IDENTIFYING FACTORS FOR FARMERS TO ADOPT NEW FARMING TECHNIQUES

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THESIS
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Abstract

Farming in the United States is a triumph that is unique in world history. While not the first society to actively strive to educate farmers, American agriculturalists have benefitted from a well-constructed extension network coupled with a large information laden agriculture industrial base (Yamazak & Resosudarmo, 2008). When one considers the ever evolving agricultural technology and practices that are constructed at an even faster rate, there is a continuing need to understand what truly influences a farmer to augment their current practices.

Research was conducted through mailings amongst Midwestern and Northeastern farmers in order to gauge the state of American farmer’s influences for adoption. Sixty-three farmers were surveyed on their educational levels as well as learning preferences to glean which instructional strategies may be considered most beneficial to knowledge acquisition. Results indicated that online and other media learning is growing especially in younger generations. In addition, social learning through the dissemination of information from friends and family was still a powerful method that was utilized by the group of farmers. Also, respondents reported that economic justification, congruency with current practices, enjoyment, family acceptance, and availability of a local knowledgeable farmer were the most influential factors in adopting new practices. These findings have implications for extension educators in understanding what avenues one can take to encourage farming practice adoption or modification.
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Chapter One: Introduction

Background

The United States has had a strong tradition in the last 150 years of utilizing the agricultural extension network setup through land grant colleges (Ortiz, Garrett, Heath, Orrego, & Nelson, 2004). In the last several years, the process of disseminating agricultural technology has changed. Increased internet usage and other multimedia technologies, coupled with the downsizing of extension posts throughout the country in the last three years, there is a new need to assess what influential factors are important for modern farmers (Oliver, Valentin, Erickson & Boehlje 2008). Without the understanding of influential factors that promote change, farmers could lack some of the key critical skills needed to practice new technologies and methodologies. Across the country practice adoption and efficiency gains are seen as crucial for continued improvement to provide foodstuffs for a rapidly expanding world population (Yamazaki & Resosudarmo, 2008).

To understand the possible changes in farmers’ learning patterns, there is a need to understand what areas of personal and social interactions and situations influence modern farmers to not only learn about, but also become knowledgeable in newer technologies. While the idea of upgrading production methodologies is not new, successes have in the past been based on farmer’s learning new information from extension group meetings, seminars, or extension publications (McCown, 2002). Historically, farmers have a very high tendency to compare and contrast any newly learned information from previous experiences (Bowers & Lane, 2008). When the new production methods do not fall in line with their previous experiences, farmers tend to place little or no value on those methods (Butler, Grice, & Reed, 2006). In addition, a lack of educational understanding, which is the effective breakdown of
communicated knowledge, is the most touted hindrance that producers face to practice adoption (McCown, 2002).

Within the last decade, the motivation to change, or augment, practices has been more focused on individual farmers instead of whole farming groups or communities (Boz & Ozctalbas, 2010). Much of this is attributed to a desire by researchers to understand if individuals in the developing world value the same social and practical norms as the western world (Boz & Ozctalbas, 2010). The true state of farmer’s influences is still unknown due to lack of adequate research. The reasons for a lack of practice adoption or modification seem to speak to both human psychological and practical needs. While no two farmers are the same, even when coming from similar backgrounds and working on similar operations, there has been several studies conducted that outline what common needs must be met in order for them to consider adopting a technique or technology, this includes the studies done by Bowers and Lane (2008), as well as Hartwich and Scheidegger (2010). There seems to be a growing desire to have a more solid understanding of what farmer’s preferences for knowledge acquisition and factors influencing farming practice adoption or modification. This need has been brought into recent attention due to the cuts in many agriculture extension networks as well as the growth of alternative information sources such as the internet (Bowers & Lane, 2008).

Statement of the Problem

The key to efficiency gain is knowledge (Butler, Grice, & Reed, 2006). The block to this knowledge transfer is a lack of understanding or concern from extension or industry into what factors motivate farmers to adopt new practices (McCown, 2002). This problem is multifaceted in that many factors that may limit practice adoption can further limit on-farm decision-making (McCown, 2002). This includes the opportunity for expansion and diversification which may go
against tradition and social norms. Previous studies have found social, cultural, and educational differences to be the most influential factors in practice adoption (Stobbe, Groot, Bishop, Hall, & Pretty, 2009). Influences to adopt new practices will naturally vary from person to person; however by group(s), one can study what factors generally directly impact individuals’ propensities to embrace new practices. The problem in its simplest form is that the lack of practice adoption or modification can stifle agricultural productivity (Jarvis, 1990). In many regions, practice adoption is unknown; therefore, understanding the factors that impact farmers’ decisions for adopting or modifying practices is necessary.

**Purpose and Objectives**

The purpose of this study was to glean insights on the learning preferences and factors influencing the adoption of farming practices for farmers and agriculturalists in four different states. This information will be useful in helping extension agents develop effective educational materials for teaching and new farming techniques for these regions in order to increase adoption or modification of farming practices. The following objectives guided this study:

1. Describe the demographic characteristics of the sample as it relates to the role, size, age, income, type of operation, and education level;
2. Describe the methods of knowledge acquisition for preferred farming techniques used by the sample;
3. Describe the sample’s perceptions of methods of knowledge acquisition previously used to determine preferred farming techniques;
4. Describe the preferences for implementation of preferred farming techniques;
5. Determine the relationship between the sample's perceptions of methods of knowledge acquisition and the implementation of preferred farming techniques and demographic characteristics (age and level of education).

Definitions of Terms

Farmer Field Schools - Schools developed and implemented in developing countries which involve farmers in group learning. This is accomplished by showing new technologies and trends in the field and then digest information through small groups’ farmers learn new methodology in a non-intimidating setting. The use of these schools in a more advanced setting for American farmers is interesting to note if hands on learning is deemed necessary for all technology adaption.

Mixed Adoption Techniques - The adoption practices that farmers employ when deciding to incorporate certain technology or methods into their operations. The mixed comes from the influences that push them to adoption; while not strictly agricultural extension it may be a conglomeration of this plus either family, industry, farmer groups, or other factors.

Limitation of the Study

The first limitation was a lack of monetary resources to sample a larger audience. Therefore, this study can only be generalized to the participants and not the targeted population. The second limitation was limited access to the frame. Due to extension network rules, agents were not able to give out farmers contact information to a third party and therefore limited the ability to address non-response error by seeking out non-respondents.

