an email on December 17, 2009

announcing the survey was almost complete for 2009. The survey was left active on the

DPP until Jan 3, 2010.

The response rate was 8.3% for the 2009 survey (292 responses divided by 3,504 total

number of emails sent minus the 105 undeliverable). Possible reasons for the low response

rate are: low incentive to fill out the survey and that the survey was conducted online rather

than by mail or phone. Both mail and phone would be more expensive methods. Also, a

33% segment of less active users did not access the DPP system during the time that the

survey was open.

3.2.2   Internal Company Data

In addition to the survey data provided by customers through the 2009 customer survey,

information was used from the internal Farms Technology database, which included:

Total Accounts – This variable is the total number of DPP accounts/grain buyers a grower has been approved to sell to. (Growers may have approvals to sell to more than one local buyer on the DPP.) The way to verify this information is using a custom query for accounts with same first name, last name and email address.

Total 2009 Logins – This variable represents the total number of times a producer has logged into the DPP trading system. This is per account number and may include multiple logins per day. After a period of inactivity, growers are logged out of the DPP system for security.

Years on DPP – This variable is the number of years a producer has been on the DPP system. This information was calculated by taking the date from account creation and calculating the number of years since that time stamp. This number was rounded to the closed one year increment.

Offered Bushels in 2009 – This variable is the total quantity of bushels offered by the producer (units are in bushels of grain- corn, soybeans or wheat) for the year 2009. This number is an internal key performance indicator (KPI) that the company follows very closely as a leading indicator to bushels that can trade on the DPP.

Trade Desk Calls – This variable is the number of documented support calls in which a Farms Technology associate helped a grower with a trading question. Farms Technology uses an extensive customer relationship management system (CRM) to track customer information and to help the service team to track all points of contacts. Customers call for help with the system, training, system updates and providing suggestions. The average

number of calls per customer is 2.78 with a range from 0 to 14 documented calls per customer surveyed.

While the DPP survey focused on DPP customers in the Corn Belt region, it is important to look at a breakdown of the states represented in the linear regression model and the logit mobile adoption model. As shown in Figure 3.1, the sample group is heavily concentrated in the western Corn Belt area where DPP usage is the heaviest.
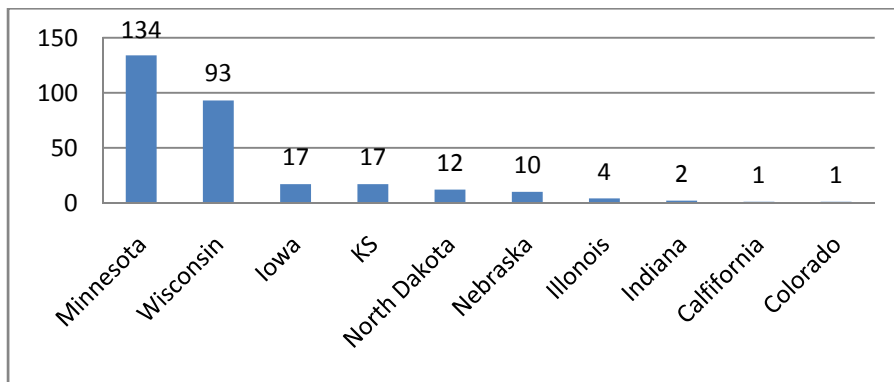

Figure 3.1: Survey Response by State

Summary statistics for the data used in the study are presented in Table 3.1. While the data are proprietary to Farms Technology and not publicly available, aggregate results are shown here. Two groups of growers are in the 2009 DPP Survey; those who have used the system to trade and those who use the system for cash-price monitoring. According to Table 3.1, for customers responding to the survey, the average number of bushels traded in 2009 was 14,396 bushels. The average percent of grain forward contracted was 40 percent and the average farm size was just less than 1000 acres. Of the survey respondents, 35 percent said they sell via the web as compared to 42 percent that said they prefer to sell

over the phone. It is expected that the percentage of growers who currently sell via the web will be higher in this survey sample than the normal population, as all survey respondents already have a DPP account. The average age was 48, the average distance farmers were willing to haul grain 62 miles, and 34 percent of the growers used a grain marketing service. Eighteen percent of the farmers received text messages with futures price updates.

Table 3.1: Model Variable Definitions and Statistics

Dependent Variables	Definition	Mean	Standard Deviation	Min	Max	Data Type
Bushels Traded DPP	The total traded bushels in 2009 (Units= Bushels of Grain- Corn, Soybeans or Wheat). These values represent the total number of bushels of grain a producer traded through the DPP trading system in 2009.	14,396	339,524	0	339524	Continuous
Mobile Application Adoption	Equal to '1' if a producer would adopt a mobile DPP application and '0' otherwise. (Binary variable)	0.4158	0.4929	**0**	**1**	Binary

Independent Variables[1]	Definition	Mean	Standard Deviation	Min	Max	Data Type
Forward Contract (Midpoint)	Variable is used to describe the midpoint value for each grower as a range in percent that they expect to forward contract during a year. Forward contract means selling grain for cash delivery at a future point in time.	40.65	32241.13	0	339524	Continuous
Acres (Midpoint)	Variable describes the midpoint value for each grower in terms of how many acres they farm.	929.98	770.68	125	3000	Continuous
On Farm Storage (Midpoint)	Variable which describes the midpoint value for growers in the percent of grain they can store on their farm. On farm storage would usually be stored in grain bins or silo storage.	66.08	28.04	10	90	Continuous
Sell Web (Midpoint)	Variable describes the midpoint percent of grain sold over the web by a grower. This information comes from the 2009 survey data and is a range entered by a producer.	34.60	26.51	10	90	Continuous
Sell Phone (Midpoint)	Variable describes the midpoint percent of grain sold over the telephone by a grower. This information comes from the 2009 survey data and is a range entered by a producer.	42.44	29.72	10	90	Continuous

Table 3.1 continued

Independent Variables	Definition	Mean	Standard Deviation	Min	Max	Data Type
Sell Person to Person	Variable describes the midpoint percent of grain sold in person by each grower. For example, a farmer would walk into an elevator office and sell face to face. This information comes from the 2009 survey data and is a range entered by a producer.	1.29	.82	1	5	Continuous
Age (Midpoint)	Variable measures the midpoint age for each grower. This information is measured in years.	48.16	13.01	25	75	Continuous
Distance Haul	Demonstrates the total mileage a grower is willing to haul their commodity to different grain buyers.	61.98	49.33	0	300	Continuous
Use Marketing Service	Variable explains whether or not a producer uses a professional marketing service to help in the marketing of their grain. Marketing services help producers determine certain marketing programs.	0.34	0.47	0	1	Binary
Dial Up Internet	Describes growers that only have dial up internet access	.08	.27	0	1	Binary
Receive Text Futures	This information demonstrates if a grower currently receives text message futures price updates via their cell phone	0.18	0.39	0	1	Binary
No DPP - Prefer Phone	Defines growers that don't sell through the DPP because they would prefer to sell the grain over the phone.	0.27	0.45	0	1	Binary
No DPP - TooHard	Variable defines growers that don't sell through the DPP because they believe it is too hard to use the DPP	0.01	0.12	0	1	Binary
Total # of DPP Accounts	The total number of DPP accounts/grain buyers a grower has been approved to sell to. (Growers may have approvals to sell to more than one local buyer on the DPP)	0.43	0.99	0	5	Continuous
Total 2009 DPP Logins	Variable represents the total number of times a producer has logged into the DPP trading system.	172.81	205.25	1	1457	Continuous
# Years On DPP	The number of years a producer has been on the DPP system.	3.43	1.74	1	8	Continuous

Table 3.1 continued.

Independent Variables	Definition	Mean	Standard Deviation	Min	Max	Data Type
Offer 2009 Bushels	Represents the total quantity of bushels offered by the producer (Units are in bushels of grain- corn, soybeans or wheat) for the year 2009.	26,763	70,517	0	87,910	Continuous
Trade Desk Calls	The total number of documented support calls in which a Farms Technology associate helped a grower with a trading question	2.78	3.14	0	14	Continuous
No Cell Phone	Variable describes producers that do not own a cell phone	.96	.17	0	1	Binary
Text Message	This information describes the status of receiving text messages via the phone by producers. (This variable does not differentiate what kind of text messages, meaning commodity related or family and friends).	.53	.5	0	1	Binary
Smart Phone	Variable indicates whether or not grower owns a smart phone	.12	.33	0	1	Binary
Customer Service	This is the rated level of customer service from Farms Technology associates	3.32	.99	0	4	Continuous
DPP Usefulness	Variable that describes how useful a grower rates the DPP	2.86	.42	0	3	Continuous

[1]Midpoint is defined at the midpoint of the range selected by a producer on the 2009 Survey. During the survey process, producers were presented a range for certain questions. This data was then converted to a midpoint number.

Table 3.2: Average Farmer Age by Farm Size (USDA Agricultural Census 2007)

Farm Acreage	140-179	180-219	220-259	260-499	500-999	1000-1999	2000+	Overall Average
Wisconsin	57.1	56.7	55.8	55.3	54.5	54.1	53.9	55.34
Minnesota	57.7	57.2	57	55.9	54	52.7	52.1	55.23

3.2.3 Comparison to the 2007 Agricultural U.S. Census

To compare DPP customers and the overall agricultural population the Census of Agriculture (2007) is utilized. The comparison reviewed state data for Wisconsin and Minnesota, the two states with the most respondents. The average age of 2007 agriculture producers in Wisconsin was 7.18 years older than the average DPP customer. Likewise, the 2007 agricultural producers in Minnesota were 7.07 years older than the DPP customers. The interesting characteristic from the Census of Agriculture (2007) was how as the size of the farm increased, the average age decreased. Furthermore, Farms Technology has learned that as farm size increases, the total bushels traded on the DPP increases. The median age for DPP customers is approximately seven years less than the USDA average age, thus the DPP market segment is not completely representative of the USDA farmer segment. One reason for this variance can be explained by the medium in which the surveys were collected. The DPP survey was conducted 100% online compared to a more expensive yet comprehensive mailed survey completed by the USDA.

