# EXPLORING PRODUCER PERCEPTIONS FOR CATTLE PRICE AND ANIMAL PERFORMANCE IN THE STOCKER INDUSTRY

by

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# Abstract

Stocker cattle economic research is very limited in scope. A focus of this research is to deepen our understanding of how cattle price and animal performance variability is viewed and approached by stocker cattle producers in the United States. Another part of this research focuses on what characteristics may be drivers of whether producers choose to practice different risk management strategies.

To analyze how cattle price and animal performance variability is viewed and approached by stocker cattle producers, a stated preference valuation method was used to find willingness-to-pay (WTP) estimates. Two different approaches were used to provide outcome probability information where one approach had probabilities for expected ADG change across scenarios and ADG ranges were held constant (Treatment Group A) and the second approach had ADG ranges change across scenarios and the probabilities were held constant (Treatment B). The results of our study suggest that survey respondents process scenarios differently when presented in formats Treatment Group A versus Treatment Group B. The underlying reason for this is beyond identification in this study as respondent certainty and comfort as assessed in follow-up questions was similar across the treatments. Results indicate that producers value buying cattle versus opting out of purchasing cattle and they value higher performing cattle; however, each additional pound is not valued the same.

To determine the characteristics of producers and their operations that use different risk management practices, we estimated multiple probit models with the dependent variables being use of the different risk management practices. Results from the probit models suggest how producers source cattle for their operation, whether it is the region or the different markets they source from, are key determinants on whether producers practice different management

strategies for market and price risk. The results suggest the model were not a good fit. Of the 30 explanatory variables included in the model, on average five explanatory variables were significant throughout the seven different dependent variables. This could be attributed to factors our study does not explicitly observe; therefore it remains a knowledge gap for the industry.

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# Chapter 1 - Introduction

Beef cattle production in the United States is comprised of three different phases of production including cow-calf, stocking or backgrounding, and finishing. Additional weight gain and the utilization of rangeland and foraged based grazing systems is the typical focus of stocker production. Some stocker systems use a mix of feed and forages to add additional pounds to their cattle. Stocker producers buy cattle after weaning or retain their own calves from a cow-calf production system and generally sell the cattle to feedlots to receive a finishing diet. Cow-calf producers have the opportunity to capitalize on these margins by retaining ownership of their weaned calves for extra growth before the finishing phase.

The stocking or backgrounding segment is important to the overall beef cattle industry due in part to the high emphasis on cattle health management and nutrition during this phase of production. However, the stocker segment has received little economic research attention over the years. A number of issues faced by the stocker industry in the United States are rising in economic importance, but are poorly understood due to evolving risk environments, as well as the issue that the segment has received less research consideration. Evolving risk environments include increased input costs, price volatility, and financial risk. Commodity prices, such as corn, have been highly volatile prices in recent years. Pasture land has also risen dramatically in recent years. Price volatility is of importance to stocker producers due to seasonal and fundamental factors influencing the spread between stocker calf and yearling prices. Large capital investments are required to enter the cattle market at any production stage. Since there is a large dollar requirement, stocker producers face financial risk in market prices.

A key issue is the current lack of understanding of how buyers assess the value of cattle based on purchase price and anticipated Average Daily Gain (ADG). Average daily gain is a performance indicator that measures the weight gained over a certain time period. The more representative of reality that the stocker producer perceptions of risk are relative to purchase price and anticipated ADG of purchase prospects, the more likely producers are to make correct buying decisions.

Beyond my own interest in stocker cattle and risk management, the information gap that stocker producers experience during placement purchasing is the core motivation behind this research. Improved understanding of the industry and how assessment is made during purchasing will help enhance understanding at different levels of the production phases. Improved understanding will also enhance cow-calf producer backgrounding assessments and decisions.