Basic Assumptions

The first assumption is that all the participants were actively working on farms or had decision-making power over farming practices for their operations. It was also assumed that the
respondents were honest in their answers. As well it is assumed that the agent delivering the instrumentation checked the list of participants to make sure that it was accurate, thus addressing frame error. Finally, it was assumed the study dealt with farmers in the selected regions and their adoption techniques have varied.

**Significance**

The implications of understanding the motivational factors that influence a farmer’s decisions are immense. With an understanding of the relationship between formal educations, the types of learning methods utilized, and the motivational aspects they correlate to, policies could be created that help foster practice modification, information understanding, and farming practices adoption. With lower capital and a short supply of knowledgeable agriculturalists being the likely future for each of the states; determining how to tailor educational offerings to subjects, specifically when demographic and educational factors are considered, is vital for higher production gains in terms of yield and overall farm efficiency. Additionally, industry could tailor their educational initiatives to be more cost effective by focusing on understanding methods that encourage the producers to adopt the new farming practices.
Chapter Two: Review of Literature

A review of the current literature for this wide-ranging topic is essential for understanding and forming a basis for this descriptive study. Most of the recent research that was related to farmers through training and knowledge understanding are in the context of developing countries, as these areas have received a large number of agricultural training and development resources in the last decade (Gunes, Koksal, Ozden, & Ozer, 2010). The factors that were found to be the most important to agricultural practice change were the culture, learning techniques, and educational stance towards information disseminators and motivation to adopt. Similarly, studies conducted in the U.S. support the findings of the international studies leading to strong evidence that while vast in terms of cultures, many of the factors for practice adoption remain the same around the world (Jarvis, 1990; McCown, 2002).

Demographics

Several demographic characteristics play a major role in the acquisition of knowledge and behavioral changes associated with the acquisition of knowledge. Hartwich and Scheidegger, (2010) confirmed in their findings that education, social networks, farm size, income level, and age are especially important in the rate in which farmers are willing to adopt new techniques, regardless of where they are from or their specific culture. Several studies have purported an individual’s environment as a key influence (Esquivel, Gurdian, Lopez, Handa, Pineda, & Regalia, 2009; Stobbelaar, Groot, Bishop, Hall, & Pretty, 2009). Stobbelaar et al. (2009) found that if a farmer had a non-secondary formal educational level and was over 35 years of age, they were more resistant to practice augmentation than their peers with more formal education. They also found that the younger farmers, regardless of education level, were more open to practice change (Stobbelaar et al., 2009).
Researchers Oliver, Valentin, Erickson, and Boehlje (2008) concluded in their study conducted with over two-hundred respondents that farmers with farms that were less than $50,000 in gross operating profit and less than 150 acres did not reply as strongly when asked how high they value new technology adoption. Conversely, the findings for farmers with farms over $50,000 and 850 acres revealed a strong correlation between practice and technology adoption. Furthermore, observed in this study was an inverse correlation between age and increased interest in production skill adoption. Tiamiyu, Akintola, and Rahji (2009) found in their study of 220 Nigerian farmers that adopters who demonstrated high levels of acceptance of transmitted agricultural education as well as high levels of technology utilization tended to be nine years younger, have five years plus more education, and receive five times as much extension agency contact per year as those who were non-receptive to new technology and agricultural education.

Research from Mishra and Park (2005) found that an additional year of formal education increased the use of the internet for farm practice research by 2.6 percent when polling both northeastern and Midwestern farmers. This is reinforced in a study done by Briggeman and Whitacre (2008) who found that farm operators who do use the internet tend to have higher levels of farm income, strongly correlate to being under forty-five years of age, are either livestock or crop producers, and have higher levels of education. Farm operators who do not use the internet for their farm business were more likely older and had less formal education (Briggeman & Whitacre, 2008).

Understanding of the national norms in the United States is useful to help form an accurate comparison. According to the United States Department of Agriculture [USDA] (2007), census which was the latest available, the on-farm roles break down as 62.5% of all operators
being full owners, 27.8% being part owners, and 9.7% being classified as supervisor or other. The average US farm size regardless of operation type is 418 acres (USDA, 2007). Of this the USDA breaks down “small farms” as being operations of less than 850 acres as compared to “large farms” of 851+ acres. The average age of an active farmer is 57.1 years and 86.1% list their gender as male and the average gross income for farm production was $29,246 (USDA, 2007). In terms of the types of operations the USDA (2007), estimates that of the 2,200,930 active farms; 1,237,100 or 56% are livestock operations (also may have some form of crop production) while the remaining 936,830 or 44% are solely crop production. Education estimates place 27.2% of U.S. farmers as graduates of a four year college, which is on par with the U.S. average (USDA, 2007).

Social Influences

Social influences have been shown to have a major impact on the ease and willingness for participants to adopt new techniques or technologies (Boz & Ozctalbas, 2010; Graaff, Hella, & Tenge, 2003). Social strains or stigmas have been purported to impact learning and behavior adoption. Boz and Ozctalbas (2010) found that outside practices that were not utilized by other members of a community were opposed to be taken up by Turkish farmers. In addition, Boz and Ozctalbas (2010) sought to understand the motivational factors that encourage education, through targeted instrumentation focused on what value subjects place on education. Subjects were divided by level of education to determine if the stated correlation is valid or if unstudied societal factors place a larger influence on practice integration. Graaff et al. (2003) from the soil and erosion conservation group in Tanzania set out to determine the socioeconomic factors that influence adoption of soil and water conservation techniques. Among the results, higher levels of adoption of these techniques were directly correlated with education, contact with extension
agents, and overwhelmingly involvement in farmer groups; key to the adoption of the methodologies were farmer visits, study tours to implemented farms, and membership in labor sharing groups. Interestingly, on farms where females were head of household, adoption of methodology was found to be more rapid (Graaff et al., 2003). The researchers attributed this to higher levels of social contact.

Ortiz, Garrett, Heath, Orrego, and Nelson (2004) from Kansas State University and Cornell University conducted a study to determine the effectiveness of Farmer Field Schools in management of late blight on potato field yields. Participants of the field schools were measured for knowledge of blight conditions and treatment techniques, and measured against nonparticipants. Participants were verified to have higher levels of knowledge than nonparticipants as well as higher average yields than nonparticipants. The benefits of the school include better cultivar selection and management practices. Participants showed a high level of contact with other participants throughout the growing season to share ideas and make decisions.

