FACTORS LIMITING PRODUCER ADOPTION OF VALUE-ADDED MANAGEMENT AND MARKETING PRACTICES AND DETERMINING VALUE DIFFERENCES FOR STEERS AND HEIFERS

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CHAPTER I

INTRODUCTION

Beef production in the U.S. is divided into three sectors: cow-calf, growing, and finishing. Production begins at the cow-calf level where a producer breeds his herd and expects to yield a calf crop after nine months of gestation. Calves are then weaned when they are six to ten months old. After weaning, calves can be sent to a stocker operation if they are younger or lighter-weight where they will be allowed to graze and gain weight until they are between twelve and sixteen months of age. At that time stocker calves may be sent to the feedlot. However, calves are sometimes sent directly to the feedlot after weaning if they are weaned heavier, or they may be marketed at an auction barn after being weaned or after they finish the stocker/growing phase. Additionally, some heifers may not be sent to the feedlot or sold and will be kept by a producer as replacement females. Once at the feedlot, feeder cattle are given a grain-based ration and are fed for four to six months. This period at the feedlot is also known as the finishing phase. When the cattle reach a market weight of 1,200 to 1,400 pounds, they are shipped to a packing plant where they are processed into beef products (Johnson et. al, 2010; Cattlemen's Beef Board and NCBA, 2009).

The process of separating the calves from the cows at weaning is one of the most stressful events for cattle with significant health and nutrition challenges. To refer to the conditioning and preparation of calves to enter the stocker or feedlot phase, the word "preconditioning" was coined by Dr. John Herrick of Iowa State University in 1965 (Dhuyvetter, Bryant, Pas, 2005; Miksch, 1984; Thornsbury, 1991). However, others say the term was derived from the joining of the words "pre-vaccinating" and "conditioning" at the first organized meeting held to discuss the promotion of management practices. This meeting among animal scientists and veterinarians was held in September 1967 at Oklahoma State University (Gill, 1967; Lalman and Smith, 2001).

Preconditioning consists of administering a health protocol and implementing management practices which include but are not limited to castrating, dehorning, weaning, and bunk feeding (Dhuyvetter, Bryant, Pas, 2005; Schumacher, Schroeder, Tonsor, 2011). These practices cause calves to experience anxiety after being separated from the cow, physical distress from bawling and castration, discomfort when changing to a ration of water and feed, and fatigue from being handled. The stress on calves is further increased when being transported and grouped with other calves. Thus, a calf's stress is reduced when preconditioning occurs 14 to 60 days before shipping. Preconditioning also allows calves that become sick a chance to recover before being transported for a long distance. Consequently, the health protocol and management practices boost the calves' immune system and health and enhance calf performance during the remaining production process (Avent, Ward, and Lalman, 2004; Bulut and Lawrence, 2007; Dhuyvetter, 2004; Herrick, 1969, McKinney, 2007; Savell, 2008).

Because preconditioning has existed for over four decades, one will question why the subject is still being reviewed today (Dhuyvetter, Bryant, Pas, 2005). Lalman and Smith (2001) answered this question by stating that implementation of preconditioning has been extremely slow, and controversy on the subject matter still exists. Cole (1984) credited contradictory research to the slow acceptance and debate on preconditioning, while Dhuyvetter, Bryant, and Pas (2005) noted the wide variability of beef cow-calf production is also an obstruction. Moreover, preconditioning is expected to be promoted more in the present and near future due to recent trends in the U.S. beef industry. The development of value based marketing programs, improved communication of information, and the increased synchronization of the supply chain will generate stronger indicators and incentives to support the adoption of best management practices which are affiliated with preconditioning (Lalman and Smith, 2001).

The practices entailed with preconditioning along with other management and marketing practices are often referred to as "value-added." Value-added marketing is the process of implementing management practices for the purpose of adding value to a commodity. The producer then sells the particular commodity and expects to receive compensation for the added value. However, if the commodity is not marketed in a way that captures the added value, the value-added traits are worthless (Smith, 2007). "Value-added" programs have been introduced in the last 20 years and require a more extensive vaccination protocol along with strict management practices (Mathis, 2008).

The historical theory of producing a cheap calf and then marketing the calf for the next production process is outdated. The beef industry is now asking producers to evaluate how their calves meet industry needs and to implement value-added practices

that will better a calf in the remaining production phases, and producers are being advised to have a management and marketing plan before producing a calf. Not only have current market signals raised attentiveness to practices that producers should be doing, but market signals have also provided a financial incentive to implement such practices. Moreover, having a marketing plan first will ensure a producer receives the added value for his calves. In Smith (2007), Dr. Bill Mies said, "To realize value, you must market value. It does no good to do all the right things and then throw the calf to the marketplace as a generic product" (p. 2).The guidelines entailed with value-added programs have consequently caused more uniformity in management practices (Cleere and Boleman, 2006; Mathis, 2008; McNeill, 2001; Smith, 2007).

To be involved in many of the value added programs, ranchers must be more attentive to keeping records such as the dates of the first and last calf born in a calving season, heath protocols, dates of vaccinations, and lot numbers to name a few. Good records are a common requirement in all value added programs. For example, records may be even more important with natural-raised cattle to document what was and was not done to the cattle. Thus, it can be noted which cattle have been given antibiotics or implants and can be separated from the rest of the herd. Administering antibiotics to a small number of cattle does not prevent the rest from being marketed as natural beef if good records have been kept to prove which practices have been executed on which cattle (Smith, 2007). In Smith (2007), Dr. Bill Mies of Elanco Animal Health is quoted as saying "The more records you have on the cattle, the more opportunity you have to increase their value" (p. 3).

Because of the advantages that preconditioning provides, many studies have proven that premiums exist for these preconditioning and value-added practices. Similar research has also shown the implementation of value-added practices to increase profits (Avent, Ward, Lalman, 2004; Bulut and Lawrence, 2007; Crawford, 2008; Dhuyvetter, 2004; Dhuyvetter, Bryant, and Blasi, 2005; King et al., 2006; Lalman and Smith, 2001; Turner et al., 1992; Ward and Lalman, 2003; Ward, Ratcliff, and Lalman, 2003; Zimmerman, 2010). For instance, King et al. (2006) found Vac-45 calves (calves that have vaccinated and weaned for 45 days) to bring an average premium of $6.50 to $8.00/cwt, while Vac-34 calves have been bringing a premium of $2.45 to $4.68/cwt. In Smith (2007), Jolley found similar premiums for all inclusive preconditioning programs to be $7.60 per cwt.

Even though there is evidence that premiums exist for preconditioning and value-added practices, only 4.3 percent of the 1.9 million calves in Oklahoma were eligible to be marketed as value-added in 2009. In that same year, the state's cattle industry was worth approximately $4 billion, which indicates the value of the cattle industry will likely increase if more producers begin implementing and marketing value-added practices (McKinney, 2009; U.S. Department of Agriculture, 2010). Slow adoption can be partially credited to the belief by many Oklahoma producers that there are few opportunities to market value-added calves and transportation expenses must be incurred (Williams et al., 2012). Moreover, the costs of preconditioning can also be an issue due to high input costs in recent times. Therefore, minimizing costs will likely be more of a concern in the near future than increasing weight gain during preconditioning (Mathis, 2008).

In addition to preconditioning and value-added practices, the physical and marketing characteristics of feeder cattle have been show to influence price. These attributes include gender, weight, health, condition/fleshiness, hide, uniformity, fill, frame, muscle score, horns, age and source verification, special sales, and reputation. The condition of a specific attribute can bring either a premium or discount, suggesting cattle producers' management choices influence the price they obtain (Avent, Ward, and Lalman, 2004; Barham and Troxel, 2007; Buccola, 1980; Bulut and Lawrence, 2007; Crawford, 2008; Dhuyvetter, Bryant, and Pas, 2005; Halfman, Lehmkuhler, and Cox, 2009; Kellom et al., 2008; King et al., 2006; King and Seeger, 2004; Leupp et al., 2008; Lalman and Smith, 2001; Langemeier, Schroeder, and Mintert, 1992; Schulz et al., 2010; Smith et al., 2000; Zimmerman et al., 2012). While previous studies give one an idea of how a trait affects the price of a feeder calf, it is essential to keep in mind that markets are volatile, causing premiums and discounts to fluctuate (Schulz et al., 2010). Additionally, it is important to note that high cattle prices are not always within reach, but implementing the correct marketing and management practices and having a marketing plan will reduce discounts that can be incurred (Cleere and Boleman, 2006).

The beef industry has long been known for the insufficient sharing of information and verification among the beef industry branches, which has caused substantial inefficiency in the beef supply chain (Schroeder and Kovanda, 2003). Asymmetric information was first observed by George Akerlof (1970) who reverted to a used car market as an example. In such a market sellers are aware of the caliber of the cars they market, but buyers are not. Buyers are aware that sellers of both high-quality and low-quality cars have a motive to state that their vehicles are in good condition in order to

receive a higher price. However, if the true quality of the car is too difficult to assess by the buyer or too costly, the buyer would, at best, offer an "average" price, causing the high-quality cars to be driven out of the market or inefficient allocation of all cars to occur (Akerlof, 1970).

One way market failure and inefficiency is evident in the beef cattle industry is in live cattle auctions. Even though sellers may announce that their cattle have been vaccinated, buyers will typically vaccinate the cattle again, which usually averages between $0.50 and $5.00 per head (Chymis et al., 2007). For a small herd size, revaccinating is not very expensive. However, large herd sizes can incur a large expense very quickly, especially when indirect costs such as time are taken into account. One may wonder why a buyer would revaccinate. The answer is due to the fact that buyers are unaware of the quality of the cattle they buy and do not fully trust sellers, or even if they do trust the seller, they may have their own reason for revaccinating, such as wanting commingled groups of cattle to have the same health protocol. A buyer's hesitation stems from the difficulty in visually evaluating cattle as vaccinations, weaning, and other management practices are unobservable. Additionally, sick cattle can infect healthy cattle with diseases in the process of commingling (Chymis et al., 2007).

Sellers at live auctions have incentives to overemphasize the value of their cattle or fail to provide negative information. These incentives entail reputations being less important when sellers only market cattle a few times a year without face to face contact with buyers. Direct sales are less likely to have asymmetric information when buyers can purchase from reputable, known sellers. However, direct sales have a higher cost of price discovery, causing direct sales to be appealing only to large buyers and sellers.

Consequently, live cattle auctions will remain popular among a majority of buyers and sellers, but if sellers cannot validate the attributes of their cattle, buyers will have meager enticement to pay premiums and will only pay average market prices, which may mean that sellers who invested in the health and quality of their cattle will not receive the full value of those attributes. Furthermore, the average price of cattle markets will decline just as George Akerlof showed in his used car scenario (Akerlof, 1970; Bulut and Lawrence, 2006; Chymis et al., 2007; Schroeder and Kovanda, 2003).

To help resolve information asymmetry in the cattle market, third-party certification programs were developed in which health protocols and management procedures are verified by veterinarians or organization officials (Bulut and Lawrence, 2006). Third-party certification programs with low costs will increase the efficiency of the beef supply chain due to the separation of high-quality cattle from low-quality cattle to a certain degree (Chymis et al., 2006). Thus, cattle buyers can be assured of the quality of the cattle they are purchasing, and feedlot operators can adjust their processing procedures and reduce expenses because they have knowledge of a herd's previous preconditioning protocol (Schumacher, Schroeder, and Tonsor, 2012). Even though this asymmetric information problem is alleviated by third-party certification programs, buyers must have faith in the integrity of a particular program and its requirements. It is also important to note that not all third-party certification programs are the same, as they exist in a variety of types and organization. Nonetheless, third-party certification programs have taken a noteworthy position in the cattle market, and the ultimate financial worth will likely rely on the value of the program to upstream participants of the beef

supply chain along with the credibility of the program (Bulut and Lawrence, 2006; McKinney, 2007; Schumacher, Schroeder, and Tonsor, 2012; Zimmerman et al., 2012).

To promote the implementation of value-added practices to Oklahoma's 47,000 cow-calf producers, the Oklahoma Quality Beef Network was developed as a joint venture between Oklahoma State University and the Oklahoma Cattlemen's Association in 2001. OQBN is a brand-neutral, third-party certification program that requires its participants to precondition their calves and follow a health protocol. As part of the obligations, producers cannot sell or ship their cattle for at least 45 days after the weaning period. Producers must also castrate their bull calves, dehorn the horned cattle, and vaccinate plus feed a concentrate supplement for at least 14 days following weaning. A certified OQBN representative will then visit the ranch to insure all qualifications have been met and that records are complete. The verification by the OQBN representative and final certification transactions have to be finished at least 21 days before the cattle can be sold or shipped. If these guidelines are met, OQBN verifies a producer has met the requirements. In addition to preconditioning verification, OQBN offers age and source verification (Ward and Lalman, 2003; Ward, Ratcliff, and Lalman, 2003; Williams et al., 2012).

The value of third party certification for preconditioning comes from the enhanced credibility it provides, and many studies have proven the value for third-party certification programs (Bulut and Lawrence, 2007; Dhuyvetter, 2004; King et al., 2006; Schumacher, Schroeder, and Tonsor, 2012; Ward, Ratcliff, and Lalman, 2003, Zimmerman et al., 2012).

For instance, Schumacher, Schroeder, and Tonsor (2012) found third-party certification to be worth $0.85 more per cwt for feeder cattle when compared to a supplier's claim according to feedlot operators and the combination of weaning and a recognized health protocol is valued at $7-$12 per cwt. Furthermore, feedlot operators expect cattle with third-party certification to have a reduced morbidity and mortality rate and have a greater feed efficiency and daily gain (Schumacher, Schroder, and Tonsor, 2011).

Because it is now known that preconditioning, value-added practices, and third-party certification yield premiums, it is important to discover why some producers have still not adopted these practices and programs. Numerous studies have evaluated the reasons why agricultural producers adopt or choose not to adopt a practice. However, there are only a limited number of studies that have examined the reasons why beef cattle producers do not adopt production, best management, or recommended practices, and there are no current studies on why producers fail to adopt value-added management and marketing practices, let alone in Oklahoma. This is the focus of this part of the thesis. Furthermore, a plethora of studies have evaluated the value for value-added and physical characteristics of feeder cattle, but only one study to date has identified the value of value-added and physical characteristics separately for heifers and steers. This is the focus on the second part of the thesis.

The results of this study will prove to be valuable to many key players in the beef industry. First, extension personal will be able to more clearly identify who is not adopting value-added management and marketing practices and what is keeping them from adoption. This information will allow extension educators to implement programs designed to cater to producers' needs. Additionally, determining the value of physical and

market characteristics for heifers and steers will aid producers in quantifying the price impacts of these traits on the value of their cattle and will show how management and marketing decisions influence price. Moreover, cattle buyers will have more knowledge on the market value of calf characteristics, which can help them in purchasing decisions, cattle feeding, and marketing arrangements by knowing accurate information on specific traits. Thus, the improved information will allow consumers, producers, and beef industry affiliates to gain through the increased efficiency and quality of beef production (Schulz et al., 2010; Zimmerman et al., 2012).

CHAPTER II

FACTORS HINDERING THE ADOPTION OF VALUE-ADDED MANAGEMENT AND MARKETING PRACTICES

Problem Statement

U.S. agricultural productivity has made tremendous strides in the last few decades and even more so in the last century. Many producers have modified or adopted new production practices over time, but what resulted for the producers who did not change their practices? The size of the U.S. cattle herd and number of cattle operations have been declining (USDA National Agricultural Statistics Service), and due to a decreased quantity of cattle that are marketed, it is important for producers to receive the highest potential price for their cattle. One way to do this is by adopting value-added management and marketing practices (McKinney). While numerous studies have been conducted pertaining to the implementation of new practices in agriculture, only a few studies have focused on the reasons why cattle producers have not adopted a practice. Therefore, there is little information that identifies non-adopters in the beef cattle industry in order to provide them with educational support (Gillespie, Kim, and Paudel, 2007; Johnson et al., 2010).

A variety of value-added programs have been designed and implemented to aid producers in choosing the right management and marketing practices. The marketing of value-added cattle has become popular and has allowed for enterprising producers to receive a higher price for their calves that possess traits valued by buyers. Frequently, producers market their cattle with value-added characteristics but without a formal certification from a program. Even with expanded opportunities, many producers are uninformed and unaccustomed to these programs and the common practices they entail. In fact, only 11.9 percent of Oklahoma producers used a value-added program in 2007 to market their cattle (McKinney, 2007; McKinney, 2009). Why would producers not adopt value added practices when it is proven to be profitable? What is the relationship between characteristics of Oklahoma cattle producers and reasons why they do not implement specific management and marketing practices? The Oklahoma Cooperative Extension service would like to answer these questions to help producers and affiliates of the beef industry within the state. This research will discover what ways producers need educational resources and which producers to target for the purpose of enhancing producers' operations and financial return.

Objectives

The overall objective of this research is to determine the constraints to producer adoption of basic cattle management and marketing practices.

The specific objectives of this research are to

1) determine the most frequent management and marketing practices that are not adopted
2) determine the most frequent reasons why producers have not implemented these practices

3) identify the characteristics of producers that are not adopting each management and marketing practice, and
4) identify the characteristics of non-adopting producers who state specific reasons for non-adoption of a particular practice.

Literature Review: Impediments to Adoption

Numerous studies have determined what management, marketing, and production practices are more likely to be adopted by different types of beef producers (Johnson et al., 2010; Kim, Gillespie, and Paudel, 2005; Rahelizatovo and Gillespie, 2004; and Ward et al., 2008). While this information can provide insight on the characteristics of beef producers who do not implement these practices, only a handful of studies identify the reasons why some beef producers are non-adopters. The limited articles on this issue cite financial feasibility, lack of knowledge and educational support, inapplicability, unfamiliarity, and opposition to change as the main reasons for non-adoption. Consequently, previous research has offered little advice on how to direct educational efforts in this field toward non-adopters in order to provide more information in making adoption decisions.

Financial concerns and feasibility are often significant reasons why producers do not adopt a practice. Economic factors were the most common cause of non-adoption for conservation practices in the work of Rodriguez et al (2008). These factors include initial and transition costs, financial apprehension, lack of financial incentives, risk, and low commodity prices to name a few. Rahelizatovo and Gillespie (2004) observed that the most frequently implemented management practices in their study were those that had been viewed as economically feasible by producers. Sometimes large capital investments

may not be an impediment to adoption of a practice, but the requirement of extra time and/or labor may serve as a barrier to adoption (Ward et al., 2008). The cattle industry differs from the previous examples because high costs were not a great impediment to adoption of management practices (Gillespie, Kim, and Paudel, 2007).

Another common impediment to adoption is insufficient knowledge and educational assistance. Rodriguez et al. (2008) found this to be true in the non-adoption of conservation practices, which coincides with statements from producers that they are unfamiliar with certain practices. More specific reasons include lack of information regarding effectiveness and on government programs, change agent's or producer educator's beliefs and misconceptions about sustainable agricultural practices, and lack of institutional support from information sources to name a few. Moreover, if a producer is unknowledgeable about a practice, he will be unaware of the economic attributes of the practice and how it could enhance his profitability. Rodriquez et al. quoted one survey participant as saying "there is no local research showing dollars and cents savings from certain practices" and concluded that producers who are using conservation practices are using those that are more easily applied to their particular farms, causing a need for greater focus on specific operations and more information. Moreover, one respondent commented that sustainable agricultural practices were complicated and required great skill that could only be learned though textbooks, reiterating the need for producer education. Furthermore, educational support is not only needed in raising awareness of the new practice but also needed for showing the negative impact of traditional practices (Rodriguez et al., 2008).

Similarly, unfamiliarity is a reason why producers do not adopt a practice, which reiterates the need for educational opportunities for producers. However, many producers in the Southeast view owning cattle as a hobby, causing educational efforts directed toward these producers to pose a challenge (Gillespie, Kim, and Paudel, 2007).

Gillespie, Kim, and Paudel (2007) found "inapplicability" to be the greatest reason why producers did not adopt management practices. Some practices may truly not be relevant to a producer's operation, but the authors suspect that producers used the "inapplicable" response due to misconception that might be resolved through educational programs. "Incompatibility" was also listed as to why producers did not adopt conservation practices according to Rodriguez et al. (2008).

Producers may not want to adopt a practice simply due to opposition to change. A resistance to change may stem from "old habits," the heritage of traditional practices, cultural norms, or from a lack of understanding about the risks that would be imposed with the adoption of a new practice (Marra, Pannell, and Ghadim, 2003; Rodriguez et al., 2008). Rodriguez et al. (2008) explain how social norms often have a negative effect on peers within a group, causing these standards to be one of the primary barriers in the implementation of conservation practices. Similarly, non-adoption among producers frequently occurs due to preference of the practices they currently use (Gillespie, Kim, and Paudel, 2007).

While Gillespie, Kim, and Paudel (2007) and Rodriguez et al. (2008) are similar to this research in that they focus on determining the reasons for non-adoption, my research will focus on beef cattle producers in Oklahoma and value-added management and marketing practices rather than conservation practices or environmental management

practices on cattle operations. This study should add to existing knowledge by identifying reasons for non-adoption of value-added management and marketing practices in the beef cattle industry. Determining the reasons hindering implementation of value-added management and marketing practices in this field will prove especially useful in helping producers increase the value of their calves, as 4 million head of cattle and calves were sold in Oklahoma in 2007 alone and were valued at $3 billion (United States Department of Agriculture).

Literature Review: Preconditioning Practices

To overcome these obstacles and oppositions, there must be "proof in the pudding." Producers must be shown the true value and importance of these practices to be convinced to adopt these value-added management and marketing practices. Preconditioning, which typically includes castration, dehorning, vaccinations, and weaning at the minimum, has long been proven to provide premiums to producers (Avent, Ward, and Lalman, 2004; Bulut and Lawrence, 2007; King et al., 2006; Lalman and Smith, 2001; Zimmerman, 2010).

Castration is performed on calves when they are between a day and a year old but preferably when they are less than 4 months old. Not only does castration reduce the hostility and aggressiveness of bull calves, but castration is also worth $3 to $6/cwt more to the market and allows beef to be more tender and consistent. Consequently, producers who do not castrate can expect to receive a discount for bull calves (Arnold, 2011; Cleere and Boleman, 2006; Ward and Lalman, 2003).

Furthermore, dehorning is required in preconditioning programs because horned cattle can cause injury to people, can cause wounds to other calves which lowers their

carcass value, and consume more space in a feedlot. Thus, horned calves are marked down by $2/cwt while dehorned calves will realize a premium (Cleere and Boleman, 2006; Ward and Lalman, 2003).

Preconditioning also entails weaning calves some period of time before shipping. Weaning causes calves to experience distress from bawling and agitation from changing to a feed ration. Therefore, weaning calves before shipping reduces their stress and allows those who become sick during preconditioning a chance to recuperate before being shipped. Zimmerman et al. (2012) found weaning premiums to be worth between $3.47/cwt and $5.42/cwt, while Williams et al. (2012) discovered a weaning premium of $2.05/cwt.

The next practice implemented with preconditioning is giving respiratory vaccinations, which boosts calves' immune system and health and enhances the calves' performance during the remaining production process (Avent, Ward, and Lalman, 2004; Bulut and Lawrence, 2007; Dhuyvetter, 2004; Herrick, 1969, McKinney, 2007; Savell, 2008). According to Williams et al. (2012), a vaccination premium is worth $1.44/cwt. However, Zimmerman et al. say vaccination premiums are valued at $1 to $2 for heifers and $2 to $4 for steers.

Due to the fact that weaned calves are more predisposed to internal parasites which suppress their appetite, lower their immune system, and diminish the effect of vaccinations, preconditioning requires calves to be dewormed. The earlier calves can be dewormed the better, as this mitigates the possibility of reduced weight gain and injury to the digestive tract from internal parasites. Deworming increases "the efficiency, profitability, and effectiveness of the entire preconditioning effort" (Lalman et al., 2002).

Research has shown deworming enhances weight gain up to 17%, reduces morbidity by 7 to 40%, and decreases death loss by 10 to 40% (Cole and McCollum III, 2007). The appropriateness and value of deworming may depend on the time of year and the location as some regions have known heavy parasite loads while other regions may have little or only seasonal parasite problems.

While accustoming calves to feed bunks is not researched for its direct added value, training calves to eat their ration from a feed bunk and drink water from a trough is coupled with weaning and is recommended in many preconditioning programs. Starting calves on a feeding program not only teaches calves to eat out of feed bunk, but it also assists producers in monitoring the calves' health and serves as a method of administering supplemental nutrients to the calves if needed. Additionally, strategically positioning feed bunks next to a fence will restrain calves from walking the fence line (King et al., 2006; Lalman et al., 2002).

Another frequently non-adopted practice is implanting. Implants are small pellets that are inserted beneath the skin on the back of a calf's ear. The implant releases low doses of hormones that increase average daily gain by 7 to 17% and feed efficiency by 4 to 12%. However, implants cannot improve growth rates if a calf is not receiving proper nutrition. When used properly, implants yield higher net returns than many other management practices and only cost approximately a $1/head (Cleere and Boleman, 2006; Lalman et al., 2002).

Value-added management and marketing practices often entail niche markets such as using no antibiotics in production or raising natural beef. In recent times, consumers have become more concerned with the how animals are raised and the safety of their

food. Consequently, some people prefer animals to not be treated with antibiotics. Calves marketed as "natural" increased from 13% in 2003 to 38% in 2007, which mirrors the decline in number of calves that are implanted. Research on Superior Livestock Auction data has shown "natural" calves to receive premiums (Zimmerman et al., 2012). Moreover, niche markets such as naturally raised beef may continue to increase in demand as consumers continue to express their preferences regarding production standards (Blank, Forero, and Nader, 2009; Zimmerman et al., 2012).

To be involved in many of the value added programs, ranchers must be more attentive to keeping records such as the dates of the first and last calf born in a calving season, heath protocols, dates of vaccinations, and lot numbers to name a few. Good records are a common requirement in all value added programs. Records should even be kept on natural-raised cattle. Thus, it can be noted which cattle have been given antibiotics or implants and can be separated from the rest of the herd. Administering antibiotics to a small number of cattle does not prevent the rest from being marketed as natural beef if good records have been kept to prove which practices have been executed on which cattle (Lardy, 2007; Smith, 2007).

Preconditioning is likely to receive more attention due to recent interests in the U.S. beef industry such as individually identifying animals, age and source verification, and country-of-origin labeling (King et al., 2006). King et al. (2006) found a $0.52/cwt premium for calves tagged with radiofrequency identification (RFID). Moreover, age and source verification has increased in value in recent years due to the discovery of BSE (bovine spongiform encephalopathy) in the U.S. in December 2003 and the demand for verification to export markets such as Japan (Schroeder and Tonsor, 2012; Zimmerman et

al., 2012). Age and source verification has shown to bring a premium of $1 to $2.75 per cwt (Zimmerman et al., 2012). Moreover, feedlot operators value age and source verification at $5.84/cwt (Schumacher, Schroeder, and Tonsor, 2011). In addition to age and source verification, country-of-origin labeling (COOL) has been a hot topic. Even though producers will not have to contribute to the documentation of COOL as once thought, previous research has shown that labeled products can bring up to 18.7% more in value due to consumer willingness to pay (Sitz et al., 2005; Smith et al., 2005). However, more recent studies found that only 14% to 25% of consumers are aware of the existence of COOL law, and approximately 60% of consumers indicated they do not look for information regarding the origin of beef products when shopping (Klain, 2011).

Conceptual Framework

The literature review has identified research discussing reasons hindering adoption and why the value-added management and marketing practices are important. If producers can realize value from such practices, one might then question the main production objective of these efforts. The principal assumption of production economics is that the goal of the firm is to maximize profit, or in some circumstances to minimize the cost of production, subject to technical and economic constraints (Beattie, Taylor, and Watts, 2009). Therefore, increasing revenue and decreasing costs are the two key production objectives. Ramsey et al. (2005) used three interdependent methods for economic performance: costs, production, and profitability. While total cost is a key factor in profit maximization and the quantity of production determines the amount of income, profitability is the primary focus, as profitability is an amalgamation of reducing costs and increasing income (Ramsey et al., 2005; Vestal, 2007). However, producers

usually have limited resources and consequently allocate those resources to maximize utility. Thus, depending on the quantity and quality of the resources at hand, producers do not necessarily use the most progressive or suggested practices when maximizing utility (Vestal, 2005).

Rogers and Shoemaker (1971) note that the actual innovation, publicizing information about the innovation, and time are critical to the dispersal of the latest theories. Yapa and Mayfield (1978) have explored the motives required to adopt a new practice and concluded that four prerequisites must occur. First, a satisfactory level of information must be accessible. Second, there must be a positive perception of the new practice. Third, the new practice must be financially feasible. Fourth, the new practice must be physically obtainable. Gillespie, Kim, and Paudel (2007) further extended these criteria to include three more fundamentals. These are that the adoption must yield positive net returns for the producer, the producer must be dedicated to modifying current practices to incorporate the adoption, and the adoption must be relevant to the producer's operation. Consequently, Gillespie, Kim, and Paudel (2007) found that unfamiliarity and unsuitability to be the most frequent reasons given for non-adoption.

It has been proposed that beef producers may rank their goals in another manner than producers of other agricultural operations. Thus, the adoption rate of new practices for beef producers could be dissimilar (Gillespie, Kim, and Paudel 2007). Basarir (2002) discovered that producers of cow-calf operations focused more on maintenance and preservation of their land than maximizing profits. This may be a result of smaller cow-calf producers who view their operation as a hobby rather than a vital source of income. When evaluating the implementation of practices by dairy producers in Louisiana, the

results of Rahelizatovo and Gillespie (2004) show that producers who seek to maximize profits must be provided with substantial financial incentives for them to use the best management practices.

In agriculture, the adoption of a new practice or technology relies on individual characteristics that can be classified into two groups. One of the groups focuses on characteristics of the new practice that is proposed to be adopted, which was discussed in the previous literature review, and the second group focuses on the traits of the producer himself such as education level (Guerin and Guerin 1994). Thus, the following text concentrates on traits relating to the individual producer and how those traits influence adoption.

Many research studies of technology adoption have included farm size as a variable and concluded that the greater the size of the farm (or herd size) the more likely the farm would be to adopt new practices (e.g., Feder et al., 1985; Rahelizatovo and Gillespie, 2004). The idea behind this is that larger farms have more incentive to be progressive because they can take advantage of economies of size. Likewise, Putler and Zilberman (1988) found farm size to have a significant impact on technology adoption. On the contrary, Gillespie, Kim, and Paudel (2007) and D'Souza, Cyphers, and Phipps (1993) found that farm size did not have an impact on adoption rates. Kebede (1992) discovered that farm size had a negative effect on the implementation of new practices by Ethiopian farmers when opportunities to earn revenue off of the farm were present, but farm size had a positive effect when agriculture production was the only means of revenue.