3.3 Online Trading Model

The first model was an online trading regression model. It will help Farms Technology make business decisions regarding variables impacting trade on the DPP. The lessons learned in this research can easily be applied to online transactions in other areas of

agriculture. The dependent variable for the model is the total bushels traded on the DPP in 2009. This variable was selected as the dependent variable in that traded bushels is a source of revenue for Farms Technology. Understanding how other explanatory variables impact trades is extremely beneficial to the company. A number of other factors were identified based on the literature review and expertise from Farms Technology that may impact online grain trading volume. The conceptual model takes the following linear form:

$$BuTradedOnDPP = \beta o + \beta_1 \text{ ForwardContract} + \beta_2 \text{ AcresM} + \beta_3 \text{FarmStorage} + \beta_4 \text{SellWeb} +$$
$$\beta_5 \text{SellPhone} + \beta_6 \text{Age} + \beta_7 \text{DistanceHaul} + \beta_8 \text{UseMarketingServ} + \beta_9 \text{RecTextFuture}_s +$$
$$\beta_{10} \text{NoDPP} + \text{PreferPhone} + \beta_{11} \text{NoDPP-TooHard} + \beta_{12} \text{TotalAccounts} + \beta_{13} \text{Total2009Logins}$$
$$+ \beta_{14} \text{YearsonDPP} + \beta_{15} \text{Offer2009Bushels} + \beta_{16} \text{TradeDeskCalls},$$

where the explanatory variables and their expected signs are presented below.

ForwardContract is the midpoint percent that they expect to forward contract during a given year. In the survey, each grower was asked, "What percentage of your expected production do you forward contract in an average year?" Possible responses were, 0-20%, 21-40%, 41-60%, 61-80%, and 81-100%. Next, the data was converted to the midpoint number for each range for each grower. For example, 21-40% would be converted to 30%. This variable shows what percentage of their crop they sell forward in a given crop year. The reason this variable is important, is that many growers are looking to lock in prices for future delivery periods and this model will examine the impacts of forward contracting percentage on 2009 trades on the DPP.

The Expected Sign for β₁ is positive: A positive relationship is expected with trading volume, in that the higher percent a producer forward contracts the more likely the producer is to use the DPP online offer system. The reason for this is that the DPP provides increased transparency and ease of locking in prices for trades.

Acres is the midpoint number of acres farmed, which is more commonly known in research as Farm Size. Each grower was asked, "In acres, what is your total farm size?" Possible responses included 0 – 250, 251 – 750, 751 - 1,500, 1,500 - 3,000 and 3,000+. The data were converted to midpoint number for each grower. For example, 251-750 was converted to 500. It is important to understand the impacts of farm size on volume of bushels traded. *The Expected Sign for β₂ is positive*: Larger farms are expected to produce more bushels and therefore more could be marketed through the DPP.

FarmStorage is a variable which describes the percent of grain producers can store on their farm. Each grower was asked, "What percent of annual crop production are you able to store on your farm?" The response categories included: 0-20%, 21-40%, 41-60%, 61-80%, and 81-100%. The data were converted to midpoint number for each grower. For example, 21-40% was converted to 30%. This variable is important because as growers can store more grain on their farm, there are increased marketing opportunities throughout the year. *The Expected Sign for β3 is positive*: The larger the percent of on-farm storage, the more opportunity a producer has to market grain year round, and thus, would more likely use the DPP.

SellWeb is the midpoint variable that describes the percent of grain sold over the web by a grower. Each grower was asked, "What percent of grain do you sell using the internet?" The possible answers were 0-20%, 21-40%, 41-60%, 61-80%, or 81-100%. The data were converted to midpoint number for each grower. For example, 21-40% was converted to 30%. This variable measures the percentage of grain sold by a producer that is transacted through the web. This variable is important as growers were able to relay a level of expected sales percent online. This data can then be analyzed in comparison to what was actually contacted over the DPP.

The Expected Sign for β_4 is positive: The percentage a grower prefers to sell over the internet should be positively correlated with grain traded using the DPP.

SellPhone is the midpoint percent of grain sold over the phone for each grower. Growers were asked, "What percent of grain do you sell using the phone?" 0-20%, 21-40%, 41-60%, 61-80%, or 81-100%. The data were converted to midpoint number for each grower. For example, 21-40% was converted to 30%. This variable shows the expected percentage of grain sold person to person.

The Expected Sign for β_5 is negative: Given producers only have X number of bushels to sell in a given year, the higher percentage that are sold over the phone should lead to a decreased percent sold over the DPP.

Age is the midpoint age for each grower measured in years. Each grower was asked, "What is the age of the primary decision maker of transactions created on the DPP? 20-29, 30-39, 40-49, 50-59, 60-69, and 70+. In this situation if a grower answered the range of 40-49 they

were assigned a midpoint value of 45. This factor is important because we want to measure the impact that age has on bushels traded.

The Expected Sign for β_6 is positive: The older the person using the DPP, the more influence they have over when and where to market the grain and complete trades.

DistanceHaul demonstrates how many miles a grower is willing to haul their commodity to different grain buyers. Growers were asked, "How far are you willing to haul grain?" Users were asked to type in answers in numeric format for the number of miles. (There were not criteria on the data entry for this section. Note that in three situations growers typed ranges such as 50-75. The data was given the midpoint value in these three scenarios rather than disregard the entire survey response.) The reason this variable was important is to determine how far growers are willing to haul grain. The objective is to see if distanced hauled impacts the level of trade on the DPP.

The Expected Sign for β_7 is positive: As producers indicate they are willing to haul further distances, they would be expected to have increased opportunities to sell to more buyers that trade on the DPP grain procurement application.

UseMarketingSer is a yes or no binary question that explains whether or not a producer uses a professional marketing service to help in the marketing of their grain. Growers were asked, "Do you subscribe to any marketing advisory services?" Producers could choose to select yes or no. This variable is important because we wanted to determine if using a marketing service impacted the level of traded bushels on the DPP. It is important to note that marketing services focus on telling producers when to sell certain quantities and give

advice. This is in contrast to the DPP, which solely focuses on execution of trades at specific levels.

The Expected Sign of β₈ is positive: Since the DPP fills a different role than a marketing advisory service and the two actually work together, we expect this to be a positive relationship. Marketing services are giving recommendations to producers as to when to sell, while the DPP helps producers complete the trade and achieve the target price. It is expected that if growers are seeking marketing help, they would be interested in a tool to help execute trades, as well.

RecTextFutures is a binary variable that explains if a grower currently receives text message for futures price updates via their cell phone. Growers were asked, "Do you receive futures price text updates?" Producers could choose to select yes or no. This is important in that we have seen a dramatic increase in the number of text messages sent to agricultural producers. We were trying to determine if text messages increase the level of traded bushels on the DPP

The Expected Sign of β_9 *is positive*: We expect producers following the markets closely to be more likely to make trades on the DPP. This group would be expected to be more technology oriented and in tune with the markets, which should increase DPP traded bushels.

NoDPP-PreferPhone is the variable which identifies growers that don't sell through the DPP, because they would prefer to sell grain over the phone. NoDPP-PreferPhone demonstrates perception of the grower compared to percent sold over the phone which demonstrates actual revealed behavior. This information was gathered via the survey

question in which growers were asked, "If you do not sell grain through the DPP, then please tell us why?" This variable is a binary response equal to 1 if the respondent said "Yes, I prefer to sell over the telephone" and 0 if it was not checked. This variable is just another way to evaluate how selling via phone impacts traded bushels on the DPP. This variable is important as we believe the phone is a significant competitor as we evaluate DPP traded bushels.

The Expected Sign of β_{10} *is negative*: Experience suggests that if growers prefer to sell over the phone, they are less likely to trade bushels on the DPP

NoDPP-TooHard is a variable identifying growers that don't sell through the DPP because they believe selling over the DPP is too difficult. Growers were asked, "If you do not sell grain through the DPP, then please tell us why?" This variable is a binary response that is equal to 1 if respondent said "Selling over the DPP is too hard" and is 0 otherwise. This variable helps evaluate how perceived difficulty of selling on the DPP impacts trades. This variable is important so that Farms Technology can evaluate if ease of use of the system is a variable that impacts trades on the system.

The Expected Sign of β_{11} *is negative*: Theory tells us that if growers selling over the DPP perceive the process as too hard, they would be expected to trade less bushels on the DPP.

TotalAccounts is the total number of DPP accounts/grain buyers a grower has been approved to sell to. For example if a grower has an account with an ethanol plant and an end use processor in the same town they would have 2 accounts. This variable measures Farms Technology's penetration into certain markets, such as Southern Minnesota, to understand

how total accounts impacts the number traded bushels. This value is determined by the

number of accounts that have the same email and first name and last name. This information

is determined from an internal proprietary database at Farms Technology.

The Expected Sign of β_{12} *is positive*: Experience suggests that as growers have more

opportunities to sell over the DPP, it would increase total traded bushels.

Total2009Logins represents the total number of times a producer has logged into the DPP

trading system. This information is determined from the internal database proprietary to

Farms Technology. This information is important as we review the suggested model in

Figure 2.2. It was stated that Farms Technology expects logins to lead to offers and offers to

lead to trades. Since this is a core indicator for the company, its inclusion will demonstrate

how important logins are to the number of traded bushels on the DPP.

The Expected Sign of β_{13} *is positive*: As producers log in more, they are more likely to post

offers and those offers will lead to more trades. Therefore this coefficient is expected to be

positive.

YearsOnDPP is the number of years a producer has been on the DPP system. This

information is determined from the internal database proprietary to Farms Technology. To

calculate this number we found the date the producer registered for the DPP and calculated

the number of years they have been on the DPP trading system.