Another factor being studied is the subject’s perceptions of learned elders, government policies, as well as extension agents as they factor in as highly educated peers. A study found that one factor most farmers see as a roadblock to adoption was the inability to relate with more educated people (Alwang, Feder, Miah, Norton, & Ricker-Gilbert, 2008). Understanding why this is an issue in subjects could lead to adaption of instructional methods that utilize more common agents of change. Research has found that this method can work effectively with poorly educated people as well as educated (Dixon & Hellin, 2008).

A study by the Sustainable Ecosystems Department in Australia explored why the use of management scientist’s help has been low by managers of farming operations (McCown, 2002). The study focused on the management practices of family farms as was determined by external
influence as well as internal factors (McCown, 2002). Similar to previous studies, research
determined the process of managing farms; combined with the factors such as education,
infrastructure, and intrinsic motivation were the greatest hindrances to utilization of these
services. In addition, this article makes note of the relationship between farmers and familiar
people as well as the positive influences on adoption of technologies.

Learning Techniques

According to Butler, Grice, and Reed (2006) group learning is another area that has been
found to play a significant role in the adoption process. Informal social learning was found to
encourage intrinsic motivation in individuals, making it more likely that the individuals would
demonstrate behavioral engagement or adopt new processes (Esquivel et al., 2009). Deci and
Ryan (2000) define intrinsic motivation as, “The doing of an activity for its inherent satisfactions
rather than for some separable consequence.” Eliciting this condition becomes important in that
the enjoyment one gets from intrinsic motivation was defined by these researchers as coming
from the activity itself rather than being rewarded by some physical reward. This still allows it
to comply with operant theory as defined by Skinner (1953) which says that all behaviors are
motivated by some form of reward.

In order to understand why this can be most beneficial, one must realize what a farmer’s
role is in a functional, even laid back type of group learning environment. A farmer’s role on a
team is to not only listen to other farmers, but to analyze what team members are saying and
formulate a way in which the experiences they are hearing can be applied to their operation
(Kariuki, & Ngugi, 2009). In addition, a participating farmer should be obliged to delineate on
their situation and experiences and take a role to help teach other farmers in the group (Kariuki,
& Ngugi, 2009). And finally a successful group learning team must be able to objectively grade
each other on the effectiveness of each other’s practices and suggest improvements (Kariuki & Ngugi, 2009). Research from Lilja, Sanginga, and Tumwine (2006) was conducted to determine, what is the common criterion for farmers to participate in a research group? The researchers concluded that farmer adoption does not follow the normal adoption curve; there generally is high early participation with dramatic decrease in participation closely following. Information concluded that farmers are most interested in managing and sharing information and technologies with other farmers, while not deciding on specific treatments (Lilja et al., 2006).

Researchers from the College of Economics in Beijing conducted a study on the behavior of Chinese farmers on information acceptance and implementation into practices (Fu, Zhang, Zhang, & Zheng, 2010). From the 231 questionnaires returned, researchers concluded that Chinese farmers were most interested in information sources that were easily accessible. The respondents also reported feeling a void in their knowledge acquisition abilities due to their inability to research information effectively and extension being either poor or nonexistent. One implication to the findings of this study is that even in different cultures, a key component of being open to changes in one’s farming practices is the accessibility to new information. These farmers chose the easiest source to learn new techniques, not because it was the most technically correct or even recommended, but because it was the easiest to access and the easiest to put into practice.

The authors, from the Tegemeo Ag Policy Institute outline in their paper on small scale entrepreneurship, how groups have a large role in organizing every key facet of agricultural production in the productive areas of Kenyan Agriculture (Kariuki & Ngugi, 2009). The authors of the study surveyed over 1,000 households and drew correlations to the percent of households that were members of one or more of these organizations, as well as household income. There
was a positive correlation between being a member of an agricultural production group and higher household income for those who said farming was the household’s main occupation. This paper highlights the power of promoting farmer practice groups to provide for higher levels of financial security. The reasons for respondents not to join groups included lack of groups in their area, time, fear, and ignorance of interest groups.

Research from Australia has tried to answer if Farmer Field Schools actually produce a favorable effect to yield improvement while also reducing pesticide use (Yamazaki & Resosudarmo, 2008). The researchers compared rice yields with a control group in the same region of Indonesia who received no new knowledge either through schools or directly. The researcher concluded that while yields and pesticide use did improve immediately after the Field Schools, in most cases, after time the performance became stagnate. This finding support the hypothesis by which this study was founded that farmer focus groups are a key piece, and that informal education is needed to continue innovation.

A study from Turkey highlighted what methods of education producers were relying on for production of oregano (Gunes, Koksal, Ozden, & Ozer, 2010). The research brought out that oregano producers were generally graduates of primary school, reliant on oregano production for survival, and primarily informed of production techniques from relatives and neighbors over 86% (Gunes et al., 2010). It is noteworthy that the article mentioned the importance of farmer groups who deal with market uncertainties. The study also concluded that the best case scenario to improve oregano production from its already high levels would be to invest in field days in particular regions to show better production techniques and let the societal groups discuss information like usual (Gunes et al., 2010).

The effects of influences of the peer were particularly relevant for analysis in this study.
Jarvis (1990) analyzed the characteristics of Texas rice producers who adopted computers relative to non-adopters to compare the discernable differences between producers. Regardless of age, farm size, or any other discernable factor, the positive relationship between the numbers of peers using computers was found to be the most influential reason for farmers to adopt the use of computers in their operation (Jarvis, 1990). This was especially true in cooperative situations where a previously non-using farmer shared certain resources with a computer using farmer and learned about the use of the computer through his peer connection. This makes sense when one takes into account the relatively small and open world of farmers in terms of their communication with each other. It also speaks to a more human need to “fit in” and learn from people in similar situations (Deci & Ryan, 1985; 2000).