The region in which a producer resides also plays a role in the adoption of practices. Often the terrain and climate from the north to south or east to west sectors of a state can be vastly different, meaning practices will have a different probability of adoption depending on the environment. For instance, eastern Oklahoma receives more rainfall than western Oklahoma. Therefore, eastern producers are more likely to be concerned with internal parasites due to the wet environment, causing them to deworm their cattle more than western producers.

The adoption manner of a producer is often impacted by his/her age (Ashby 1982; Coughenour and Chamala 1989; Heffernan and Green 1986). As producers grow older, it is expected that they will become less familiar with the best management practices of the era. This is because they will be more accustomed to practices that have been around for a longer period of time (Gillespie, Kim, and Paudel 2007; Rodriguez et al. 2008). Older producers may also be resistant to change due to the fact that they may not realize any gains from adopting the practice if they plan to retire soon (Rodriguez et al. 2008). Soule, Tegene, and Wiebe (2000) and Feder, Just, and Zilberman (1985) found results that were consistent with this hypothesis when researching conservation adoption and technology adoption. Rahelizatovo and Gillespie (2004) acknowledged similar results for the same reasons when analyzing the dairy business in Louisiana.

Similar to age, the number of years of experience will influence adoption. Producers who have been in the cattle industry for a period of time are more likely to be aware of common practices, such as castration and weaning, but may not see the benefit of more recent practices, such as age and source verification. However, producers with less experience are probably aware of more recently-introduced practices like using no

antibiotics or “natural” beef due to public media. Life experiences may help producers be more progressive. For instance, an older producer who is just getting into the beef cattle industry may seek out information and awareness of lack of knowledge.

The highest level of education achieved by a producer is also expected to influence adoption rates (Bultena and Hoiberg 1983; Carlson and Dillman 1988; Gould, Saupe, and Klemme, 1989). The results of Gillespie, Kim, and Paudel (2007) show that a Bachelor’s degree positively impacted five practices and that producers with a degree were less inclined to say that they were unfamiliar with a practice or that it was not applicable. D’Souza, Cyphers, and Phipps (1993) also found education to be significant and to have a positive impact on the implementation of sustainable agricultural practices, and they concluded that a high school education would increase the probability of adopting the practices under evaluation by twenty percent. Not surprisingly, Kebede (1992) discovered that education had a negative effect on the implementation of new practices by Ethiopian farmers when opportunities to earn revenue off of the farm were present, but education had a positive effect when agriculture production was the only means of revenue.

Income is also thought to impact adoption rates. For example, producers with less total income may not adopt practices with higher expenses due to the fact that more upfront costs are incurred. On the other hand, producers with higher income levels may not care to implement value-added practices with little return per head.

Similarly, percentage of farm income affects the implementation of practices. If a producer earns a significant share of income from off-farm employment, the off-farm source of revenue will be deemed more important than beef production. On the contrary,

a producer who depends on cattle production for a majority of income is more likely to be progressive and adopt value-added management and marketing practices (Vestal, 2007).

Another variable used in the analysis of Gillespie, Kim, and Paudel (2007) was contact with the National Resources Conservation Service (NRCS) and the Louisiana Cooperative Extension Service (LCES). They predicted that producers would be more favorable toward adopting a practice if they had more contact with these organizations, and as a result, the odds of these producers stating that they were unfamiliar with a practice or that it was not applicable would be less. The research of Rahelizatovo and Gillespie (2004) showed that these assumptions pertaining to their study were correct.

Methods and Procedures

In 2009 the Departments of Agricultural Economics and Animal Science at Oklahoma State University and the Oklahoma Cooperative Extension Service funded and conducted a Beef Management and Marketing Survey with the assistance of the National Agricultural Statistics Service. The National Agricultural Statistics Service's office in Oklahoma City was in charge of mailing, receiving, and accumulating the data from the surveys. NASS used a stratified random sample to form a representative sample of cow-calf producers in Oklahoma by herd size and geographical region. The survey was issued via mail and was sent to 17,511 of the 34,652 cow-calf producers in Oklahoma. A cover letter was sent along with the survey to explain to producers the purpose and to encourage participation. Both the cover letter and survey are shown in the Appendix in Documents 1 and 2. The survey was issued in late August 2009 and concluded in November 2009. 1,861 of the surveys were returned, yielding a 12.1 percent response rate. When a survey was not completed in a section of interest, the observation was

deleted, leaving 1,453 usable observations and a usable survey response rate of 8.3 percent. The survey asked producers a variety of questions including their demographic background, their current management and marketing practices, why they did or did not use these practices, special marketing programs they participate in, and the educational materials they use.

To complete the first objective and determine the most common management and marketing practices that were not adopted, a frequency procedure was used in SAS. The frequency procedure indicated how many times each practice was not adopted. Similarly, a frequency procedure was used in SAS to complete the second objective and determine the most common reasons why producers have not implemented these practices, indicating targets for improvement for implementation of marketing and management practices by producers. To achieve the third objective, a binomial logit model was used to estimate the probability of a specific management or marketing practice not being adopted based on producers' demographics. The logit model was chosen because all dependent variables are dichotomous. The logit model that will be used is as follows:

(1) $$Prob(\text{Producer } i \text{ adopts a practice}) = \frac{e^Z}{1+e^Z},$$

where *Prob* (Producer *i* adopts a practice) is the probability of producer *i* adopting each management or marketing practice. In this equation *e* is the base of the natural logarithm and is a constant, equaling roughly 2.718281828. *Z* is

(2)

$$Z = \alpha + \sum_{j=1}^{4} \beta_1 \, HerdSize + \sum_{j=1}^{4} \beta_2 \, Region + \sum_{j=1}^{4} \beta_3 \, AEClass + \sum_{j=1}^{4} \beta_4 \, Education + \sum_{j=1}^{5} \beta_5 \, Income + \sum_{j=1}^{4} \beta_6 \, FarmIncome + \sum_{j=1}^{2} \beta_7 \, Training$$

where *HerdSize* is the number of cattle a producer owns with categories of 1 to 4, *Region* is the region of Oklahoma in which the producer resides with categories from 1 to 4, *AE Class* is the combination of the age and experience of the producer and is classified into categories ranging from 1 to 4, *Education* is the highest level of education the producer has obtained with categories from 1 to 4, *Income* is the total income of the producer with categories from 1 to 5, *FarmIncome* is the percent of a producer's income from beef cattle production with categories from 1 to 4, and *Training* is whether the producer has participated in either the Master Cattlemen Program or Quality Assurance Training with 1 indicating a producer has received training and 0 indicating a producer has not received training. The probability of a producer not adopting a practice is 1, while the probability of a producer adopting a practice is 0. The dependent variables include castrating, dehorning, weaning for 45 days, administering 2 respiratory vaccinations, deworming, accustoming calves to feed bunks, implanting, administering no antibiotics, keeping vaccination, medical, and/or birthday records, individually identifying calves, and age and source verification. Independent variables are further explained in Table 3 in the Appendix. Furthermore, it is important to note that many of the independent variables

may have fewer classes than what was asked in the survey. Some of the classes were logically grouped due to a low number of respondents.

The AE Class is an index of age and experience. The index is created by multiplying a producer's age category by the producer's experience category with a range of 1 to 20, which is broken into four classes. Age is simply the age of the producer with categories ranging from 1 to 5, and experience is the number of years of experience a producer has in the cattle industry with categories ranging from 1 to 4. Former studies have included either age or experience but have rarely included both due to the high correlation among the two (Levy and Sharma, 1994). Because of the unique relationship between age and experience, the AE Class was created to exhibit the idea that the blend of age and experience and the proportion of the blend is a stronger indicator of adoption rather than age or experience alone. For instance, when evaluating age independently, one might predict younger producers to be more likely to adopt a practice. However, when analyzing age and experience simultaneously, a younger producer with more experience may be less likely to adopt a particular practice than initially expected because he may be opposed to change or may already be aware of the practice but has chosen to not adopt it.

A large portion of respondents checked "I market my calves to sellers based on this practice" as one of the reasons they did not adopt a practice, which intuitively does not make sense. This response was initially intended for producers who do not use antibiotics (as part of a natural program), but it was evident that it was misunderstood. Using other information in the survey, some of the responses were altered for clarification If a producer checked this box for any of the practices and checked another

reason hindering adoption for the same practice, the response was not changed. If a producer marked this box, did not indicate any other reason for non-adoption of a particular practice, and responded in Table 5 of the survey that they did the practice, the response was changed from a 1 (a practice is not implemented) to a 0 (the practice is implemented), meaning the producer meant to say the practice is used. If a producer marked "I market my calves to sellers based on this practice," did not indicate any other reason for non-adoption, and did not respond to Table 5 indicating a practice was used, the response was deleted due to misunderstanding. After these changes were made, Proc Logistic was used in SAS to execute the binomial logit model where the lowest category for each independent variable served as the base. For instance, herd size 1 (1 to 49 cows) serves as the base.

Producers who did not implement one or more of the practices were then evaluated to determine the probability of the constraint categories hindering adoption. Four logit models based on Equation 1 were evaluated for each practice. The dependent variables were the four constraint categories: doubt returns/premiums, technical education, marketing education, and management, which are further described in Table 4 in the Appendix. Table 4 also lists two other constraint categories which were eliminated from this portion due to a low number of responses. The independent variables were the same as Equation 2. The probability of a non-adopting producer indicating a constraint category hinders adoption is 1, while the probability of a non-adopting producer stating a constraint category does not hinder adoption is 0. For example, if a non-castrating producer has a 25% probability of management hindering adoption, this means there is a

25% chance that a producer who does not castrate calves will state he/she did not adopt due to management related issues.

Because our logit models consist of binary dependent variables, use Maximum Likelihood Estimation (MLE), and do not try to minimize the sum of squares, the logistic regressions used here do not make any assumption of normality, linearity, and homogeneity of variance for the independent variables. Moreover, tests for multicollinearity were conducted in SAS using TOL (tolerance) and VIF (variance inflation factor) options after a PROC REG procedure with the same independent variables as above. The tests concluded that there is not a strong correlation between our independent variables in any of the logit models. A goodness-of-fit test was also evaluated using the Hosmer and Lemeshow statistic in each of the logit models. The HL statistic was not significant for all but four of the logit models, meaning one would fail to reject the associated null hypothesis in the non-significant models. In other words, the null hypothesis of a good model fit was accepted for all but four models. The four logit models that were significant and do not yield a good fit all occurred when analyzing reason categories for non-adopting producers and include marketing education for castration, marketing education for feed bunks, doubt returns/premiums for individual identification, and marketing education for COOL. These four models are noted at the bottom of each corresponding chart in the Appendix with the significant HL statistic below the practice.

Results: Descriptive Statistics

Table 1. Percentage of Non-Adopting Producers by Practice

Practice	Percent
Castrate	0.27
Dehorn	0.31
Wean	0.46
Respiratory Vaccinations	0.51
Deworm	0.28
Feed Bunks	0.35
Implant	0.57
No Antibiotics	0.40
Vaccination Records	0.44
Medical Records	0.45
Birth Date Records	0.29
Individual ID	0.50
Age & Source Verification	0.61
Country-of-Origin Labeling	0.63

The survey yielded a response rate of 1,299 producers who indicated they did not implement one or more of the fourteen value-added management and marketing practices listed. The table above and Chart 1 in the Appendix show the frequency of non-adopting producers by practice and answer the first objective. Country-of-Origin-Labeling was the most frequently non-adopted practice, as is shown in the table above and was expected due its short period of existence and recent findings that producers will have little involvement with the process of COOL. Age and source verification with a 61% non-adoption rate was the second most non-adopted practice, which is also justified by its recent introduction. The significant number of producers who do not implant or give respiratory vaccinations is surprising due to the potential high returns and importance of these practices (Cleere and Boleman, 2006). Implants had a non-adoption rate of 57% while respiratory vaccinations had a non-adoption rate of 51%. Moreover, the lack of record keeping was expected, as many producers may indicate they do not keep records

because they know what happens at their operation or do not keep formal records. It is surprising though that 27% of the respondents to this section of the survey said they do not castrate. The percentage of respondents continues to increase for other preconditioning practices as well, which have been in existence for a period of time. These frequencies of non-adopters indicate the need for educational programs for even the most basic value-added management and marketing practices.

The number of observations by practice and reasons hindering adoption are shown in Table 3 in the Appendix, and Table 2 lists the explicit reason for each corresponding constraint and constraint category. For example, six producers stated they did not castrate because they were "hesitant to ask for financing to pay for the upfront costs." Table 4 shows the number of producers by practice who do not adopt when individual reasons for non-adoption are aggregated into constraint categories. Table 4 is shown because the observations shown in Table 3 are not additive for the purpose of determining the number of producers in each constraint category. From these frequencies, the second objective can be answered, as it is evident that the two biggest constraint categories to producers are "doubt returns and premiums" and technical education. The category of doubt returns and premiums includes the reasons "other cattlemen tried it and it did not pay," "buyers don't pay any premium for it," "buyers don't pay enough premium to cover the cost," and "haven't done it in the past and have done okay." The reasons for non-adoption in the technical education category include "I am not familiar with this practice," "I am familiar with this practice but don't use it on my ranch," "don't really know what it requires or value it adds," and "thought about it but need help with specifics of how to implement it on my ranch."

Results: Frequencies of Demographic Variables

Producer demographics serve as the independent variables of the binary logit models used in this research, which are explained in Table 5 in the Appendix. The frequencies of these demographics across all practices are shown in Table 6 and Charts 2 through 10, and the frequencies of the demographics by practice are shown in Table 7. The results of these frequencies give one an insight on the respondents of this survey. A majority of respondents have fewer than 50 head of cattle, followed closely by producers who have between 50 and 99 head of cattle. This is similar to Vestal et al. (2007) who found 68% of commercial producers to own less than 100 head and to the 2007 Census of Agriculture which stated 86% of the cow-calf producers in Oklahoma have 100 head of cattle or less (USDA). However, a few producers have operations with 500 head of cattle or more. Region also plays a vital role in describing the respondents, as 64% percent of these producers live in the Southeast or Northeast regions of the state of Oklahoma, and the smallest percentage of respondents reside in the Northwest or Panhandle regions.

The aging of agricultural producers is a current concern in the agricultural industry. The age distribution of producers in this study clearly supports this concern, since approximately 40% of the respondents are 65 or older and roughly 40% of respondents are between the ages of 51 and 64, meaning a significant share of producers are near or at retirement. The age distribution of this research is similar to the 2007 Census of Agriculture which found approximately 48% of Oklahoma cow-calf producers to be over the age of 65 (USDA). Moreover, the high number of older producers corresponds with the results of the experience classes. Producers who stated they have over 25 years of experience comprise 68% of the respondents, and only 1% of

respondents claim to have less than 5 years of experience. Consequently, a large share of respondents fall in "AE Class 4" while very few fall in "AE Class 1."

Educational attainment has been shown to influence adoption rates in many former studies and plays a role in this research as well. The bulk of survey respondents have a high school education or less, which coincides with the fact that most producers are older and have more than 16 years of experience. Full-time agricultural production comprised a larger percentage of employment several decades ago (Dimitri, Effland, and Conklin), and thus, many producers began a career in farming and ranching after they finished high school or dropped out of school to start an agricultural vocation. Accordingly, fewer respondents have a vocational education, a Bachelor's degree, or a Graduate or Professional degree.

The means of the respondents' income levels shows 55% of producers have a household income of $30,000 to $59,000 or $60,000 to $89,999, and a significantly large portion of respondents stated farm income makes up less than 20% of their income while very few indicated farm income comprised more than 61% of their income. The percentage of farm income distribution in this research is also similar to Vestal et al. (2007) who discovered that 76% of cow-calf producers depended on cattle production for less than 40% of their household income. These results correspond with the notion that fewer people are involved with full-time agricultural and more producers consider their operation as a hobby. In fact, the United States Department of Agriculture Economic Research Service has shown off farm employment to increase from 54% of households in the United States in 1970 to 93% in 2002 (Dimitri, Effland, and Conklin). Furthermore,

respondents who have not had Master Cattlemen training or Beef Quality Assurance training far exceed those who have had training.

The frequencies of herd size by region, age by experience, household net income by percentage of farm income, and education by percentage of farm income are exhibited in Tables 8 through 11. These charts further exemplify the demographics of the responding producers, especially Table 9 which features age by experience or the AE Index. Table 9 illustrates the noteworthy contrast between those producers who are older and have more experience and the few producers who are younger and have less experience.

Results of Overall Logit Models

The initial probabilities of a producer not adopting the practices with all independent variables at their mean are shown in Table 12 in the Appendix. For instance, castration has the lowest initial probability which is .246, meaning any given Oklahoma beef producer is 25% likely to not castrate. When the practices are placed in ascending order of their probabilities in Table 12, Furthermore, the initial probabilities of the non-adopted practices conforms to the number of non-adopting producers by practice as shown in Chart 1. Thus, in both Chart 1 and Table 12 castration is the practice that is not implemented the least and is the least likely to not be adopted, while COOL is the practice not adopted the most often and is the most likely to not be adopted.

When assessing how producer demographics influence the non-adoption of these value-added marketing and management practices (third objective), the results from the first set of logit models show similar patterns of significance for comparable practices. These results are shown in Table 13 in the Appendix. Table 13 includes the parameter

estimates, the p-values, and the marginal change in probability of non-adoption of the practice for each characteristic compared to the base in that category of characteristics. For this study, the threshold of significance is considered to be a p-vale of 0.1 or smaller. These marginal effects provide an easy interpretation of the effect of demographics on non-adoption of a practice. For example, the marginal effect of herd size 2 on the probability of a producer not using castration is -0.041 meaning that the probability of not castrating is 4.1 percent less for producers with herds of 50-99 cows compared to herds of less than 50 cows (herd size 1). In general, for hands-on practices like castration, dehorning, weaning, accustoming calves to feed bunks, and individually identifying calves, herd size 3 (100-499 cows) has a significant influence on all but one of these practices (individual id) and reduces the probability of non-adoption by 9.8-11.8%. This outcome may be attributed to the idea that producers do not see "hands-on" practices being worthwhile for less than 100 head of cattle or for hobby-type producers, but a herd size of 500 head or more of cattle may not be feasible for these practices either, as more labor would be required. Region plays a role in reducing the probability of non-adoption in most of these "hands-on" practices except accustoming calves to feed bunks when compared to the base region (Southeast). The most outstanding regional effect occurs from Northwest region in castration which reduces the probability of non-adoption by almost 18%. Due to the traditional, commercial ranching operations, Northwest producers are less likely to not adopt dehorning and weaning than Northeast and Southwest producers. Moreover, the only AE class that has a significant effect in reducing non-adoption of these hands-on practices is AE class 4 on familiarizing calves to feed bunks. This result exhibits the idea that older and more experienced producers

precondition their calves with the next stage of production in mind. Similarly, a graduate or professional degree is the only education class that lowers the probability of non-adoption of accustoming calves to feed bunks and individually identifying cattle. Income has a significant effect in reducing the probability of non-adoption in castration and dehorning, but there is not always a higher reduction in the probability of non-adoption as a producer receives more income. Furthermore, for all of the "hands-on" practices, the probability of non-adoption is reduced by at least one of the farm income classes. Generally, as the percent of farm income increases, the likelihood of non-adoption decreases. Training reduces the probability of non-adoption for all of the "hands-on" practices, especially for weaning, accustoming calves to feed bunks, and individual identification which reduces the probability by 15%, 16%, and 22%, respectively.

Of the fourteen practices listed, respiratory vaccinations, deworming, and implanting can be considered health related practices. Having a herd of 100 to 499 cows reduces the probability of not adopting respiratory vaccinations and deworming by 12.6-14.7%. Again, this may be due to the notion that hobby type producers do not see it worthwhile to implement heath-related practices on fewer than 100 head or are not familiar these practices, and giving respiratory vaccinations, deworming, and implanting may not be feasible for 500 head or more of cattle. Producers who live in Southwest and Northwest regions are less likely to not-adopt deworming and implanting. When compared to AE class 1, AE class 3 and 4 reduce the possibility of non-adoption only for implanting. However, educational level plays an interesting and opposite role in these health related practices than expected. For respiratory vaccinations, producers with a vocational education or higher significantly increase the probability of non-adoption, and

producers with a vocational education or higher raise the likelihood of non-adoption of implanting as well. Hobby-type producers may also be influencing these results because they are likely more formally educated and thus have off farm income. Producers who obtain 21% or more of their income from the farm have a reduced chance of not adopting respiratory vaccinations and implanting from 10 to 25% but do not have a significant effect on deworming. Moreover, training decreases the probability of non-adoption for all health related practices, especially for respiratory vaccination which is reduced by approximately 23%.

Because using no antibiotics (for natural programs) has not existed for a long period of time and can be viewed as a marketing tool, the practice of not using antibiotics can be considered a niche sector in the beef industry. Producers in the Northeast and Southwest regions have a reduced probability of not implementing "no antibiotics" or natural beef along with AE class 3 and 4. Even though producers who fall into AE class 3 and 4 are older and often "set in their ways," these producers may realize the value of natural beef and its niche market. On the other hand, producers holding a Bachelor's degree or higher have an increased likelihood of not using "no antibiotics." It is noteworthy that training is not significant for this practice.

The models for record keeping, which consists of vaccination records, medical records, and birth date records, yield mixed results. Producers with 100 to 499 head of cows are less likely to not keep vaccination records or medical records, but having 100 to 499 head of cows does not significantly affect the probability of keeping birth date records. Moreover, a producer is 7% less likely to not keep birth date records when he falls into AE class 2 and is 9% less likely when falls into AE class 4. Producers of a

younger age and experience category may see the importance in keeping birth date records, while older producers with more experience may see the value in keeping birth date records as well. AE class 4 also decreases the likelihood of not keeping vaccination records. The probability of not keeping birth date records is also notably influenced by and increased by holding a Graduate or professional degree, meaning the most educated producers may not realize its value or have the time to document birth dates if earning off farm income consumes a majority of their time. Higher levels of household net farm income only decrease the likelihood of not adopting medical records, and training significantly diminishes the probability of not adopting all three of the record keeping practices.

For more recently introduced practices such as age and source verification and country-of-origin labeling mixed results were found. The probability of not adopting age and source verification is reduced by owning 100 to 499 head of cows, even though the likelihood of not adopting COOL is decreased when a producer owns between 50 and 499 head of cows. Perhaps having a herd size of 100 to 499 head is optimal for age and source verification as with many other practices. AE class 4 significantly diminishes the probability of not adopting both age and source verification and COOL. Moreover, producers holding a vocational education or higher affect both practices but increase the likelihood of non-adoption rather than reducing the likelihood. Because one might suspect that more formally educated producers would be well informed on current industry affairs, these results are contrary to intuitive conclusions. Again, these results coincide with the notion that educated producers are more concerned with off farm income and may be considered hobby farmers, meaning they are not always progressive.

Producers earning a net household income of $30,000 to $89,999 and $120,000 or more have an increased probability of non-adoption of age and source verification, and earning a household net income of $60,000 to $89,999 and $120,000 or more increases the likelihood of not participating in COOL. Furthermore, producers who receive 41% to 60% of their income from the farm have a reduced likelihood of not adopting age and source verification and COOL. Training, however, reduces the likelihood of not adopting age and source verification by 17.3% and of not participating in COOL by 18.6%.

When analyzing the impacts of producer demographics on these practices, it is notable that training is significant for all practices except for no antibiotics, indicating extension efforts are effective. Owning 100 to 499 head significantly reduces the likelihood of non-adoption for ten of the fourteen practices. This result for this herd size may indicate implementing these practices is most advantageous for 100 to 499 head of cattle. At least one farm income class diminishes the probability of non-adoption for ten of the practices and by as much as 25%. Education as a whole affects eight of the practices but increases the probability of non-adoption rather than decreasing the probability. Both Region and AE classes have an impact on reducing the likelihood of non-adoption for 7 practices. Additionally, income significantly reduces the probability of non-adoption for castration and dehorning but increases the probability of non-adoption for implants, age and source verification, and COOL.

Results of Reason Categories within Each Practice

After evaluating the effects of demographics on producers who did not implement the value-added management and marketing practices, an additional set of logit models were estimated to determine the effect of producer demographics on the probability that

various constraints were likely to be listed as reasons for non-adoption These model estimates are listed in Tables 14 through 27 and address the fourth objective. For producers who do not castrate, producers owning 50 to 499 head have lower likelihoods of listing technical education and management issues as constraints by 4.3% to 6.4%. In the Northwest region the likelihood of a producer who did not castrate decreases to list three of the four categories (doubt returns/premiums, technical education, and management) as a constraint, while the Southwest region decreases the probability of a non-castrating producer describing management as a limitation. AE class 4 is the only AE class to have a significant impact on technical education, and AE class 4 increases the likelihood of a non-castrating producer listing technical education as a constraint. Producers with a household net income of $60,000 to $119,999 have a reduced probability of a non-castrating producer stating doubt returns/premiums, technical education, or management as a deterrent to castration. Moreover, producers who do not castrate are less likely to state technical education as an obstacle when they receive 21% to 40%, 41% to 60%, and 61% to 100% of their income from the farm by 4.9%, 7.6%, and 10.5%. Training does not significantly influence any of the 4 constraint categories for non-castrating producers. Furthermore, 7 of the producer demographics in technical education significantly influence the probability of a producer stating technical education as a constraint to castration, while management has 6 significant producer demographics.

Another value-added management practice known to bring a premium is dehorning. Owning 100 to 499 head reduces the probability of a producer who does not dehorn listing management as a constraint. Additionally, owning 500 head or more significantly increases the probability of a non-dehorning producer to list marketing

education as a constraint by 28%. The probability of a producer listing marketing education or management as a constraint to dehorning is significantly reduced by producers in the Northwest region. It is also noteworthy that producers holding a vocational education will have an increased likelihood of stating management as an issue for dehorning. For producers who do not dehorn, the odds of them stating technical education as a restriction is diminished if they have a household net income of $60,000 or more and if they make 21% to 60% or their income from the farm. As with the producers who do not castrate, none of the constraint categories for producers who do not dehorn are influenced by training programs, and technical education and management had more significant demographics than doubt returns/premiums and marketing education.

The constraint categories entailed with weaning show more concise results than many of the other practices. Owning 50 to 99 head reduces the probability of a non-weaning producer stating management is an obstruction to weaning but increases the probability of the producer doubting the returns/premiums. For non-weaning producers, owning 100 to 499 head significantly reduces the likelihood of technical education being a constraint hindering weaning. Producers in the Northeast, Southwest, and Northwest regions have a diminished probability of a producer who does not wean his calves to say management is an issue, while producers in the Southwest and Northwest regions have a reduced likelihood of technical education being an obstacle to weaning. Producers who receive 21% to 40% and 41% to 60% of their income from the farm will have a 5.7% and 11.5% reduced likelihood of stating technical education as a constraint to weaning. Additionally, producers earning 61% to 100% of their income from the farm have a reduced chance of stating management as a constraint. Doubting returns/premiums and

technical education are 6.7% and 11.6% less likely to be limitations to weaning when producers have had training. Overall, technical education and management had the most number of significant demographics, and marketing education did not have any significant demographics.

The next value-added management and marketing practice that is often not implemented is giving respiratory vaccinations. It is noteworthy that none of the herd size classes influence the four constraint categories. The Northeast and Southwest regions both reduce the chance that a producer who does not give respiratory vaccinations will cite management factors as an issue by approximately 3.9%. Moreover, the odds of listing technical education as a hindrance to respiratory vaccinations are reduced by 6.9% if a producer lives in the Northwest. Holding a Bachelor's degree diminishes the likelihood of a producer stating marketing education is a constraint to giving respiratory vaccinations, while a producer holding a Bachelor's degree or higher has an increased likelihood of being obstructed by technical education. A producer is more probable to doubt returns/premiums when holding a Graduate or Profession degree and has a household net income of $30,000 to $89,999. On the other hand, producers are less likely to state technical education as an issue when they have a household net income of $60,000 or more. When a producer receives 21% to 60% of income from the farm, the probability of doubting returns/premiums and technical education being issues in giving respiratory vaccination is diminished. Furthermore, training decreases the odds of doubting returns/premiums, technical education, and management being constraints to administering respiratory vaccinations. Technical education had the most significant demographics, followed by the doubt returns/premiums constraint category.

The health protocol of preconditioning programs usually calls for calves to be dewormed. Producers who do not deworm their calves are less likely to state doubting returns/premiums, technical education, or management issues as constraints when they own between 100 and 499 head of cattle. Producers living in the Southwest region are less likely to state doubting returns/premiums or marketing education as constraints to adoption of deworming. Technical education is more probable to be an issue when producers are in AE class 4 or hold a vocational education. Additionally, there are greater odds of doubting returns/premiums being a constraint in deworming when a producer has a Graduate or professional degree or has a household net income of $30,000 to $59,999. However, producers who have a household net income of $30,000 or more have a reduced chance of stating technical education as a limitation to deworming. Training was not found to be significant in any of the constraint categories in this practice. As with respiratory vaccinations, technical education and doubt returns/premiums had the highest number of significant demographics.

The constraint categories for the non-adoption of feed bunks show clear results. Herd size does not have any significant impact on any of the constraint categories. Producers in the Southwest region have an increased likelihood of saying they doubt the returns/premiums from using feed bunks. Producers holding a Graduate or professional degree have a higher probability of doubting returns/premiums and technical education being a constraint to accustoming calves to feed bunks. Having a household net income of $60,000 to $89,999 reduces the probability of producers stating technical education is a constraint. Technical education is also diminished by producers earning $90,000 or more for their household net income, earning 21% or more of their income from the farm,

and who have had training. For this practice, technical education has the most significant producer demographics, while management does not have any significant demographics.

Like many of the preconditioning practices, implanting calves is still frequently not adopted. Owning 500 head or more increases the probability by 15% of non-adopting producers to say marketing education is a constraint when producers do not implant. Southwest producers have diminished odds of technical education and management issues inhibiting implanting, and producers in the Northwest region have a reduced chance of doubting returns/premiums and marketing education to be obstacles. The chances of technical education being a restraint to implanting is lessened by 8.6% for AE class 3, while AE class 4 reduces the odds of marketing education hindering implanting by 3.2%. Producers holding a Bachelor's degree have an increased probability of management concerns restricting producers from implanting and are the only significant education class for the four constraint categories. A producer is more prone doubt returns/premiums when in a household net income of $60,000 to $89,999. Furthermore, having a percentage of farm income of 21% to 40% diminishes the likelihood that doubting returns/premiums, technical education, or management issues will hinder implanting, while having a percentage of farm income of 41% to 60% and 60% or more lowers the probability of technical education and management matters deterring producers from implanting by 5.3% to 19.6%. Producers who have had training will be 10% less likely to state technical education as a limitation but will be 4.25% more likely to say marketing education is a constraint. As with many other practices, technical education and management are more significantly influenced by producer demographics.