The Expected Sign of β_{14} *is positive*: We expect that the more time a grower is on the DPP

the more they typically would trade in a given year. Once a grower has experienced the

simplicity of trading on the DPP, we typically don't see growers decrease trades unless
market conditions erode dramatically.

Offer2009Bushels represents the total quantity of bushels offered by the producer (units are

in bushels of grain- corn, soybeans or wheat) in the year 2009. This information is

determined from the internal database proprietary to Farms Technology. While a producer

can offer grain that does not necessarily trade, Farms Technology does find this variable to

be a leading indicator of the number of traded bushels on the DPP.

The Expected Sign of β_{15} *is positive*: Experience suggests that as producers log in more, they

get more comfortable with the system, and in turn will be more likely to post offers , which

is the way to increase the number of DPP bushels traded.

TradeDeskCalls accounts for the total number of documented support calls in which a

Farms Technology associate helped a grower with a trading question. This information is

determined from the internal Customer Relationship Management (CRM) database

proprietary to Farms Technology. This information is important so that we can measure the

contacts with a customer in relation to how many bushels they traded over the DPP.

The Expected Sign of β_{16} *is positive*: Past experience shows that each time an internal

associate explains the system and emphasizes features/benefits; the expected number of

trades should increase.

3.4 Mobile Application Adoption Model

The second model developed was a mobile DPP application adoption model. The

motivation for this model was to better understanding the likelihood of producers'

willingness to use mobile applications (handheld devices) as a method of trading grain compared to online via the personal computer (PC) or over the telephone. Farms Technology experience and economic theory were used to identify variables that may impact a grower's likelihood of adopting mobile technology for grain trading. The postulated conceptual latent linear model is:

$$\text{MobileAdoption} = \beta_0 + \beta_1 \text{NoCellPhone} + \beta_2 \text{UseTextMessage} + \beta_3 \text{SmartPhone} + \beta_4 \text{CustomerService} + \beta_5 \text{DPPusefulness} - \beta_6 \text{TooHardOnline} + \beta_7 \text{SellonDPPOnline} + \beta_8 \text{DialUp} + \beta_9 \text{RecFuturesText} + \beta_{10} \text{ForwardContract} + \beta_{11} \text{Acres} + \beta_{12} \text{SellOnWeb} + \beta_{13} \text{SellPhone} + \beta_{14} \text{SellInPerson} + \beta_{15} \text{Age} + \beta_{16} \text{2009Logins} + \beta_{17} \text{TradeDeskCalls}$$

where the explanatory variables and their expected signs are presented below.

NoCellPhone is a binary variable that indicates if producers own a cell phone. During the survey, each grower was asked, "Do you have a cell Phone?" Growers could select between yes and no. If they answered "no" then the variable is equal to 1 and 0 if otherwise. This variable is important because it shows which growers are already using mobile phones in at least a calling capacity.

The Expected Sign for β_1 *is positive*: Theory and experience explain that growers owning a cell phone would be more likely to use mobile application technology.

UseTextMessage is a binary variable which describes the status of receiving text messages via a cell phone by producers. (This variable does not differentiate what kind of text messages, meaning commodity related or family and friends). During the survey, each

grower was asked, "With cell phones usage becoming more prominent among agriculture producers, do you receive text messages?" Growers could select between "yes" and "no", in which case the "yes" answers were converted to a '1' and "no" answers were converted to a '0'. This variable is important because it shows which growers are already using mobile phones in the text messaging mode.

The Expected Sign for β_2 *is positive*: Theory helps describe the expectation that growers who use text messaging would be more likely to an adopt mobile trading application. These growers are already using a basic form of mobile application.

SmartPhone describes whether or not a grower has a smart phone. This was a binary variable. During the survey, each grower was asked, "With cell phones usage becoming more prominent among agriculture producers, do you use a Smart Phone (Blackberry, Palm, I-Phone etc)?" Growers could select between "yes" and "no", in which case the "yes" answers were converted to '1' and "no" answers were converted to '0'. This variable is important because it shows which growers already own smart phones and thus would be able to use mobile technology without any device limitations.

The Expected Sign is β_3 *positive*: It is expected that growers who have a smart phone would be more likely to use mobile trading application.

CustomerService describes the rated level of customer service the respondent gave Farms Technology. During the survey, each grower was asked, "Please rate your customer service experience with Farms Technology:" Answers included: "excellent", "good", "satisfactory", "poor", "no customer service experience" and "other". Next, the data were convert to a

binary numbers with 1 = "excellent", "good", "satisfactory" and 0 = "poor", "no customer service experience" and "other." As agriculture is a "relationship" business, this variable is important in measuring mobile application adoption.

The Expected Sign for β_4 *is positive*: Past experience suggests the better customer experience the more likely they are to trade on the DPP and potentially similar mobile applications.

DPPusefulness describes how useful a grower rates the DPP. During the survey, each grower was asked, "How useful of a marketing tool do you find the DPP?" Choices included "very useful", "useful", "somewhat useful", "not useful", "do not use the DPP". Next a binary number was assigned by 1 to selections: "very useful", "useful", "somewhat useful". The number 0 was assigned to "not useful" and "do not use the DPP". This information is important so that mobile adoption can be measured as a function of how useful the web application is to growers.

The Expected Sign for β_5 *is negative*: Experience suggests users that heavily use the DPP would be less likely to switch to a mobile application. Many people are opposed to change and may find changing from a web application to a mobile application a perceived hassle.

NoDPP-TooHard is a variable explaining why growers don't sell on the DPP because they believe selling over the web is too difficult. Growers were asked, "If you do not sell grain through the DPP, then please tell us why?" This variable is a binary response that is equal to 1 if respondent said "Selling over the DPP is too hard" and 0 otherwise. This variable helps evaluate how the perceived difficulty of selling on the DPP would impact mobile application

adoption.   This variable is important so that we can evaluate the ease of use of the web and the probability of adopting mobile technology.

The Expected Sign for β_6 *is negative*: Experience suggests that if growers selling over the DPP are too hard, they are not technology oriented and will probably have lower adoption rates.

SellonDPPOnline describes the midpoint percent of grain sold on the DPP for each grower. During the survey, each grower was asked, "What percent of grain do you sell using the internet?" 0-20%, 21-40%, 41-60%, 61-80%, or 81-100%. Next, the data were converted to midpoint number for each grower. For example, 21-40% would be converted to 30%. This variable shows what percentage of the grain sold by each producer is transacted through the DPP. This variable is important so that we can evaluate the ease of use of the web and the probability of adopting mobile application technology.

The Expected Sign for β_7 *is positive*: Conversations with small segments of customers suggests the larger the percent a grower prefers to sell over the web would be positively correlated to impacts on the use of mobile technology. This group could be classified as early adopters and thus would enjoy mobile trading technologies.

DialUpInternet describes growers that have dial up Internet access. The survey question asked was, "What type of Internet connection do you have at the location from which you access the Dynamic Pricing Platform the most?" Selections included: "dial-up", "cable/DSL", "satellite" or "T1". All growers that answered "dial-up" were assigned a "1" and a "0" otherwise.   This internet connection variable is important so we can determine if dial impacts mobile trading adoption.

The Expected Sign for β $_8$ *is negative*: Experience suggests the larger the percentage of growers that have dial-up, the more likely it is they will use mobile technology, as it is more convenient to use a mobile device.

RecFuturesText is a binary variable that explains growers currently receiving text messages of futures price updates via the cell phone.   The survey question asked was, "Do you receive Futures Price Text Updates?" Growers could select between "yes" and "no", in which case the "yes" answers were converted to '1' and "no" answers were converted to '0'.

The Expected Sign for β $_9$ *is positive*: Experience suggests that producers following the markets closely via text to be more likely to make trades on their mobile device or cell phone.

ForwardContract describes the midpoint value for each grower as a range in percent that growers expect to forward contract during a given year. On the survey, each grower was asked, "What percentage of your expected production do you forward contract in an average year?" Possible responses were, 0-20%, 21-40%, 41-60%, 61-80%, and 81-100%. Next, the data was converted to the midpoint for each grower. For example, 21-40% would be converted to 30%. This variable shows what percentage of their crop they sell forward in a given crop year. The reason this variable is important is that many growers are looking to lock in prices for future delivery periods and this model shows the impacts of forward contracting on potential mobile phone application adoption.

The Expected Sign for $β_{10}$ *is Positive*: A positive relationship is expected with trading volume, in that the higher percent a producer forward contracts the more likely the producer

is willing to use a mobile application to trade. The reason is a mobile trading application provides increased transparency and ease of locking in prices.

Acres is the variable that describes the midpoint value for each grower in terms of how many acres they farm or overall farm size. Each grower was asked, "In acres, what is your total farm size?" Possible responses included 0 – 250, 251 – 750, 751 - 1,500, 1,500 - 3,000 and 3,000+.   The data were converted to midpoint number for each grower. For example, 251-750 was converted to 500. It is important to understand the impacts of farm size on mobile trading adoption.

The Expected Sign for β_{11} *is positive*: Larger farms are expected to produce more bushels which could be marketed using a mobile device.

SellOnWeb describes the midpoint percent of grain sold over the web (DPP) by a grower. Each grower was asked, "What percent of grain do you sell using the internet?" The possible answers were 0-20%, 21-40%, 41-60%, 61-80%, or 81-100%. The data were converted to midpoint number for each grower. For example, 21-40% was converted to 30%. This variable measures the percentage of grain sold by each producer that is transacted through the DPP. This variable is important as growers were able to relay a level of expected sales percent through the web.

The Expected Sign for β_{12} *is positive*: The larger the percent a grower prefers to sell over the internet should be positively correlated with the probability a grower would use a mobile device to complement their online trading experience.

SellPhone describes the midpoint percent of grain sold over the phone value for each grower. Each grower was asked in the survey, "What percent of grain do you sell using the phone?" 0-20%, 21-40%, 41-60%, 61-80%, or 81-100%. Next, the data were converted to midpoint numbers. For example, 21-40% would be converted to 30%. This variable shows the percentage of grain sold over the telephone. Since mobile transactions would replace some traded bushels over the phone this variable was important to the model.