The method a producer uses to acquire knowledge is relevant in understanding how educational transfer can be optimized. The key characteristic that was found in the aforementioned review of literature is that the methods of acquisition will vary based on a multitude of factors. However, the most prevalent as well as relevant, based on these studies are farmer groups, family members, and media outlets. Available research on how producer’s rate extension was limited, most of the recent extension studies found were from foreign countries in a different stage of extension development than the current United States. However, the research indicated that the willingness to accept extension as a reliable source for knowledge mainly came down to the producers experiences with extension programs. If the producers rated the programs overall effect as negative, or considered the advice of an agent as leading to no increase in production or reduction of labor then they generally had a negative view of extension across the board.
Motivation

Along with the external factors of adoption, it is the intent of this study to analyze the internal factors of motivation for implementation that compel a farmer to adopt or learn how to adopt new practices. The search to understand these internal motivational factors is best through the conceptual framework of the self-determination theory (Deci & Ryan, 1985; 2000). This theory looks to understand the intrinsic and extrinsic motivations and see how each affects the subject’s willingness and or speed to adapt to changing dynamics. This theoretical framework was applied to a small case study for dairy farmers in the Netherlands (Stobbelaar, Groot, Bishop, Hall, & Pretty, 2009). The study was to determine what influenced farmers to adapt their practices to safeguard their local environment. The results showed that organic farmers were internally motivated for nature conservation and had strong institutional links (Stobbelaar et al., 2009). They were more likely to internalize the goals of environmental policy schemes than conventional farmers who focused predominantly on financial rewards. This example shows that while motivation will vary from individual to individual the likelihood of what influences farmers in different areas will rest on what their core beliefs and which motives are more closely aligned to what they value (Deci & Ryan, 1985; 2000). All the research analyzed points to the broad encompassing set of criteria that may play a role in adoption levels of practice modification for modern producers. While the primary purpose of the study was to determine glean insights on the learning preferences and factors influencing the adoption of farming practices, the research points to a clear group of factors that must be explored for the research to accurately describe the representative subjects of the states studied.
Chapter Three: Methodology

Research Design

This descriptive study utilized a mixed methods approach (Ary, Jacobs, Razavieh, & Sorensen, 2009). The reason for having chosen a mixed method approach is the ability to glean insights that are not only quantitative, but provide a richer level of data to address the reasons why the participants responded in a certain manner. A similar study by Bowers and Lane (2008) also employed this design.

Population and Sampling Procedures

The populations studied were farmers from three different states in the American Midwest and one state from the Northeast. The Midwestern states were Missouri, Wisconsin, and Iowa. The Northeastern state selected was New York. The subjects in these states consisted of farmers or agriculturalists that are currently involved and have directional influence in a farming operation. The subjects were involved in livestock, row crop, specialty, or mixed farming operations. Each state was sent the same number of surveys, so each state had the same opportunity to reply in terms of quantities of responses. As capital and resources varied, education level and source of agricultural practice knowledge were studied to assess if there is any correlation to these flagstones of practice adoption and innovation and other telltale intrinsic factors.

Error Control

The control of sampling error utilized the use of a large sample population size. Each state received 100 sample surveys; 63 samples were returned which gives a large enough base to control sampling errors of the mean (Ary, Jacobs, Razavieh, & Sorensen, 2009; Jarvis, 1990). The resulting fifteen percent return rate fell in line statistically with other studies that were
researched such as Jarvis (1990) and Bowers and Lane (2008). The control of selection error was accomplished by using agricultural extension personnel in these states to provide contact information that reflects known active farmers. Control of frame error was accomplished by only using farmers who are currently in the occupation this was accomplished by having the intermediate person who delivered the instrumentation check that the list they used was not out of date.

Instrumentation

A 25-question survey instrument was used to collect data. Questions assessed demographic, current practice, as well as general adoption factors. Questioning broke farmers into groups by educational level, and crucial factors for adoption. There were eleven open-ended questions on the instrument, nine multiple choice questions, and one question that had a ratings scale. The open-ended questions prompted respondents to provide specific answers other than yes or no. The multiple choice questions probed the participants on demographics, their preferences for acquiring knowledge, the value they place on extension agencies and programs, and previous personal practice modifications in their operations. The rating scale probed the participants on factors crucial to adoption of new practices.

The questionnaire was reviewed by a panel that included an instrumentation expert, three content experts which were farmers not involved in the study, and two graduate students in agricultural education for face and content validity. Control of qualitative instrumentation reliability was based off of a triangulation of the responses of the qualitative and quantitative questionnaires with the responses obtained from previous research to use as a comparison. There was also a retest by the experts from above which was conducted a week after the first round of the six members of the panel 83% or five of the six respondents noted no change in their opinion.
in the second viewing from the first. The one changing member of content validity noted a
direction in question 14 to add farmer groups / field day as a method of for agricultural
knowledge transfer to your operation, it was subsequently added. On the instrumentation,
questions were constructed in a qualitative manner to allow the participant to explain their
answer from the quantitative question. The goal was to compare this when analyzing the results
and compare this with the general findings of previous research.

Data Collection

Data was collected using a paper questionnaire with both closed and open-ended
questions. Questionnaires were distributed by an agent of the University of Missouri Extension
agency, an Iowa State University employee, field extension agents of the University of
Wisconsin Extension network, and an Agricultural Engineering Professor for the University of
New York Cobleskill. The data was collected through mailing of the instrumentation along with a
consent form to each of the addresses provided. The mailings contained a return envelope which
included pre-paid postage. Non responses were a challenge with this study because of the
distances involved and the channels for which the questionnaires had to go through, the research
was not able to contact non-respondents and therefore conclusions can only be generalized to the
sample.

Data Analysis

Quantitative data was analyzed by entering the responses into an excel file in which
responses were coded for each question. Each question was organized in this excel file under the
objective it was designed to answer. This way the researcher could organize questions quickly
and process them quickly. Quantitative data was used by showing the percentages of
respondents who selected particular responses from a predetermined list, as well as the mean and
IQR were utilized in research objective four in order to show preference for implementation of preferred farming techniques. From here the researcher was able to use the findings to accurately report the findings and make recommendations.

Qualitative data was recorded from each participant and entered into an excel file as it was written in the instrumentation in order to precisely record what was wrote. From here the researcher was able to group responses together if they were either the exact same or referenced the same activities, such as vertical tillage as an example of new innovations.