The practice of using no antibiotics in livestock production had been introduced more recently than most of the other value-added management and marketing practices and is considered to be a niche market. A producer who does not use any antibiotics in production is less probable to state doubting returns/premiums or technical education problems as constraints when residing in the Northeast region. AE classes 2 through 4 decrease the probability of marketing education hindering the adoption of "no antibiotics," and AE class 4 will lessen the likelihood that technical education will be an obstruction to implementing "no antibiotics." Moreover, producers holding a Graduate or professional degree are 4.4% more likely to state they doubt returns/premiums and will be 7.6% more prone to say technical education is an impediment to adopting the practice of using no antibiotics. Earning a household net income of $30,000 to $89,000 and $12,000 or more diminishes the chance that management constraints will play a role in non-adoption of "no antibiotics," while earning a household net income of $90,000 to $119,999 increases the odds that producers who do not use no antibiotics will doubt returns/premiums. Additionally, producers earning 21% to 40% and 61% or more of their income from the farm have an increased possibility of management issues hindering adoption of "no antibiotics," and producers earning 61% or more of their income from the farm have increased odds of doubting returns/premiums as well. Training does not significantly influence any of the constraint categories for this practice. Furthermore, management has the most statistically significant demographics followed by doubt returns/premiums.

Keeping vaccination records is another practice producers may not deem important or valuable. Producers who do not keep vaccination records are 3% and 4.8%

less probable to say management is a constraint when they own 50 to 499 head. Producers in the Northeast and Southwest regions have lower probabilities that technical education will hinder adoption of this practice, and both AE classes 2 and 4 diminish the likelihood of marketing education deterring the adoption of vaccination records by approximately 5.6%. Producers who hold a Graduate or professional degree are 5.9% more likely to state they doubt returns/premiums of keeping vaccination records. Moreover, the probability that technical education will be a constraint to producers who do not keep vaccination records is less when producers earn a household net income of $60,000 or more. Training decreases the chance of doubting returns/premiums and technical education to hinder this practice. As with many other practices technical education has the largest number of statistically significant producer demographics.

A management and marketing practice that is not always carried out is keeping medical records. The likelihood that management issues will constrain the implementation of keeping medical records is reduced by 3.8% and 5.4% for producers own 50 to 99 head. Producers in the Northeast region have a decreased chance of stating doubt returns/premiums, technical education, or management issues are constraints while producers in the Southwest region also have reduced probability of stating they have technical education issues. AE classes 2 through 4 diminish the odds of marketing education limiting a producer in keeping medical records. The likelihood of marketing education being an obstruction to adoption is also reduced by producers earning a household net income of $30,000 to $59,999 and receiving 41% to 60% of their income from the farm. However, producers earning a household net income of $120,000 or more have an increased probability of management issues hindering a producer from keeping

medical records. Training reduces the likelihood of "doubt returns/premiums" and technical education hindering adoption of medical records by 8.4% and 14.4%. For the practice of keeping medical records, marketing education had the most number of significant producer demographics.

Birth date records are another set of documentation that is often not implemented. A producer who owns 50 to 99 head has diminished odds of management issues hindering this practice, as keeping birth date records are easier to observe and confirm for a smaller herd size. Producers in the Northeast region are less probable to state management issues as an obstruction, while producers in the Southwest region are less prone to be hindered by marketing education. AE classes 2 through 4 diminish the chance that marketing education will deter adoption of keeping birth date records by as much as 11.4%. Moreover, producers holding a Graduate or professional degree have an increased probability of stating they doubt returns/premiums. The likelihood that technical education will impede adoption is lessened by producers obtaining a household net income of $30,000 or more. Training decreases the odds of "doubt returns/premiums" and management hindering adoption of keeping birthday records by approximately 5%. The most number of significant demographics were in marketing education followed by technical education.

Individually identifying calves is another practice that is frequently not adopted. Producers in the Northeast region have a decreased probability of not adopting due to technical education. Producers in the Southwest region have a reduced probability of being hindered by technical education and management issues while technical education is also less of an obstruction when producers live in the Northwest region. AE classes 2

through 4 diminish the chance that marketing education will hinder adoption of individual identification. When 21% to 60% of income is earned via the farm, a producer has a decreased chance of marketing education constraining adoption, and producers earning 21% to 40% and 61% or more of their income from the farm have an increased chance of management issues restricting implementation. The odds of technical education and management issues constraining adoption are lessened by 19.3% and 5% when a producer has received training. For this practice, marketing education and management have the largest number of significant producer demographics.

One of the newest value-added management and marketing practices this survey has evaluated is age and source verification. Producers owning 50 to 99 head have an increased probability of marketing education being a constraint, whereas producers owning 100 to 499 head are less likely to have management issues. The chances of "doubt returns/premiums" and management issues hindering the adoption of age and source verification are diminished when producers reside in the Northeast region. AE class 4 decreases the chances of technical education being an impediment by 13.4%. Producers holding a vocational education or a Graduate or professional degree have increased odds of stating "doubts returns/premiums" as a reason hindering adoption for this practice. None of the income classes are significant for the four constraint categories, but producers earning 61% or more of their income from the farm have decreased odds of stating they doubt returns/premiums and have management issues by 18.5% and 9%. Training diminishes the likelihood that technical education will be a limitation but increases the probability that marketing education will serve as an obstruction. The

constraint category of doubt returns/premiums has the most significant number of variables for age and source verification.

Country-of-Origin-Labeling (COOL) has been a recent development in the past several years in response to several outbreaks of bovine spongiform encephalopathy (BSE). Producers who have not implemented COOL on their ranches are 6.8% less likely to state management is a concern when they own 100 to 499 head of cattle. Producers in the Northeast region also have a reduced probability of management issues obstructing the adoption of COOL. Technical education is less likely to be an impediment to adoption when producers are in AE class 4. Furthermore, producers have an increased likelihood of stating the doubt returns/premiums when they hold a Bachelor's degree or higher and a greater probability of listing technical education as a constraint when they hold a Bachelor's degree. There is also an increased chance of technical education hindering adoption of COOL when producers earn a household net income of $60,000 to $89,999. Moreover, producers earning more than 61% of their income from the farm have increased odds of "doubting returns/premiums" and management issues being constraints to the implementation of COOL. Training reduces the probability that a producer will be hindered by technical education by 16.9%. As with many other practices, technical education has more significant producer demographics than the other three constraint categories.

Conclusion

The distribution of the demographic variables gives one a good idea of the type of respondents and producers in Oklahoma. Most producers have fewer than 99 cows, are at least 51 years of age, have 16 or more years of experience, have 20% or less of their

income come from the farm, and have not had training. Thus, many of producers are older and are at or near retirement age, meaning they may not want to adopt practices because they will be retiring soon, and the older producers may be downsizing as well. Furthermore, the large percentage of small herd sizes and large percentage of producers who earn less than 20% of their income from the farm indicates most producers are now hobby-type producers. This likely contributes to the large portion of producers who have not had Master Cattleman or Beef Quality Assurance training, as training for beef production would not be as important when beef production does not comprise the majority of a producer's income.

Moreover, the results of the first objective indicate castration is not adopted the least, (conversely castration was adopted more often) with 27% of respondents reporting they still do not castrate calves. Thus, many of the preconditioning practices that have existed for quite some time are still not being adopted. The results of the second objective show technical education hindered adoption the most followed by "doubt returns/premiums." Therefore, most producers are unfamiliar with a practice, do not know how to implement the practice, do not believe the practice yields a premium, or do not think the practice is worth their time and effort. Additionally, it was discovered that finance did not obstruct very many producers from adoption.

The initial probabilities of non-adopted practices in Table 12 corresponded with the frequencies of the practices not adopted in Table 2. For instance, as a whole Oklahoma beef producers are 25% likely to not adopt castration, 29% likely to not adopt dehorning, 45% likely to not adopt weaning, 50% likely to not give respiratory vaccinations, and 57% likely to not adopt implants to name a few.

When determining which producer demographics significantly affect the non-adopted practices, herd size 3 reduces the probability of non-adoption in ten of the fourteen practices, meaning owning 100 to 499 head positively influences for adoption. Region also plays a role in determining who adopts some of the hands-on practices such as castrating, dehorning, weaning, deworming, and implanting. Furthermore, the practices just mentioned are usually less likely to not be adopted when producers are in the Southwest or Northwest regions of Oklahoma. The AE classes that were created are a new contributing initiative, and the AE classes show how the combination of age and experience influences and reduces the likelihood of non-adoption of practices that can be considered beyond the basic preconditioning practices like implanting, using no antibiotics, keeping vaccination and birthday records, implementing age and source verification, and participating in COOL. Thus, as producers become older and have more experience, they are more likely to adopt supplemental value-added management and marketing practices. At least one of the education classes is significant in eight of the fourteen practices. However, education is shown to increase the probability of non-adoption rather than decreasing it. Moreover, a producer with a higher education level is more likely to have a job off of the farm, have a smaller percentage of income from the farm, and have less concern for beef production, which is demonstrated by the frequency of education by percentage of farm income in Table 11 in the Appendix. As mentioned earlier, higher levels of household income reduces the likelihood of non-adoption of castration and dehorning, but income increases the probability of non-adoption for implants, age and source verification, and COOL. Perhaps the practices that have a heightened likelihood of non-adoption based on income stems from the notion that

producers are less concerned with added-value when they reach a higher income level. At least one of the percentage of farm income classes is statistically significant in ten of the fourteen practices, and generally speaking, the probability of non-adoption decreases as the percentage of farm income increases. This is to be expected, as higher dependence on the income from cattle production increases the likelihood of a producer being progressive and adopting practices that add value. Furthermore, training was significant in all of the practices except using no antibiotics, signifying the effectiveness of extension efforts.

The second set of logit models identifies the producer demographics that statistically influence reasons hindering implementation for non-adopting producers. It should be noted that the results are more obscure than the results from the first set of logit models. These results show the most frequent determinant of producers who doubt returns/premiums is education class 4, which increases the likelihood that non-adopting producers will doubt returns/premiums. Thus, when a producer has a graduate or professional degree, he or she is more likely to be uncertain about the financial return of these practices. Moreover, a producer who states technical education as an obstruction is most identifiable by training status, income, and percent of farm income. The most frequent significant class of demographics in determining marketing education constraints are the AE classes. Additionally, producers who are more likely to cite management as an obstruction to implementation are most easily identifiable by their herd size, region, and percentage of farm income.

Overall, these results show Oklahoma beef producers are older with more experience and/or receive a majority of their income off of the farm, meaning being a

progressive producer is not always a priority. Smaller herd sizes are also the norm, indicating many producers raise cattle as a hobby or to maintain an agricultural lifestyle. While the training that producers have received is effective, future extension efforts will mostly be needed to educate producers on how to implement practices and the value of the practices. However, this could prove difficult as older producers are unlikely to be willing to adopt practices, and a majority of producers maintain small herd sizes, which supports the fact that a majority of producers have a job off of the farm. Therefore, small producers may not care to adopt practices for their "hobby" and may not think the practices are worth their time, effort, and investment.

CHAPTER III

DETERMINING VALUE DIFFERENCES FOR STEERS AND HEIFERS

Problem Statement

Numerous studies have illustrated the importance of implementing preconditioning practices on calves and have proven the existence of premiums from preconditioning (Avent, Ward, Lalman, 2004; Bulut and Lawrence, 2007; Crawford, 2008; Dhuyvetter, 2004; Dhuyvetter, Bryant, and Blasi, 2005; King et al., 2006; Lalman and Smith, 2001; Turner et al., 1992; Ward and Lalman, 2003; Ward, Ratcliff, and Lalman, 2003; Zimmerman, 2010). Furthermore, preconditioning programs can earn income for beef cattle producers but not because of the added premium value alone. Multiple factors add to the increased income from preconditioning, such as marketing heavier calves, marketing when the seasonal price is increasing, selling steers instead of bulls, selling dehorned calves rather than horned calves, and marketing larger, more uniform, and healthier lots of calves (Ward and Lalman, 2003).

However, when marketing preconditioned cattle, inefficiencies have been proven to exist in auction markets. This is due to the fact that all sellers have incentives to claim

their cattle as high quality when in fact not all cattle are, as beneficial traits like weaning and vaccination are unobservable. Consequently, buyers tend to only pay average market prices due to their hesitation of the quality of cattle they will be receiving (Bulut and Lawrence, 2006; Chymis et al., 2007; Schroeder and Kovanda, 2003). Thus, third-party certification for feeder cattle came into existence in order for sellers to verify the quality of their cattle to buyers via a third, independent party.

The Oklahoma Quality Beef Network (OQBN) is one such program in Oklahoma that was developed by the Departments of Animal Science and Agricultural Economics at Oklahoma State University, Oklahoma Cooperative Extension Service, and Oklahoma Cattleman's Association (Bulut and Lawrence, 2006; Ward and Lalman, 2003; Ward, Ratcliff, and Lalman, 2003; Williams et al., 2012). Moreover, certification has been proven to bring a premium (Bulut and Lawrence, 2007; Dhuyvetter, 2004; King et al., 2006; Schumacher, Schroeder, and Tonsor, 2012; Ward, Ratcliff, and Lalman, 2003, Zimmerman et al., 2012). Additionally, steers have been shown to fetch a higher price than heifers, and price per cwt for both heifers and steers decreases at an increasing rate as weight increases with the price for steers declining at a faster rate than heifers. However, when determining the market price of steers and heifers, earlier research accounts for feeder calf prices according to gender and weight with adjustments for feeder calf traits such as frame, fill, and uniformity. The premium or discount that is applied to a predicted price for a specific trait is applied to both heifers and steers. Consequently, it is unknown whether preconditioning premiums differ for feeder calf traits between heifers and steers. Zimmerman et al. (2012) is the only study to date that has evaluated steers and heifers separately. However, the data used in the work of

Zimmerman et al. (2012) was from Superior Livestock Auction which caters more toward special order buyers and sellers and not from local auction barns where it more likely for buyers and sellers to be representative of the region, as is the case in this research.

Objectives

The primary objective of this research is to determine the premium/discount of specific OQBN feeder cattle characteristics and whether that premium differs for heifers and steers.

Literature Review

Third-party certification programs exist for sellers to verify to buyers that their information is reliable and that calves are preconditioned according to a certain protocol. Third-party certification offers the possibility of reducing asymmetric information in the market, but for it to be successful, buyers must believe that the information is factual and believe in the reliability of the certification program (Bulut and Lawrence, 2007). As preconditioning programs gain a higher reputation, premiums for preconditioned calves will likely increase and move toward the full value of preconditioning (Dhuyvetter, 2004). Nyamusika et al. (1994) and Chymis et al. (2007) claim that a third party certification program provided at low-cost could increase the efficiency in the cattle market by allowing the high-quality calves to be separated from the low-quality calves. Moreover, appropriate economic signals such as premiums and discounts must exist to guarantee that management plans that are advantageous to the beef industry and its consumers are utilized (Dhuyvetter, 2004).

Third party certification does not exist just in livestock markets but exists in the global food system as well. Globalization of the food system and multiple other reasons related to retailers and consumers have caused third-party certifiers to become beneficial in ensuring food guidelines and safety. Third-party certifiers are attractive in that they are independent and unbiased, causing them to be seen as more trustworthy than first or second-party certifiers, and third-party certifiers monitor and ensure more than just food safety in the food system. They also evaluate the processes of the entire company, such as manufacturing and employment procedures to name a few. While third-party certification executes private regulations, retailers have used third-party certification to achieve participation in new markets as well as niche markets, to ensure customers of the food merit and safety, to minimize their own risk, to minimize transaction expenditures, and to be competitive in the niche markets they enter. As the value of third-party certification has grown among retailers, retailers have begun to use their substantial market power to demand that their suppliers use third party certification, securing many advantages for retailers (Hatanaka, Bain, and Busch, 2005).

Suppliers who are third-party certified can also foresee economic and other incentives. For instance, suppliers will then be able to enter niche markets and secure their position in the food system. Producers who operate on a larger scale will be better able to implement any changes necessary to become third-party certified. However, producers who are smaller than "large" may find it difficult to finance changes in their operation, which could have negative results. Nonetheless, third-party certifiers can aid suppliers in improving their product quality and cutting costs. Suppliers will then have the benefit of accessing more markets, executing traceability methods, and guaranteeing

payment from buyers (Hatanaka, Bain, and Busch, 2005). Hatanaka, Bain, and Busch (2005) are quoted as saying, "As growing numbers of major retailers request certification, TPC (third party certification) may become less about gaining a competitive edge and more about simply remaining in the marketplace" (p. 361). This information provided by Hatanaka, Bain, and Busch (2005) is not only helpful to the use of third party certification by livestock markets but also provides insight on the current state of the rest of the food system.

Results from Bulut and Lawrence (2007) show that certified preconditioned calves that have been weaned for thirty days received a premium of $6.15/cwt, whereas uncertified preconditioned calves who had been weaned for thirty days received a premium of $3.40/cwt. The results of King et al. (2006) show that certified preconditioned calves who have been weaned for thirty-four days received a premium in the range of $0.99/cwt to $3.47/cwt and that the certified preconditioned calves who had been weaned for forty-five days received a premium in the range of $2.47/cwt to $7.91/cwt. Additionally, King et al. (2006) found that both the Vac-34 and Vac-45 protocols for certified preconditioning programs increased the market value of calves sold in all eleven years of their study. Furthermore, the Virginia Quality Assured certified preconditioning program discovered premiums ranging between $1.85 and $4.25 depending on the calves' sex and weight (Dhuyvetter, 2004), while calves certified in the Oklahoma Quality Beef Network have received a premium ranging from $2.32/cwt to $13.04/cwt (Ward, Ratcliff, and Lalman). The cost of participating in a third party certification program, which averages $1/cwt, is less than the difference of the premiums for certification and non-certification. By choosing to not certify calves through third

party certification programs, sellers would on average be worse off (Bulut and Lawrence, 2007). King et al. (2006) and Ward, Ratcliff, and Lalman found that premiums for certified preconditioned calves increased over time as did the quantity of calves in certification programs. Moreover, preconditioning programs are expected to be more highly valued when calf prices are high because producers have more incentive to decrease death loss (Bailey and Stenquist, 1996).

Prior research has also shown what can be expected from characteristics of cattle in the market. For instance, the research done by Kellom et al. 2008 showed that vaccinated calves received a premium of $14.81 per head and that weaned calves received a premium of $17.64 per head.

Prior research has shown gender to impact feeder cattle price differences. Producers who castrate their bull calves for preconditioning protocols and sell steers can expect to receive a higher price than selling bull calves (Avent, Ward, and Lalman, 2004). For instance, the results of Avent, Ward, and Lalman (2004) and Bulut and Lawrence (2007) showed that bull calves received a discount compared to steers. Additionally, steers and bulls receive a higher price than heifers (Bulut and Lawrence, 2007; King et al., 2006). The work of Kellom et al. (2008) on calves marketed though Superior Livestock video auctions show that 600 pound steers received $52.43 more per head than heifers. Leupp et al. (2008) found that steers that were sold in the fall received approximately $10/cwt more than heifers while steers sold in the spring received $8.40/cwt more than heifers. Moreover, the work of Lalman and Smith show that certified preconditioned calves sold in special sales received a premium of $4.24/cwt to $8.75/cwt if they were steers and $2.76/cwt to $8.63/cwt if they were heifers. Bulls

receive a lower price than steers because there are more management problems involved with bulls. Due to the hostile and sexual behavior of bulls when they are confined together (Adams and Adams, 1986).

Male calves gain weight faster and have a greater feed conversion rate than females of the same age and genetics (Dahmen and Bogart, 1952). Langemeier, Schroeder, and Mintert (1992) found that 86 to 87% of the variation in revenue from heifers and steers was due to differences in sales prices, feeder prices, feed conversions, and average daily gains. Research by Burris, Bogart, and Oliver (1953) showed that testosterone injections boosted the average daily and gain and feed efficiency of both heifers and steers that were tested. Testosterone injections also allowed calves to supply heavier wholesale cuts of beef (Burris, Bogart, and Oliver, 1953).

Feeder cattle prices are influenced by weight in that price per pound typically decreases at a decreasing rate as weight increases, causing price and weight to exhibit a negative, convex relationship (Avent, Ward, and Lalman, 2004; Buccola, 1980; Bulut and Lawrence, 2007; Barham and Troxel, 2007). Preconditioned calves typically weigh more than similar non-preconditioned calves and can be expected to receive a lower price per pound. However, producers can counterbalance this drawback by taking advantage of high prices in the seasonal price pattern (Avent, Ward, and Lalman, 2004; Dhuyvetter, 2004). Avent, Ward and Lalman (2004) found that heavier preconditioned calves received a lower price per pound but producers were able to sell more pounds. Dhuyvetter, Bryant, and Blasi, Pas (2005) also found that the added premium received for a calf being preconditioned outweighs the discount of selling a heavier weight calf.

Similarly, Buccola (1980) found that the break-even price for cattle buyers declines as purchase weight increases for both heifers and steers.

Preconditioned calves generally have better health, less anxiety, and more enduring immune systems than calves that have not been preconditioned. Thus, producers can anticipate a premium when their calves have been preconditioned due to the increased health status (Avent, Ward, and Lalman, 2004). This expectation has been proven in many research endeavors, including that of Avent, Ward, and Lalman (2004) who showed that unhealthy calves received a discount of $23.68/cwt.

The condition of calves is another variable that can affect the price of feeder cattle. Calves that are too thin will be discounted if the thinness is due to inadequate health or muscling. On the other hand, buyers may pay a premium for thin cattle if the cause is malnourishment because buyers can expect gains by enhancing the calves' level of nutrition (Avent, Ward, and Lalman, 2004; Bulut and Lawerence, 2007). Halfman, Lehmkuhler, and Cox (2009) found that calves noted as having average condition or below average condition were discounted. On the other hand, cattle that were noted as having excess condition or as being "fleshy" did not have a significant effect on prices (Halfman, Lehmkuhler, and Cox, 2009). Contradicting this information, Smith et al. (2000) found that calves appearing to be "fleshy" were discounted $1/cwt to $2/cwt when compared to cattle with an average condition.

Research by Halfman, Lehmkuhler, and Cox (2005) on factors affecting Wisconsin feeder calf prices showed black cattle to be the second most frequent hide behind Holsteins. However, black cattle sold for a better price than Holsteins, which were discounted approximately $14/cwt compared to black coated cattle. Additionally, this

study concluded that the information used is consistent with other sources in that a bulk of the beef feeder calves have black hide (Halfman, Lehmkuhler, and Cox, 2005). Hide color is important because it may impact a buyer's outlook of growth, performance, and carcass attribute, causing certain hide colors to be worth more (Smith et al., 2000).

Numerous studies have shown that premiums have been rewarded to producers with preconditioned calves sold at livestock auctions through special sales (King et al., 2006). Avent, Ward, and Lalman (2004) found that preconditioned calves sold at special sales received premiums between $1.94/cwt and $3.30/cwt. The work of Lalman and Smith in Lincoln County, Oklahoma, found that 400-500 pound steers sold in special preconditioned sales received a premium of $4.24/cwt to $8.75/cwt. Additionally, King and Seeger (2004) found that certified preconditioned calves that were sold in special sales received a premium of $5.33/cwt.

Results from Avent, Ward, and Lalman (2004) show that cattle buyers pay the premiums necessary to buy preconditioned calves. While the premiums paid are often not as large as expected, producers can obtain perceived premium values by building and maintaining a good reputation (Avent, Ward, and Lalman, 2004). Yeboha and Lawrence (2000) also address this matter by explaining that buyers' confidence in a particular preconditioning program and its reputation is displayed in the premiums they are willing to pay according to the quality of the cattle from the program.

Cattle buyers often look for sale lots that contain a certain number of head. By having a lot size that will fully fill a truckload, pen size, or pasture, shipping, production, and feeding efficiency are improved. As a result, cattle buyers pay premiums for larger sale lots. The results of Avent, Ward, and Lalman (2004) show that truckload sized lots

brought a higher price. Moreover, Leupp et al. (2008) found that the larger the lot size the higher the sale price for calves sold both in the spring and fall. Halfman, Lehmkuhler, and Cox (2009) found that larger lot sizes brought a higher price even though a majority of the lots in this study were smaller than lots in other markets. This is because smaller producers in the area support the supply and demand of smaller lots, causing higher prices to be supported for a few head over a single-head lot (Halfman, Lehmkuhler, and Cox, 2009).

Cattle buyers also look for uniformity when purchasing lots of cattle, and implementing preconditioning protocols is one way to meet this demand (Avent, Ward, and Lalman, 2004; Bulut and Lawrence, 2007). The results of Avent, Ward, and Lalman (2004) showed uniform lots did not collect a premium compared to non-uniform lots. However, this may be due to fact that characteristics of a sale lot that affect uniformity are already accounted for when evaluating prices (Avent, Ward, and Lalman, 2004).

Third party certification is also available to verify the age and source of livestock and has been used recently as a marketing plan by producers. Because age and source verification is another way to add value to livestock, Kellom et al. (2008) looked at the value obtained for calves sold on Superior Livestock video auctions based on their age and source verification. The results of this particular study showed that 600 pound calves received an added $6.15/cwt for being age and source verified.

According to Lalman and Smith, calves were discounted $3/cwt to $4/cwt if they were noted as being “full” as compared to cattle that were noted as having an average fill. Barham and Troxel (2007) found that cattle noted as gaunt and shrunk received a higher

selling price when compared to cattle sold with an average fill, and cattle that were noted as full and tanked received a lower price when compared to cattle with an average fill.

The research by King et al. (2006) showed that the frame score of calves did not have a significant impact on the sale price. However, Barham and Troxel (2007) found that large and medium-framed cattle received similar prices while small-framed cattle received approximately $23/cwt less.

Barham and Troxel (2007) researched the USDA muscle scoring system of 1 through 4 and found that scores with a lower value received a higher price.

Polled or dehorned cattle have been shown to receive a premium relative to horned cattle. Thus, producers who dehorn their calves as part of the preconditioning process will receive a higher market price than those who choose to leave their calves horned (Avent, Ward, and Lalman, 2004; Bulut and Lawrence, 2007).

Theory

Ladd and Martin (1976) provide the basic hedonic pricing model that has been used by the majority of the previous studies to explain the price of a product as a function of the characteristics (quality attributes) of the product. Thus, physical characteristics and management characteristics can be used to explain price differences in a cross-section of transactions. The model can be expanded to account for differences in time, place, and form. In the current model, the dependent variable is specified as the difference (basis) between the price of a given lot of cattle and a reference market for the particular week of the sale. This accounts for changes in underlying market conditions over several sales dates. A random effects component is included in the model in the various sale locations (Schumacher and Peel, 2012).

Methods and Procedures

Data was gathered from sixteen feeder cattle auctions at seven different locations during the fall of 2010 and from seven feeder cattle auctions at five different locations during the fall of 2011 in Oklahoma. The 2010 data was collected between October 27 and December 13, and the 2011 data was collected between October 11 and December 12. In 2010, there were 2,973 lots were recorded that represent 25,839 head of cattle, and 1,133 lots represented 8,157 head of cattle in 2011. OQBN data was collected at eight of the sixteen sales in 2010 and at all seven sales in 2011. Six of the sales in which OQBN data was collected in 2010 were held in alliance with regular feeder cattle sales, and the other two sales in which OQBN data was collected in 2010 were special OQBN certified cattle sales. Six of the seven sales in 2011 were regular sales which featured a special portion of certified cattle, and the other 2011 sale was a special OQBN. Overall, 833 lots and 7,332 head of OQBN cattle sold in 2010, and 465 lots containing 3,604 head of OQBN cattle sold in 2011. Of the 2010 lots, 1,545 head were steers and 1,304 head were heifers. The 2011 lots contained 2,182 steers and 1,422 heifers. Data collected on all lots contained the sale price of a specific lot along with information on physical characteristics, specific management attributes, and market influences. Physical characteristics include gender, number of head in a lot, average weight per calf, hide color, fleshiness, frame score, uniformity, health status, horned status, muscle score, and fill. Specific management attributes include a calf's vaccination, weaning, preconditioning certification, and age and source certification status. Market influences include sale location and a reference market price. The reference price used is a 750 pound (Medium and Large, #1) steer from the market in Oklahoma City, Oklahoma.

Moreover, only heifers and steers weighing between 300-799 pounds are evaluated for the purpose of this research (Williams, 2011).