The Expected Sign for β_{13} *is negative*: It is expected that the larger the percentage of grain a grower prefers to sell over the phone, the less likely they are adopt mobile application technology.

SellInPerson is the midpoint percent of grain sold person to person by growers. Person to person selling is when grower's physically go to a buyers location and sell grain face to face. Growers were asked, "What percent of grain do you sell using the phone?" 0-20%, 21-40%, 41-60%, 61-80%, or 81-100%. The data were converted to midpoint number for each grower. For example, 21-40% was converted to 30%. Since this model is analyzing an automatic trading system (through mobile device) , the person to person impact will be extremely important.

The Expected Sign for β_{14} *is negative*: The larger the percent a grower prefers to sell in person would negatively impact grain traded on the mobile application. Since producers only have X number of bushels to sell in a given year, the higher percentage that are sold in person should lead to lower mobile phone adoption rates. This means those farmers selling face to face would be the least expected group to trade on a mobile device.

Age describes the midpoint age for each grower. During the survey, each grower was asked, "What is the age of the primary decision maker of transactions created on the DPP? 20-29, 30-39, 40-49, 50-59, 60-69, and 70+. The midpoint is the middle point assigned so that the model has one variable defined. For example, if a grower selected an age range of 50-59, the number 55 was assigned.

The Expected Sign for β_{15} *is negative*: Experience from the author in farmers meetings over the last year suggests that as age increases the level of mobile adoption decreases.

2009Logins represents the total number of times a producer has logged into the DPP trading system. This information is determined from the internal database proprietary to Farms Technology. This information is important as we review the suggested model in Figure 2.2. It was stated, that Farms Technology expects logins to lead to offers and offers to lead to trades. Since this is a core indicator for the company, the model can help to demonstrate how important logins are to the potential mobile technology adoption. A mobile device should allow increased access to price and trade information. This increased access should allow for more transactions.

The Expected Sign for β_{16} *is positive*: Experience shows that as producers log in more, they will be more likely to post offers and offers will lead to trades. Taking this one step further, the mobile device should allow increased access to price and trade information. This increased access should allow for more transactions.

TradeDeskCalls accounts for the total number of documented support calls in which a Farms Technology associate helped a grower with a trading question. This information is

determined from the internal Customer Relationship Management (CRM) database

proprietary to Farms Technology. This information is important so that we can measure the

contacts with a customer in relation to how many bushels they traded over and how familiar

they are with the DPP.

The Expected Sign for β_{17} *is positive*: Experience suggests that each time an internal associate

explains the system and emphasizes features/benefits the more likely a farmer is to trade on

the DPP, which could increase the probability of adopting a mobile device DPP application.

3.5 Empirical Model Estimation

The online trading model was estimated as a linear regression model which evaluated how

the sixteen independent variables impact the number of bushels traded on the DPP in 2009.

In this model the statistic package Minitab was used for regression modeling and analysis.

The second model was estimated as a logistic regression model using MATLAB

(Mathworks, 2004) following Greene (2000). This framework was utilized given the

dependent variable for this model was binary. Marginal effects were estimated as the mean

across respondents and standard errors were obtained using the delta method (Greene 2000).

CHAPTER IV: RESULTS

4.1 Introduction

The results of the linear regression trading model demonstrate that certain factors and farmer

demographics impact total bushels traded on the DPP. While much of the information was

expected, there are lessons learned from some of the non-significant factors. In addition to

the linear regression trading model, the mobile-application adoption model provides insight

into the factors affecting the adoption of a potential mobile DPP application, which is

important because mobile adoption is cutting edge technology and there is limited research

currently available relating online grain trading via a mobile application. As Farms

Technology moves forward, factors guiding mobile application development in regards to

adoption are important. In the logit model estimated, the marginal effects of different

variables on mobile technology adoption highlight the different farmer specific attributes that

may improve potential adoption of mobile application technologies.

4.2 Online DPP Trading Regression Model Results

Table 4.2 shows the trading regression model results including coefficient estimates,

standard errors, t-statistics, and p-values for the variables analyzed. In addition, the table

provides fit statistics for the regression. The regression provided interesting insight into

online grain trading. Some variables that were thought to be statistically relevant were found

statistically insignificant. The variables that were statically significant included: (farm size)

acres, bushels offered, and if farmers received text messages. Other variables of interest

include on-farm storage, and percent of grain sold over the phone. Model results in table 4.2

are as follows:

Acres is significant at the 5 percent level with a P-Value of .008. This variable is the midpoint acreage for the producer. Thus, as farm size increases by one acre, online trading of bushels increases by 2.5 bushels. This means that as farm size increases, traded bushels on the DPP increase. In the past, Farms Technology assumed that farm size was not a significant factor in traded bushels, because the technology treats all offers the same. These results indicate that in fact, farm size does impact traded bushels on the DPP. With this evidence, one could argue the DPP online trading application offers larger producers marketing solutions that benefit economies of size.

RecTextFutures was a major lesson for Farms Technology. The result was significant and opposite of the expected result, indicating that Farms Technology should review current technological opportunities. The study found that the text message variable was significant at the 1% level with a p-value of .004. Farms Technology expected growers that received text messages to be more likely to trade on the DPP. The model surprisingly showed the opposite result. Growers that received futures text messages trade 5000 bushels a year less than those who don't receive text messages. This result could possibly suggest that growers receiving text messages are relying on incoming data to help them in their decisions about when to sell grain, as compared to those producers that use the DPP to set a target price, letting the system find the price match and indirectly keep track of prices.

Offer2009Bushels variable was significant at the 1 percent level with a P-Value of 0.000. This result confirms that offers are directly correlated to trades. It is easy to see how the more offers producers make, the more trades are expected. This result now illustrates how

offers are related to traded bushels. The coefficient explains that for each bushel offered on the DPP, 0.430 bushels are traded. Not all offers will meet the target price, but almost 50% of the offers trade according to the Offered2009 variable. As growers make offers and become more comfortable with the process, they will move into the trading category.

Farm Storage while not significant at the 10% level still has a P-Value of .086. The results for this variable indicate that farmers who have on-farm storage capabilities will trade more on the DPP application. The results indicate for every additional percentage of grain producers are able to store on the farm, there is an increase of 39.9 bushels traded on the DPP. This provides evidence that DPP users utilize the online application more when they can market grain year round.

SellPhone while not significant at the 10% level still has a P-Value of .104. This variable shows the expected percentage of grain sold over the telephone. The results indicate that for every percent increase that a producer prefers to trade over the phone, there is a decrease of 44.869 bushels traded on the DPP. This result suggests that if growers prefer to be price-takers and sell directly over the phone, then they are less likely to trade on the DPP system. This result confirms that the telephone is the biggest competitor with the DPP online trading application.

Table 4.2: Regression Model for DPP Online Traded Bushels

Variable	Coefficients	Standard Error	t Stat	P-value
Intercept	-1360.886	3558.981	-0.382	0.702
ForwardContract	10.881	29.004	0.375	0.708
Acres	2.470	0.922	2.680	0.008
FarmStorage	39.930	23.153	1.725	0.086
SellWeb	26.388	30.115	0.876	0.382
SellPhone	-44.869	27.510	-1.631	0.104
age	34.068	48.415	0.704	0.482
DistanceHaul	-13.662	13.714	-0.996	0.320
UseMarketingServ	974.809	1415.148	0.689	0.492
RecTextFutures	-4953.401	1727.457	-2.867	0.004
NoDPP-PreferPhone	-975.453	1682.737	-0.580	0.563
NoDPP-TooHard	-1017.335	5418.115	-0.188	0.851
TotalAccounts	-526.407	718.366	-0.733	0.464
Total2009Logins	-5.208	3.533	-1.474	0.142
YearsOnDPP	238.966	456.527	0.523	0.601
Offer2009Bushels	0.430	0.010	42.021	0.000
TradeDeskCalls	75.598	251.308	0.301	0.764

Fit Statistics

R^2	0.899
Adjusted R^2	0.893
s	10534.9
Number of Observations	291

Some of the expected signs ended up being opposite than what was hypothesized. Since the

P-values were not significant at either the 5% or 10% they were not discussed but they are

still of interest to the company. In essence, their effects are statistically equal to 0 (on

average). For example, the model showed a scenario in which additional accounts created

on the DPP produced a negative co-efficient, but experience suggested more accounts would

lead to more trades. The implication of this unexpected sign is that when farmers add additional accounts they may not necessarily trade more on the DPP. Also, it was interesting that SellPhone had a more significant P-value at .104 as compared to SellWeb which was less significant at .382. The phone variable is likely more relevant than the SellWeb variable. This result could be attributed to the fact that more total volume is still traded via the phone as compared to the web. Lastly, YearsontheDPP had the expected sign (positive), but the P-value was .601, and so was not significant in comparison to other variables. Graphical representations further depict results by demonstrating how the coefficients interact with the traded bushels variable.