Data for objective one included all sixty-three responders fully participating in all of the questions asked. In all six quantitative questions, seven actual responses per instrument as question four had two questions were asked and the answers put into tables in order to analyze. Data for objective two encompassed six quantitative questions in which all sixty three responded. Objective three included one qualitative question that yielded four common responses from the participants. Objective four asked three qualitative questions, the first of which did not share common responses while the remaining two questions could be commonly sorted through five responses per questions. Quantitative questions included three multiple choice questions that only had 3 and four respectively non-replies, as well there was the rating question that received full replies. Objective five utilized SPSS to sort the results from the instrumentation. Pearson’s correlation was used to determine the strength of the correlation between the criterions both at the .05 level. As well the two tail level of significance was utilized.
Chapter Four: Findings

Objective 1

Research objective one was to describe the demographic characteristics of the sample as it relates to the role, size, age, income, type of operation, and education level. There were 63 people that provided usable data. With respect to their farming operation, 64% were owner/operators, followed by 25% partners, and 11% supervisors. In terms of overall differences between farm sizes: 63.5% of respondents farmed 850 acres or less with 42.9% farming between 101-850 acres. Over this the 36.5% of respondents who were on very large farms 19% were between 851-1500 acres with 1501+ being the remainder. Age wise, 20.6% were between 18-24 years old, 23.8% were between 25-35, 28.6% were between 36-50, 15.9% were between 51-60, and 11.1% were 61 years of age or older. Income shows that the majority of farmers polled were well of for typical yearly gross farm income with only 22.2% being under $50,000. 28.6% were between $50,000 and $250,000, 36.5% were between $250,001 and $1,000,000, and a somewhat staggering 12.7% were above $1,000,000. Of the operation an overwhelming 71.4% were involved in a livestock farm either solely or mixed with row crops compared to only 66.7% that had shared investment in row crops. Of sole operations 33.3% were livestock, and 28.6% were only row crop. Lastly, graduating education level was measured; 47.6% only reached a high school degree, 41.3% had received their undergraduate, and 11.1% were recipients of a graduate degree.

Objective 2

Research objective two was to describe the methods of knowledge acquisition for preferred farming techniques used by the sample. Of the twenty respondents who answered that they checked the internet daily 55% were in the 18-24 age range. 30% were in the 25-35 age
range, and 15% were in the 35-50 age range. Of the 20 who checked the internet weekly, 25% were in the 25-35 age range, 55% were in the 35-50 age range, and 20% were in the 51-60 age range.

When responding on their main method for acquiring agricultural knowledge; 28.6% responded as farmer groups, 30.2% said family members or friends, 34.9% said the media or industry sources, and only 6.3% said extension was their main knowledge source. Typical times a respondent talked to his neighbor or relative about new practices or technology a month broke down as 68.2% being less than ten with five or less being 31.7%. Eleven to fifteen times per month was selected by 17.5% while 16 and above was 14.3%. When the farmer was most in contact with family members and neighbors to exchange new information was very concise. Spring, Fall, and Winter were each 22.2% while Summer was 33.3% of the respondent’s main time for contact.

Learning preferences for the respondents showed that 41.3% labeled themselves as self-learners, while 30.2% thought they learned best in a one on one situation with an expert. The remaining 28.6% considered group learning to be the most effective way to digest and absorb new knowledge. Lastly participants were asked if they had been involved in a farm group or organization of which 42.9% replied as yes where the remaining 57.1% said no.

**Objective 3**

Objective three was to describe the sample’s perception of methods of knowledge acquisition previously used to determine preferred farming techniques. When asked, “Do you tend to check in on recommendations made by agricultural extension agents on your own after they are made?” Over 60% said that yes they did, the most common form of checking in that respondents wrote in was that they checked in with their neighbors or other producers. While
there were 8 non-respondents for this question it can be accounted for as they had no previous experience with extension agent recommendations.

Right at 73.5% of those responders who did have contact in extension through programs rated the programs as having a success on their operation. While only 26.5% rated the program as having been a failure. It is important to note that only 34 of the possible 63 responders replied to this section. Common successes that respondents wrote in were vaccinations programs for cattle, crop scouting schools, soil fertility training, and introductory to value marketing. When asked if they would partake in a future extension programs 60.5% of the 43 responders would partake again while only 23.3% would not and 16.3% replied as possibly.

Respondents were asked in an open-ended question if they took any issues specifically with agricultural extension recommendations. The most common responses included the following which correlate across multiple farmer sizes and types:

1. The agents not being orientated correctly with what other agents recommendations had been previously (sending mixed messages).
2. Not practical for their operation.
3. The agent lacked knowledge in the required fields to make accurate recommendations.
4. The agent’s information was outdated or out of step from what industry has recommended.

**Objective 4**

Objective four had instrumentation that was used to describe the preferences for implementation or preferred farming techniques. When asked what influenced them to take up farming as an occupation, 79.4% responded as family having the major influence. Only 6.3% and 14.3% respectively responded as selecting it for the income opportunities and lifestyle.
When asked about which technique they most strongly identify themselves as practicing when trying a new production practice; 50.8% selected integrating known methods as the method they would choose. Whereas, 23.7% chose experimenting with their own ideas, as being the method they would utilize, and 25.5% selected a mixture of both. When asked if they had made any significant changes to their operation in the past three years due to extension recommendations 41.7% responded that they had while the remainder said no.

The respondents were given a scale towards the end of the survey to rate which factor they considered most crucial for adopting new farming practices. This scale asked them to rate a factor as not crucial, slightly crucial, moderately crucial, or very crucial. The factor of community acceptance of the new practice was rated by 57.2% as not or only slightly crucial with 27% saying not crucial at all. Thirty-Four point nine per cent said it was moderately crucial while only 7.9% said it was very crucial. The median in this adoption factor was 2 (IQR = 2) slightly crucial.

When asked about the economic justification of the factor, no responded rated this as not crucial; while 76.2% rated this as very crucial. Four point eight per cent rated this as slightly crucial and 19% rated this as moderately crucial. The median in this factor was 4 (IQR = 0). Respondents rated enjoyment of the practice as 17.5% being slightly crucial, 44.4% considering this moderately crucial, while 38.1% responded as very crucial. The median for this was 3 (IQR = 3). Responders rated extension as 33.3% considered it not crucial, 31.7% as slightly crucial, 23.8% as moderately crucial, and only 11.1% as very crucial. The median was 2 (IQR = 2).

Family acceptance found that 7.9% of farmers rated this as not crucial and 12.7% rated it as slightly crucial. An overwhelming 47.6% rated this as moderately crucial, with the remaining 31.7% placing this as very crucial for adoption. The median for this factor was 3.
The factor of fitting in with your current practices had only 3.2% respond as not crucial and 9.5% as slightly crucial. Moderately crucial took the lion’s share of responses with 47.6% as very crucial also was high with 39.7%. The median of this factor was 3 (IQR = 1).

The inclusion of government grants or other help found 27% consider this not crucial and 25.4% found this as only slightly crucial. 39.7% responded as moderately crucial to their operation and 7.9% rated this as very crucial. The median for this adoption factor was 2 (IQR = 1). The last factor was having local and knowledgeable farmers in their area to assist them. 7.9% rated this as not crucial, 31.7% rated this as slightly crucial, 44.4% rated this as moderately crucial and 15.9% rated this as very crucial. The median of this factor was 3 (IQR = 0).