To determine how the feeder cattle characteristics of each gender influenced the basis price, a PROC MIXED procedure was first used in SAS with separate continuous and class variables for each gender. All variables were run in one model with a basis price serving as the dependent variable. However, CONTRAST statements used to compare the specific categories within a class across gender variables for the same characteristic were unsuccessful, meaning one of the initial objectives could not be achieved. Thus, separate models for each gender were run in a PROC SYSLIN using the seemingly unrelated regression (SUR) option. The SUR option was chosen because data for both gender equations comes from the same data set, and the SUR option allows for the same independent variables in two equations to estimate different dependent variables. Correspondingly, both of the equations in this study contain an OQBN sale, barn, and year variable. Moreover, the SUR option improves the coefficients and estimates the standard errors by allowing for correlation errors in both models. The models used were as follows:

(1) $$HBasis_{it} = \alpha + \beta_1 HLnHead_{it} + \beta_2 HAvgWt_{it} + \beta_3 HAvgWt_{it}^2 + \beta_4 HVac_{it} + \beta_5 HWean_{it} + \beta_6 HCert_{it} + \beta_7 HRed_{it} + \beta_8 HHereford_{it} + \beta_9 HWhiteGrey_{it} + \beta_{10} HDairyLonghorn_{it} + \beta_{11} HBlackMixed_{it} + \beta_{12} HRedMixed_{it} + \beta_{13} HMixed_{it} + \beta_{14} HOther_{it} + \beta_{15} HBrahman_{it} + \beta_{16} HThin_{it} + \beta_{17} HFleshy_{it} + \beta_{18} HLarge_{it} + \beta_{19} HMediumLarge_{it} + \beta_{20} HUniform_{it} + \beta_{21} HHealthy_{it} + \beta_{22} HHorns_{it} + \beta_{23} HThick_{it} + \beta_{24} HMixed12_{it} + \beta_{25} HMixed23_{it} + \beta_{26} HLight_{it} + \beta_{27} HGaunt_{it} + \beta_{28} HFull_{it} + \beta_{29} HAgeSource_{it} + \beta_{30} HReputation_{it} + \beta_{31} OSale_{it} + \beta_{32} Barn2_{it} + \beta_{33} Barn3_{it} + \beta_{34} Barn4_{it} + \beta_{35} Barn5_{it} + \beta_{36} Barn6_{it} + \beta_{37} Barn7_{it} + Year_{it} + e_{it}$$

(2) $$SBasis_{it} = \alpha + \beta_1 SLnHead_{it} + \beta_2 SAvgWt_{it} + \beta_3 SAvgWt_{it}^2 + \beta_4 SVac_{it} + \beta_5 SWean_{it} + \beta_6 SCert_{it} + \beta_7 SRed_{it} + \beta_8 SHereford_{it} + \beta_9 SWhiteGrey_{it} + \beta_{10} SDairyLonghorn_{it} + \beta_{11} SBlackMixed_{it} + \beta_{12} SRedMixed_{it} + \beta_{13} SMixed_{it} + \beta_{14} SOther_{it} + \beta_{15} SBrahman_{it} + \beta_{16} SThin_{it} + \beta_{17} SFleshy_{it} + \beta_{18} SLarge_{it} + \beta_{19} SMediumLarge_{it} + \beta_{20} SUniform_{it} + \beta_{21} SHealthy_{it} + \beta_{22} SHorns_{it} + \beta_{23} SThick_{it} + \beta_{24} SMixed12_{it} + \beta_{25} SMixed23_{it} + \beta_{26} SLight_{it} + \beta_{27} SGaunt_{it} + \beta_{28} SFull_{it} + \beta_{29} SAgeSource_{it} + \beta_{30} SReputation_{it} + \beta_{31} OSale_{it} + \beta_{32} Barn2_{it} + \beta_{33} Barn3_{it} + \beta_{34} Barn4_{it} + \beta_{35} Barn5_{it} + \beta_{36} Barn6_{it} + \beta_{37} Barn7_{it} + Year_{it} + e_{it}$$

where i = 1,…, N denotes each sale lot transaction, t = 1,…,T_i denotes the sale date, HBasis is the basis for heifers, and SBasis is the basis for steers. Variables beginning

with a “H” denote a heifer, while variables beginning with a “S” denote a steer. The continuous variables used were the logarithm of the number of head in a lot, the average weight of a lot, and average weight squared, which was calculated in the SAS code and makes the estimated coefficient in linear terms. The remaining variables are dummy variables and account for a lot’s vaccination status, weaning status, certification status, color, Brahman influence, fleshiness, frame size, uniformity, health and horn status, muscling, fill, age and source status, reputation, Oklahoma Quality Beef Network (OQBN) sale, barn, and year. These dummy variables are further described in Table 28 along with which variables serve as the base. Moreover, OQBN sale, barn, and year are included in both of the models. The basis (dependent variable) for each lot and gender is the sale price of the lot minus the price of 750 pound, Medium and Large #1 steers at Oklahoma City, Oklahoma for the same week (USDA Agricultural Marketing Service Report KO_LS795). Furthermore, because of the addition of 2011 data, both the 2011 reference price and sale prices were deflated using the GDP implicit price deflator for the third quarter of 2010 and 2011 (Economic Report of the President). The equation used to calculate the deflated prices is as follows:

$$\text{Price}(2010) = \text{Price}(2011) * (\text{Index}(2010)/\text{Index}(2011)) \quad (3)$$

Results

The steer and heifer hedonic models were estimated using a SUR (seemingly unrelated regression analysis) and resulted in a weighted R-squared of 0.5632. Most of the coefficients have the expected sign and are statistically different from zero at the 0.05 level. Heteroskedasticity has not been tested for at this time, and correlation did not seem

to be an issue, as the OLS estimates used to find the SUR estimates were not very different. Summary statistics for steers and heifers are shown in Table 29, and the regression coefficients are shown in Table 30.

The average weight and average weight squared estimates for both steers and heifers are statistically significant. However, the average weight estimates for steers and heifers are positive in sign, while the average weight squared estimate is negative. These signs are contradictory to prior research where average weight in former studies has been negative and average weight squared is positive. For instance, Zimmerman et al. (2012) found weight to decrease at a decreasing weight with steer prices declining faster than heifers. However, this research has found weight to decline at an increasing rate with steer prices declining at a more rapid rate than heifers. The opposing signs for the weight variables are due to the fact that maximum price is achieved before the lowest weight included in this study, making the area of interest on the right hand side of the quadratic function.

The value of vaccination is \$2.80/cwt ($p=0.0004$) for steers and \$3.34/cwt ($p=<0.0001$) for heifers. Weaning is also shown to be significant for steers ($p=0.0064$) at \$1.97/cwt but does not make a significant impact on the basis price for heifers. Zimmerman et al. (2012) found similar weaning premiums in 2001 of \$2/cwt for both steers and heifers but found a higher premium of \$4.50/cwt from 2008 to 2010. The increased value of weaning premiums in Zimmerman's research is likely due to the more prominent existence of value-added marketing in recent times, causing a higher demand for weaned calves. The resulting coefficients do not show the explicit OQBN certification to be significant for either gender. However, it is important to note that the OQBN

certification coefficient is in addition to the weaning and vaccination premiums, and consequently, OQBN certification premiums, which encompass weaning and vaccination to become certified, in this research may not be significant due to the weaning and vaccination coefficients already capturing the value for weaned and certified calves.

The signs of the estimated coefficients for all hide colors of both genders are statistically significant and are as expected, as they are all discounted relative to black cattle. For instance, red steers are discounted $7.64/cwt (p= <0.0001) when compared to black steers, and red heifers are discounted $4.56/cwt (p= <0.0001). Steers are generally discounted more for hide color than heifers as described in the previous example except for white/grey hides and black mixed lots. The discount of $3.63/cwt (p= <0.0001) for white/grey hides for heifers is presumed to be due to the lack of maternal qualities of Charolais cattle, whereas the discount for white/grey steers is $2.54/cwt (p= 0.0112). Dairy/longhorn and black mixed are discounted more heavily than any other color. Dairy/longhorn lots are shown to be discounted $32.06/cwt (p= <0.0001) for steers and $21.57/cwt (p= <0.0001) for heifers, while black mixed lots of steers receive a $13.39/cwt (p= <0.0001) discount and heifers receive a discount of $14.21/cwt (p= <0.0001). The large discount for dairy/longhorn cattle can be attributed to their lack of efficiency and performance in the feed yard and handling issues entailed with longhorns. Moreover, steers receive a much larger discount for Hereford cattle of $13.03/cwt (p= <0.0001) than heifers who are discounted $4.33/cwt (p= 0.0002), likely indicating the desire for the maternal qualities of Herefords in the market place. These results are conclusive with former studies such as Zimmerman et al. (2012) who find that black calves receive the highest premium of any hide color. Similarly, Brahman heifers are

discounted $2.91/cwt (p= <0.0001)while Brahman steers are discounted $5.43/cwt (p= <0.0001), showing Brahman heifers are desired for their maternal attributes.

Thin calves are discounted $11.25/cwt (p= <0.001) for steers and $7.18/cwt (p= <0.001) for heifers. However, fleshy heifers are also discounted $1.16/cwt (p= 0.0022) when compared to cattle with an average fleshiness. These results concur with Halfman, Lehmkuhler, and Cox (2009) who found thin cattle to be discounted, while fleshy cattle did not make a significant impact on price. Moreover, large and medium/large frame sizes do not have a significant impact on the basis price for either gender.

Lots deemed as not uniform, un-healthy, or having horns are discounted. Non-uniform lots of steers are discounted by $5.99/cwt (p= 0.0297), while non-uniform lots of heifers are docked $13.86/cwt (p= <0.0001). These discounts are similar to those found by Zimmerman et al. (2012) who found lots that were uneven in weight were discounted by $1.67/cwt. Un-healthy lots in particular are deeply discounted, as un-healthy steer lots are docked $46.54/cwt (p= <0.0001) and un-healthy heifer lots are marked down by $41.34/cwt (p= <0.0001). Steer lots with horns are marked down by $5.21/cwt (p= <0.0001), and heifer lots with horns are docked $3.61/cwt (p= <0.0001). The larger discount for steers with horns than heifers suggests the distaste for horned steers in the feed yard, as management and handling issues would be of concern. These discounts for horns are similar to the $1/cwt discount for horns found by Zimmerman et al. (2012).

Heifers with thick muscling receive a premium of $2.83/cwt (p= <0.0001). However, mixed #2 and #3 lots reduce the basis price along with light muscled calves. Mixed #2 and #3 lots of steers are discounted $21.10/cwt (p= <0.0001). Light steers are discounted $23.30/cwt (p= <0.0001), while light heifers are discounted $14.53/cwt (p=

<0.0001). Again, steers are discounted much more in the muscling variables than for heifers. This is likely due to the importance of good muscling characteristics for steers when entering the feed yard. Moreover, the only "fill" variable that is significant is for full steers, which are discounted by $1.75/cwt (p= 0.0094).

Age and source verification does not make a significant impact on either gender, but reputation results in a discount of $1.14/cwt (p= 0.0303) for steers and $0.88/cwt (p= 0.0153) for heifers. In this research, reputation indicates lots where the seller was announced during the sale. Additionally, sale barns had mixed effects on steers and heifers, and 2011 heifers receive an added premium of $0.62/cwt (p= 0.0135) while steers are discounted by $0.75/cwt (p= 0.0643).

Conclusion

Steers receive much larger discounts for various traits than heifers. This is likely due to heifers being purchased for maternal qualities and the significance of steer characteristics for feed efficiency and carcass quality. For instance, Hereford heifers are discounted $4.33/cwt (p=0.0002) while Hereford steers are discounted $13.04/cwt (p= <0.0001). Moreover, Hereford females are known for their reproductive performance, mothering ability, and crossbreeding advantage. When a trait is not desired for maternal reasons, heifers receive a larger discount than steers. This is the case for white/grey hided cattle, as Charolais cattle are not known for their maternal ability and are often temperamental. It is also noteworthy that even though the data for this research comes from feeder cattle sales, it is unknown whether heifers are being purchased to go to the feed yard or to serve as replacement heifers, whereas it is known that steers are going to the feed yard. Consequently, the use of heifers in two market alleys likely influences the

discovered coefficients. Moreover, the combination of premiums for vaccination and weaning is larger for steers than for heifers. Uniform, healthy lots with no horns are clearly desired in the market place, as with previous research, and lighter muscled cattle are discounted for both genders, indicating the desire for feeder cattle to have feed efficiency, a higher carcass weight, and greater carcass quality (Ward, Ratcliff, and Lalman, AGEC-602). Certification for both genders was found to be insignificant, which may be due to the fact that this variable is explicitly for certification and vaccination and weaning variables are also in the models. Additionally, this can be contribute to the fact that certified cattle are vaccinated and weaned, but cattle that are not certified are not always vaccinated and weaned. While further research is necessary to compare whether or not the premium/discount for a particular variable is statistically the same for both genders, this research serves as a contribution in the form of representing local auction barn buyers and sellers specifically in the state of Oklahoma.

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APPENDICES

Document 1: Introductory Survey Letter

Division of Agricultural Sciences and Natural Resources

Department of Agricultural Economics
515 Agricultural Economics
Stillwater, Oklahoma 74078-6034
405-744-6083
Fax: 405-744-9835

Dear Oklahoma Beef Producer,

OSU Agricultural Economists and Animal Scientists are cooperating with the Oklahoma Field Office of the National Agricultural Statistics Service to conduct a Beef Management and Marketing survey. We are asking your participation in this research survey because of your involvement in the Oklahoma cattle industry. Your candid answers to the following questions will help us to better understand issues related to management and marketing practices in the Oklahoma beef industry. The primary goal of the survey is to gather information that helps us develop targeted educational programming that better serves your needs as Oklahoma beef producers.

We know that your time is valuable but know that your input into this survey will be valuable to us. You are not expected to provide exact numbers from your operation's records. Your best estimates are acceptable. We estimate that the survey will take less than 20 minutes of your time, based on feedback from producers who tested the survey for us. Once completed, please use the enclosed postage paid Business Reply envelope for returning your completed survey questionnaire. Your mailing identification has been kept separate from your individual questionnaire to protect your confidentiality and survey response.

If you have questions concerning survey content, please contact Kellie Raper, 514 Ag Hall, Stillwater, OK 74078, 405-744-9819 or Kellie.Raper@okstate.edu. If you have questions about your rights as a research volunteer, you may contact Dr. Shelia Kennison, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405-744-1676 or irb@okstate.edu. Details regarding your consent to participate and accessibility of data are listed below.

Thank you for your time in completing the survey, and in helping us better serve you!

Sincerely,

Kellie Raper

Kellie Curry Raper
Extension Economist

Consent and Accessibility of Survey Results:

Your completed and returned survey serves as your consent to participate in this research endeavor and your permission for us to use your response. There are no known risks associated with this project which are greater than those ordinarily expected in daily life. Individual responses are kept confidential. Only totals, averages and other statistical measures will be published. Data storage will be on a secured OSU computer network server. Summary results of the survey will be published as an Oklahoma Cooperative Extension Service Factsheet at the completion of the study and will be available free of charge on http://www.beefextension.com.

Document 2: 2009 Beef Management and Marketing Survey

Confidential xxxxxxxxx

Beef Management and Marketing Survey

Please answer the following questions as completely as possible. Your best estimates are acceptable. You are <u>not</u> expected to provide exact numbers from ranch records.

1. How many beef cows do you currently own?
☐ 1 to 24 ☐ 25 to 49 ☐ 50 to 99 ☐ 100 to 249 ☐ 250 to 499 ☐ 500 to 999 ☐ 1000 +

2. In which region of the state is your cattle operation? (As defined by Interstate 40 and Interstate 35)
☐ Panhandle ☐ Northwest ☐ Southwest ☐ Northeast ☐ Southeast

3. What are the *predominant* breeds used in your operation? *(Crossbred example: Angus X Hereford)*

	Purebreds:	*Crossbreds:*		
Sires			X	
			X	
			X	
Cows			X	
			X	
			X	

4. What do you consider to be the primary nature of your beef business?
☐ Sale of commercial calves ☐ Purebred seedstock ☐ Youth show animals
☐ Other *(Please describe)*: _____

Current Management and Marketing Practices

1. Indicate what percentage of your herd's calves are born for each month. ***(Total should add to 100 percent)***

Month	Percent	Month	Percent	Month	Percent
January	%	May	%	September	%
February	%	June	%	October	%
March	%	July	%	November	%
April	%	August	%	December	%

2. Indicate what percentage of your calves are vaccinated for respiratory diseases (IBR, BVD, etc.) at the specified times:

Timing of Vaccination	Percent Vaccinated
1 to 3 months	
1 month before weaning	
At weaning	
Booster given at weaning	

3. Enter an estimate for the percentage of your calves marketed for the following categories for each year specified.

Percentage of Calves Sold	2003	2008	2013 (Expected)
Marketed at weaning	%	%	%
Marketed at least 30 days post-weaning	%	%	%
Retained and marketed after my own stocker program	%	%	%
Retained and marketed after someone else's custom stocker program	%	%	%
Retained and marketed after a custom feedlot program	%	%	%
Other: *(Please describe.)*	%	%	%
TOTAL	100%	100%	100%

***Column totals should add to 100 percent**

Document 2: Continued

Confidential ***Confidential***

Enter an estimate for the percentage of your calves marketed for the following categories for the years specified. *(Continued)*

Percentage of Calves Sold	2003	2008	2013 (Expected)
Through regular *Local* livestock market sales	%	%	%
Through special *Local* livestock market sales (preconditioned, breeding sales, etc.)	%	%	%
Through regular *Regional* livestock market sales	%	%	%
Through special *Regional* livestock market sales (preconditioned, breeding sales, etc.)	%	%	%
Through Oklahoma National Stockyards regular sales	%	%	%
Through video, satellite or internet auction	%	%	%
Directly from ranch to stocker	%	%	%
Directly from ranch to feedlot	%	%	%
Other: *(Please describe)*	%	%	%
TOTAL	100%	100%	100%

Percentage of Calves Sold	2003	2008	2013 (Expected)
Less than 50 miles from the ranch	%	%	%
Within 51 to 100 miles from the ranch	%	%	%
More than 100 miles from the ranch	%	%	%
TOTAL	100%	100%	100%

*****Column totals should add to 100 percent*****

4. For the Management and Marketing practices you ***DO NOT*** use in your cattle operation, please tell us why. **(*Check all that apply*)**

	Castrate bull calves to be sold as steers.	Dehorn calves.	Calves weaned 45 days before marketing.	Two rounds of respiratory vaccinations.	Get calves used to feed bunks.	Deworm calves.	Implant calves.	Use NO antibiotics.	Keep records of vaccinations.	Keep records of medical treatments.	Keep records of calf birthdates.	Individually ID calves.	Age and Source Verification.	Labeling (COOL).	Documentation for Country of Origin
I am not familiar with this practice.															
I am familiar with this practice but don't use it on my ranch.															
I use this practice, but don't know how to use it in marketing my cattle.															
I market my calves to sellers based on this practice.															
Haven't done it in the past and have done okay.															
Don't really know what it requires or value it adds.															
Thought about it but need help with specifics of how to implement it on my ranch.															
Hesitant to ask for financing to pay for the upfront costs.															
My lender says no to financing th upfront costs.															
Other cattlemen tried it and it did not pay.															
Requires too much labor.															
Didn't have enough calves to mess with it.															
Buyers don't pay any premim for it.															
Buyers don't pay enough premium to cover the cost.															
Don't want to commit to selling calves through a specific company or group.															
My buyers do it themselves once they have the cattle.															
Don't know were/how to market these cattle.															

Document 2: Continued

Confidential ***Confidential***

5. For the Management and marketing practices you ***DO*** use in your cattle operation, please tell us why. ***(Check all that apply)***

	Castrate bull calves to be sold as steers.	Dehorn calves.	Calves weaned 45 days before marketing.	Two rounds of respiratory vaccinations.	Dewormed calves.	Get calves used to feed bunks.	Implant calves.	Use NO antibiotics.	Keep records of vaccinations.	Keep records of medical treatments.	Keep records of calf birthdates.	Individually ID calves.	Age and Source Verification.	Labeling (COOL).	Documentation for Country of Origin
Increases weight gain while on the ranch.															
Lessens incidence of illnesses or injury in my calves.															
Buyers are willing to pay a premium.															
Improves my reputation with buyers.															
Increases performance at stocker/feedlot level.															
Increases quality of beef at consumer level.															
Other:															
Information provided to buyer at marketing:															
Management practices announced by auctioneer at livestock market. No third party certification.															
Management practices announced by auctioneer at livestock market. Signed affidavit required.															
Management practices announced by auctioneer at livestock market. Third party verification required.															
Had to meet pre-sale requirements for special sale.															
Participant in Quality System Assessment (QSA) or Process Verified (PVP) Program. *(See example below.)*															

Examples of some programs active in Oklahoma:
ABS Global, AgInfo Link, Angus Source, AzTx Cattle, Champion Innovations, IMI Global, Maverick Ranch, Micro Beef Technologies, Morgan-Davis International, Power Genetics, Red Angus, Samson, Sterling Solutions, Texas Cattle Feeders Association.

6. Complete the following table:

Percentage of your calves participating in:	2003	2008	2013 (Expected)
A marketing program through an animal health company, breed association, USDA PVP or an umbrella program. *(See examples below.)*	%	%	%
If you are comfortable sharing the specific program, please list the program here or circle those below that apply:			

Examples of some programs active in Oklahoma:
ABS Global, AgInfo Link, Angus Source, AzTx Cattle, Brangus Gold Star, Champion Innovations, Global Management, Hereford Verified, IMI Global, Laura's Lean, Merial SureHealth, Micro Beef Technologies, Oklahoma Quality Beef Network, Pfizer Animal Health, Power Genetics, Red Angus, Samson, Simmental.

7. If you regularly use some of these marketing and management practices listed above, but do not market your calves through a special program, please tell us why by ranking your *top 3 reasons* of those given below.

Reason	Rank Top 3
Don't know where/how to find programs or sales that market value-added cattle	
Reduces flexibility in marketing my cattle.	
Don't want to make a long term commitment.	
Don't want to be tied to a specific company.	
Can get just as much for my calves without the program.	
Buyers know the value of my calves without using a program.	
Would consider it if I could use a program that isn't tied to a specific company.	
Lack of nearby market that distinguishes value-added calves or offers a special sale.	
Program sale dates don't match up with my weaning program.	
Other: *(Please specify)*	

Document 2: Continued

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Demographics

1. How many years have you been in the cattle business?
☐ Less than 5 ☐ 5 to 15 ☐ 16 to 25 ☐ Over 25

2. Please select your age group.
☐ Under 30 ☐ 31 to 40 ☐ 41 to 50 ☐ 51 to 64 ☐ 65 or over

3. Check the category that best describes the highest level of education you have attained.
☐ High school Graduate ☐ Vocational, Technical, or 2 year degree ☐ Bachelor's Degree ☐ Graduate or Professional Degree ☐ None of these

4. Are you a graduate of OSU's Master Cattleman program or a current participant expecting to graduate in the next 12 months? ☐ Yes ☐ No

5. Are you a member of any of the following? (Please check all that apply.)
☐ Local/County Cattlemen's Association ☐ Oklahoma Cattlemen's Association
☐ National Cattlemen's Beef Association ☐ Breed Association:_____

6. Have you completed Beef Quality Assurance (BQA) training? ☐ Yes ☐ No

7. How often have you sought information on marketing opportunities for your cattle from the following resources in the last 12 months?

	Never	Once or Twice	More than Twice
County Extension Educator			
OSU State Extension Specialist			
OSU Fact Sheets			
OSU Newsletters			
OSU Websites			
Other Websites *(Please specify)*:			
Veterinarian			
Livestock market manager/staff			
Trade magazine			
Professional marketing service			
Ag Lender			
Other Cattlemen			
Other *(Please specify)*:			

8. Which of the following would be most helpful to you as a source of information on *Value Added Marketing* in cattle? Please rank your top 3 picks.

Information Source	Rank Top 3
County Meetings	
Newsletters	
E-mails	
OSU Fact Sheets	
Ranch Demonstrations	
Webinars (free online seminars)	
Podcasts	

9. Is there specific assistance that would be useful to you in implementing certain value enhancing management and/or marketing practices?

10. Which of the following best describes the past year's household NET income from all sources?
☐ Less than $30,000 ☐ $30,000 to $59,999 ☐ $60,000 to $89,999 ☐ $ 90,000 to $119,999 ☐ $120,000 and above

11. Approximately what percentage of the past year's household net income came from your beef cattle operation?
☐ Zero percent ☐ 1 to 20 percent ☐ 21 to 40 percent ☐ 41 to 60 percent ☐ 61 to 80 percent ☐ 81 to 100 percent

*This survey is from OSU IBR Number AG094.

Chart 1: Number of Non-Adopting Producers by Practice

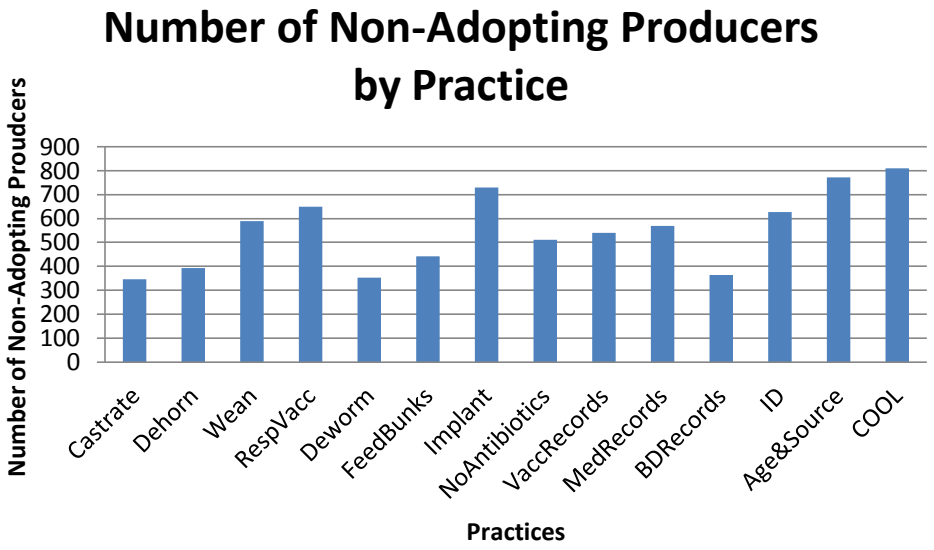

Table 2. Reasons Hindering Adoption in Each Constraint Category

Finance	
1	Hesitant to ask for financing to pay for the upfront costs
2	My lender says no to financing the upfront costs
Doubt Returns/Premiums	
3	Other cattlemen tried it and it did not pay
4	Buyers don't pay any premium for it
5	Buyers don't pay enough premium to cover the cost
6	Haven't done it in the past and have done okay
Technical Education	
7	I am not familiar with this practice
8	I am familiar with this practice but don't use it on my ranch
9	Don't really know what it requires or value it adds
10	Thought about it but need help with specifics of how to implement it on my ranch
Marketing Education	
11	I use this practice, but don't know how to use it in marketing my cattle
12	Don't know where/how to market these cattle
Marketing	
13	I market my claves to sellers based on this practice
14	Don't want to commit to selling calves through a specific company or group
Management	
15	Requires too much labor
16	Didn't have enough calves to mess with it
17	My buyers do it themselves once they have the cattle

Table 3. Number of Observations by Non-Adopted Practice and Reasons Hindering Adoption

Finance	Castrate	Dehorn	Wean	Respiratory Vaccinations	Deworm	Feed Bunks	Implant
1	6	5	10	6	4	7	12
2	4	3	6	3	3	5	5
Doubt Returns/Premiums							
3	9	7	14	3	7	10	17
4	30	23	42	41	25	40	44
5	35	31	94	65	33	41	44
6	51	56	106	154	61	70	121
Technical Education							
7	38	40	43	80	37	55	109
8	114	163	255	253	89	156	421
9	13	13	30	34	14	21	35
10	3	2	16	15	4	7	19
Marketing Education							
11	98	70	58	46	119	96	35
12	6	4	10	7	5	7	15
Marketing							
13	24	18	11	12	15	14	9
14	7	5	7	4	4	4	7
Management							
15	43	41	70	72	30	35	59
16	27	38	52	32	13	30	34
17	30	21	19	35	20	22	29

Table 3. Continued

Finance	No Antibiotics	Vaccination Records	Medical Records	Birth Date Records	ID	Age & Source Verification	COOL
1	9	6	6	7	13	12	16
2	5	3	3	3	9	10	11
Doubt Returns/ Premiums							
3	10	4	4	6	9	12	13
4	35	40	40	45	60	63	57
5	36	33	35	36	46	56	53
6	65	87	96	87	95	105	101
Technical Education							
7	83	51	50	43	67	153	230
8	268	268	294	0	301	363	351
9	31	28	30	32	46	91	101
10	14	9	10	12	23	47	50
Marketing Education							
11	55	79	76	137	95	61	47
12	15	12	12	13	17	29	32
Marketing							
13	9	194	6	10	10	14	12
14	10	4	4	6	9	12	16
Management							
15	16	40	49	64	85	65	67
16	16	26	26	30	51	54	56
17	11	12	13	8	18	15	21

Table 4. Number of Producers in Each Constraint Category by Non-Adopted Practice

Constraint Category	Castrate	Dehorn	Wean	Respiratory Vaccinations	Deworm	Feed Bunks	Implant
Finance	6	5	11	6	4	8	12
Doubt Returns/Premiums	95	96	204	232	98	128	174
Technical Education	153	203	317	355	131	219	536
Marketing Education	101	72	65	50	121	101	45
Marketing	27	21	15	14	17	16	12
Management	76	86	121	122	51	73	102

Table 4. Continued

Constraint Category	No Antibiotics	Vaccination Records	Medical Records	Birth Date Records	ID	Age & Source Verification	COOL
Finance	9	6	6	7	15	15	18
Doubt Returns/Premiums	113	132	138	130	154	179	160
Technical Education	366	327	355	74	381	559	624
Marketing Education	62	86	83	145	104	83	72
Marketing	14	194	8	14	14	21	22
Management	32	65	76	90	126	115	115

Table 5. An Explanation of Each Demographic Category

Demographics	
HERD1	1 to 49 cows
HERD2	50 to 99 cows
HERD3	100 to 499 cows
HERD4	500 + cows
REGION1	Southeast
REGION2	Northeast
REGION3	Southwest
REGION4	Northwest and Panhandle
AGE1	Under 30 years of age
AGE2	31 to 40 years of age
AGE3	41 to 50 years of age
AGE4	51 to 64 years of age
AGE5	65 + years of age
EXPERIENCE1	Less than 5 years of experience
EXPERIENCE2	5 to 15 years of experience
EXPERIENCE3	16 to 25 years of experience
EXPERIENCE4	Over 25 years of experience
AECLASS1	Age Class x Experience Class= 1-8
AECLASS2	Age Class x Experience Class= 9-12
AECLASS3	Age Class x Experience Class= 13-16
AECLASS4	Age Class x Experience Class= 17-20
EDUCATION1	"None of these" or High School graduate
EDUCATION2	Vocational education
EDUCATION3	Bachelor's degree
EDUCATION4	Graduate or Professional degree
INCOME1	Household net income of less than $30,000
INCOME2	Household net income of $30,000 to $59,999
INCOME3	Household net income of $60,000 to $89,999
INCOME4	Household net income of $90,000 to $119,999
INCOME5	Household net income of $120,000 +
FARMINCOME1	0% to 20%
FARMINCOME2	21% to 40%
FARMINCOME3	41% to 60%
FARMINCOME4	61% to 100%
TRAINING0	No Master Cattleman or Beef Quality Assurance training
TRAINING1	Master Cattleman or Beef Quality Assurance training

Table 6. Overall Frequencies of Each Demographic Class

Demographics		Overall
Herd size	HERDSIZE1	0.44
	HERDSIZE2	0.33
	HERDSIZE3	0.22
	HERDSIZE4	0.01
Region	REGION1	0.33
	REGION2	0.31
	REGION3	0.20
	REGION4	0.16
Age	AGE1	0.00
	AGE2	0.04
	AGE3	0.13
	AGE4	0.40
	AGE5	0.42
Experience	EXPERIENCE1	0.01
	EXPERIENCE2	0.12
	EXPERIENCE3	0.19
	EXPERIENCE4	0.68
AE Class	AECLASS1	0.12
	AECLASS2	0.22
	AECLASS3	0.32
	AECLASS4	0.34
Education	EDUCATION1	0.39
	EDUCATION2	0.18
	EDUCATION3	0.24
	EDUCATION4	0.19
Income	INCOME1	0.13
	INCOME2	0.28
	INCOME3	0.27
	INCOME4	0.15
	INCOME5	0.17
Farm Income	FARMINCOME1	0.59
	FARMINCOME2	0.22
	FARMINCOME3	0.11
	FARMINCOME4	0.07
Training	TRAINING0	0.91
	TRAINING1	0.09

*Please note age and experience are not included individually in the logit models but are included as a combined class.