Figure 4.2 shows that as age increases, there is a slight increase in total bushels traded. This suggests that it is not always a young technology oriented person, but in many cases the older grower, which is responsible for making the marketing decisions on grain sales for the farm.
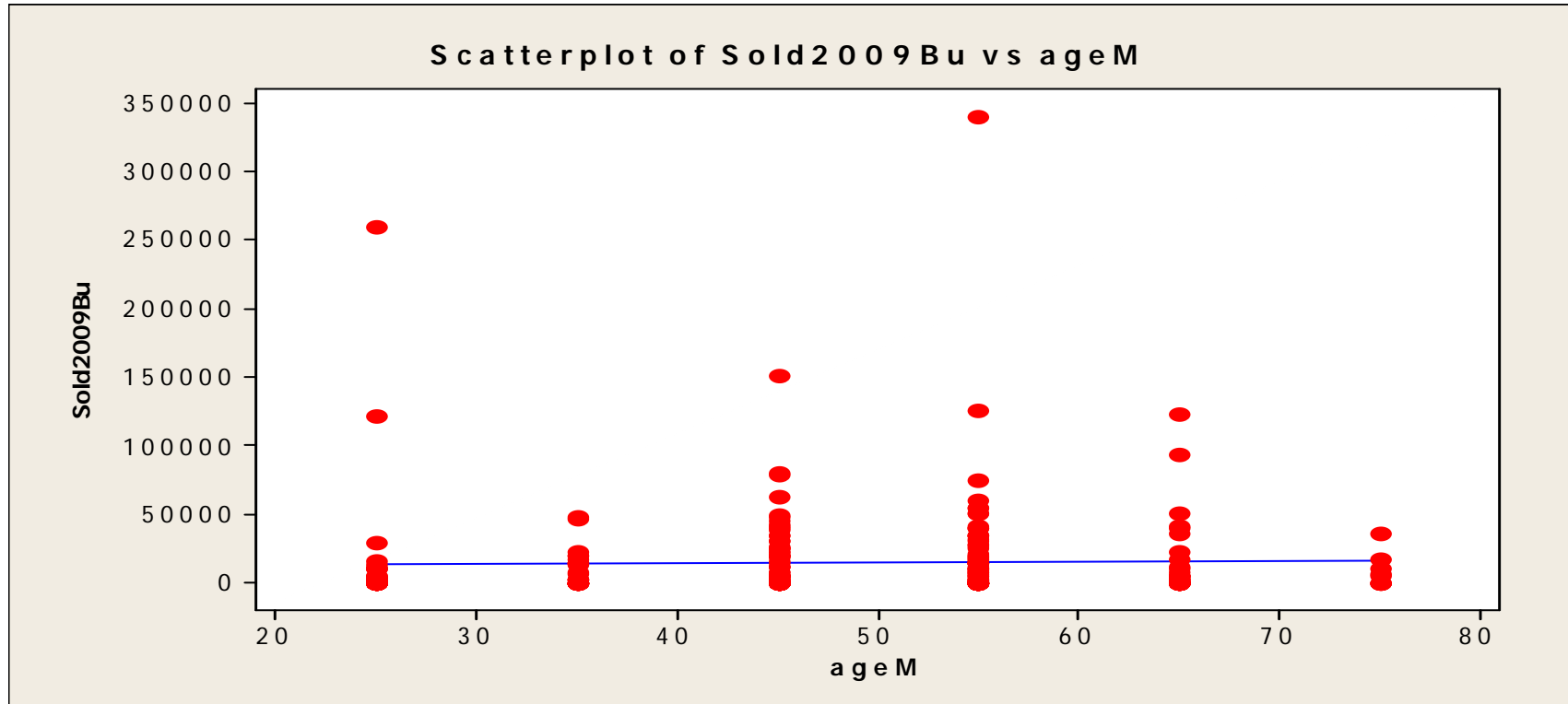
Figure 4.2: Traded Bushels as a Function of Age

Figure 4.3 shows results when comparing total traded bushels to the percent of trade bushels online. Since Farms Technology generates revenue from traded bushels, the trend that total trade volume increases as a grower trades a higher percent over the web, demonstrates the potential for increased future revenue.
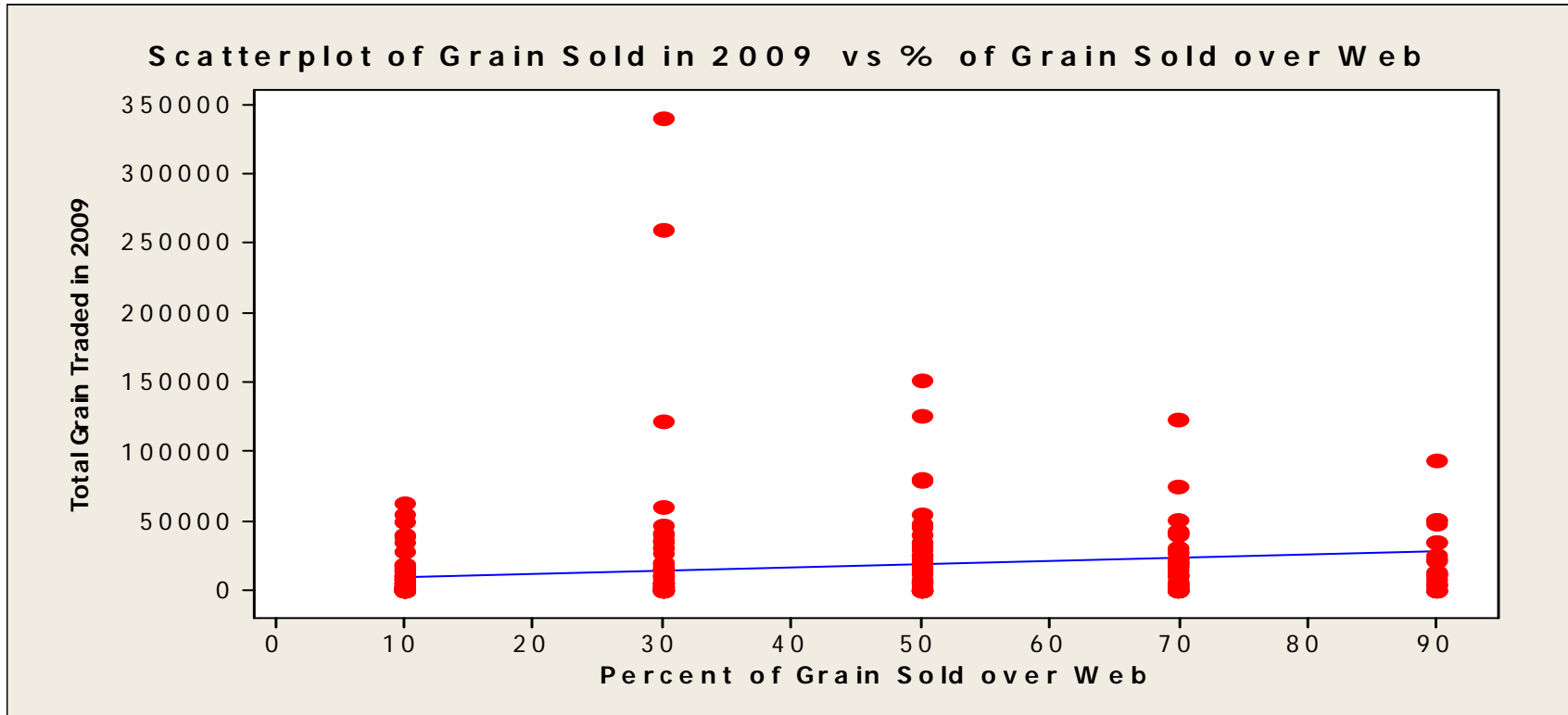
Figure 4.3: Traded Bushels as a Function of percent Sold on DPP

Figure 4.4 compares total traded bushels in 2009 to the percent of traded bushels over the phone. Since Farms Technology generates

revenue from traded bushels over the web, the trend that volume decreases with those that trade a higher percent over the phone

demonstrates increased future potential for online trading applications.
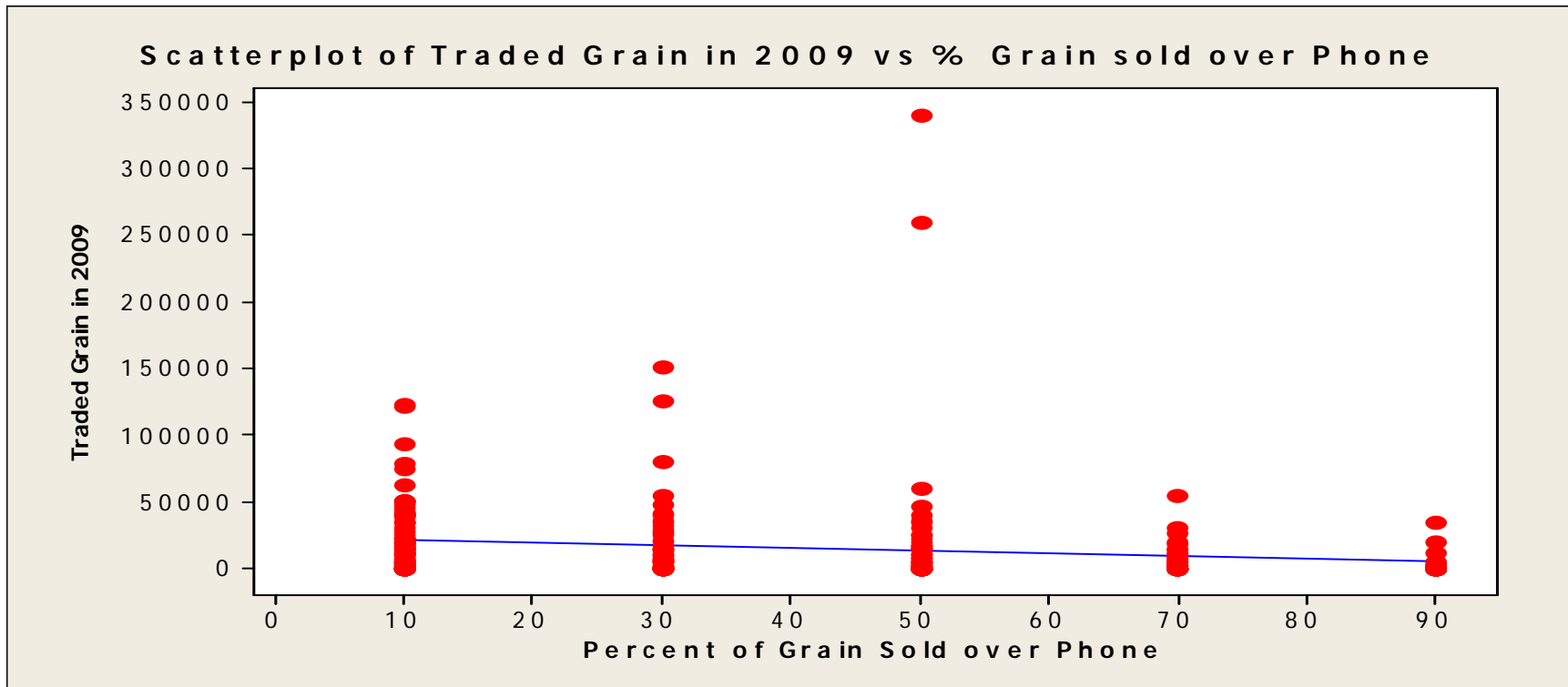
Figure 4.4: Traded Bushels as a Function of percent Sold over the Phone