Table 1

Farmers’ Perceptions of Factors that are Crucial to Adoption of Farming Practices (n = 63)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Not Crucial</th>
<th>Slightly Crucial</th>
<th>Moderately Crucial</th>
<th>Very Crucial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community</td>
<td>27.0%</td>
<td>30.2%</td>
<td>34.9%</td>
<td>7.9%</td>
</tr>
<tr>
<td>Economics</td>
<td>0.0%</td>
<td>4.8%</td>
<td>19.0%</td>
<td>76.2%</td>
</tr>
<tr>
<td>Enjoyment</td>
<td>0.0%</td>
<td>17.5%</td>
<td>44.4%</td>
<td>38.1%</td>
</tr>
<tr>
<td>Extension</td>
<td>33.3%</td>
<td>31.7%</td>
<td>23.8%</td>
<td>11.1%</td>
</tr>
<tr>
<td>Family</td>
<td>7.9%</td>
<td>12.7%</td>
<td>47.6%</td>
<td>31.7%</td>
</tr>
<tr>
<td>Current Practices</td>
<td>3.2%</td>
<td>9.5%</td>
<td>47.6%</td>
<td>39.7%</td>
</tr>
<tr>
<td>Grants</td>
<td>27.0%</td>
<td>25.4%</td>
<td>39.7%</td>
<td>7.9%</td>
</tr>
<tr>
<td>Other Farmers</td>
<td>7.9%</td>
<td>31.7%</td>
<td>44.4%</td>
<td>15.9%</td>
</tr>
</tbody>
</table>

23
The sample was asked specific questions in order to elicit responses that would provide examples for their preferences for implementation. The first question was what innovations had these producers implemented to increase productivity. The results were rather wide ranging from small changes on fencing and rotational grazing to exploring ways to make byproducts on the farm become more value added. The second question was what technologies were they currently in the process of adopting and implementing on their operation. The results from this were again wide reaching, listed are some of the most common:

1. Introducing new grain varieties and technologies for accelerating growth and yield.
2. Bettering pastures management through rotational grazing and low cost supplements.
3. New cattle and harvesting equipment; particularly including robotic milking / working facilities and precision input control machinery.
4. New tillage equipment such as vertical tillage and no till in order to reduce erosion and lower inputs.
5. Better overall farm management techniques especially fiscal planning.

When asked what has changed for them personally in terms of the motivation to adopt new practices since they started farming, the responses to this were much more common and included the following:

1. Understanding the need to adopt new practices to maximize profits, especially in bad years.
2. Becoming more market oriented through education about differentiation and maximization.
3. Discouragement from past failures.
4. Understanding that maximization of efficiencies is sometimes better able to be learned then spend time and efforts experimenting with.

5. Become much more independent thinking when analyzing problems.

**Objective 5**

Objective five was aimed to determine the relationship between the sample’s perceptions of methods of knowledge acquisition and the implementation of preferred farming techniques and demographic characteristics (age and level of education). As well, inference was checked using the two tailed significance approach. When viewing the data, no clear relationship was found between age and any of the factors the participants labeled as crucial to their adoption of practices or methods of knowledge acquisition, or preferred farming techniques. As well, there was no clear evidence of any truly significant correlation between education level and either criterion.

The relationship between age and the perception of methods of knowledge acquisition was analyzed by determining the correlation of age with the three quantitative questions asked in Objective three. Those three questions are as follows: Do you tend to research or “check on” the recommendations made by the agricultural extension agent on your own after they are made (checking)? What successes or failures (program perceptions) have you experienced with state recommended programs? Will you partake in any more of these programs in the future (future engagement)? Those questions yielded the following Pearson’s correlation and two tailed significance as follows ($r = .219, p > .05$), ($r = -.006, p > .05$), ($r = .200, p > .05$) for the associated factors the results show a very weak correlation. When determining the two tail significance the results show that there can be no level of confidence in the hypothesis that there was a significant relationship.
Educations relationship to the before mentioned questions resulted in the following \( (p = - .256, r > .05), (p = - .036, r > .05), (p = - .093, r > .05) \) this shows a negative Pearson’s correlation for the factors of perception of methods of knowledge acquisition. When determining the two tail significance the results show that there can be no level of confidence in the hypothesis that there was a significant relationship. It is notable that the number of participants answering these questions was rather low \( (n = 55, 34, 43) \) for a gauge of correlation.

The relationship between age and the implementation of preferred farming techniques show no correlation; the Pearson’s correlation shows in fact only two positive associations which are both below .1 which indicate no correlation. The correlation and two tail significance between age and factors most crucial to the subjects for farming practice adoption resulted in the following: community \( (p = .094, r > .05) \), economics \( (p = -.020, r > .05) \), enjoyment \( (p = -.061, r > .05) \), extension help possible \( (p = -.111, r > .05) \), family acceptance \( (p = -.093, r > .05) \), fits in with current practices \( (p = -.083, r > .05) \), government grants available \( (p = -.174, r > .05) \), and other knowledgeable local farmers available to help \( (p = .039, r > .05) \).

Level of education had only one weak factor that showed under the Pearson’s Correlation which was economics; the other factors were either no correlation or a weak negative correlation. The correlation and two tail significance between age and factors most crucial to the subjects for farming practice adoption resulted in the following: community \( (p = -.063, r > .05) \), economics \( (p = .148, r > .05) \), enjoyment \( (p = .025, r > .05) \), extension help possible \( (p = -.049, r > .05) \), family acceptance \( (p = -.034, r > .05) \), fits in with current practices \( (p = .046, r > .05) \), government grants available \( (p = -.135, r > .05) \), and other knowledgeable local farmers available to help \( (p = -.178, r > .05) \).
Table 2

*Pearson Product-Moment Correlation between Demographic Characteristics and Perceptions of Learning and Practice Implementation*

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Age</th>
<th>Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Checking</td>
<td>55</td>
<td>.219</td>
<td>-.256</td>
</tr>
<tr>
<td>Program Perceptions</td>
<td>34</td>
<td>-.006</td>
<td>-.036</td>
</tr>
<tr>
<td>Future Engagement</td>
<td>43</td>
<td>.200</td>
<td>-.093</td>
</tr>
<tr>
<td>Community</td>
<td>63</td>
<td>.094</td>
<td>-.063</td>
</tr>
<tr>
<td>Economics</td>
<td>63</td>
<td>-.020</td>
<td>.148</td>
</tr>
<tr>
<td>Enjoyment</td>
<td>63</td>
<td>-.061</td>
<td>.025</td>
</tr>
<tr>
<td>Extension</td>
<td>63</td>
<td>-.111</td>
<td>-.049</td>
</tr>
<tr>
<td>Family</td>
<td>63</td>
<td>-.093</td>
<td>-.034</td>
</tr>
<tr>
<td>Current Practices</td>
<td>63</td>
<td>-.083</td>
<td>.046</td>
</tr>
<tr>
<td>Grants</td>
<td>63</td>
<td>-.174</td>
<td>-.135</td>
</tr>
<tr>
<td>Other Farmers</td>
<td>63</td>
<td>.039</td>
<td>-.178</td>
</tr>
</tbody>
</table>