Chart 2.

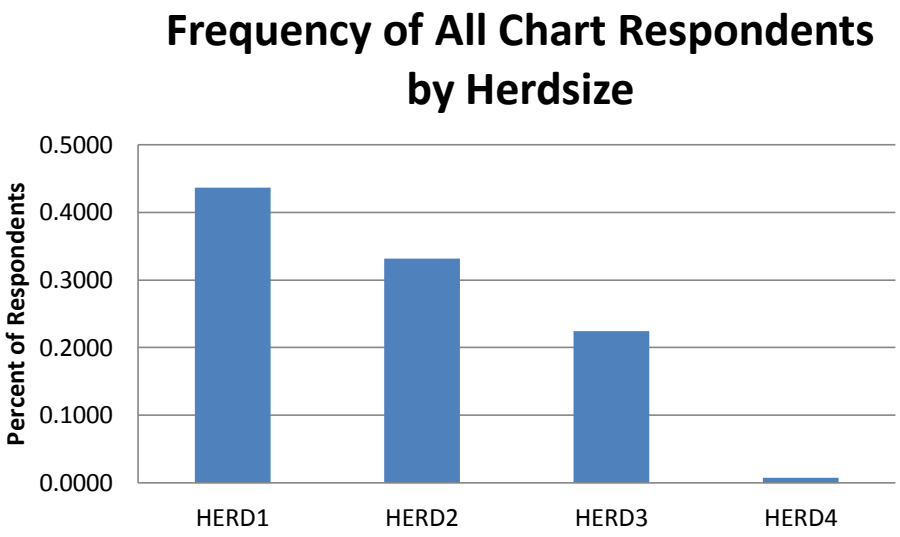

Chart 3.

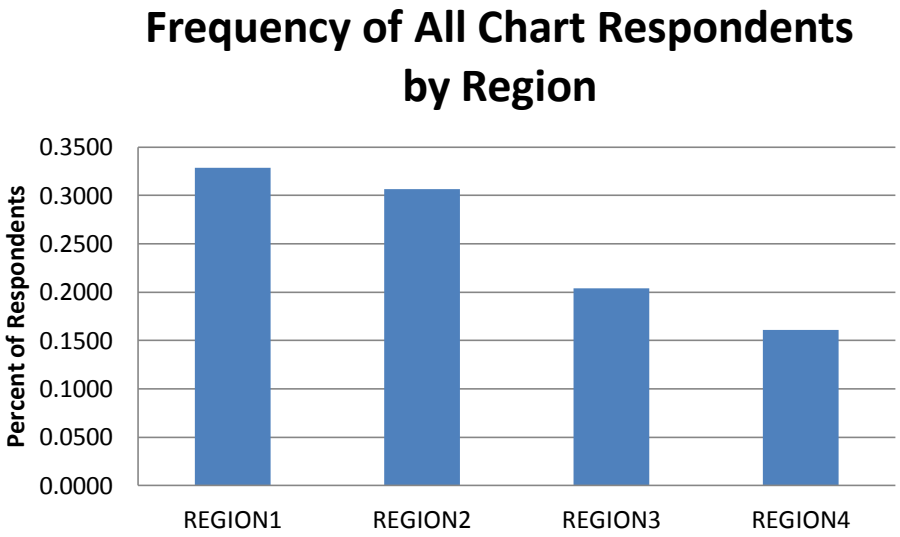

Chart 4.

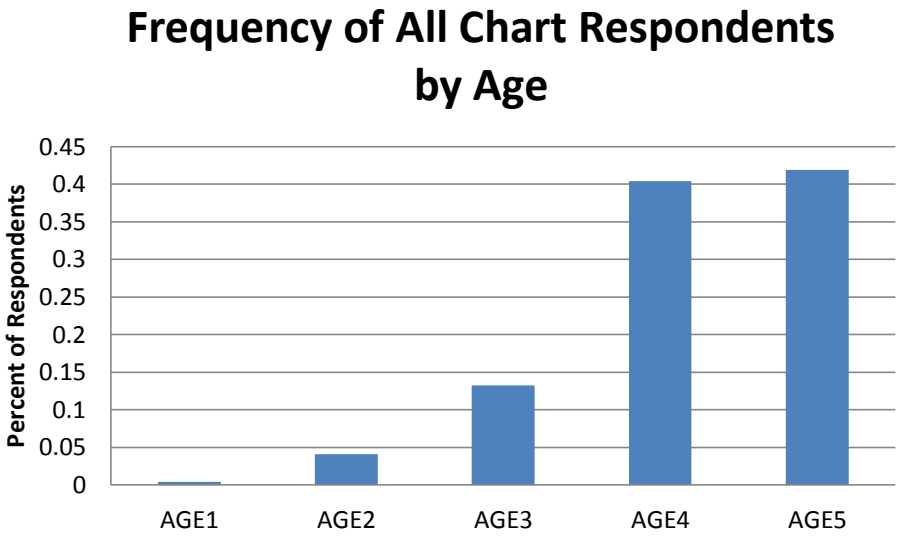

Chart 5.

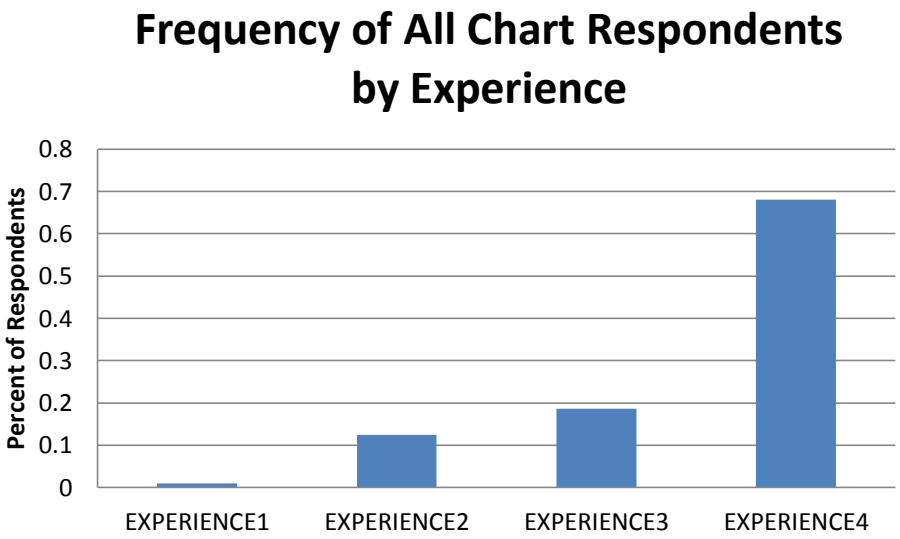

Chart 6.

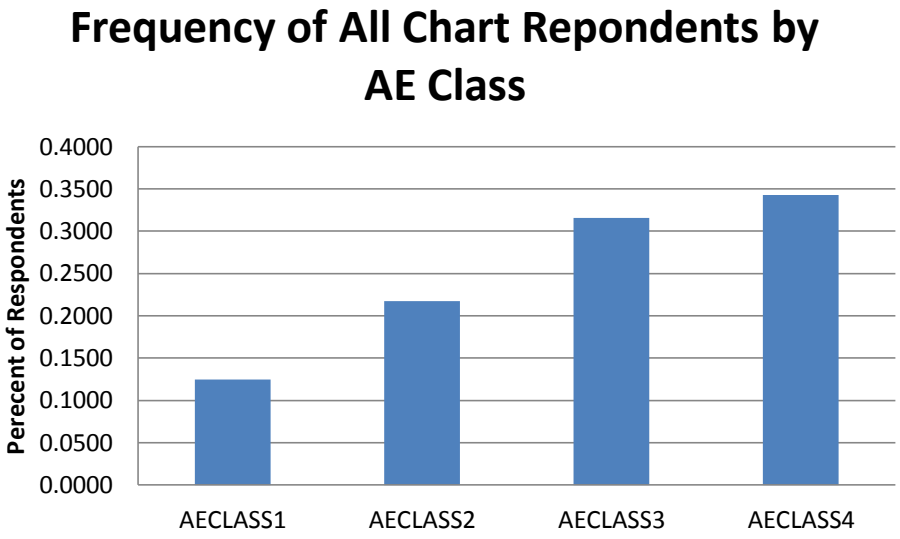

Chart 7.

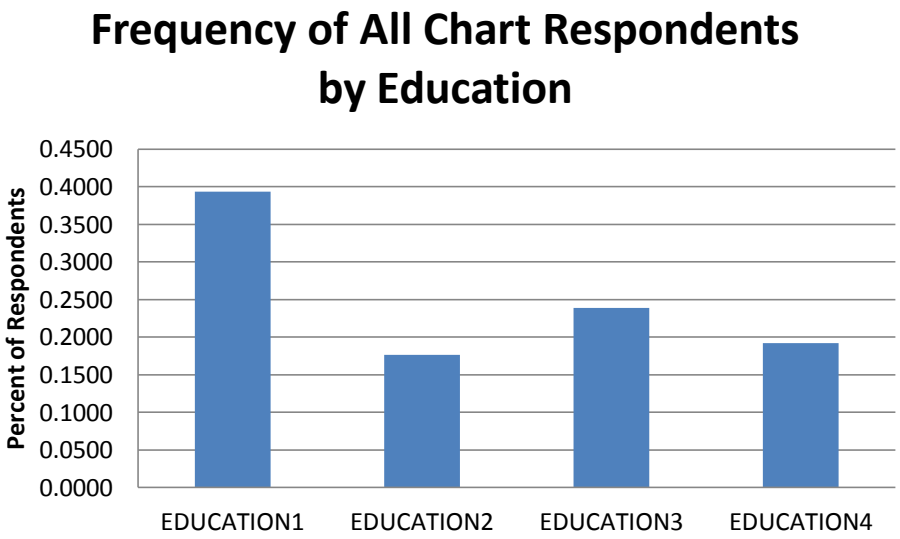

Chart 8.

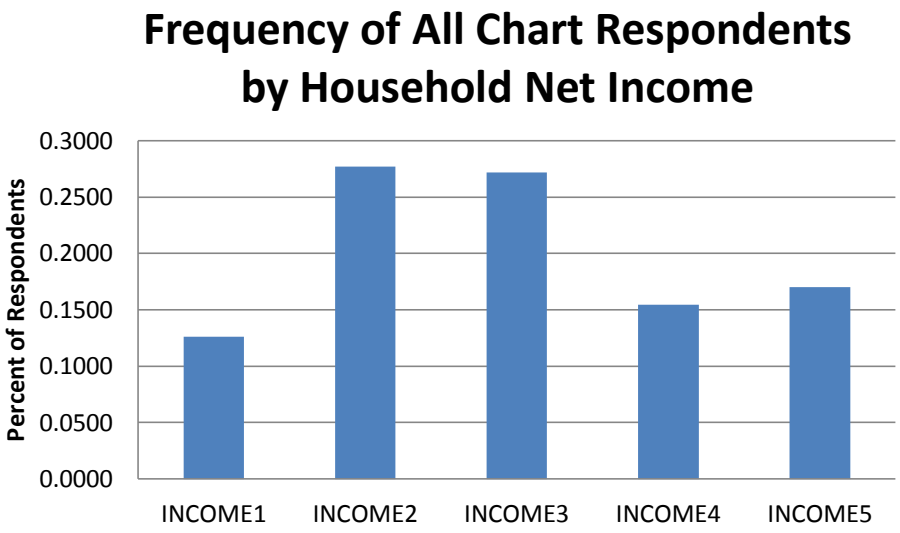

Chart 9.

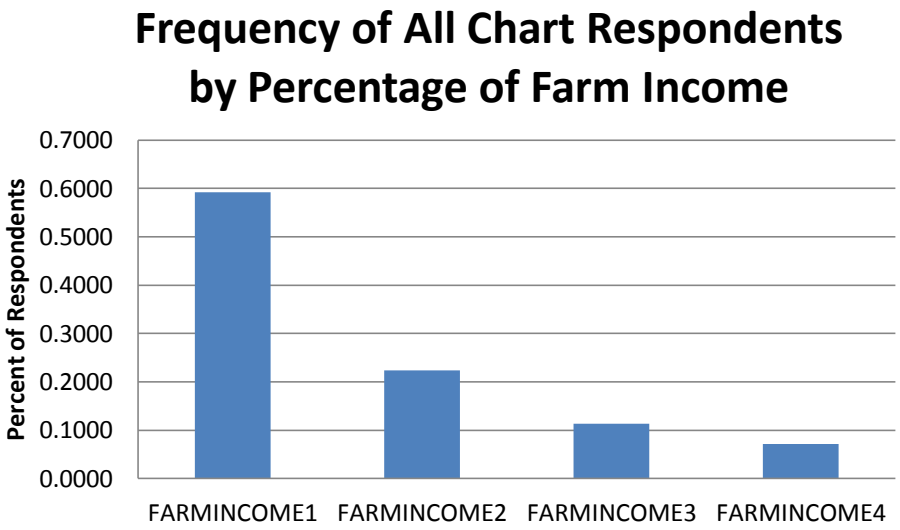

Chart 10.

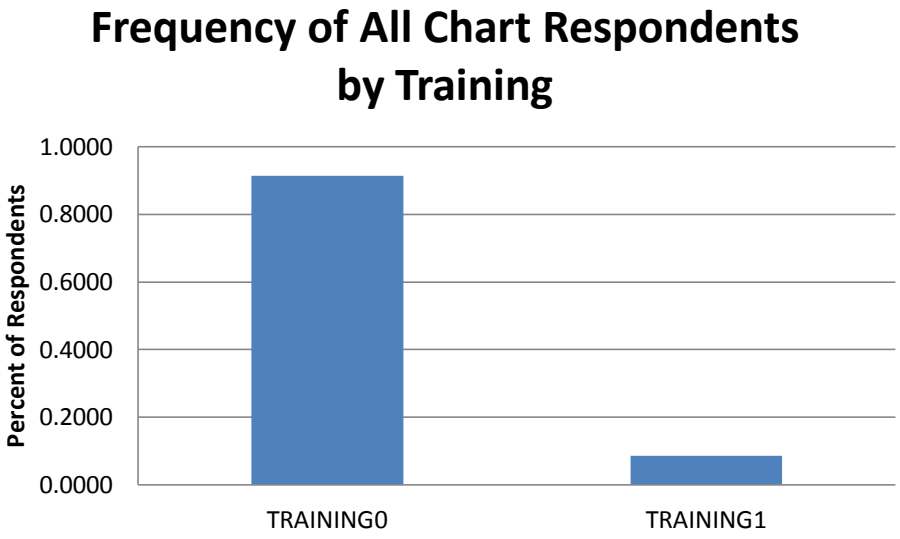
Frequency of All Chart Respondents by Training
Percent of Respondents
1.0000
0.8000
0.6000
0.4000
0.2000
0.0000
TRAINING0
TRAINING1

Table 7. Demographic Frequencies by Non-Adopted Practice

Demographics		Castrate	Dehorn	Wean	Resp Vacc	Deworm	Feed Bunks	Implant
Herd size	HERDSIZE1	0.57	0.55	0.50	0.51	0.55	0.52	0.49
	HERDSIZE2	0.31	0.32	0.34	0.33	0.33	0.33	0.33
	HERDSIZE3	0.11	0.13	0.15	0.16	0.12	0.14	0.18
	HERDSIZE4	0.00	0.01	0.01	0.00	0.01	0.01	0.00
Region	REGION1	0.44	0.39	0.38	0.35	0.38	0.35	0.36
	REGION2	0.29	0.32	0.32	0.30	0.31	0.30	0.33
	REGION3	0.18	0.17	0.18	0.20	0.17	0.22	0.18
	REGION4	0.09	0.11	0.12	0.15	0.14	0.13	0.14
Age	AGE1	0.00	0.01	0.00	0.00	0.01	0.00	0.00
	AGE2	0.03	0.04	0.05	0.05	0.03	0.04	0.04
	AGE3	0.13	0.13	0.13	0.12	0.11	0.12	0.14
	AGE4	0.36	0.39	0.40	0.43	0.37	0.44	0.41
	AGE5	0.47	0.43	0.42	0.40	0.48	0.39	0.40
Experience	EXPERIENCE1	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	EXPERIENCE2	0.15	0.13	0.13	0.14	0.13	0.15	0.15
	EXPERIENCE3	0.19	0.20	0.20	0.18	0.17	0.18	0.19
	EXPERIENCE4	0.65	0.66	0.66	0.67	0.69	0.66	0.65
AE Class	AECLASS1	0.14	0.15	0.13	0.14	0.13	0.15	0.15
	AECLASS2	0.21	0.21	0.22	0.21	0.20	0.21	0.24
	AECLASS3	0.27	0.29	0.31	0.32	0.27	0.33	0.29
	AECLASS4	0.38	0.36	0.33	0.32	0.41	0.31	0.32
Education	EDUCATION1	0.43	0.39	0.38	0.34	0.37	0.37	0.36
	EDUCATION2	0.18	0.20	0.18	0.19	0.19	0.17	0.20
	EDUCATION3	0.20	0.20	0.24	0.26	0.22	0.24	0.23
	EDUCATION4	0.20	0.21	0.21	0.21	0.22	0.22	0.21
Income	INCOME1	0.19	0.18	0.14	0.13	0.15	0.14	0.11
	INCOME2	0.30	0.29	0.30	0.30	0.29	0.28	0.29
	INCOME3	0.27	0.27	0.29	0.29	0.29	0.28	0.29
	INCOME4	0.11	0.14	0.13	0.14	0.13	0.14	0.15
	INCOME5	0.14	0.13	0.15	0.15	0.14	0.16	0.16
Farm Income	FARMINCOME1	0.72	0.71	0.68	0.69	0.69	0.70	0.67
	FARMINCOME2	0.20	0.20	0.20	0.19	0.20	0.20	0.20
	FARMINCOME3	0.06	0.06	0.08	0.07	0.08	0.07	0.08
	FARMINCOME4	0.03	0.03	0.04	0.05	0.04	0.03	0.04
Training	TRAINING0	0.95	0.95	0.94	0.95	0.95	0.95	0.93
	TRAINING1	0.05	0.05	0.06	0.05	0.05	0.05	0.07

Table 7. Continued

Demographic		No Anti-biotics	Vaccin-ation Records	Medical Records	Birthday Records	ID	Age & Source	COOL
Herd size	HERDSIZE1	0.46	0.50	0.49	0.48	0.46	0.47	0.48
	HERDSIZE2	0.32	0.35	0.34	0.31	0.32	0.33	0.32
	HERDSIZE3	0.21	0.16	0.17	0.21	0.21	0.20	0.19
	HERDSIZE4	0.01	0.00	0.00	0.00	0.00	0.01	0.00
Region	REGION1	0.37	0.35	0.35	0.33	0.36	0.33	0.33
	REGION2	0.28	0.31	0.29	0.30	0.30	0.29	0.30
	REGION3	0.18	0.19	0.19	0.19	0.19	0.20	0.20
	REGION4	0.17	0.15	0.16	0.18	0.16	0.17	0.17
Age	AGE1	0.01	0.01	0.00	0.00	0.00	0.00	0.01
	AGE2	0.05	0.04	0.04	0.05	0.05	0.05	0.05
	AGE3	0.16	0.14	0.14	0.13	0.14	0.16	0.15
	AGE4	0.40	0.41	0.41	0.41	0.40	0.43	0.43
	AGE5	0.38	0.40	0.40	0.41	0.41	0.36	0.37
Experience	EXPERIENCE1	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	EXPERIENCE2	0.16	0.15	0.14	0.15	0.14	0.13	0.13
	EXPERIENCE3	0.23	0.20	0.20	0.19	0.20	0.20	0.21
	EXPERIENCE4	0.61	0.64	0.65	0.66	0.65	0.65	0.65
AE Class	AECLASS1	0.16	0.14	0.14	0.15	0.14	0.14	0.14
	AECLASS2	0.25	0.23	0.24	0.21	0.22	0.24	0.24
	AECLASS3	0.29	0.30	0.29	0.32	0.31	0.33	0.32
	AECLASS4	0.30	0.33	0.33	0.32	0.33	0.28	0.30
Education	EDUCATION1	0.34	0.39	0.37	0.37	0.37	0.34	0.35
	EDUCATION2	0.17	0.18	0.18	0.19	0.19	0.19	0.19
	EDUCATION3	0.25	0.24	0.25	0.23	0.23	0.25	0.26
	EDUCATION4	0.24	0.20	0.20	0.22	0.21	0.21	0.20
Income	INCOME1	0.11	0.13	0.12	0.13	0.12	0.10	0.11
	INCOME2	0.27	0.29	0.29	0.27	0.29	0.27	0.27
	INCOME3	0.28	0.27	0.28	0.27	0.27	0.29	0.30
	INCOME4	0.16	0.14	0.15	0.15	0.15	0.15	0.15
	INCOME5	0.18	0.16	0.16	0.17	0.17	0.18	0.18
Farm Income	FARMINCOME1	0.64	0.65	0.64	0.63	0.62	0.63	0.63
	FARMINCOME2	0.22	0.23	0.23	0.22	0.23	0.22	0.23
	FARMINCOME3	0.09	0.08	0.08	0.09	0.09	0.09	0.09
	FARMINCOME4	0.05	0.04	0.05	0.07	0.06	0.06	0.05
Training	TRAINING0	0.92	0.95	0.95	0.95	0.95	0.93	0.94
	TRAINING1	0.08	0.05	0.05	0.05	0.05	0.07	0.06

Table 8. Frequency of Herd size (row) X Region (column)

Frequency	1	2	3	4	Total
1	210	156	118	83	567
2	136	150	82	63	431
3	77	88	64	62	291
4	4	4	1	1	10
Total	427	398	265	209	1299

Table 9. Frequency of Age (row) X Experience (column)-AE Index

Frequency	1	2	3	4	Total
1	0	5	0	0	5
2	1	26	21	5	53
3	2	28	61	81	172
4	4	65	103	353	525
5	5	37	57	445	544
Total	12	161	242	884	1299

Table 10. Frequency of Income (row) X Percentage of Farm Income (column)

Frequency	1	2	3	4	Total
1	109	22	15	18	164
2	207	85	43	25	360
3	218	88	31	16	353
4	116	40	33	12	201
5	119	55	25	22	221
Total	769	290	147	93	1299

Table 11. Frequency of Education (row) X Percentage of Farm Income (column)

Frequency	1	2	3	4	Total
1	278	113	70	50	511
2	142	51	22	14	229
3	179	69	40	22	310
4	170	57	15	7	249
Total	769	290	147	93	1299

Table 12. Initial Probability of Non-Adopted Practices with Independent Variables at the Means

Practice	Initial Probability
Castration	0.246
Dehorn	0.293
Wean	0.454
Respiratory Vaccinations	0.504
Deworm	0.263
Feed Bunks	0.335
Implant	0.571
No Antibiotics	0.394
Vaccination Records	0.437
Medical Records	0.445
Birthday Records	0.272
Individually ID	0.496
Age and Source Verification	0.613
Country-of-Origin-Labeling	0.641

Table 13. Effect of Producer Demographics on Non-Adopted Practices

			Castrate			Dehorn		
	Variable	**Description**	Coefficient	P-Value	Marginal Effect	**Coefficient**	**P-Value**	**Marginal Effect**
	Intercept		0.459*	0.083		0.293	0.253	
Herd size	**Herdsize 2**	50 to 99 cows	-0.211	0.176	-0.041	-0.158	0.289	-0.034
	Herdsize 3	100 to 499 cows	-0.673*	0.003	-0.118	-0.492*	0.020	-0.098
	Herdsize 4	500 + cows	-0.734	0.508	-0.126	0.024	0.977	0.005
Region	**Region 2**	Northeast	-0.412*	0.010	-0.083	-0.104	0.500	-0.023
	Region 3	Southwest	-0.481*	0.009	-0.096	-0.433*	0.016	-0.089
	Region 4	Northwest and Panhandle	-1.032*	<.0001	-0.179	-0.560*	0.006	-0.112
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.216	0.344	-0.041	-0.300	0.169	-0.063
	AECLASS 3	Age Class x Experience Class= 13-16	-0.338	0.122	-0.063	-0.275	0.185	-0.058
	AECLASS 4	Age Class x Experience Class= 17-20	-0.033	0.879	-0.007	-0.147	0.484	-0.032
Education	**Education 2**	Vocational education	-0.045	0.814	-0.008	0.189	0.295	0.040
	Education 3	Bachelor's degree	-0.182	0.325	-0.033	-0.050	0.774	-0.010
	Education 4	Graduate or Professional degree	-0.013	0.947	-0.002	0.161	0.379	0.034
Income	**Income 2**	$30,000 to $59,999	-0.437*	0.036	-0.091	-0.300	0.139	-0.068
	Income 3	$60,000 to $89,999	-0.546*	0.012	-0.111	-0.474*	0.024	-0.104
	Income 4	$90,000 to $119,999	-0.832*	0.002	-0.159	-0.488*	0.046	-0.107
	Income 5	$120,000 +	-0.497*	0.056	-0.102	-0.615*	0.015	-0.131
Farm Income	**FarmIncome 2**	21% to 40%	-0.237	0.173	-0.046	-0.270*	0.102	-0.058
	FarmIncome 3	41% to 60%	-0.750*	0.007	-0.128	-0.738*	0.004	-0.142
	FarmIncome 4	61% to 100%	-1.067*	0.007	-0.166	-0.904*	0.009	-0.167
Training	**Training**	MC or BQA Training	-0.552*	0.053	-0.090	-0.598*	0.025	-0.110

*Asterisk denotes significance of 0.1 or better.

Table 13. Continued

			Wean			Respiratory Vaccinations		
	Variable	**Description**	**Coefficient**	**P-Value**	**Marginal Effect**	**Coefficient**	**P-Value**	**Marginal Effect**
	Intercept		0.439*	0.077		0.342	0.172	
Herd Size	**HerdSize 2**	50 to 99 cows	-0.084	0.551	-0.021	-0.149	0.296	-0.037
	HerdSize 3	100 to 499 cows	-0.418*	0.024	-0.102	-0.511*	0.006	-0.127
	HerdSize 4	500 + cows	0.279	0.693	0.070	-0.988	0.240	-0.237
Region	**Region 2**	Northeast	-0.098	0.502	-0.024	-0.143	0.336	-0.036
	Region 3	Southwest	-0.443*	0.008	-0.109	-0.205	0.220	-0.051
	Region 4	Northwest and Panhandle	-0.588*	0.001	-0.144	-0.240	0.186	-0.060
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.087	0.672	-0.022	-0.181	0.389	-0.045
	AECLASS 3	Age Class x Experience Class= 13-16	-0.074	0.708	-0.018	-0.090	0.654	-0.022
	AECLASS 4	Age Class x Experience Class= 17-20	-0.120	0.550	-0.030	-0.166	0.415	-0.041
Education	**Education 2**	Vocational education	0.002	0.989	0.001	0.373*	0.029	0.093
	Education 3	Bachelor's degree	0.190	0.230	0.047	0.646*	<.0001	0.160
	Education 4	Graduate or Professional degree	0.263	0.124	0.065	0.571*	0.001	0.142
Income	**Income 2**	$30,000 to $59,999	0.092	0.642	0.023	0.285	0.151	0.071
	Income 3	$60,000 to $89,999	0.017	0.934	0.004	0.155	0.448	0.039
	Income 4	$90,000 to $119,999	-0.337	0.149	-0.082	-0.178	0.445	-0.044
	Income 5	$120,000 +	-0.176	0.451	-0.044	-0.056	0.813	-0.014
Farm Income	**FarmIncome 2**	21% to 40%	-0.291*	0.055	-0.072	-0.475*	0.002	-0.118
	FarmIncome 3	41% to 60%	-0.610*	0.005	-0.148	-0.800*	0.000	-0.196
	FarmIncome 4	61% to 100%	-0.872*	0.002	-0.206	-0.541*	0.043	-0.134
Training	**Training**	MC or BQA Training	-0.642*	0.005	-0.151	-0.965*	<.0001	-0.229

*Asterisk denotes significance of 0.1 or better.

Table 13. Continued

			Deworm			Feed Bunks		
	Variable	**Description**	**Coefficient**	**P-Value**	**Marginal Effect**	**Coefficient**	**P-Value**	**Marginal Effect**
	Intercept		-0.506*	0.061		0.017	0.948	
Herd Size	**HerdSize 2**	50 to 99 cows	-0.203	0.187	-0.042	-0.060	0.681	-0.014
	HerdSize 3	100 to 499 cows	-0.825*	0.000	-0.147	-0.464*	0.020	-0.099
	HerdSize 4	500 + cows	-0.258	0.762	-0.053	0.465	0.540	0.113
Region	**Region 2**	Northeast	-0.174	0.274	-0.035	-0.049	0.747	-0.011
	Region 3	Southwest	-0.410*	0.028	-0.078	0.152	0.370	0.035
	Region 4	Northwest and Panhandle	-0.269	0.181	-0.053	-0.252	0.192	-0.054
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.131	0.571	-0.024	-0.306	0.148	-0.070
	AECLASS 3	Age Class x Experience Class= 13-16	-0.139	0.529	-0.026	-0.159	0.427	-0.037
	AECLASS 4	Age Class x Experience Class= 17-20	0.300	0.172	0.061	-0.369*	0.073	-0.084
Education	**Education 2**	Vocational education	0.222	0.236	0.043	0.032	0.858	0.007
	Education 3	Bachelor's degree	0.108	0.548	0.020	0.148	0.372	0.033
	Education 4	Graduate or Professional degree	0.294	0.114	0.058	0.333*	0.059	0.075
Income	**Income 2**	$30,000 to $59,999	-0.034	0.875	-0.007	-0.069	0.735	-0.016
	Income 3	$60,000 to $89,999	-0.017	0.940	-0.003	-0.153	0.465	-0.035
	Income 4	$90,000 to $119,999	-0.226	0.379	-0.043	-0.282	0.244	-0.063
	Income 5	$120,000 +	-0.062	0.811	-0.012	-0.184	0.451	-0.042
Farm Income	**FarmIncome 2**	21% to 40%	-0.256	0.137	-0.050	-0.248	0.119	-0.057
	FarmIncome 3	41% to 60%	-0.365	0.147	-0.069	-0.661*	0.006	-0.140
	FarmIncome 4	61% to 100%	-0.503	0.139	-0.092	-1.122*	0.001	-0.215
Training	**Training**	MC or BQA Training	-0.536*	0.053	-0.093	-0.830*	0.002	-0.160

*Asterisk denotes significance of 0.1 or better.