Farms Technology takes customer service seriously and believes that trading grain over the web takes a team willing to work with growers. According to Figure 4.5, there is a slight increasing trend in traded bushels volume as the number of calls increases or customers have more interaction with Farms Technology.
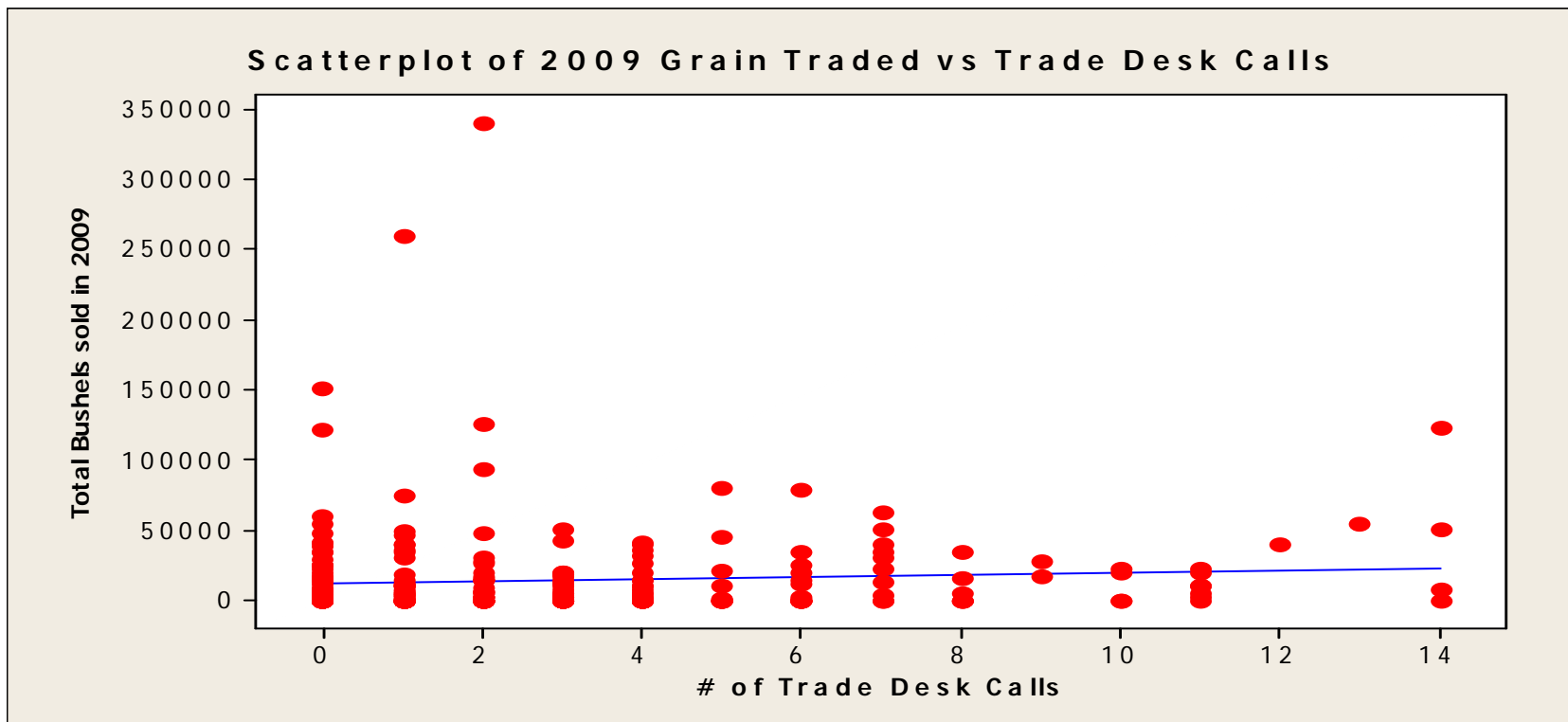
Figure 4.5: Traded Bushels as a Function of Support Calls

4.3 Logit Model for Mobile Application Adoption

The logit model provided insight into factors affecting adoption of a potential mobile DPP application. It is important to note that there is not a current DPP mobile trading application. This model is based on a possible future mobile based trading application that resides on a handheld device. In the logit model, the marginal effects of different variables on mobile application adoption provide substantive inference concerning the impact of producer preferences and characteristics. Table 4.3 provides the estimated marginal effects, standard errors, t-statistics, associated p-values and fit statistics for the estimated logit adoption model. Variables that significantly positively impacted willingness of growers to adopt a DPP mobile application included: farmers with no cell phone, farmers who are currently receiving text messages, farmers owning a smart phone, customer service rating for Farms Technology by the farmer and acres (farm size). Variables that significantly negatively impacted mobile application adoption included: farmers that currently sell on the DPP and farmers who believe the online DPP application is too difficult to use. This model used the two-sided asymptotic t-tests to assess statistical significance.

Table 4.3: Logit Model for Mobile Adoption Probability

Rmarginal	Marginal Effects	Standard Error	T-Stat	P-Value
No Cell Phone	0.5185	0.1305	3.9726	0.0030
Text Message	0.2082	0.0698	2.9842	0.0014
Smart Phone	0.1279	0.0928	1.3780	0.0841
Customer Service	0.1604	0.0888	1.8057	0.0355
DPP Usefulness	0.0802	0.0934	0.8584	0.1953
TooHardOnline	-0.3327	0.1367	-2.4334	0.0075
SellonDPP	-0.1533	0.0788	-1.9445	0.0259
DialUpInternet	0.0747	0.1008	0.7416	0.2292
RecFutureTextMsgs	0.0403	0.0776	0.5191	0.3019
ForwardContract	0.0011	0.0013	0.8738	0.1911
Acres	0.0001	0.0000	1.3889	0.0824
SellonWeb	0.0011	0.0014	0.7958	0.2131
SellPhone	0.0008	0.0012	0.6911	0.2448
SellPersonToPerson	0.0007	0.0016	0.4550	0.3245
Age	-0.0006	0.0022	-0.2697	0.3937
Logins	-0.0000	0.0000	-0.4396	0.3301
TradeDeskCalls	-0.0082	0.0093	-0.8840	0.1883

Fit Statistics

McFadden's Pseduo R2	0.1162
Correct Predictions (0.50 threshold)	67.01
Number of Observations	291

No Cell Phone variable is significant at the 1% level with a P-Value of 0.0030 and has the

expected sign. From the marginal effects of the logit model, farmers that don't currently

own a cell phone are 52% more likely to adopt mobile technology. This result suggests that

farmers who do not use a cell phone today might buy one for the mobile trading application.

Additionally, when buying a new phone today, most are data capable phones that would

support mobile applications. The cell phone technology has migrated to smart phone

models.

Text Message is significant at the 1% level with a P-Value of 0.0014. This result shows that growers who receive text messages are more likely to adopt mobile application technology, as they already use it. The marginal effects indicate that farmers currently receiving text messages are 21% more likely to adopt mobile technology.

Customer Service is significant at the 10% level with a P-Value of .0355. This shows that customers the firm has contact with on a regular basis may be the type of customer who would adopt mobile technology applications. The marginal effect indicates that farmers who ranked Farms Technology with a high customer service rating are 16% more likely to adopt a mobile DPP application.

TooHardOnline is significant at the 5% level with a P-Value of .0075. This is an interesting finding in that users that believe the DPP is too hard online and don't use the web application, most likely will not adopt a mobile technology. The marginal effect indicates that farmers which believe the DPP online is too challenging are 33% less likely to adopt a similar mobile application.

SellonDPP is significant at the 10% level with a P-Value of .0259. This value describes the midpoint percent of grain sold over the DPP for each grower. The expected sign was negative because growers using the online system would be less likely to change. The marginal effect indicates that farmers who sell grain using the DPP online are 15% less likely to adopt mobile application technology, supporting the company's hypothesis.

Acres is not significant at the 10% level with a P-Value of .0824 but it is still reported for discussion purposes. This result shows that as farm size increases, the probability of using a

mobile application increases. These results indicate that in fact, farm size could impact the probability of producers adopting mobile trading applications. One could argue that, larger farmers need better forms of communication and thus would be more likely to adopt a cell phone.

Smart Phone while not significant at the 10% level is still reported for discussion purposes, and has a P-Value of 0.0841. This variable shows that growers who have a smart phone are more likely to adopt mobile application technology. This makes sense from the standpoint that few people would purchase a smart phone without intending to use it for the intended purpose (i.e. use of mobile online applications). The marginal effect indicates that farmers that currently own a smart phone are 13% more likely to adopt mobile application technology.

The model also found many of the variables not to be statically significant. The age variable had a calculated P-Value of .3937 and DPP Online Logins had a calculated P-value of .3301, both of which were not significant. While most of the discussion is focused on significant variables, these findings are important to the firm, because future marketing activities will be segmented differently based on these findings. The expected sign can assist in creating new segments for mobile marketing opportunities in the future. Due to the fact that no research exists in many of the areas that Farms Technology is exploring, any insight this data unveils is a basic foundation for future decision making and confirmation of current hypotheses.