*p < .05
Chapter Five: Conclusions

The results of objective one for defining the demographic characteristics of the subject group revealed a diverse group of operators and operations. In terms of operator’s role on the farm, it is interesting to note from this breakdown that the sample population is a very close representation for what the USDA shows as the national average. The 63.5% is 1% higher than the national average for owner operators. As well the 25.4% of the sample that listed themselves as farm partners is very close to the 27.8% USDA results. The 11.1% of those surveyed who responded as farm supervisors was as well very close to the national average of 9.7%.

Farm size for the sample showed that the farm size of the sample contained an overall larger number of what are considered large operators. Forty-nine percent of actual farms in the U.S. are below 100 acres; this population contained 79.4% of respondents who were on 100+ acre farms. In fact, with the national farm size being 418 acres the respondents actually contained 36.5% of what would be considered “large farms” of over 850 acres. Much of this may be attributed to the fact that three of the four states are Midwestern states that usually have larger acreages compared to the northeast and southeastern states for example.

The age of the operators in question was relatively evenly distributed amongst under 50 years of age. In fact the high percentage of operators who are under the national average age of 57.1 years (73 %+) must be considered when observing the results of determination as research from Stobbelaar et al. (2009) showed. The fact that 44.4% of the sample was under 35 years old would lend credence to the population being accepting of practice change as seen through their study.

The gross farm income for the sample was very high when one considers the national average of $29,246. Again one must consider several factors in this sample population to play a
role in the discrepancy. Of the sample population 49.2% were over $250,000 which would be considered in the category of large farms in that category.

The breakdown in types of operations from the sample yielded interesting results when compared to the USDA numbers. The sample was heavily livestock oriented with over 71.4% of respondents being livestock producers when you add in the mixed category. This is over 15% higher than the national average. The 28.6% of sole crop producers was significantly lower (44%) than the national average.

Education levels were very high when compared to the national average. The percentage of the sample who graduated from a four year university or beyond was 52.4%. When compared to the 27.2% of farmers nationally being college graduates this sample clearly is on the higher end of the educational ladder which when again factoring in Stobbeelaar et al. (2009) might skew the results more favorably towards being open to practice modification.

The overall results from identifying the sample population show that this sample is very different from the “average” American farmer in many ways. From a farm size, gross operating income and educational standpoint the sample tended to be much larger and educational advanced. Coupled with the relatively younger age of the majority of the sample would tend to sway the results on how they view and accept agricultural practice change much differently than the average farmer. However, the results of this will be of value to research that focuses on the trend of larger farms in the United States, as well with the relatively high percentage of responders who were involved with livestock the results of this study would be more weighted to research and drawing conclusion for livestock education.

For objective two the results showed that the respondents who most checked the internet daily for new information on practice adoption carried along traditional age assumptions as 85%
of those who responded in this way were in the 18-35 years of age range. This is important for research in that it shows that respondents at certain age breaks are more willing to go online to acquire information than their older counterparts. When one considers the mostly younger aged farmers that were surveyed in this study, this shows a strong relationship for this trend. When one combines it with the fact that over one third of responders said that their primary method of knowledge acquisition was from media, combined with the fact that only a little over 6% stated that extension was a source of knowledge, this shows there may be an area for extension to further investigate.

When analyzing responders, 30% said that they received their agricultural knowledge solely from family and friends. This would corroborate the findings of Fu et al. (2010) that shows that farmers are more willing to accept information if they have other farmers around them who have experience in the subject to be learned. The study found the time period a farmer typically talks to his neighbor about new technologies or methods tends to be ten times or less a month. This shows that informal learning still has a high importance. The fact that there were a higher percentage of discussions in the summer than the other seasons; leads to evidence that farmers are more or less more open to learn in the main growing season and require visual proof of a successful implementation of a technique.

Finally for objective two, respondents reported as 41% considering themselves self-learners with the remaining believing that they would learn best in a small group or one on one. When combined with the fact that less than 43% responded to be involved in farm groups would lend credence that perhaps more individual based media training from extension or otherwise is more needed than previously seen in research. The issue with the conflicting information from farmers wanting to learn from other farmers but a large percentage considering themselves self-
learners leads one to believe that the responders showed less formal group learning would be more beneficial.

Objective three found that there was a strong association to negative feelings about extension and extension services as a whole to previous negative experiences. Over 26% rated programs as having been a failure and this lines up very closely with the responses of 23% being not willing to partake in any future extension programs. While this is logical and somewhat common sense the responses from those that had negative experiences show that the overwhelming majority of these experiences were due to a disconnect on the extension agents side to what industry and other sources of information the farmer was investigating. With over 60% of responders saying that they did check on agents recommendations with their peers; this shows that the study that McCown (2002) conducted is accurate in that farmers tend to be somewhat hesitant in adopting technologies unless they have positive reviews from their respected peers.

Objective four which analyzed the preferences for implementation of new practices found through qualitative questioning that the psyche of farmer adoption was largely based off of past experiences. The general trend was that a large amount of learning had been experiential and that reasons for non-adoption of techniques or technologies were largely based on past failures. These results reaffirm the position of McCown (2002) who found that farmers largely felt the desire and willingness to adopt rested solely on intrinsic motivation.

The findings on why the respondent took up farming were overwhelmingly due to family influences which of course correlate to nearly every study, in particular the study from Boz and Ozcatalbas, (2010). Over 50% responded as only being willing to integrate new methods into their operation. This reaffirms what Lilja, Sanginga, and Tumwine (2006) found in that farmers
are most interested in managing and sharing information and technologies with other farmers, while not deciding on specific treatments. When you add in that a further 22.5% included some use of existing methods into their operation it shows a pattern that American farmers less likely to experiment. With the extensive (large land sizes) way the majority of respondents farm this is logical as these farmers are more specialized in production than being involved in multiple stages of the agricultural process.