Table 13. Continued

			Implant			No Antibiotics		
	Variable	**Description**	**Coefficient**	**P-Value**	**Marginal Effect**	**Coefficient**	**P-Value**	**Marginal Effect**
	Intercept		0.520*	0.040		-0.123	0.625	
Herd Size	**HerdSize 2**	50 to 99 cows	-0.067	0.647	-0.016	-0.058	0.684	-0.014
	HerdSize 3	100 to 499 cows	-0.244	0.190	-0.060	-0.076	0.683	-0.018
	HerdSize 4	500 + cows	-0.919	0.282	-0.225	0.246	0.725	0.060
Region	**Region 2**	Northeast	0.037	0.805	0.009	-0.252*	0.086	-0.061
	Region 3	Southwest	-0.419*	0.012	-0.103	-0.348*	0.037	-0.083
	Region 4	Northwest and Panhandle	-0.498*	0.006	-0.123	-0.084	0.638	-0.020
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.087	0.686	-0.020	-0.175	0.388	-0.043
	AECLASS 3	Age Class x Experience Class= 13-16	-0.412*	0.042	-0.100	-0.544*	0.005	-0.132
	AECLASS 4	Age Class x Experience Class= 17-20	-0.351*	0.089	-0.084	-0.568*	0.004	-0.138
Education	**Education 2**	Vocational education	0.395*	0.022	0.096	0.096	0.576	0.022
	Education 3	Bachelor's degree	0.188	0.237	0.047	0.325*	0.040	0.077
	Education 4	Graduate or Professional degree	0.367*	0.035	0.090	0.607*	0.000	0.146
Income	**Income 2**	$30,000 to $59,999	0.552*	0.006	0.136	0.244	0.232	0.058
	Income 3	$60,000 to $89,999	0.474*	0.021	0.117	0.150	0.474	0.035
	Income 4	$90,000 to $119,999	0.277	0.235	0.069	0.172	0.465	0.040
	Income 5	$120,000 +	0.261	0.265	0.065	0.198	0.405	0.046
Farm Income	**FarmIncome 2**	21% to 40%	-0.418*	0.006	-0.102	-0.073	0.634	-0.018
	FarmIncome 3	41% to 60%	-0.620*	0.003	-0.152	-0.315	0.149	-0.074
	FarmIncome 4	61% to 100%	-1.032*	0.000	-0.252	-0.262	0.340	-0.062
Training	**Training**	MC or BQA Training	-0.524*	0.016	-0.130	-0.168	0.435	-0.039

*Asterisk denotes significance of 0.1 or better.

Table 13. Continued

			Vaccination Records			Medical Records		
	Variable	**Description**	**Coefficient**	**P-Value**	**Marginal Effect**	**Coefficient**	**P-Value**	**Marginal Effect**
	Intercept		0.287	0.250		0.097	0.696	
Herd Size	**HerdSize 2**	50 to 99 cows	-0.025	0.864	-0.006	-0.095	0.500	-0.024
	HerdSize 3	100 to 499 cows	-0.498*	0.009	-0.120	-0.482*	0.010	-0.117
	HerdSize 4	500 + cows	-1.559	0.158	-0.313	-0.956	0.259	-0.218
Region	**Region 2**	Northeast	-0.089	0.551	-0.022	-0.176	0.228	-0.044
	Region 3	Southwest	-0.216	0.200	-0.053	-0.215	0.192	-0.053
	Region 4	Northwest and Panhandle	-0.143	0.438	-0.035	-0.052	0.771	-0.013
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.073	0.727	-0.018	0.033	0.873	0.008
	AECLASS 3	Age Class x Experience Class= 13-16	-0.311	0.117	-0.077	-0.256	0.194	-0.063
	AECLASS 4	Age Class x Experience Class= 17-20	-0.345*	0.088	-0.085	-0.196	0.326	-0.049
Education	**Education 2**	Vocational education	-0.037	0.832	-0.009	0.038	0.824	0.009
	Education 3	Bachelor's degree	0.146	0.366	0.036	0.256	0.106	0.063
	Education 4	Graduate or Professional degree	0.222	0.206	0.055	0.157	0.358	0.039
Income	**Income 2**	$30,000 to $59,999	0.063	0.752	0.016	0.162	0.413	0.040
	Income 3	$60,000 to $89,999	-0.099	0.631	-0.024	0.097	0.632	0.024
	Income 4	$90,000 to $119,999	-0.178	0.446	-0.044	0.066	0.774	0.016
	Income 5	$120,000 +	-0.065	0.784	-0.016	0.140	0.548	0.034
Farm Income	**FarmIncome 2**	21% to 40%	0.171	0.273	0.043	0.096	0.530	0.024
	FarmIncome 3	41% to 60%	-0.320	0.156	-0.077	-0.468*	0.032	-0.112
	FarmIncome 4	61% to 100%	-0.359	0.214	-0.086	-0.236	0.390	-0.058
Training	**Training**	MC or BQA Training	-0.930*	0.000	-0.208	-0.915*	0.000	-0.207

*Asterisk denotes significance of 0.1 or better.

Table 13. Continued

			Birthday Records			Individually Id		
	Variable	**Description**	**Coefficient**	**P-Value**	**Marginal Effect**	**Coefficient**	**P-Value**	**Marginal Effect**
	Intercept		-0.418	0.120		0.296	0.232	
Herd Size	**HerdSize 2**	50 to 99 cows	-0.167	0.282	-0.034	-0.041	0.770	-0.010
	HerdSize 3	100 to 499 cows	-0.102	0.612	-0.021	0.090	0.627	0.022
	HerdSize 4	500 + cows	-13.711	0.977	-0.310	-0.364	0.645	-0.090
Region	**Region 2**	Northeast	-0.032	0.841	-0.006	-0.194	0.181	-0.048
	Region 3	Southwest	-0.185	0.307	-0.036	-0.332*	0.041	-0.083
	Region 4	Northwest and Panhandle	0.069	0.718	0.014	-0.231	0.192	-0.058
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.369*	0.097	-0.077	-0.214	0.299	-0.053
	AECLASS 3	Age Class x Experience Class= 13-16	-0.294	0.160	-0.062	-0.289	0.140	-0.072
	AECLASS 4	Age Class x Experience Class= 17-20	-0.413*	0.055	-0.086	-0.301	0.133	-0.075
Education	**Education 2**	Vocational education	0.162	0.376	0.032	0.176	0.290	0.044
	Education 3	Bachelor's degree	0.032	0.854	0.006	0.136	0.385	0.034
	Education 4	Graduate or Professional degree	0.340*	0.064	0.069	0.333*	0.050	0.083
Income	**Income 2**	$30,000 to $59,999	-0.043	0.842	-0.009	0.213	0.278	0.053
	Income 3	$60,000 to $89,999	-0.113	0.607	-0.023	0.042	0.833	0.011
	Income 4	$90,000 to $119,999	-0.101	0.685	-0.020	-0.037	0.871	-0.009
	Income 5	$120,000 +	-0.058	0.820	-0.012	0.135	0.558	0.034
Farm Income	**FarmIncome 2**	21% to 40%	0.040	0.814	0.008	0.063	0.678	0.016
	FarmIncome 3	41% to 60%	-0.236	0.328	-0.044	-0.442*	0.038	-0.109
	FarmIncome 4	61% to 100%	0.111	0.700	0.023	-0.153	0.558	-0.038
Training	**Training**	MC or BQA Training	-0.635*	0.016	-0.110	-0.915*	<.0001	-0.217

*Asterisk denotes significance of 0.1 or better.

Table 13. Continued

			Age & Source Verification			COOL		
	Variable	**Description**	**Coefficient**	**P-Value**	**Marginal Effect**	**Coefficient**	**P-Value**	**Marginal Effect**
	Intercept		0.463*	0.074		0.685*	0.009	
Herd Size	**HerdSize 2**	50 to 99 cows	-0.154	0.296	-0.036	-0.249*	0.097	-0.056
	HerdSize 3	100 to 499 cows	-0.348*	0.065	-0.083	-0.503*	0.008	-0.117
	HerdSize 4	500 + cows	-0.525	0.499	-0.127	-0.426	0.584	-0.098
Region	**Region 2**	Northeast	-0.122	0.418	-0.029	-0.125	0.411	-0.029
	Region 3	Southwest	-0.130	0.437	-0.031	-0.171	0.314	-0.040
	Region 4	Northwest and Panhandle	0.093	0.619	0.021	0.102	0.593	0.023
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.018	0.935	-0.004	-0.069	0.764	-0.014
	AECLASS 3	Age Class x Experience Class= 13-16	-0.224	0.287	-0.050	-0.319	0.141	-0.069
	AECLASS 4	Age Class x Experience Class= 17-20	-0.672*	0.002	-0.159	-0.626*	0.004	-0.143
Education	**Education 2**	Vocational education	0.341*	0.049	0.082	0.384*	0.031	0.090
	Education 3	Bachelor's degree	0.350*	0.030	0.084	0.564*	0.001	0.129
	Education 4	Graduate or Professional degree	0.544*	0.002	0.128	0.340*	0.054	0.080
Income	**Income 2**	$30,000 to $59,999	0.347*	0.082	0.085	0.324	0.107	0.077
	Income 3	$60,000 to $89,999	0.450*	0.030	0.109	0.494*	0.018	0.115
	Income 4	$90,000 to $119,999	0.290	0.217	0.071	0.160	0.496	0.039
	Income 5	$120,000 +	0.424*	0.075	0.103	0.432*	0.072	0.102
Farm Income	**FarmIncome 2**	21% to 40%	-0.015	0.921	-0.004	0.092	0.565	0.021
	FarmIncome 3	41% to 60%	-0.368*	0.081	-0.089	-0.386*	0.066	-0.092
	FarmIncome 4	61% to 100%	0.077	0.771	0.018	-0.292	0.264	-0.069
Training	**Training**	MC or BQA Training	-0.706*	0.001	-0.174	-0.765*	0.000	-0.186

*Asterisk denotes significance of 0.1 or better.

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Table 14. Effects of Producer Demographics on Reason Categories for Producers Who Do Not Castrate

			Doubt Returns/ Premiums			Technical Education		
	Variable	**Description**	**Coefficient**	**P-value**	**Marginal Effects**	**Coefficient**	**P-value**	**Marginal Effects**
	Intercept		-1.587*	0.000		-1.005*	0.004	
Herd Size	**HerdSize 2**	50 to 99 cows	0.327	0.187	0.026	-0.319	0.134	-0.038
	HerdSize 3	100 to 499 cows	-0.384	0.333	-0.023	-0.602*	0.063	-0.064
	HerdSize 4	500 + cows	-12.619	0.986	-0.075	-12.494	0.984	-0.157
Region	**Region 2**	Northeast	-0.162	0.532	-0.012	-0.338	0.116	-0.041
	Region 3	Southwest	-0.239	0.431	-0.018	-0.330	0.179	-0.040
	Region 4	Northwest and Panhandle	-0.813*	0.046	-0.048	-0.814*	0.012	-0.083
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.216	0.558	-0.017	0.088	0.789	0.009
	AECLASS 3	Age Class x Experience Class= 13-16	-0.398	0.268	-0.030	0.017	0.957	0.002
	AECLASS 4	Age Class x Experience Class= 17-20	-0.257	0.469	-0.020	0.505*	0.100	0.060
Education	**Education 2**	Vocational education	0.212	0.461	0.018	-0.076	0.765	-0.009
	Education 3	Bachelor's degree	-0.795*	0.028	-0.045	-0.259	0.309	-0.029
	Education 4	Graduate or Professional degree	0.053	0.862	0.004	-0.136	0.596	-0.016
Income	**Income 2**	$30,000 to $59,999	-0.176	0.587	-0.015	-0.418	0.111	-0.054
	Income 3	$60,000 to $89,999	-0.579*	0.101	-0.041	-0.353	0.195	-0.047
	Income 4	$90,000 to $119,999	-0.625	0.151	-0.044	-0.916*	0.013	-0.100
	Income 5	$120,000 +	-0.089	0.825	-0.008	-0.411	0.235	-0.053
Farm Income	**FarmIncome 2**	21% to 40%	-0.082	0.770	-0.006	-0.445*	0.070	-0.049
	FarmIncome 3	41% to 60%	-0.598	0.204	-0.035	-0.774*	0.047	-0.076
	FarmIncome 4	61% to 100%	-0.609	0.346	-0.036	-1.285*	0.041	-0.105
Training	**Training 1**	MC or BQA Training	-0.964	0.112	-0.048	-0.574	0.194	-0.054

*Asterisk denotes significance of 0.1 or better.

Table 14. Continued

			Marketing Education			Management		
	Variable	**Description**	**Coefficient**	**P-value**	**Marginal Effects**	**Coefficient**	**P-value**	**Marginal Effects**
	Intercept		-1.313*	0.001		-1.578*	0.001	
Herd Size	**HerdSize 2**	50 to 99 cows	0.177	0.475	0.014	-0.763*	0.013	-0.043
	HerdSize 3	100 to 499 cows	-0.025	0.943	-0.002	-1.306*	0.007	-0.060
	HerdSize 4	500 + cows	0.747	0.525	0.075	-13.592	0.987	-0.085
Region	**Region 2**	Northeast	-0.376	0.138	-0.031	-0.413	0.154	-0.025
	Region 3	Southwest	-0.568*	0.064	-0.044	-0.699*	0.048	-0.038
	Region 4	Northwest and Panhandle	-0.683*	0.054	-0.050	-1.083*	0.019	-0.051
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.415	0.217	-0.040	-0.159	0.727	-0.007
	AECLASS 3	Age Class x Experience Class= 13-16	-0.472	0.136	-0.044	0.342	0.412	0.019
	AECLASS 4	Age Class x Experience Class= 17-20	-0.699*	0.034	-0.060	0.280	0.508	0.015
Education	**Education 2**	Vocational education	-0.379	0.251	-0.026	0.076	0.818	0.005
	Education 3	Bachelor's degree	-0.144	0.621	-0.011	-0.327	0.341	-0.019
	Education 4	Graduate or Professional degree	0.182	0.531	0.016	-0.886*	0.029	-0.040
Income	**Income 2**	$30,000 to $59,999	-0.328	0.340	-0.027	-0.337	0.334	-0.020
	Income 3	$60,000 to $89,999	-0.145	0.672	-0.013	-0.808*	0.048	-0.039
	Income 4	$90,000 to $119,999	-0.286	0.476	-0.024	-0.268	0.560	-0.016
	Income 5	$120,000 +	-0.476	0.257	-0.037	0.603	0.152	0.053
Farm Income	**FarmIncome 2**	21% to 40%	-0.051	0.852	-0.004	-0.205	0.545	-0.011
	FarmIncome 3	41% to 60%	-0.651	0.169	-0.040	-0.574	0.310	-0.026
	FarmIncome 4	61% to 100%	-0.585	0.325	-0.037	-0.649	0.408	-0.029
Training	**Training 1**	MC or BQA Training	-0.513	0.251	-0.033	-0.827	0.263	-0.032
			HL: 0.0332					

*Asterisk denotes significance of 0.1 or better.

Table 15. Effects of Producer Demographics on Reason Categories for Producers Who Do Not Dehorn

			Doubt Returns/ Premiums			Technical Education		
	Variable	Description	Coefficient	P-value	Marginal Effects	Coefficient	P-value	Marginal Effects
	Intercept		-1.9669*	<.0001		-0.9012*	0.0036	
Herd Size	**HerdSize 2**	50 to 99 cows	0.186	0.457	0.014	-0.020	0.913	-0.003
	HerdSize 3	100 to 499 cows	-0.286	0.447	-0.018	-0.374	0.173	-0.049
	HerdSize 4	500 + cows	-12.748	0.986	-0.077	-12.560	0.982	-0.180
Region	**Region 2**	Northeast	-0.171	0.499	-0.013	0.056	0.774	0.008
	Region 3	Southwest	-0.757*	0.027	-0.047	-0.075	0.740	-0.010
	Region 4	Northwest and Panhandle	-0.464	0.183	-0.032	-0.037	0.884	-0.005
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.271	0.481	-0.018	-0.112	0.683	-0.015
	AECLASS 3	Age Class x Experience Class= 13-16	0.086	0.807	0.007	-0.171	0.517	-0.022
	AECLASS 4	Age Class x Experience Class= 17-20	-0.162	0.657	-0.011	0.166	0.525	0.024
Education	**Education 2**	Vocational education	0.160	0.595	0.012	0.275	0.205	0.040
	Education 3	Bachelor's degree	-0.273	0.388	-0.017	-0.122	0.587	-0.016
	Education 4	Graduate or Professional degree	0.171	0.570	0.012	0.023	0.921	0.003
Income	**Income 2**	$30,000 to $59,999	0.003	0.994	0.000	-0.324	0.168	-0.053
	Income 3	$60,000 to $89,999	-0.025	0.944	-0.002	-0.674*	0.007	-0.099
	Income 4	$90,000 to $119,999	-0.462	0.306	-0.028	-0.547*	0.064	-0.083
	Income 5	$120,000 +	0.075	0.859	0.006	-0.693*	0.025	-0.101
Farm Income	**FarmIncome 2**	21% to 40%	-0.217	0.445	-0.015	-0.426*	0.044	-0.057
	FarmIncome 3	41% to 60%	-0.593	0.207	-0.035	-1.064*	0.004	-0.114
	FarmIncome 4	61% to 100%	-0.660	0.308	-0.038	-0.679	0.106	-0.083
Training	**Training**	MC or BQA Training	-0.731	0.170	-0.038	-0.444	0.207	-0.053

*Asterisk denotes significance of 0.1 or better.

Table 15. Continued

			Marketing Education			Management		
	Variable	**Description**	**Coefficient**	**P-value**	**Marginal Effects**	**Coefficient**	**P-value**	**Marginal Effects**
	Intercept		-2.0341*	<.0001		-1.5276*	0.0003	
Herd Size	**HerdSize 2**	50 to 99 cows	0.205	0.489	0.011	-0.452*	0.103	-0.030
	HerdSize 3	100 to 499 cows	0.235	0.548	0.012	-0.847*	0.050	-0.048
	HerdSize 4	500 + cows	2.242*	0.026	0.281	-13.060	0.987	-0.087
Region	**Region 2**	Northeast	-0.297	0.307	-0.018	-0.251	0.354	-0.017
	Region 3	Southwest	-0.482	0.172	-0.026	-0.463	0.154	-0.029
	Region 4	Northwest and Panhandle	-0.951*	0.039	-0.043	-0.939*	0.029	-0.049
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.151	0.704	-0.010	-0.571	0.154	-0.033
	AECLASS 3	Age Class x Experience Class= 13-16	-0.372	0.332	-0.022	-0.110	0.756	-0.008
	AECLASS 4	Age Class x Experience Class= 17-20	-0.521	0.190	-0.029	-0.173	0.633	-0.012
Education	**Education 2**	Vocational education	-0.155	0.693	-0.007	0.662*	0.027	0.048
	Education 3	Bachelor's degree	0.050	0.886	0.002	-0.015	0.965	-0.001
	Education 4	Graduate or Professional degree	0.534	0.109	0.033	-0.008	0.981	0.000
Income	**Income 2**	$30,000 to $59,999	-0.414	0.312	-0.024	-0.346	0.302	-0.025
	Income 3	$60,000 to $89,999	-0.294	0.472	-0.018	-0.603*	0.094	-0.039
	Income 4	$90,000 to $119,999	-0.610	0.216	-0.033	-0.550	0.208	-0.036
	Income 5	$120,000 +	-0.329	0.486	-0.020	-0.117	0.783	-0.009
Farm Income	**FarmIncome 2**	21% to 40%	0.055	0.861	0.003	-0.026	0.931	-0.002
	FarmIncome 3	41% to 60%	-0.183	0.700	-0.009	-0.984	0.118	-0.043
	FarmIncome 4	61% to 100%	-1.361	0.113	-0.042	-0.336	0.612	-0.019
Training	**Training**	MC or BQA Training	-0.376	0.443	-0.017	-0.663	0.277	-0.031

*Asterisk denotes significance of 0.1 or better.

Table 16. Effects of Producer Demographics on Reason Categories for Producers Who Do Not Wean

			Doubt Returns/ Premiums			Technical Education		
	Variable	Description	Coefficient	P-value	Marginal Effects	Coefficient	P-value	Marginal Effects
	Intercept		-1.8498*	<.0001		-0.5162*	0.0577	
Herd Size	HerdSize 2	50 to 99 cows	0.329*	0.080	0.044	-0.072	0.649	-0.014
	HerdSize 3	100 to 499 cows	0.374	0.122	0.051	-0.422*	0.058	-0.076
	HerdSize 4	500 + cows	-12.808	0.981	-0.139	1.007	0.163	0.234
Region	Region 2	Northeast	0.250	0.185	0.034	-0.125	0.440	-0.025
	Region 3	Southwest	-0.113	0.615	-0.014	-0.355*	0.062	-0.068
	Region 4	Northwest and Panhandle	-0.302	0.240	-0.034	-0.451*	0.035	-0.084
AE Class	AECLASS 2	Age Class x Experience Class= 9-12	0.023	0.933	0.003	0.023	0.921	0.004
	AECLASS 3	Age Class x Experience Class= 13-16	0.000	0.999	0.000	-0.118	0.596	-0.022
	AECLASS 4	Age Class x Experience Class= 17-20	-0.049	0.857	-0.006	0.048	0.829	0.009
Education	Education 2	Vocational education	-0.270	0.242	-0.033	0.067	0.731	0.012
	Education 3	Bachelor's degree	-0.195	0.356	-0.025	0.171	0.345	0.033
	Education 4	Graduate or Professional degree	0.059	0.789	0.008	0.209	0.276	0.040
Income	Income 2	$30,000 to $59,999	0.288	0.296	0.035	-0.251	0.246	-0.050
	Income 3	$60,000 to $89,999	0.344	0.219	0.042	-0.116	0.597	-0.024
	Income 4	$90,000 to $119,999	-0.041	0.901	-0.004	-0.404	0.124	-0.077
	Income 5	$120,000 +	0.242	0.449	0.029	-0.281	0.283	-0.055
Farm Income	FarmIncome 2	21% to 40%	-0.231	0.260	-0.029	-0.303*	0.088	-0.058
	FarmIncome 3	41% to 60%	-0.163	0.556	-0.021	-0.667*	0.015	-0.115
	FarmIncome 4	61% to 100%	-0.557	0.148	-0.062	-0.346	0.288	-0.065
Training	Training	MC or BQA Training	-0.643*	0.056	-0.067	-0.717*	0.015	-0.116

*Asterisk denotes significance of 0.1 or better.

Table 16. Continued

			Marketing Education			Management		
	Variable	**Description**	**Coefficient**	**P-value**	**Marginal Effects**	**Coefficient**	**P-value**	**Marginal Effects**
	Intercept		-2.3232*	<.0001		-1.7165*	<.0001	
Herd Size	**HerdSize 2**	50 to 99 cows	0.184	0.537	0.009	-0.595*	0.017	-0.047
	HerdSize 3	100 to 499 cows	-0.493	0.294	-0.019	-0.143	0.646	-0.013
	HerdSize 4	500 + cows	-12.918	0.989	-0.049	-12.581	0.985	-0.112
Region	**Region 2**	Northeast	-0.455	0.157	-0.020	-0.431*	0.067	-0.038
	Region 3	Southwest	-0.550	0.152	-0.024	-0.536*	0.052	-0.045
	Region 4	Northwest and Panhandle	-0.242	0.533	-0.012	-0.963*	0.006	-0.069
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.049	0.912	-0.002	-0.216	0.518	-0.016
	AECLASS 3	Age Class x Experience Class= 13-16	0.111	0.788	0.006	0.094	0.762	0.008
	AECLASS 4	Age Class x Experience Class= 17-20	-0.432	0.333	-0.017	-0.094	0.771	-0.007
Education	**Education 2**	Vocational education	-0.635	0.129	-0.025	0.349	0.186	0.032
	Education 3	Bachelor's degree	-0.323	0.356	-0.014	-0.003	0.991	0.000
	Education 4	Graduate or Professional degree	-0.093	0.795	-0.005	-0.360	0.232	-0.024
Income	**Income 2**	$30,000 to $59,999	0.228	0.600	0.010	0.294	0.387	0.021
	Income 3	$60,000 to $89,999	0.318	0.474	0.015	0.315	0.364	0.022
	Income 4	$90,000 to $119,999	-0.657	0.277	-0.020	0.186	0.646	0.012
	Income 5	$120,000 +	-0.011	0.984	0.000	0.450	0.264	0.034
Farm Income	**FarmIncome 2**	21% to 40%	-0.230	0.503	-0.010	-0.432	0.118	-0.033
	FarmIncome 3	41% to 60%	-0.836	0.189	-0.028	-0.516	0.198	-0.038
	FarmIncome 4	61% to 100%	-0.181	0.788	-0.008	-1.646*	0.030	-0.080
Training	**Training**	MC or BQA Training	0.146	0.752	0.007	-0.253	0.546	-0.018

*Asterisk denotes significance of 0.1 or better.

Table 17. Effects of Producer Demographics on Reason Categories for Producers Who Do Not Give Respiratory Vaccinations

			Doubt Returns/ Premiums			Technical Education		
	Variable	Description	Coefficient	P-value	Marginal Effects	Coefficient	P-value	Marginal Effects
	Intercept		-2.0716*	<.0001		-0.5419*	0.0437	
Herd Size	**HerdSize 2**	50 to 99 cows	0.247	0.162	0.038	-0.048	0.754	-0.010
	HerdSize 3	100 to 499 cows	0.080	0.737	0.012	-0.342	0.111	-0.068
	HerdSize 4	500 + cows	-12.704	0.980	-0.172	0.135	0.874	0.030
Region	**Region 2**	Northeast	-0.055	0.769	-0.008	-0.081	0.612	-0.017
	Region 3	Southwest	0.072	0.726	0.011	-0.214	0.244	-0.044
	Region 4	Northwest and Panhandle	-0.020	0.931	-0.003	-0.341*	0.098	-0.069
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.216	0.431	-0.029	0.273	0.233	0.057
	AECLASS 3	Age Class x Experience Class= 13-16	0.193	0.439	0.029	0.088	0.691	0.017
	AECLASS 4	Age Class x Experience Class= 17-20	0.078	0.760	0.012	0.163	0.466	0.033
Education	**Education 2**	Vocational education	0.092	0.677	0.013	0.250	0.189	0.047
	Education 3	Bachelor's degree	0.126	0.536	0.017	0.737*	<.0001	0.154
	Education 4	Graduate or Professional degree	0.547*	0.008	0.086	0.402*	0.036	0.079
Income	**Income 2**	$30,000 to $59,999	0.682*	0.014	0.095	-0.271	0.193	-0.062
	Income 3	$60,000 to $89,999	0.556*	0.050	0.074	-0.401*	0.063	-0.089
	Income 4	$90,000 to $119,999	0.337	0.292	0.042	-0.768*	0.003	-0.159
	Income 5	$120,000 +	0.123	0.709	0.014	-0.618*	0.016	-0.132
Farm Income	**FarmIncome 2**	21% to 40%	-0.241	0.216	-0.035	-0.484*	0.006	-0.097
	FarmIncome 3	41% to 60%	-0.567*	0.056	-0.074	-0.892*	0.001	-0.163
	FarmIncome 4	61% to 100%	-0.254	0.472	-0.037	-0.461	0.141	-0.093
Training	**Training**	MC or BQA Training	-0.619*	0.049	-0.076	-0.848*	0.003	-0.146

*Asterisk denotes significance of 0.1 or better.

Table 17. Continued

			Marketing Education			Management		
	Variable	**Description**	**Coefficient**	**P-value**	**Marginal Effects**	**Coefficient**	**P-value**	**Marginal Effects**
	Intercept		-2.235*	<.0001		-1.9726*	<.0001	
Herd Size	**HerdSize 2**	50 to 99 cows	-0.150	0.683	-0.005	-0.312	0.191	-0.026
	HerdSize 3	100 to 499 cows	-0.008	0.986	0.000	-0.224	0.470	-0.019
	HerdSize 4	500 + cows	-13.395	0.989	-0.035	-12.753	0.985	-0.103
Region	**Region 2**	Northeast	-0.140	0.703	-0.004	-0.463*	0.059	-0.039
	Region 3	Southwest	-0.335	0.450	-0.010	-0.472*	0.089	-0.039
	Region 4	Northwest and Panhandle	0.164	0.695	0.006	-0.312	0.278	-0.028
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.541	0.216	-0.024	0.004	0.990	0.000
	AECLASS 3	Age Class x Experience Class= 13-16	-0.405	0.321	-0.019	0.116	0.716	0.010
	AECLASS 4	Age Class x Experience Class= 17-20	-1.285*	0.008	-0.043	-0.004	0.991	0.000
Education	**Education 2**	Vocational education	-0.528	0.220	-0.019	0.351	0.196	0.029
	Education 3	Bachelor's degree	-0.740*	0.075	-0.024	0.302	0.248	0.025
	Education 4	Graduate or Professional degree	-0.454	0.287	-0.016	-0.066	0.824	-0.005
Income	**Income 2**	$30,000 to $59,999	0.005	0.992	0.000	-0.083	0.807	-0.006
	Income 3	$60,000 to $89,999	0.387	0.443	0.013	0.127	0.708	0.010
	Income 4	$90,000 to $119,999	-0.262	0.683	-0.006	0.176	0.647	0.014
	Income 5	$120,000 +	0.374	0.514	0.012	0.411	0.282	0.036
Farm Income	**FarmIncome 2**	21% to 40%	-0.246	0.545	-0.007	0.035	0.890	0.003
	FarmIncome 3	41% to 60%	-0.927	0.233	-0.021	-0.167	0.657	-0.013
	FarmIncome 4	61% to 100%	0.409	0.489	0.017	-0.959	0.132	-0.055
Training	**Training**	MC or BQA Training	0.202	0.690	0.007	-2.443*	0.016	-0.089

*Asterisk denotes significance of 0.1 or better.