4.4 Concluding Remarks

The results confirm lessons in the literature review of this thesis. The results focus specifically on factors impacting level of trades on the online DPP application.   For Farms

Technology business to continue to grow, analyzing current users and learning which market segments to target (with different messages) is very important to their future growth. The literature review on the other hand supports that more and more users are going to be coming online, and as Beurskens (2003) points out, web applications will lead the information revolution which the DPP online trading system as a part of it.

According to Sartwelle et al. (2000), personal and business characteristics have significant impacts on individual grain marketing practices. This research shows that certain factors do indeed impact trade levels on the DPP online trading system. While the variables might be different, there are now research findings indicating variables that do statistically influence online versus more traditional forms of trading.

Finally, findings from Mittal (2009), Mukhebi et al. (2007), and Labonne and Chase (2009) suggest mobile phones can be a way of connecting with agriculture producers. This research takes this one step further and develops a model with variables examining the potential adoption by producers of an online mobile grain trading application that can offer mobile trading solutions.

CHAPTER V: SUMMARY AND CONCLUSIONS

5.1 Introduction

In summary, this project helped quantify many marketing elements Farms Technology has

developed and learned over many years of working with customers. A key part of this

research is the combination of both user data and survey data in both an online trading and

potential mobile application adoption models. The research looked at actual user data such

as logins and traded bushels derived from an internal database proprietary to Farms

Technology, as well as customer survey information in which growers provided feedback on

why they use the DPP. This combination of data allowed for more complete and useful

models, as the research was based on both what customers said they wanted and what they

did on the system.

More importantly, this research helped Farms Technology step back from day to day

operations and look at what factors impact online grain trades, by helping guide and enhance

future development of both mobile and online technology solutions. The logit adoption

model not only provided a baseline for users that have a probability of greater than 50

percent of adopting mobile technology, but also helped to create a set of criteria for those

producers for a beta-group. Finally, this model showed what types of producers may be

more likely to use a mobile DPP application as compared to the DPP web-based application.

5.2 Lessons Learned from Research

This project is important to the firm since the results and lessons can help direct future

activities for the company. Farms Technology will use lessons in this section for current

operational and marketing plans and future application development strategies. This

research was completed to help Farms Technology in their business decision making

process. Using this research going forward will cut costs on marketing activities by taking advantage of market segments more effectively.

5.2.1 Identified variables that impact traded bushels

Farms Technology has an initial model described in Figure 2.2 to show how producers move through the online trading process. This research has helped Farms Technology refine the initial model and add more detail while quantifying key producer characteristics that make trades using the DPP. Some specifics include marketing communications that drive producers to log in to the system by pushing information relating to commodity markets. This research is important because the firm generates revenues from online grain trades, and any increased understanding as to what influences online grain trade is helpful to the company. After several years of customer feedback, Farms Technology associates have gleaned information and this research quantified much of that experience.

5.2.2 Defined future mobile application development opportunities

There will be future opportunities for mobile software applications for producers in agriculture. While the specific projects Farms Technology is currently developing will not be discussed, there is strong potential for mobile applications that complement the current DPP web-based system. There has been a surge in the level of text messaging by producers, but the challenge with text messages is that they only offer one-way communication. In order for farmers to monitor and execute decisions based on market activity, they need mobile applications that allow for both sending and receiving of information. Taking into consideration the mobile adoption percentages presented by Butcher (2008) from a device standpoint, more agricultural producers are going to have the

hardware (cell phone) for mobile applications. The key is making sure the applications are in production at the right time and meet the needs of the producer.

5.2.3 Defined Beta Mobile Application Farmer Group

The logit adoption model produced results of nearly 100 growers that have probabilities of 50 percent or greater of adopting mobile technologies. As the company looks for test groups and to marketing campaigns, the firm now has identified grower characteristics that can help identify growers that may be more likely to adopt mobile applications and technology. The characteristics of growers who were expected to adopt mobile technology and those which the model predicted are quite different. Thus, the model provided a framework for market segments defined by model factors that may utilize certain mobile grain trading applications. Factors include growers receiving text messages, growers current usage of the DPP and age. The data as to which producers and expected percentages are proprietary to the firm and not available.

5.2.4 Medium Based Marketing

Initially, Farms Technology was solely considered a technology company. Now, the firm has evolved into a service company that provides marketing opportunities to clients. This additional marketing service has helped both farmers and grain merchandisers find even more value in the trading application. This research shows that there is a market segment that will adopt mobile technology; therefore Farms Technology must plan to expand into this medium in the future. Secondly, this research identified characteristics of producers that are more likely to influence their trades which will guide marketing segmented projects.

Farms Technology has developed a proprietary producer marketing model that is supported

by this research. The key elements to the producer marketing model are that producers

need information communicated when it is pertinent and timely. Not only is market-based

information sent in a timely matter important, but the understanding of what type of

medium to be used in the communication process is important, as well. There are several

different mediums that can be utilized ranging from information pushes to mobile devices,

direct mail, email, text messages, buyer commentary on the website, webinars and direct

phone calls. These are all examples of mediums used in disseminating information for

Farms Technology. Since markets are constantly changing, it is difficult to plan when to

send out specific information. The key is being able to be the first to disseminate

information in the proper format, so producers can make informed marketing decisions.

5.3 Current Opportunity Identification

Much of this research is centered on longer terms strategic decisions. There are however

some short-term opportunities that the company is currently focusing on to grow the

business. The first is marketing to farmers that are on the DPP system that don't trade

currently. The second is to increase the number of buyers on the DPP in other geographic

regions. More buyers will allow for more selling opportunities for farmers. These

strategies will influence trade revenues the quickest in the short-term for the firm.

5.3.1 Increase current farmers' level of trading on the DPP

Farms Technology is currently working on marketing tactics to convert non-

customers/non-traders through the enhanced model created by this research. This project

has helped the firm be much better at using market segmentation and different marketing methods. A very basic example is using a targeted email campaign to a segmented group of sellers that took time to register for the DPP and then never returned to the website. This group gets messages with value of logging-in to view the cash and basis information and directions of how to do so. These messages would not be beneficial to the grower who uses the DPP and trades several times a month.

5.3.2 Increase the number and regions of DPP Buyers

Farms Technology must continue to increase awareness to buyers not currently using the patented technology, regarding how it can help them and their business. In looking at Figure 5.1, there are many opportunities in many other commodity production states including but not limited to Illinois, Indiana, and Missouri. The value of the DPP to a buyer is worth more than the $0.01 bu. transaction fee in time savings convenience, accuracy and increased customer service. Many DPP Buyers often state they would never go back to being disconnected from the ePit again.
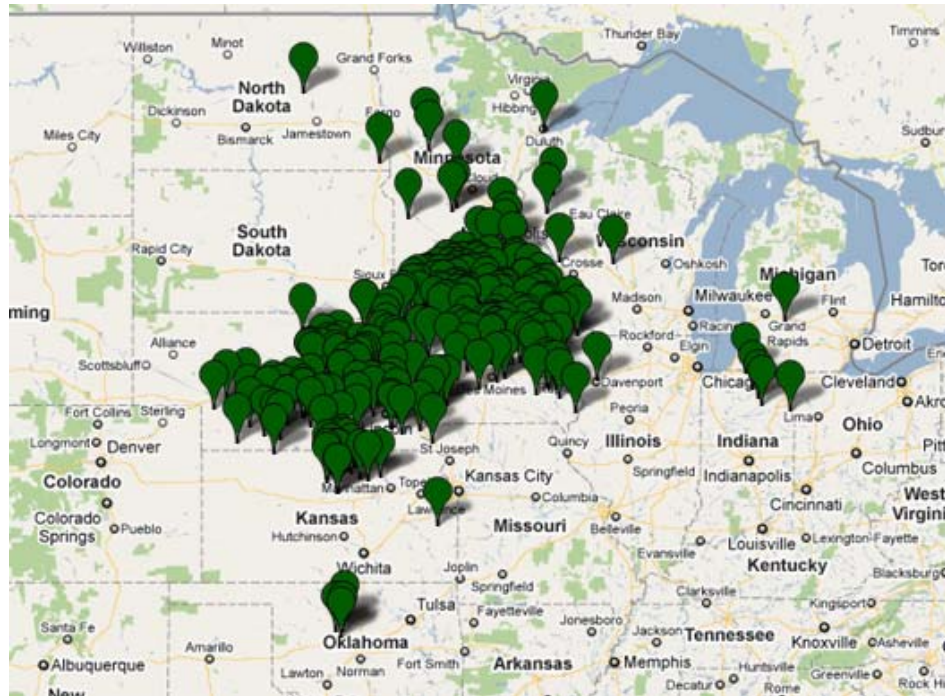
Figure 5.1: Farms Technology Buyer Locations

According to Troy Olson (personal communication, year?), Grain Merchandiser, Absolute Energy 2010, "The DPP trading system is a key part of the grain procurement process for Absolute Energy. Knowing that I can procure grain day or night and offers are hedged automatically is essential to our business. This technology allows me to communicate constantly updating prices and it helps my customers execute their marketing plans when their target price is met regardless of day or night."

Furthermore, the concept of virtual grain (grain that sellers have offered to the buyer with a price but is not yet purchased) is new to many buyers not on the DPP. This concept is essential when it comes to the future of grain management, and the more awareness by non-DPP Buyer customers the shorter the sales cycle for new grain companies.

DPP buyer prospects will need to see that online technology will help their business become more efficient. Decreasing friction between buyers and sellers will be a direct result of increased price transparency by grain companies, particularly the overnight markets, therefore leading to an increase in farmer satisfaction. As sellers prepare to make grain marketing decisions they are going to want to have as much price and basis information as possible. Providing that level of transparency is important to increasing value to farmers on the DPP. These concepts are noted by current customers and the key messages that Farms Technology shares with future customers and current prospects of the DPP.