Perhaps the most relevant findings of this study were in how the respondents rated factors of adoption. When analyzing this information it is very apparent to which factors respondents’ rate as most crucial and therefore most important for accepting new techniques and technologies. Economic justification was the highest with 76% considering this most important it was followed by fitting in with current practices, enjoyment, family acceptance, and them having local knowledgeable farmers. This shows that future effort for educating farmers must strive to push for techniques that shows how this can impact a farms overall bottom line in terms of cash flow and monetary gain, but this must be addressed in a way that is not a direct departure from his current operation in order for him to achieve buy in. While at the same time this demonstrates that if a practice is too unpleasant or conflicts with this family’s acceptance any amount of education will struggle to overcome this.

After running the numbers through SPSS there was no significant relationship between the sample’s perceptions of methods of knowledge acquisition, the implementation of preferred farming techniques and demographic characteristics as Stobbeaar et al. (2009) found. When viewing the demographics of the operators as a whole, a possible reason for there being no significant relationship in the rate of implementing techniques could possibly be due to differences in farm sizes and the need on especially large extrinsic operations to follow normal
production techniques in order to stay afloat. The lack of relationship between education levels and their perception of knowledge acquisition cannot be explained.

**Recommendations**

Analysis of the study offers the following recommendations. More attention needs to be placed to ways to reach producers through different forms of media. As seen in the questionnaires, younger producers are more comfortable with finding and utilizing techniques researched through the internet. The data depicts a large percentage of responders being self-learners, online information either through reports, taped video, or other methods would allow this sizeable percentage to gather information and make a decision more quickly and easily. It is recommended that for the population that is more group or one-on-one focused internet classrooms and discussion groups should be emphasized, especially from an extension point of view. This would allow the lower numbers of extension agents we are seeing to more effectively interact and promote best practices with a wider audience. As well industry can tailor e-class learning on specific products.

The understanding that a large percentage of respondents only gain new techniques through family and friends reinforces the recommendation that further funding to extension and other resources must continue and or be increased. This is required in order to keep a substantial percentage of the population informed on best practices and technologies in order for them to absorb information in a more informal way, which the researched suggested is preferred by a substantial percentage of the farming community. Furthermore, it is recommended that an emphasis in making sure extension agents and other educational disseminators are kept up to date on the newest practices and technologies is needed in order not to misinform or cause a
negative experience with farmers. This recommendation is a result of studied population pointing
to this as the highest reason why they tended to ignore extensions recommendations.

It is recommended for future studies that the basis of this study could be further improved
by becoming more specific to producers in terms of demographic techniques. One thing became
clear while conducting this study and that is that producers in different age groups, farm sizes,
and so on vary a great deal from each other in specific areas. A recommendation would be to
focus on comparative demographic characteristics would make the study more refined and most
likely lead to more concrete relationships being observed. Additionally, future studies are also
recommended to focus on younger producers and how they absorb media information best. This
way this growing acquisition can be utilized as well as taught through more effectively.
References


Appendix A: Questionnaire

Name:___________________

Motivation of Participants to Adopt Farming Methods Questionnaire

**NOTICE:** All responses are confidential. No third parties whether governmental, commercial, or private will be given response data. Please make marks distinct and print clearly, where appropriate, so that all your responses are interpreted accurately.

1. What is your current occupation as it relates to the following criteria?
   ___ Farm Owner/Supervisor
   ___ Farm Owner/Operator
   ___ Farm Partner/Other

2. What is the total number of acres you currently farm?
   ___ 0-100
   ___ 101-850
   ___ 851-1500
   ___ 1501-3500
   ___ 3501+

3. How often do you research new farming methods or technology on-line?

   What topics do you research? Why?

4. What age range and gender do you fall into?

   ___ 18-24
   ___ 25-35
   ___ 36-50
   ___ 51-60
   ___ 61+

   Male_______                            Female______
5. Does any member of your immediate family derive income from off-farm occupations?
   ____ Yes
   ____ No

6. What issues if any do you take with agricultural extension agents recommendations?

7. Do you tend to research or "check on" the recommendations made by the agricultural extension agent on your own after they are made?

8. What was the Gross operating income of your farming operation last year?
   ____ $0-50,000
   ____ $50,001-250,000
   ____ $250,001- 1,000,000
   ____ $1,000,000 +

9. What would best describe your current farming system?
   ____ Livestock
   ____ Row Crop Production
   ____ Specialty Crops
   ____ Mixed

10. What influenced you to take up your current farming operation?

11. What is the highest level of education you have completed?
    ____ Grade School
    ____ High School / Equivalent
    ____ College/University
    ____ Graduate School
12. What successes or failures have you experienced with state recommended programs?

13. Will you partake in any more of these programs in the future?

14. What is the main method for agricultural knowledge transfer to your operation? (*Check one*)
   
   ____ Family member/ neighbor
   ____ Media (TV, Internet, Radio, etc)
   ____ Extension specialist(s)
   ____ Farmer groups/ Field Days

15. Are you more interested in integrating existing known methods or experimenting with your own ideas?

16. Have you made significant changes to your farming operation in the past three years due to agriculture extension intervention?
   
   ____ YES
   ____ NO - If no, what was/has been the reason?

17. What innovations on your farm have you developed for increasing your operations output or productivity?
18. What type of learning engages you most in terms of agricultural practice adoption?  
(Please circle one)  
A. Group learning  
B. One on one with an expert  
C. Self learning  

19. Have you been involved in any government sponsored farmer groups, organizations, or unions?  
___ Yes  
___ No  

20. How many times a month do you discuss with a neighbor or relative your farming practice?  
___ 0-5  
___ 6-10  
___ 11-15  
___ 16+  

21. What time period are you most in contact with neighboring farmers in discussion of farming practices?  
___ Spring  
___ Summer  
___ Fall  
___ Winter  
___ N/A  

22. What new farming practices / technologies are you currently in the process of adopting?  

23. Where did you learn of this methodology/technology?
24. On a scale from 1 to 4, which of the following factors is most crucial to you for farming practice adoption? (Circle one response for each item.)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Not Crucial</th>
<th>Slightly Crucial</th>
<th>Moderately Crucial</th>
<th>Very Crucial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community Acceptance</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Economic Justification</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Enjoyment (Intrinsic Motivation)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Extension Help/ Direction</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Family Acceptance</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Fits with current practices</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Government Grants/ Help</td>
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</tr>
<tr>
<td>Local knowledgeable farmers</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

25. What has changed for you personally, as it relates to motivation to adopt new practices, since you started farming?