Table 18. Effects of Producer Demographics on Reason Categories for Producers Who Do Not Deworm

			Doubt Returns/ Premiums			Technical Education		
	Variable	Description	Coefficient	P-value	Marginal Effects	Coefficient	P-value	Marginal Effects
	Intercept		-2.5618*	<.0001		-1.5708*	<.0001	
Herd Size	**HerdSize 2**	50 to 99 cows	0.093	0.712	0.007	-0.247	0.278	-0.024
	HerdSize 3	100 to 499 cows	-0.675*	0.078	-0.038	-0.693*	0.043	-0.057
	HerdSize 4	500 + cows	-13.645	0.985	-0.080	0.106	0.927	0.012
Region	**Region 2**	Northeast	-0.106	0.678	-0.008	-0.179	0.457	-0.016
	Region 3	Southwest	-0.591*	0.072	-0.036	-0.150	0.582	-0.014
	Region 4	Northwest and Panhandle	-0.480	0.172	-0.031	0.195	0.488	0.021
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.555	0.166	-0.035	0.030	0.934	0.002
	AECLASS 3	Age Class x Experience Class= 13-16	-0.270	0.457	-0.019	-0.116	0.742	-0.009
	AECLASS 4	Age Class x Experience Class= 17-20	-0.049	0.890	-0.004	0.645*	0.051	0.065
Education	**Education 2**	Vocational education	0.040	0.897	0.003	0.443*	0.090	0.044
	Education 3	Bachelor's degree	-0.557*	0.104	-0.029	0.010	0.970	0.001
	Education 4	Graduate or Professional degree	0.550*	0.050	0.046	0.297	0.277	0.028
Income	**Income 2**	$30,000 to $59,999	0.685*	0.084	0.041	-0.698*	0.012	-0.081
	Income 3	$60,000 to $89,999	0.484	0.241	0.026	-0.545*	0.053	-0.067
	Income 4	$90,000 to $119,999	0.340	0.470	0.017	-1.269*	0.002	-0.121
	Income 5	$120,000 +	0.627	0.178	0.036	-0.631*	0.075	-0.075
Farm Income	**FarmIncome 2**	21% to 40%	0.105	0.704	0.007	-0.281	0.278	-0.025
	FarmIncome 3	41% to 60%	0.062	0.881	0.004	-0.258	0.487	-0.023
	FarmIncome 4	61% to 100%	0.628	0.198	0.052	-0.233	0.623	-0.021
Training	**Training**	MC or BQA Training	-0.213	0.614	-0.013	-0.814	0.125	-0.058

*Asterisk denotes significance of 0.1 or better.

Table 18. Continued

			Marketing Education			Management		
	Variable	**Description**	**Coefficient**	**P-value**	**Marginal Effects**	**Coefficient**	**P-value**	**Marginal Effects**
	Intercept		-1.7321*	<.0001		-3.5338*	<.0001	
Herd Size	**HerdSize 2**	50 to 99 cows	0.086	0.704	0.008	-0.430	0.221	-0.016
	HerdSize 3	100 to 499 cows	-0.339	0.316	-0.026	-1.011*	0.065	-0.030
	HerdSize 4	500 + cows	0.553	0.633	0.061	-13.347	0.990	-0.048
Region	**Region 2**	Northeast	-0.136	0.558	-0.013	-0.612	0.110	-0.020
	Region 3	Southwest	-0.541*	0.064	-0.045	-0.200	0.605	-0.008
	Region 4	Northwest and Panhandle	-0.463	0.142	-0.040	-0.417	0.359	-0.015
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.260	0.405	-0.026	0.849	0.203	0.020
	AECLASS 3	Age Class x Experience Class= 13-16	-0.356	0.239	-0.034	1.031	0.107	0.026
	AECLASS 4	Age Class x Experience Class= 17-20	-0.340	0.271	-0.033	1.015	0.119	0.026
Education	**Education 2**	Vocational education	-0.035	0.905	-0.003	0.324	0.437	0.011
	Education 3	Bachelor's degree	0.181	0.492	0.016	0.460	0.228	0.017
	Education 4	Graduate or Professional degree	0.207	0.452	0.019	-0.150	0.743	-0.004
Income	**Income 2**	$30,000 to $59,999	0.090	0.793	0.007	0.025	0.955	0.001
	Income 3	$60,000 to $89,999	0.182	0.599	0.016	-0.528	0.305	-0.015
	Income 4	$90,000 to $119,999	0.145	0.711	0.012	0.182	0.732	0.007
	Income 5	$120,000 +	0.223	0.572	0.019	0.129	0.818	0.005
Farm Income	**FarmIncome 2**	21% to 40%	-0.428	0.111	-0.037	0.067	0.861	0.002
	FarmIncome 3	41% to 60%	-0.935*	0.043	-0.067	-0.480	0.464	-0.013
	FarmIncome 4	61% to 100%	-0.802	0.171	-0.060	0.210	0.762	0.008
Training	**Training**	MC or BQA Training	-0.330	0.402	-0.026	-0.621	0.405	-0.016

*Asterisk denotes significance of 0.1 or better.

Table 19. Effects of Producer Demographics on Reason Categories for Producers Who Do Not Accustom Calves to Feed Bunks

			Doubt Returns/ Premiums			Technical Education		
	Variable	Description	Coefficient	P-value	Marginal Effects	Coefficient	P-value	Marginal Effects
	Intercept		-2.7571*	<.0001		-0.9782*	0.0014	
Herd Size	**HerdSize 2**	50 to 99 cows	0.215	0.330	0.021	0.031	0.864	0.005
	HerdSize 3	100 to 499 cows	-0.519	0.116	-0.038	-0.235	0.357	-0.033
	HerdSize 4	500 + cows	-12.961	0.984	-0.100	0.028	0.980	0.004
Region	**Region 2**	Northeast	0.321	0.195	0.025	-0.053	0.786	-0.008
	Region 3	Southwest	0.588*	0.023	0.052	0.242	0.243	0.038
	Region 4	Northwest and Panhandle	0.027	0.933	0.002	0.014	0.952	0.002
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.266	0.464	-0.019	-0.139	0.602	-0.021
	AECLASS 3	Age Class x Experience Class= 13-16	0.230	0.476	0.021	-0.007	0.977	-0.001
	AECLASS 4	Age Class x Experience Class= 17-20	0.044	0.895	0.004	-0.083	0.746	-0.012
Education	**Education 2**	Vocational education	-0.163	0.586	-0.012	0.081	0.717	0.011
	Education 3	Bachelor's degree	-0.033	0.902	-0.003	0.131	0.531	0.019
	Education 4	Graduate or Professional degree	0.500*	0.053	0.049	0.395*	0.068	0.061
Income	**Income 2**	$30,000 to $59,999	0.408	0.231	0.033	-0.300	0.205	-0.052
	Income 3	$60,000 to $89,999	0.047	0.897	0.003	-0.493*	0.047	-0.080
	Income 4	$90,000 to $119,999	0.280	0.483	0.022	-0.678*	0.022	-0.105
	Income 5	$120,000 +	0.439	0.266	0.037	-0.504*	0.085	-0.082
Farm Income	**FarmIncome 2**	21% to 40%	0.262	0.262	0.024	-0.562*	0.009	-0.078
	FarmIncome 3	41% to 60%	-0.401	0.313	-0.028	-0.541*	0.073	-0.076
	FarmIncome 4	61% to 100%	-0.328	0.526	-0.024	-0.854*	0.042	-0.108
Training	**Training**	MC or BQA Training	-0.560	0.178	-0.038	-0.942*	0.014	-0.106

*Asterisk denotes significance of 0.1 or better.

Table 19. Continued

			Marketing Education			Management		
	Variable	**Description**	**Coefficient**	**P-value**	**Marginal Effects**	**Coefficient**	**P-value**	**Marginal Effects**
	Intercept		-1.7545*	<.0001		-2.5329*	<.0001	
Herd Size	**HerdSize 2**	50 to 99 cows	-0.100	0.696	-0.007	-0.484	0.121	-0.024
	HerdSize 3	100 to 499 cows	-0.145	0.676	-0.010	-0.135	0.727	-0.008
	HerdSize 4	500 + cows	1.429	0.133	0.184	-12.754	0.988	-0.066
Region	**Region 2**	Northeast	-0.358	0.158	-0.029	-0.448	0.173	-0.020
	Region 3	Southwest	-0.866*	0.011	-0.057	0.287	0.347	0.018
	Region 4	Northwest and Panhandle	-0.394	0.219	-0.031	-0.559	0.183	-0.024
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.344	0.280	-0.031	0.273	0.544	0.012
	AECLASS 3	Age Class x Experience Class= 13-16	-0.609*	0.056	-0.049	0.635	0.126	0.034
	AECLASS 4	Age Class x Experience Class= 17-20	-0.662*	0.044	-0.053	-0.107	0.816	-0.004
Education	**Education 2**	Vocational education	0.030	0.922	0.002	0.058	0.873	0.003
	Education 3	Bachelor's degree	0.061	0.827	0.005	0.216	0.502	0.011
	Education 4	Graduate or Professional degree	-0.241	0.453	-0.016	-0.092	0.804	-0.004
Income	**Income 2**	$30,000 to $59,999	0.158	0.692	0.009	-0.205	0.606	-0.011
	Income 3	$60,000 to $89,999	0.652*	0.090	0.047	-0.260	0.531	-0.013
	Income 4	$90,000 to $119,999	0.118	0.795	0.007	-0.145	0.758	-0.008
	Income 5	$120,000 +	0.358	0.425	0.023	-0.056	0.906	-0.003
Farm Income	**FarmIncome 2**	21% to 40%	-0.394	0.188	-0.026	0.007	0.983	0.000
	FarmIncome 3	41% to 60%	-0.412	0.340	-0.027	-0.747	0.191	-0.028
	FarmIncome 4	61% to 100%	-0.711	0.247	-0.041	-0.642	0.332	-0.025
Training	**Training**	MC or BQA Training	-0.262	0.534	-0.017	-0.375	0.487	-0.016
			HL: 0.0194					

*Asterisk denotes significance of 0.1 or better.

Table 20. Effects of Producer Demographics on Reason Categories for Producers Who Do Not Implant

			Doubt Returns/ Premiums			Technical Education		
	Variable	Description	Coefficient	P-value	Marginal Effects	Coefficient	P-value	Marginal Effects
	Intercept		-2.1429*	<.0001		0.0648	0.7932	
Herd Size	HerdSize 2	50 to 99 cows	0.306	0.124	0.036	-0.063	0.656	-0.016
	HerdSize 3	100 to 499 cows	0.258	0.330	0.030	-0.293	0.117	-0.071
	HerdSize 4	500 + cows	-12.682	0.984	-0.119	-13.533	0.974	-0.458
Region	Region 2	Northeast	-0.278	0.177	-0.033	0.069	0.637	0.017
	Region 3	Southwest	-0.085	0.705	-0.011	-0.328*	0.049	-0.079
	Region 4	Northwest and Panhandle	-0.536*	0.052	-0.057	-0.207	0.253	-0.050
AE Class	AECLASS 2	Age Class x Experience Class= 9-12	-0.159	0.603	-0.016	0.119	0.557	0.030
	AECLASS 3	Age Class x Experience Class= 13-16	0.257	0.357	0.030	-0.356*	0.069	-0.087
	AECLASS 4	Age Class x Experience Class= 17-20	0.113	0.695	0.013	-0.199	0.316	-0.049
Education	Education 2	Vocational education	0.009	0.969	0.001	0.130	0.441	0.032
	Education 3	Bachelor's degree	-0.120	0.601	-0.013	0.043	0.786	0.011
	Education 4	Graduate or Professional degree	0.136	0.559	0.016	0.163	0.341	0.040
Income	Income 2	$30,000 to $59,999	0.473	0.125	0.047	0.104	0.601	0.025
	Income 3	$60,000 to $89,999	0.592*	0.058	0.062	0.134	0.510	0.033
	Income 4	$90,000 to $119,999	0.431	0.221	0.042	-0.212	0.366	-0.050
	Income 5	$120,000 +	0.245	0.501	0.022	0.093	0.693	0.023
Farm Income	FarmIncome 2	21% to 40%	-0.460*	0.043	-0.049	-0.287*	0.060	-0.070
	FarmIncome 3	41% to 60%	-0.377	0.224	-0.042	-0.371*	0.086	-0.090
	FarmIncome 4	61% to 100%	-0.478	0.240	-0.051	-0.862*	0.004	-0.196
Training	Training	MC or BQA Training	-0.418	0.219	-0.042	-0.427*	0.060	-0.101

*Asterisk denotes significance of 0.1 or better.

Table 20. Continued

			Marketing Education			Management		
	Variable	**Description**	**Coefficient**	**P-value**	**Marginal Effects**	**Coefficient**	**P-value**	**Marginal Effects**
	Intercept		-2.3433*	<.0001		-2.6242*	<.0001	
Herd Size	**HerdSize 2**	50 to 99 cows	-0.055	0.888	-0.001	-0.003	0.992	0.000
	HerdSize 3	100 to 499 cows	0.130	0.792	0.004	0.260	0.430	0.019
	HerdSize 4	500 + cows	2.026*	0.058	0.153	-12.506	0.987	-0.071
Region	**Region 2**	Northeast	-0.510	0.169	-0.016	-0.121	0.619	-0.010
	Region 3	Southwest	-0.589	0.193	-0.018	-1.264*	0.001	-0.066
	Region 4	Northwest and Panhandle	-0.944*	0.093	-0.025	-0.320	0.316	-0.024
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.687	0.135	-0.025	0.325	0.394	0.019
	AECLASS 3	Age Class x Experience Class= 13-16	-0.541	0.211	-0.021	0.130	0.731	0.007
	AECLASS 4	Age Class x Experience Class= 17-20	-0.969*	0.042	-0.032	0.585	0.115	0.039
Education	**Education 2**	Vocational education	0.109	0.795	0.004	0.451	0.140	0.029
	Education 3	Bachelor's degree	-0.471	0.283	-0.013	0.481*	0.097	0.031
	Education 4	Graduate or Professional degree	-0.594	0.215	-0.015	0.337	0.269	0.021
Income	**Income 2**	$30,000 to $59,999	-0.125	0.830	-0.003	-0.013	0.973	-0.001
	Income 3	$60,000 to $89,999	0.445	0.416	0.013	0.005	0.989	0.000
	Income 4	$90,000 to $119,999	-0.138	0.837	-0.003	0.079	0.852	0.005
	Income 5	$120,000 +	0.465	0.450	0.014	0.270	0.522	0.019
Farm Income	**FarmIncome 2**	21% to 40%	-0.439	0.333	-0.012	-0.503*	0.079	-0.034
	FarmIncome 3	41% to 60%	-0.689	0.314	-0.016	-1.441*	0.009	-0.068
	FarmIncome 4	61% to 100%	-0.296	0.677	-0.008	-0.946*	0.100	-0.054
Training	**Training**	MC or BQA Training	0.995*	0.023	0.042	-0.106	0.792	-0.007

*Asterisk denotes significance of 0.1 or better.

Table 21. Effects of Producer Demographics on Reason Categories for Producers Who Give No Antibiotics

			Doubt Returns/ Premiums			Technical Education		
	Variable	Description	Coefficient	P-value	Marginal Effects	Coefficient	P-value	Marginal Effects
	Intercept		-2.3274*	<.0001		-0.7241*	0.0066	
Herd Size	**HerdSize 2**	50 to 99 cows	-0.329	0.198	-0.025	0.166	0.283	0.034
	HerdSize 3	100 to 499 cows	-0.213	0.506	-0.017	0.174	0.386	0.036
	HerdSize 4	500 + cows	-13.698	0.983	-0.096	0.418	0.574	0.091
Region	**Region 2**	Northeast	-0.621*	0.022	-0.041	-0.273*	0.088	-0.056
	Region 3	Southwest	-0.343	0.225	-0.026	-0.107	0.547	-0.023
	Region 4	Northwest and Panhandle	0.031	0.912	0.003	0.026	0.892	0.006
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.197	0.582	-0.014	0.067	0.750	0.015
	AECLASS 3	Age Class x Experience Class= 13-16	-0.183	0.585	-0.013	-0.326	0.112	-0.070
	AECLASS 4	Age Class x Experience Class= 17-20	-0.076	0.822	-0.006	-0.517*	0.015	-0.106
Education	**Education 2**	Vocational education	-0.058	0.851	-0.004	0.185	0.317	0.037
	Education 3	Bachelor's degree	-0.013	0.963	-0.001	0.252	0.139	0.051
	Education 4	Graduate or Professional degree	0.545*	0.046	0.044	0.366*	0.046	0.076
Income	**Income 2**	$30,000 to $59,999	0.245	0.512	0.015	0.023	0.916	0.005
	Income 3	$60,000 to $89,999	0.140	0.718	0.008	-0.009	0.968	-0.002
	Income 4	$90,000 to $119,999	0.728*	0.068	0.055	-0.222	0.385	-0.044
	Income 5	$120,000 +	0.339	0.423	0.022	0.031	0.902	0.007
Farm Income	**FarmIncome 2**	21% to 40%	0.196	0.462	0.014	-0.227	0.178	-0.047
	FarmIncome 3	41% to 60%	0.156	0.683	0.011	-0.270	0.250	-0.055
	FarmIncome 4	61% to 100%	0.929*	0.025	0.089	-0.294	0.322	-0.059
Training	**Training**	MC or BQA Training	-0.720	0.108	-0.040	0.171	0.442	0.037

*Asterisk denotes significance of 0.1 or better.

Table 21. Continued

			Marketing Education			Management		
	Variable	**Description**	**Coefficient**	**P-value**	**Marginal Effects**	**Coefficient**	**P-value**	**Marginal Effects**
	Intercept		-1.8782*	0.0002		-2.9931*	<.0001	
Herd Size	**HerdSize 2**	50 to 99 cows	-0.182	0.569	-0.008	-1.239*	0.023	-0.006
	HerdSize 3	100 to 499 cows	-0.444	0.322	-0.018	-0.900	0.155	-0.005
	HerdSize 4	500 + cows	0.490	0.688	0.030	-13.508	0.987	-0.009
Region	**Region 2**	Northeast	-0.091	0.769	-0.005	-0.719	0.147	-0.003
	Region 3	Southwest	-0.601	0.137	-0.025	-0.712	0.202	-0.003
	Region 4	Northwest and Panhandle	-0.637	0.153	-0.026	-0.063	0.906	0.000
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.700*	0.074	-0.043	-0.120	0.881	0.000
	AECLASS 3	Age Class x Experience Class= 13-16	-0.661*	0.073	-0.041	0.175	0.802	0.001
	AECLASS 4	Age Class x Experience Class= 17-20	-1.228*	0.003	-0.062	0.525	0.438	0.003
Education	**Education 2**	Vocational education	0.049	0.898	0.002	0.815	0.108	0.004
	Education 3	Bachelor's degree	-0.048	0.897	-0.002	0.243	0.683	0.001
	Education 4	Graduate or Professional degree	0.172	0.646	0.008	0.845	0.110	0.004
Income	**Income 2**	$30,000 to $59,999	-0.051	0.912	-0.002	-1.443*	0.006	-0.012
	Income 3	$60,000 to $89,999	-0.184	0.695	-0.007	-1.638*	0.006	-0.013
	Income 4	$90,000 to $119,999	0.064	0.900	0.003	-0.509	0.369	-0.006
	Income 5	$120,000 +	0.375	0.455	0.019	-1.902*	0.026	-0.014
Farm Income	**FarmIncome 2**	21% to 40%	-0.031	0.931	-0.001	1.341*	0.003	0.009
	FarmIncome 3	41% to 60%	-0.295	0.615	-0.012	-0.363	0.742	-0.001
	FarmIncome 4	61% to 100%	-0.114	0.874	-0.005	2.165*	0.002	0.023
Training	**Training**	MC or BQA Training	-0.699	0.255	-0.023	-12.520	0.963	-0.013

*Asterisk denotes significance of 0.1 or better.

Table 22. Effects of Producer Demographics on Reason Categories for Producers Who Do Not Keep Vaccination Records

			Doubt Returns/ Premiums			Technical Education		
	Variable	Description	Coefficient	P-value	Marginal Effects	Coefficient	P-value	Marginal Effects
	Intercept		-2.6518*	<.0001		-0.3472	0.1957	
Herd Size	HerdSize 2	50 to 99 cows	0.117	0.603	0.012	0.081	0.610	0.017
	HerdSize 3	100 to 499 cows	-0.210	0.496	-0.018	-0.187	0.388	-0.036
	HerdSize 4	500 + cows	-13.248	0.985	-0.105	-0.646	0.562	-0.110
Region	Region 2	Northeast	-0.205	0.410	-0.017	-0.277*	0.092	-0.057
	Region 3	Southwest	0.095	0.716	0.009	-0.323*	0.084	-0.066
	Region 4	Northwest and Panhandle	0.376	0.163	0.040	-0.258	0.208	-0.053
AE Class	AECLASS 2	Age Class x Experience Class= 9-12	0.124	0.727	0.011	0.133	0.560	0.028
	AECLASS 3	Age Class x Experience Class= 13-16	0.156	0.639	0.014	-0.149	0.499	-0.030
	AECLASS 4	Age Class x Experience Class= 17-20	0.260	0.440	0.024	-0.202	0.366	-0.040
Education	Education 2	Vocational education	0.120	0.669	0.010	-0.104	0.592	-0.020
	Education 3	Bachelor's degree	0.259	0.314	0.023	0.262	0.139	0.054
	Education 4	Graduate or Professional degree	0.585*	0.027	0.059	0.048	0.808	0.010
Income	Income 2	$30,000 to $59,999	0.250	0.453	0.023	-0.234	0.271	-0.051
	Income 3	$60,000 to $89,999	0.214	0.532	0.019	-0.419*	0.058	-0.088
	Income 4	$90,000 to $119,999	0.096	0.805	0.008	-0.505*	0.049	-0.105
	Income 5	$120,000 +	0.073	0.851	0.006	-0.483*	0.063	-0.101
Farm Income	FarmIncome 2	21% to 40%	0.106	0.664	0.010	0.076	0.660	0.016
	FarmIncome 3	41% to 60%	0.137	0.694	0.013	-0.317	0.223	-0.059
	FarmIncome 4	61% to 100%	0.480	0.248	0.052	-0.244	0.455	-0.047
Training	Training	MC or BQA Training	-1.574*	0.009	-0.085	-0.915*	0.003	-0.148

*Asterisk denotes significance of 0.1 or better.

Table 22. Continued

			Marketing Education			Management		
	Variable	**Description**	**Coefficient**	**P-value**	**Marginal Effects**	**Coefficient**	**P-value**	**Marginal Effects**
	Intercept		-1.7107*	<.0001		-2.0077*	<.0001	
Herd Size	**HerdSize 2**	50 to 99 cows	-0.083	0.762	-0.005	-0.612*	0.058	-0.031
	HerdSize 3	100 to 499 cows	-0.174	0.642	-0.010	-1.213*	0.016	-0.048
	HerdSize 4	500 + cows	-13.234	0.988	-0.067	-13.828	0.989	-0.070
Region	**Region 2**	Northeast	0.333	0.223	0.022	-0.418	0.213	-0.019
	Region 3	Southwest	-0.274	0.439	-0.014	-0.435	0.252	-0.019
	Region 4	Northwest and Panhandle	-0.159	0.673	-0.008	0.076	0.837	0.004
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.809*	0.024	-0.057	-0.043	0.923	-0.002
	AECLASS 3	Age Class x Experience Class= 13-16	-0.520	0.109	-0.041	-0.014	0.973	-0.001
	AECLASS 4	Age Class x Experience Class= 17-20	-0.798*	0.020	-0.056	-0.193	0.660	-0.008
Education	**Education 2**	Vocational education	0.062	0.844	0.004	0.187	0.586	0.010
	Education 3	Bachelor's degree	-0.572	0.105	-0.028	-0.177	0.629	-0.008
	Education 4	Graduate or Professional degree	0.159	0.612	0.011	-0.506	0.240	-0.020
Income	**Income 2**	$30,000 to $59,999	-0.507	0.198	-0.027	-0.010	0.979	-0.001
	Income 3	$60,000 to $89,999	-0.035	0.925	-0.002	-0.720	0.106	-0.029
	Income 4	$90,000 to $119,999	-0.163	0.708	-0.010	-0.320	0.519	-0.015
	Income 5	$120,000 +	0.144	0.736	0.010	0.140	0.769	0.008
Farm Income	**FarmIncome 2**	21% to 40%	-0.064	0.832	-0.004	0.351	0.285	0.017
	FarmIncome 3	41% to 60%	-1.057*	0.094	-0.044	-0.430	0.504	-0.015
	FarmIncome 4	61% to 100%	-0.336	0.570	-0.019	0.585	0.347	0.032
Training	**Training**	MC or BQA Training	0.325	0.403	0.022	-0.768	0.299	-0.026

*Asterisk denotes significance of 0.1 or better.

Table 23. Effects of Producer Demographics on Reason Categories for Producers Who Do Not Keep Medical Records

			Doubt Returns/ Premiums			Technical Education		
	Variable	Description	Coefficient	P-value	Marginal Effects	Coefficient	P-value	Marginal Effects
	Intercept		-2.5158*	<.0001		-0.4578*	0.0869	
Herd Size	HerdSize 2	50 to 99 cows	0.055	0.803	0.005	0.035	0.820	0.007
	HerdSize 3	100 to 499 cows	-0.089	0.762	-0.008	-0.177	0.392	-0.035
	HerdSize 4	500 + cows	-13.205	0.984	-0.106	-0.204	0.813	-0.040
Region	Region 2	Northeast	-0.447*	0.076	-0.036	-0.330*	0.038	-0.069
	Region 3	Southwest	0.102	0.682	0.010	-0.381*	0.035	-0.079
	Region 4	Northwest and Panhandle	0.367	0.153	0.040	-0.310	0.116	-0.066
AE Class	AECLASS 2	Age Class x Experience Class= 9-12	0.282	0.429	0.022	0.226	0.312	0.049
	AECLASS 3	Age Class x Experience Class= 13-16	0.462	0.169	0.040	-0.095	0.663	-0.019
	AECLASS 4	Age Class x Experience Class= 17-20	0.351	0.308	0.029	-0.090	0.685	-0.018
Education	Education 2	Vocational education	0.044	0.873	0.004	-0.161	0.394	-0.032
	Education 3	Bachelor's degree	0.192	0.439	0.017	0.190	0.267	0.040
	Education 4	Graduate or Professional degree	0.340	0.193	0.032	0.064	0.734	0.013
Income	Income 2	$30,000 to $59,999	0.054	0.867	0.005	-0.049	0.815	-0.011
	Income 3	$60,000 to $89,999	0.123	0.706	0.011	-0.189	0.386	-0.040
	Income 4	$90,000 to $119,999	0.094	0.798	0.008	-0.307	0.222	-0.063
	Income 5	$120,000 +	0.025	0.946	0.002	-0.242	0.341	-0.050
Farm Income	FarmIncome 2	21% to 40%	-0.012	0.961	-0.001	-0.047	0.782	-0.010
	FarmIncome 3	41% to 60%	-0.202	0.564	-0.017	-0.248	0.304	-0.049
	FarmIncome 4	61% to 100%	0.365	0.356	0.039	-0.123	0.687	-0.025
Training	Training	MC or BQA Training	-1.548*	0.010	-0.084	-0.849*	0.003	-0.144

*Asterisk denotes significance of 0.1 or better.

Table 23. Continued

			Marketing Education			Management		
	Variable	**Description**	**Coefficient**	**P-value**	**Marginal Effects**	**Coefficient**	**P-value**	**Marginal Effects**
	Intercept		-1.8869*	<.0001		-2.2907*	<.0001	
Herd Size	**HerdSize 2**	50 to 99 cows	-0.324	0.255	-0.017	-0.669*	0.028	-0.038
	HerdSize 3	100 to 499 cows	-0.300	0.427	-0.016	-1.125*	0.009	-0.054
	HerdSize 4	500 + cows	-12.749	0.988	-0.066	-14.365	0.986	-0.082
Region	**Region 2**	Northeast	0.450	0.118	0.025	-0.669*	0.042	-0.032
	Region 3	Southwest	-0.009	0.979	0.000	-0.383	0.262	-0.020
	Region 4	Northwest and Panhandle	0.170	0.644	0.008	0.109	0.741	0.007
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.564*	0.098	-0.040	-0.072	0.865	-0.004
	AECLASS 3	Age Class x Experience Class= 13-16	-0.775*	0.023	-0.050	0.053	0.895	0.003
	AECLASS 4	Age Class x Experience Class= 17-20	-0.794*	0.023	-0.051	-0.061	0.883	-0.003
Education	**Education 2**	Vocational education	0.410	0.188	0.024	0.071	0.835	0.004
	Education 3	Bachelor's degree	-0.149	0.663	-0.007	-0.145	0.668	-0.007
	Education 4	Graduate or Professional degree	0.050	0.884	0.003	-0.044	0.900	-0.002
Income	**Income 2**	$30,000 to $59,999	-0.715*	0.079	-0.035	0.101	0.802	0.005
	Income 3	$60,000 to $89,999	-0.114	0.760	-0.007	-0.140	0.746	-0.006
	Income 4	$90,000 to $119,999	-0.147	0.735	-0.009	0.064	0.895	0.003
	Income 5	$120,000 +	-0.163	0.715	-0.010	0.781*	0.085	0.050
Farm Income	**FarmIncome 2**	21% to 40%	0.246	0.399	0.015	0.382	0.215	0.021
	FarmIncome 3	41% to 60%	-1.424*	0.059	-0.044	-0.325	0.569	-0.013
	FarmIncome 4	61% to 100%	-0.508	0.443	-0.023	0.860	0.107	0.059
Training	**Training**	MC or BQA Training	0.511	0.191	0.033	-1.035	0.160	-0.035

*Asterisk denotes significance of 0.1 or better.