An example that Farms Technology is working on to educate non-customers is seen in the first edition of the Grain Professional Publication published by AgriCharts, a Barchart company (2010). Not only was the DPP highlighted in the technology focus section, but the company is hosting future webinars and sales meeting for prospects for the DPP system.

5.4 Big Picture Strategies

While this research focuses on two key areas of the day to day business, it is important to discuss long term value and why Farms Technology is dependent on the patent, associates and partners. In order to operate in a Blue Ocean segment, Farms Technology must be able to do activities that other companies just can't do. The first key is an issued patented coupled with the importance of hedging and overnight marketing. The second strategy is the people and culture of the company obviously is paramount to future growth. Finally, the partners and customers that work with Farms Technology will be key links in the chain for future growth.

5.4.1 Patent

Farms Technology has different clients, all having different needs. In order for a cash grain exchange to be successful it takes both buyers and sellers. The main need for buyers is completing transactions automatically using ePit. The patent differentiates Farms Technology from the competition and it creates a major value proposition for the merchandiser. The ability to execute trades via ePit is a key factor that; helps growers sell grain during the overnight session and it allows a buyer to procure grain when not in the office.

5.4.2 Internal Industry Knowledge

Farms Technology is a small entrepreneurial company and associates have many different responsibilities. There are two kinds of employees that make the firm successful. The first are individuals that have grown up around a production operation and can understand the lifestyle of DPP customers. New employees can learn the technology and the trading element of the business, but it is very hard to teach that core "agrarian value system". The second type of employee is high-end software developers than can work in a fast paced environment and make quality applications for the agricultural industry. The technology is important, but the people and team that support the systems are just as important. People may look at Farms Technology and see a technology company when in reality Farms Technology is a service and communications company.

5.4.4 Customers and Partners

In agriculture, the value of relationships is a key component to any successful business. The first thing new customers review when evaluating DPP technology is the complete client list for Farms Technology. Once agribusiness corporations like CHS (Cenex Harvest States,

Jennie O Turkey Store, and some of the largest ethanol plants in the Midwest are noticed, the value proposition is more broadly established. As importantly, in 2008, Pioneer, a DuPont company, made an investment in Farms Technology. This solidified Farms Technologies position as the leader in the online cash grain trading arena and brought the business to the next level.

5.5 Future Research Topics

As the project progressed, there were certain areas that would be of interest for future research. The first area would be to survey non-DPP customers. It would be interesting to see how non-trader's information varies from those who are using the DPP today. This survey used midpoint number for the survey answers and it may be beneficial to ask specific values such as age and actual percentage traded on a particular medium. While it is expected the number of responses to be more limited, it would increase the overall accuracy of the model. One other area of future research would be to set up a research study similar to Sartwelle et. al. (2000), in which research was conducted in different sections of the country. For example, this could indicate how the growers in the Corn Belt would compare to say growers in Texas and Oklahoma. Finally, since Farms Technology operates both private DPP market places and the Pioneer MarketPoint open marketplace, it would be interesting to see if the trading characteristics were the same on both systems and how customer demographics compare on each.

5.6 Concluding Remarks

This thesis was invaluable to Farms Technology and will play a part in the strategic future. The research data was developed into business models that could test ideas and hypotheses

for future concepts. During this project, the firm envisioned future projects, revenue models and potential Blue Ocean Strategies.

Within technology driven companies, there are always more ideas and suggestions than time to build. That being said, prioritization of projects is an important function. This research based on customer feedback, and system usage will assist Farms Technology in business decisions based on both what customers say and what they do. Since mistakes are costly in business, hopefully this modeling will increase time to market and product focus.   Not only do models take some "grey" out of the decision-making process, but they streamline project analysis for company leaders.

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APPENDIX A

2009 DPP Grower Survey

1. What type of Internet connection do you have at the location from which you access the Dynamic Pricing Platform the most? *Drop Down*

    __ Dial-up
    __ Cable/DSL
    __ Satellite
    __ T1

2. How often do you access the Dynamic Pricing Platform? *Drop Down*

    __ Monthly
    __ Weekly
    __ Daily
    __ Several times a day

3. What percentage of your expected production do you forward contract in an average year? *Drop Down*

    __ 0-20%
    __ 21-40%
    __ 41-60%
    __ 61-80%
    __ 81-100%

4. In acres, what is your total farm size? *Drop Down*
    0 - 250
    251 - 750
    751 - 1,500
    1,500 - 3,000
    3,000+

5. With cell phones usage becoming more prominent among agriculture producers, please answer the following questions that apply to you.
    a. Do you have a cell phone?............................. _____ Yes _____No
    b. Do you receive text messages?............................_____ Yes _____No
    c. Do you send text messages?................................ _____ Yes _____No
       Do you use a Smart Phone?(Blackberry, iPhone) ____Yes _____No
    d. Do you use the internet on your smart phone?...._____ Yes _____No

6. Farms Technology is considering development of mobile website/applications that will allow growers to access their Dynamic Pricing Platform accounts from their smart phones. Which of the following services would you pay a monthly fee for?

    __ I would like to have cash price quotes
    __ I would like to view Daily Market Commentary
    __ I would like to have the ability to post offers to my local buyer
    __ I would like to receive messages from my local buyer
    __ I would not use the DPP Mobile website

7. What percent of annual crop production are you able to store on your farm? *Drop Down*
       0-20%
       21-40%
       41-60%
       61-80%
       81-100%

8. Please rate your customer service experience with Farms Technology:
    __*Excellent*
    __*Good*
    __*Satisfactory*
    __*Poor*
    __No customer service experience
    __Other

9. What are the reasons you sell grain to competitors that do not offer the Dynamic Pricing Platform? *(Check all that apply)*

    __ I use the DPP to compare prices, & then call my local buyer
    __ I do not have much on-farm storage
    __ The competitor has better bids/basis
    __ The competitor offers marketing tools or services that the DPP buyer does not
    __ What other reasons do you have that you sell grain to competitors that do not
        offer the Dynamic Pricing Platform? *(Open Ended Question)*

10. In 2009, what percent of acres are dedicated towards each crop? **Drop Down*

            a. Corn……… __ 0-20%
                        __ 21-40%
                        __ 41-60%
                        __ 61-80%
                        __ 81-100%

            b. Beans…… __ 0-20%
                        __ 21-40%
                        __ 41-60%
                        __ 61-80%
                        __ 81-100%

            c. Wheat…… __ 0-20%
                        __ 21-40%
                        __ 41-60%
                        __ 61-80%
                        __ 81-100%

            d. Other……. __ 0-20%
                        __ 21-40%
                        __ 41-60%
                        __ 61-80%
                        __ 81-100%

11. What percent of grain do you sell using the following methods?

            a. Online………………………_____%
            b. Phone………………………_____%
            c. Person to Person…..……….._____%

12. What is the age of the primary decision maker of transactions created on the DPP?
_____years *(user entered numeric format)*

13. What percentage of your crop would you say that you sell to other companies that do not offer the DPP?   _____%

14. How far are you willing to haul grain?   _____ miles.

15. I prefer to sell small lots on the DPP as opposed to selling large lots? *Drop Down*

    __Strongly Disagree
    __Disagree
    __Neither Disagree or Agree
    __Agree
    __Strongly Agree

16. I have concerns about online security that are holding me back from doing more business on the Internet? *Drop Down*

    __Strongly Disagree
    __Disagree
    __Neither Disagree or Agree
    __Agree
    __Strongly Agree

17. How useful of a marketing tool do you find the DPP? *Drop Down*

    __Very Useful
    __Useful
    __Somewhat Useful
    __Not Useful
    __Do not use the DPP

18. How important is it to trade grain with a Mobile device? *Drop Down*
    __Very Important
    __Important
    __Somewhat Important
    __Not Important
    __Do Not Use the Internet or Online Devices

19. Rate usefulness of the Following DPP Features

    a. Ability to make an offer *Drop Down*
        __ Very Useful
        __Useful
        __Somewhat Useful
        __Not Useful
        __Do Not Use the DPP

    b. Viewing updating cash prices *Drop Down*
        __Very Useful
        __Useful
        __Somewhat Useful
        __Not Useful
        __Do Not Use the DPP

    c. Market commentary *Drop Down*
        __Very Useful
        __Useful
        __Somewhat Useful
        __Not Useful
        __Do not Use the DPP

    d. Cash/Basis historic graphs *Drop Down*
        __Very Useful
        __Useful
        __Somewhat Useful
        __Not Useful
        __Do Not Use the DPP

    e. Futures Quotes *Drop Down*
        __Very Useful
        __Useful
        __Somewhat Useful
        __Not Useful
        __Do not Use the DPP

20. Do you subscribe to any marketing advisory services? (*If no, then move to question 22)*
        __ Yes
        __ No

21. How do you receive your marketing advisory services? *(Check all that apply)*
    __Email
    __Mail
    __Phone (pre-recorded message)
    __Direct Mailing
    __Online Account
    __Fax
    __Text

22. What is the highest level of education you have completed? **Drop Down*

    __ High School/GED
    __ Some College
    __ 2-Year College Degree (Associates)
    __ 4-Year College Degree (BA, BS)

23. Did you know that you can get snapshot real-time futures that make cash bids and futures quotes on all of your DPP accounts up to the minute for $45/month? *Drop Down
    __ Yes
    __ No
    __ Please contact me about this service

24. Do you receive any of the following market updates via text messages? *(Check all that apply)*
    __ Futures price quotes
    __ Cash price from local buyer
    __ Basis from local buyer
    __ Receive No Text Messages from Buyers

25. If you do not sell grain through the DPP, then please tell us why. *(Check all that apply)*
    __ I prefer to sell over phone
    __ Too hard
    __ Too much time
    __ Don't trust Internet
    __ Other *(Open Ended Question)*

26. Do you have any other comments that you would like to share with Farms Technology? Please list below. *(Open Ended Question)*

*****Note*****

Survey data used in ONLY in aggregate form for this project.

Actual data not available for public use.