Table 24. Effects of Producer Demographics on Reason Categories for Producers Who Do Not Keep Birthday Records

			Doubt Returns/ Premiums			Technical Education		
	Variable	Description	Coefficient	P-value	Marginal Effects	Coefficient	P-value	Marginal Effects
	Intercept		-2.1318*	<.0001		-1.5166*	0.0008	
Herd Size	**HerdSize 2**	50 to 99 cows	-0.081	0.732	-0.007	-0.125	0.681	-0.006
	HerdSize 3	100 to 499 cows	0.132	0.650	0.013	0.218	0.569	0.013
	HerdSize 4	500 + cows	-13.381	0.985	-0.102	-12.879	0.988	-0.056
Region	**Region 2**	Northeast	-0.316	0.221	-0.026	-0.275	0.357	-0.016
	Region 3	Southwest	0.176	0.490	0.018	-0.327	0.339	-0.018
	Region 4	Northwest and Panhandle	0.298	0.268	0.031	-0.444	0.267	-0.024
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	0.152	0.667	0.014	-0.520	0.254	-0.026
	AECLASS 3	Age Class x Experience Class= 13-16	0.174	0.598	0.016	0.047	0.905	0.003
	AECLASS 4	Age Class x Experience Class= 17-20	0.068	0.842	0.006	-0.285	0.486	-0.016
Education	**Education 2**	Vocational education	0.209	0.453	0.018	0.093	0.780	0.005
	Education 3	Bachelor's degree	0.152	0.559	0.013	-0.246	0.477	-0.012
	Education 4	Graduate or Professional degree	0.511*	0.057	0.050	-0.132	0.720	-0.007
Income	**Income 2**	$30,000 to $59,999	-0.407	0.187	-0.042	-0.804*	0.021	-0.059
	Income 3	$60,000 to $89,999	-0.590*	0.069	-0.057	-0.771*	0.031	-0.058
	Income 4	$90,000 to $119,999	-0.192	0.580	-0.022	-0.968*	0.030	-0.067
	Income 5	$120,000 +	-0.287	0.419	-0.031	-1.150*	0.016	-0.075
Farm Income	**FarmIncome 2**	21% to 40%	0.128	0.608	0.012	-0.211	0.537	-0.011
	FarmIncome 3	41% to 60%	0.140	0.676	0.013	-0.074	0.868	-0.004
	FarmIncome 4	61% to 100%	0.423	0.275	0.044	0.046	0.928	0.003
Training	**Training**	MC or BQA Training	-0.800*	0.071	-0.056	-0.386	0.474	-0.018

*Asterisk denotes significance of 0.1 or better.

Table 24. Continued

			Marketing Education			Management		
	Variable	**Description**	**Coefficient**	**P-value**	**Marginal Effects**	**Coefficient**	**P-value**	**Marginal Effects**
	Intercept		-1.3013*	0.0003		-2.0028*	<.0001	
Herd Size	**HerdSize 2**	50 to 99 cows	0.073	0.730	0.008	-0.500*	0.092	-0.028
	HerdSize 3	100 to 499 cows	-0.345	0.262	-0.032	0.252	0.445	0.019
	HerdSize 4	500 + cows	-13.123	0.985	-0.119	-13.379	0.987	-0.074
Region	**Region 2**	Northeast	0.252	0.244	0.029	-0.565*	0.060	-0.034
	Region 3	Southwest	-0.497*	0.081	-0.043	-0.475	0.146	-0.030
	Region 4	Northwest and Panhandle	-0.156	0.585	-0.015	0.205	0.492	0.017
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.696*	0.014	-0.090	-0.188	0.636	-0.012
	AECLASS 3	Age Class x Experience Class= 13-16	-0.719*	0.007	-0.093	-0.064	0.862	-0.004
	AECLASS 4	Age Class x Experience Class= 17-20	-0.962*	0.001	-0.114	-0.197	0.603	-0.013
Education	**Education 2**	Vocational education	0.310	0.222	0.031	0.176	0.567	0.012
	Education 3	Bachelor's degree	0.182	0.466	0.017	-0.284	0.376	-0.016
	Education 4	Graduate or Professional degree	0.244	0.358	0.024	0.043	0.895	0.003
Income	**Income 2**	$30,000 to $59,999	-0.091	0.770	-0.009	0.002	0.995	0.000
	Income 3	$60,000 to $89,999	0.010	0.975	0.001	-0.378	0.344	-0.022
	Income 4	$90,000 to $119,999	-0.076	0.829	-0.008	-0.199	0.657	-0.013
	Income 5	$120,000 +	-0.182	0.619	-0.018	0.199	0.639	0.015
Farm Income	**FarmIncome 2**	21% to 40%	0.030	0.898	0.003	0.345	0.218	0.025
	FarmIncome 3	41% to 60%	-0.725*	0.092	-0.058	-0.608	0.212	-0.029
	FarmIncome 4	61% to 100%	0.106	0.810	0.011	0.095	0.844	0.006
Training	**Training**	MC or BQA Training	-0.171	0.620	-0.016	-1.435*	0.050	-0.054

*Asterisk denotes significance of 0.1 or better.

Table 25. Effects of Producer Demographics on Reason Categories for Producers Who Do Not Individually Id Their Calves

			Doubt Returns/ Premiums			Technical Education		
	Variable	**Description**	**Coefficient**	**P-value**	**Marginal Effects**	**Coefficient**	**P-value**	**Marginal Effects**
	Intercept		-2.2515*	<.0001		-0.7242*	0.007	
Herd Size	**HerdSize 2**	50 to 99 cows	0.238	0.277	0.023	-0.011	0.942	-0.002
	HerdSize 3	100 to 499 cows	0.587*	0.030	0.066	0.130	0.518	0.028
	HerdSize 4	500 + cows	-12.866	0.985	-0.098	0.442	0.582	0.100
Region	**Region 2**	Northeast	-0.467*	0.042	-0.045	-0.316*	0.043	-0.069
	Region 3	Southwest	-0.237	0.331	-0.025	-0.319*	0.069	-0.069
	Region 4	Northwest and Panhandle	-0.039	0.877	-0.004	-0.427*	0.029	-0.091
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.100	0.771	-0.009	0.322	0.156	0.068
	AECLASS 3	Age Class x Experience Class= 13-16	0.251	0.416	0.025	0.127	0.560	0.026
	AECLASS 4	Age Class x Experience Class= 17-20	0.181	0.568	0.018	0.141	0.524	0.029
Education	**Education 2**	Vocational education	0.200	0.439	0.019	0.089	0.622	0.019
	Education 3	Bachelor's degree	0.203	0.397	0.019	0.088	0.606	0.018
	Education 4	Graduate or Professional degree	0.474*	0.058	0.049	0.259	0.154	0.056
Income	**Income 2**	$30,000 to $59,999	0.250	0.402	0.029	0.028	0.895	0.006
	Income 3	$60,000 to $89,999	-0.281	0.383	-0.026	0.013	0.954	0.003
	Income 4	$90,000 to $119,999	0.002	0.994	0.000	-0.356	0.158	-0.072
	Income 5	$120,000 +	-0.333	0.361	-0.030	-0.122	0.625	-0.026
Farm Income	**FarmIncome 2**	21% to 40%	0.150	0.505	0.015	0.026	0.873	0.006
	FarmIncome 3	41% to 60%	-0.084	0.792	-0.008	-0.248	0.295	-0.050
	FarmIncome 4	61% to 100%	0.285	0.436	0.030	-0.015	0.960	-0.003
Training	**Training**	MC or BQA Training	-1.073*	0.015	-0.074	-1.174*	<.0001	-0.193
			HL:0.0025					

*Asterisk denotes significance of 0.1 or better.

Table 25. Continued

			Marketing Education			Management		
	Variable	**Description**	**Coefficient**	**P-value**	**Marginal Effects**	**Coefficient**	**P-value**	**Marginal Effects**
	Intercept		-1.8051*	<.0001		-1.599*	<.0001	
Herd Size	**HerdSize 2**	50 to 99 cows	0.191	0.440	0.013	-0.286	0.241	-0.024
	HerdSize 3	100 to 499 cows	-0.040	0.907	-0.003	0.041	0.890	0.004
	HerdSize 4	500 + cows	-13.028	0.987	-0.069	-13.823	0.985	-0.103
Region	**Region 2**	Northeast	0.424	0.107	0.028	-0.256	0.293	-0.021
	Region 3	Southwest	-0.130	0.694	-0.007	-0.460*	0.104	-0.036
	Region 4	Northwest and Panhandle	0.418	0.183	0.028	0.050	0.857	0.005
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.719*	0.021	-0.061	-0.458	0.164	-0.042
	AECLASS 3	Age Class x Experience Class= 13-16	-0.668*	0.023	-0.058	-0.506*	0.101	-0.045
	AECLASS 4	Age Class x Experience Class= 17-20	-1.005*	0.002	-0.077	-0.322	0.293	-0.031
Education	**Education 2**	Vocational education	0.035	0.908	0.002	0.109	0.687	0.009
	Education 3	Bachelor's degree	-0.137	0.644	-0.008	0.087	0.736	0.007
	Education 4	Graduate or Professional degree	0.204	0.491	0.014	-0.088	0.765	-0.007
Income	**Income 2**	$30,000 to $59,999	-0.400	0.299	-0.023	0.166	0.587	0.016
	Income 3	$60,000 to $89,999	-0.079	0.829	-0.005	-0.473	0.163	-0.036
	Income 4	$90,000 to $119,999	0.199	0.615	0.014	-0.597	0.144	-0.043
	Income 5	$120,000 +	0.278	0.487	0.021	0.179	0.619	0.018
Farm Income	**FarmIncome 2**	21% to 40%	-0.666*	0.032	-0.040	0.398*	0.098	0.035
	FarmIncome 3	41% to 60%	-0.799*	0.090	-0.045	-0.306	0.447	-0.020
	FarmIncome 4	61% to 100%	-0.411	0.440	-0.027	0.721*	0.057	0.073
Training	**Training**	MC or BQA Training	0.357	0.300	0.026	-0.828*	0.084	-0.050

*Asterisk denotes significance of 0.1 or better.

Table 26. Effects of Producer Demographics on Reason Categories for Producers Who Do Not Participate in Age and Source Verification

			Doubt Returns/ Premiums			Technical Education		
	Variable	Description	Coefficient	P-value	Marginal Effects	Coefficient	P-value	Marginal Effects
	Intercept		-2.1353*	<.0001		-0.00832	0.9734	
Herd Size	**HerdSize 2**	50 to 99 cows	-0.213	0.303	-0.025	-0.168	0.236	-0.042
	HerdSize 3	100 to 499 cows	-0.199	0.449	-0.023	-0.136	0.462	-0.034
	HerdSize 4	500 + cows	-14.003	0.981	-0.148	0.315	0.682	0.079
Region	**Region 2**	Northeast	-0.424*	0.058	-0.043	-0.059	0.688	-0.015
	Region 3	Southwest	0.101	0.649	0.012	-0.168	0.305	-0.041
	Region 4	Northwest and Panhandle	0.052	0.829	0.006	-0.027	0.880	-0.007
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	-0.378	0.223	-0.039	0.149	0.466	0.037
	AECLASS 3	Age Class x Experience Class= 13-16	0.142	0.606	0.017	-0.242	0.216	-0.060
	AECLASS 4	Age Class x Experience Class= 17-20	-0.117	0.683	-0.013	-0.550*	0.006	-0.134
Education	**Education 2**	Vocational education	0.418*	0.085	0.043	0.005	0.975	0.001
	Education 3	Bachelor's degree	0.254	0.272	0.025	0.158	0.314	0.039
	Education 4	Graduate or Professional degree	0.702*	0.003	0.081	0.262	0.122	0.065
Income	**Income 2**	$30,000 to $59,999	0.274	0.352	0.030	0.089	0.658	0.022
	Income 3	$60,000 to $89,999	0.005	0.987	0.001	0.283	0.167	0.070
	Income 4	$90,000 to $119,999	0.193	0.566	0.021	-0.060	0.797	-0.015
	Income 5	$120,000 +	0.156	0.647	0.017	0.167	0.476	0.041
Farm Income	**FarmIncome 2**	21% to 40%	0.287	0.184	0.031	0.018	0.906	0.004
	FarmIncome 3	41% to 60%	0.187	0.550	0.020	-0.162	0.449	-0.040
	FarmIncome 4	61% to 100%	1.219*	0.000	0.185	-0.139	0.605	-0.034
Training	**Training**	MC or BQA Training	-0.391	0.239	-0.038	-0.647*	0.004	-0.152

*Asterisk denotes significance of 0.1 or better.

Table 26. Continued

			Marketing Education			Management		
	Variable	**Description**	**Coefficient**	**P-value**	**Marginal Effects**	**Coefficient**	**P-value**	**Marginal Effects**
	Intercept		-2.6831*	<.0001		-2.0018*	<.0001	
Herd Size	**HerdSize 2**	50 to 99 cows	0.583*	0.033	0.033	-0.245	0.310	-0.021
	HerdSize 3	100 to 499 cows	0.413	0.270	0.021	-0.632*	0.065	-0.046
	HerdSize 4	500 + cows	-12.385	0.989	-0.045	-13.732	0.985	-0.103
Region	**Region 2**	Northeast	0.237	0.402	0.013	-0.607*	0.026	-0.041
	Region 3	Southwest	-0.113	0.744	-0.005	-0.208	0.453	-0.016
	Region 4	Northwest and Panhandle	-0.036	0.922	-0.002	0.218	0.425	0.020
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	0.332	0.365	0.021	0.273	0.444	0.022
	AECLASS 3	Age Class x Experience Class= 13-16	-0.006	0.987	0.000	0.055	0.875	0.004
	AECLASS 4	Age Class x Experience Class= 17-20	-0.532	0.200	-0.023	-0.110	0.759	-0.007
Education	**Education 2**	Vocational education	0.242	0.452	0.014	0.329	0.226	0.026
	Education 3	Bachelor's degree	-0.109	0.737	-0.005	-0.067	0.812	-0.004
	Education 4	Graduate or Professional degree	0.009	0.978	0.000	0.195	0.508	0.015
Income	**Income 2**	$30,000 to $59,999	-0.425	0.317	-0.021	0.064	0.839	0.006
	Income 3	$60,000 to $89,999	0.023	0.955	0.001	-0.394	0.250	-0.029
	Income 4	$90,000 to $119,999	-0.113	0.804	-0.006	-0.321	0.415	-0.024
	Income 5	$120,000 +	-0.046	0.919	-0.003	-0.232	0.556	-0.018
Farm Income	**FarmIncome 2**	21% to 40%	-0.745*	0.030	-0.036	0.288	0.259	0.022
	FarmIncome 3	41% to 60%	-0.721	0.128	-0.035	-0.116	0.785	-0.007
	FarmIncome 4	61% to 100%	-0.643	0.272	-0.032	0.912*	0.028	0.090
Training	**Training**	MC or BQA Training	0.570*	0.104	0.037	-0.641	0.182	-0.038

*Asterisk denotes significance of 0.1 or better.

Table 27. Effects of Producer Demographics on Reason Categories for Producers Who Do Not Participate in COOL

			Doubt Returns/ Premiums			Technical Education		
	Variable	Description	Coefficient	P-value	Marginal Effects	Coefficient	P-value	Marginal Effects
	Intercept		-2.6655*	<.0001		0.2538	0.3059	
Herd Size	**HerdSize 2**	50 to 99 cows	-0.211	0.327	-0.022	-0.163	0.250	-0.041
	HerdSize 3	100 to 499 cows	-0.140	0.603	-0.015	-0.226	0.213	-0.057
	HerdSize 4	500 + cows	-13.549	0.984	-0.132	-0.197	0.804	-0.049
Region	**Region 2**	Northeast	-0.196	0.394	-0.018	-0.027	0.854	-0.007
	Region 3	Southwest	0.176	0.453	0.019	-0.208	0.202	-0.052
	Region 4	Northwest and Panhandle	0.243	0.331	0.027	0.026	0.885	0.006
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	0.099	0.766	0.009	0.056	0.787	0.014
	AECLASS 3	Age Class x Experience Class= 13-16	0.360	0.242	0.035	-0.276	0.159	-0.069
	AECLASS 4	Age Class x Experience Class= 17-20	0.293	0.352	0.028	-0.545*	0.007	-0.136
Education	**Education 2**	Vocational education	0.279	0.285	0.025	-0.053	0.753	-0.013
	Education 3	Bachelor's degree	0.422*	0.074	0.040	0.272*	0.081	0.068
	Education 4	Graduate or Professional degree	0.718*	0.003	0.076	0.153	0.365	0.038
Income	**Income 2**	$30,000 to $59,999	0.306	0.326	0.031	0.087	0.660	0.022
	Income 3	$60,000 to $89,999	0.129	0.689	0.012	0.372*	0.065	0.093
	Income 4	$90,000 to $119,999	0.077	0.831	0.007	-0.150	0.514	-0.037
	Income 5	$120,000 +	0.136	0.706	0.013	0.109	0.637	0.027
Farm Income	**FarmIncome 2**	21% to 40%	0.277	0.205	0.029	0.067	0.658	0.017
	FarmIncome 3	41% to 60%	-0.041	0.902	-0.004	-0.210	0.316	-0.052
	FarmIncome 4	61% to 100%	0.609*	0.088	0.073	-0.420	0.115	-0.104
Training	**Training**	MC or BQA Training	-0.315	0.356	-0.029	-0.693*	0.002	-0.168

*Asterisk denotes significance of 0.1 or better.

Table 27. Continued

			Marketing Education			Management		
	Variable	**Description**	**Coefficient**	**P-value**	**Marginal Effects**	**Coefficient**	**P-value**	**Marginal Effects**
	Intercept		-2.1396*	<.0001		-2.3397*	<.0001	
Herd Size	**HerdSize 2**	50 to 99 cows	0.298	0.312	0.015	-0.351	0.144	-0.031
	HerdSize 3	100 to 499 cows	-0.348	0.419	-0.013	-1.008*	0.005	-0.068
	HerdSize 4	500 + cows	1.138	0.360	0.086	-14.114	0.985	-0.112
Region	**Region 2**	Northeast	-0.199	0.540	-0.008	-0.489*	0.063	-0.034
	Region 3	Southwest	0.137	0.695	0.007	-0.270	0.335	-0.021
	Region 4	Northwest and Panhandle	0.333	0.347	0.017	0.089	0.754	0.008
AE Class	**AECLASS 2**	Age Class x Experience Class= 9-12	0.011	0.977	0.001	0.437	0.247	0.030
	AECLASS 3	Age Class x Experience Class= 13-16	-0.489	0.198	-0.028	0.300	0.414	0.020
	AECLASS 4	Age Class x Experience Class= 17-20	-1.080*	0.012	-0.049	0.292	0.434	0.019
Education	**Education 2**	Vocational education	0.068	0.841	0.004	0.315	0.268	0.023
	Education 3	Bachelor's degree	-0.374	0.277	-0.017	0.227	0.408	0.016
	Education 4	Graduate or Professional degree	-0.369	0.347	-0.017	0.323	0.265	0.023
Income	**Income 2**	$30,000 to $59,999	-0.557	0.184	-0.027	0.194	0.544	0.016
	Income 3	$60,000 to $89,999	-0.269	0.508	-0.015	-0.279	0.423	-0.019
	Income 4	$90,000 to $119,999	-0.111	0.805	-0.007	-0.269	0.506	-0.018
	Income 5	$120,000 +	-0.450	0.354	-0.023	0.099	0.799	0.008
Farm Income	**FarmIncome 2**	21% to 40%	-0.124	0.720	-0.005	0.110	0.674	0.008
	FarmIncome 3	41% to 60%	0.359	0.406	0.019	-0.296	0.501	-0.018
	FarmIncome 4	61% to 100%	0.102	0.862	0.005	0.956*	0.022	0.100
Training	**Training**	MC or BQA Training	0.805*	0.029	0.051	-0.239	0.567	-0.016
			HL: 0.0335					

*Asterisk denotes significance of 0.1 or better.

Table 28. Variables included in Equations 1 and 2 in Chapter III

	Dependent Variable	**Definition**
	$Basis_{it}$	*i*th adjusted transaction price ($/cwt) for a lot of calves in sale *t*
	Independent Variables	**Definition**
	LnHead	Continuous variable for the logarithm of lot size
Weight	AvgWt	Continuous variable for the average weight of a lot
	$AvgWt^2$	Continuous variable for average weight squared
Preconditioning Variables	Vac	1=vaccinated, 0 otherwise
	Wean	1=weaned, 0 otherwise
	Cert	1=OQBN certified, 0 otherwise
Color	Black	Base
	Red	1=red hide, 0 otherwise
	Hereford	1=Hereford, 0 otherwise
	White/Grey	1=white or grey hide, 0 otherwise
	Dairy/Longhorn	1=dairy or longhorn, 0 otherwise
	BlackMixed	1=75% + black hide, 0 otherwise
	RedMixed	1=75% + red hide, 0 otherwise
	Mixed	1=mixed hides, 0 otherwise
	Other	1="other" hide, 0 otherwise
Brahman	Brahman	1=25%+ Brahman influence, 0 otherwise
Flesh	Thin	1=thin, 0 otherwise
	Average	Base
	Fleshy	1=fleshy, 0 otherwise
Frame	Large	1= large frame, 0 otherwise
	Medium/Large	1=medium/large frame, 0 otherwise
	Medium	Base
Uniformity	Uniform status	1=un-uniform lot, 0 otherwise
Health	Health status	1=unhealthy lot, 0 otherwise
Horns	Horn status	1=horns, 0 otherwise
Muscling	Thick, all # 1	1=thick, all #1, 0 otherwise
	Mixed, #1 and #2	1=mixed, #1 and #2, 0 otherwise
	Medium, all #2	Base
	Mixed, #2 and #3	1=mixed, #2 and #3, 0 otherwise
	Light, all #3	1=light, all #3, 0 otherwise
Fill	Gaunt	1=gaunt, 0 otherwise
	Average	Base
	Full	1=full, 0 otherwise

*A preceding H in front a variable denotes a heifer, while a preceding S denotes a steer.

Table 28. Continued

	Independent Variables	**Definition**
AgeSource	Age and Source Verification	1= age and source verified, 0 otherwise
Reputation	Reputation	1=reputation announced, 0 otherwise
OSale	OQBN sale	1=OQBN cattle were sold, 0 otherwise
Barn	Barn1	Base
	Barn2	1=barn 2, 0 otherwise
	Barn3	1=barn 3, 0 otherwise
	Barn4	1=barn 4, 0 otherwise
	Barn5	1=barn 5, 0 otherwise
	Barn6	1=barn 6, 0 otherwise
	Barn7	1=barn 7, 0 otherwise
Year	Year	1=2011, 0 otherwise

*A preceding H in front a variable denotes a heifer, while a preceding S denotes a steer.

Table 29. Summary Statistics for Steers and Heifers

Lot Characteristic		Steers		Heifers	
		Mean	Std. Dev.	Mean	Std. Dev
Head		7.52	12.86	7.64	13.93
Weight (cwt.)		5.32	1.18	5.14	1.12
Price ($/cwt.)		1.28	0.23	1.15	0.19
		Frequency	Percent	Frequency	Percent
Vaccinations					
	Vaccinated	1088	27.32	798	20.04
	Not Vaccinated	2895	72.68	3185	79.96
Weaning					
	Weaned	1413	35.48	1072	26.91
	Not Weaned	2570	64.52	2911	73.09
Certification					
	OQBN Certified	763	19.16	529	13.28
	Not certified	3220	80.84	3454	86.72
Color					
	Black	1379	34.62	1095	27.49
	Red	168	4.22	120	3.01
	Hereford	37	0.93	29	0.73
	White/Gray	179	4.49	160	4.02
	Dairy/Longhorn	38	0.95	16	0.40
	Black Mixed	18	0.45	16	0.40
	Red Mixed	183	4.59	174	4.37
	Mixed	48	1.21	24	0.60
	Other	158	3.97	132	3.31
Brahman					
	No Brahman	3753	94.23	3870	97.16
	Brahman Influence	230	5.77	113	2.84
Flesh					
	Thin	53	1.33	35	0.88
	Average	1548	38.87	1262	31.68
	Fleshy	607	15.24	469	11.78
Frame					
	Large	348	8.74	255	6.4
	Medium/Large	715	17.95	451	11.32
	Medium	1145	28.75	1060	26.61
Uniformity					
	Uniform	2195	55.11	1763	44.26
	Not Uniform	13	0.33	3	0.08

Table 29. Continued

Lot Characteristic		Steers		Heifers	
Health		Frequency	Percent	Frequency	Percent
	Healthy	2186	54.88	1752	43.99
	Not Healthy	22	0.55	14	0.38
Horns					
	Horns	154	3.87	91	2.28
	No Horns	2054	51.57	1675	42.05
Muscling					
	Thick, all # 1	366	9.19	220	5.52
	Mixed, #1 and #2	709	17.8	472	11.85
	Medium, all #2	1090	27.37	1059	26.59
	Mixed, #2 and #3	11	0.28	4	0.10
	Light, all #3	32	0.80	11	0.28
Fill					
	Gaunt	12	0.30	15	0.38
	Average	1890	47.45	1526	38.31
	Full	306	7.68	225	5.65
Age & Source					
	Verified	126	3.16	80	2.01
Reputation					
	Seller Announced	760	19.08	573	14.39
O Sale		Frequency		Percent	
	Non-OQBN Sale	1193		29.95	
	OQBN Sale	2790		70.05	
Barn					
	Barn 1	988		24.81	
	Barn 2	144		3.62	
	Barn 3	718		18.03	
	Barn 4	728		18.28	
	Barn 5	739		18.55	
	Barn 6	236		5.93	
	Barn 7	430		10.80	
Year					
	2010	2850		71.55	
	2011	1133		28.45	

Table 30. Regression Coefficients for Steers and Heifers

Variable	Steers			Heifers		
	Coefficient	Std. Error	P-Value	Coefficient	Std. Error	P-Value
Intercept	0.867483	0.460744	0.0598	0.229739	0.279954	0.4119
LnHead	4.069712*	0.266043	<.0001	2.920089*	0.182895	<.0001
AvgWt	8.307924*	0.248686	<.0001	0.284462	0.172326	0.0989
$AvgWt^2$	-1.46167*	0.036746	<.0001	-0.44417*	0.026898	<.0001
Vac	2.796673*	0.791489	0.0004	3.338599*	0.535113	<.0001
Wean	1.971506*	0.722088	0.0064	0.012154	0.476513	0.9797
Cert	0.58052	0.708391	0.4126	0.6036	0.486828	0.2151
Red	-7.63994*	0.822666	<.0001	-4.56377*	0.611674	<.0001
Hereford	-13.0399*	1.624284	<.0001	-4.3344*	1.147255	0.0002
White/Grey	-2.54284*	1.002023	0.0112	-3.63075*	0.680556	<.0001
Dairy/Longhorn	-32.0574*	2.406851	<.0001	-21.5674*	1.921408	<.0001
Black Mixed	-13.3889*	2.322975	<.0001	-14.1201*	1.528228	<.0001
Red Mixed	-2.79052*	0.812586	0.0006	-1.15073*	0.533726	0.0311
Mixed	-4.38453*	1.44482	0.0024	-3.82635*	1.251269	0.0022
Other (color)	-5.99304*	0.871227	<.0001	-5.07762*	0.602038	<.0001
Brahman	-5.42742*	0.698085	<.0001	-2.91245*	0.59815	<.0001
Thin	-11.251*	1.512168	<.0001	-7.17651*	1.091198	<.0001
Fleshy	-0.79598	0.534036	0.1362	-1.1612*	0.379276	0.0022
Large	-0.70242	0.807765	0.3846	0.195775	0.592237	0.741
Medium/Large	-0.20941	0.655008	0.7492	-0.32944	0.46409	0.4778
(Non) Uniform	-5.99086*	2.754674	0.0297	-13.8679*	3.504659	<.0001
(Non) Healthy	-46.5388*	2.095897	<.0001	-41.3458*	1.634789	<.0001
Horns	-5.21092*	0.90715	<.0001	-3.60796*	0.694966	<.0001
Thick	0.983737	0.692062	0.1553	2.832602*	0.576618	<.0001
Mixed #1 & #2	-0.2368	0.635461	0.7094	0.663861	0.444618	0.1355
Mixed #2 & #3	-21.1029*	2.997881	<.0001	-4.98553	3.053061	0.1026
Light	-23.2965*	2.680725	<.0001	-14.5266*	2.396817	<.0001
Gaunt	-2.63027	2.914248	0.3668	-1.98304	1.639123	0.2264
Full	-1.75719*	0.676305	0.0094	-0.49155	0.486949	0.3128
Age&Source	-1.43039	0.947982	0.1314	0.985327	0.726391	0.175
Reputation	-1.13906*	0.525569	0.0303	-0.87858*	0.362224	0.0153
O Sale	-0.21678	0.453906	0.633	-0.66281*	0.271562	0.0147
Barn 2	-4.33441*	0.937186	<.0001	-1.63856*	0.568628	0.004
Barn 3	-2.38398*	0.533566	<.0001	-1.59817*	0.331492	<.0001
Barn 4	0.851592	0.531343	0.1091	1.478993*	0.320969	<.0001
Barn 5	0.588745	0.530789	0.2674	0.470431	0.32283	0.1451
Barn 6	2.529322*	0.732272	0.0006	0.404767	0.457232	0.3761
Barn 7	-0.96734	0.620064	0.1188	0.680549*	0.379041	0.0727
Year	-0.75277*	0.406794	0.0643	0.628345*	0.254338	0.0135

*Asterisk denotes significance of 0.1 or better.

**Class variables use the following bases: Not Vaccinated; Not Weaned; Not OQBN Certified; Color-Black; No Brahman Influence; Flesh-Average; Frame-Medium; Uniform; No Horns; Muscling-#2; Condition-Average; Not Age & Source Verified; No Seller announced; Regular Sale; Barn 7. Number of Observations: Steers, 2211; Heifers, 1772.

VITA

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Pages in Study:148 Candidate for the Degree of Master of Science

Major Field: Agricultural Economics

Scope and Method of Study: This two-essay thesis aims to better identify non-adopting cow-calf producers in Oklahoma and to find the value of steer and heifer characteristics sold in an auction barn. Using the 2009 Beef Management and Marketing Survey, the first piece determines the least adopted value-added management and marketing practices, determines the most frequent reason categories hindering adoption, identifies the probability of producers not adopting a practices based on their characteristics, and identifies the probability of non-adopting producers to state specific reason categories hindering adoption for each practice. The second piece uses Oklahoma Quality Beef Network auction data to determine the value of feeder cattle traits explicitly for steers and heifers in order to make market prices more transparent for buyers and sellers.

Findings and Conclusions: In the first piece, results showed producers are most constrained to adopting value-added management and marketing practices because the doubt the financial return from adoption or they do not know how to properly implement a practice. Moreover, a majority of Oklahoma producers are either older with a lot of experience or are “hobby” producers who receive a majority of their income off of the farm. The results also showed herd size, region, the combination of age and experience, and percentage of farm income to influence non-adoption probabilities. In the second piece, the results revealed a much larger discount for steers than heifers on most characteristics. This is likely due to the heifers being desired for their maternal ability and reproductive purposes and because it is heifers have two market alleys. Heifers can either be purchased for replacement females or to go to the feed yard.

ADVISER’S APPROVAL: Dr. Derrell Peel