## 1.1 Objective

This study looks at the overall stocker industry to provide an update to the National Stocker Survey from 2008 on producer and operation characteristics. More narrowly, this research seeks to provide an industry overview of the stocker cattle segment by summarizing production, including management characteristics, perceived ADG and profitability variability over time, stocker cattle source, placement frequency and seasonality, risk management strategies, ADG influencers, and producer demographics.

An additional, more narrow goal of this research is to enhance the understanding of how cattle price and animal performance variability is viewed and approached by U.S. stocker producers. In doing so, this work has the potential to improve the accuracy of the decision making process of producers at all stages of the beef industry. Particular objectives include identifying:

1. How producer perceptions, preferences, and management implications vary across producers distinguished by owner demographics, operation characteristics, and past patterns of management; and
2. The impact of cattle price and animal performance variability on placement purchasing decisions and producer preferences.

In order to accomplish this, three main activities were conducted. First, a review of existing literature was needed on topics related to research in the stocker industry, overall beef industry risk management, and stated-preference valuation methods. Secondly, data was gathered from a comprehensive producer survey and analyzed to meet our objectives. Finally, the results are reported and discussed with the implications.

## 1.2 Motivation

The important knowledge gap of how buyers assess the value of cattle based on purchase price and anticipated ADG is the main motivation behind this research. This research will offer valuable insight, though currently limited in scope. The information gained from this research will deepen understanding of stocker producer perceptions and preferences on key issues related to price and performance variability, leading to more efficient purchasing decisions and operation management. Given this improved understanding, targeted educational efforts and ultimately enhanced overall industry decision making will develop. The value of this understanding and additional education is magnified by the current environmental and economic conditions of the industry including historical tight calf crops and interest in heifer retention for herd expansion.

## 1.3 Organization of Thesis

This thesis is presented in five chapters, the first of which is the present introduction. Chapter 2 contains a review of previous literature of related topics that form the thesis foundation. Chapter 3, the methods section, describes the process for collection and analysis of the data used. Chapter 4 presents the results of the analysis along with a discussion and implications for the cattle industry and more specifically the stocker cattle segment. A summary of the research along with limitations and questions raised by this study for future research as provided in Chapter 5.

# Chapter 2 - Literature Review

The stocker industry is a phase of beef cattle production that is not widely researched. This chapter will provide a review of literature related regarding cow-calf management practices, risk mitigation strategies in the agriculture sector with specific focus on the livestock industry, and the use of stated preference methods in surveys will be covered. The literature reviewed will provide the foundation for the empirical work presented later in the thesis.

## 2.1 Cow-Calf Management Practices

The stocker industry is not widely researched. Therefore, this section covers a review of literature on the cow-calf sector, and more narrowly on the management practices that affect their market price. Since stocker production is the phase after cow-calf production, it's important to understand producer's behavior in the cow-calf sector in regards to management practices. When producers in the cow-calf sector receive premiums for value added management practices, this implies stocker producers see value in those management practices. The following studies are on value-added attributes in the cow-calf sector.

A study conducted by Williams et al. (2014) looked at the probability of a cow-calf producer receiving a premium for certain valued-added management practices. The authors calculated the probability of a producer received a premium for three valued-added management practices including calves announced as weaned, vaccinated, and dehorned, and three bundles of practices, including weaning plus vaccinating, weaning plus vaccinating plus dehorning, and a vac-45 preconditioning program consisting of a 45-day preconditioning period, vaccinating, dehorning, and certification. This study was motivated by low adoption rates seen in the cow-calf sector regarding value-added management practices even with encouragement from University extension faculty (Williams et al., 2014). To better encourage risk-averse producers to adopt

value-added management practices, research must extend beyond traditional approaches of only reporting premiums and budgeted profits for these practices. When producers can receive premiums for their management practices, they can in turn increase revenues.

Cow-calf producers are typically risk-averse. Pope et al. (2011) found that as risk aversion increases, producers are less likely to retain calves past weaning. This could be due to the fact cow-calf producers typically reduce risk by practicing low-cost production methods (Williams et al., 2014).Many opportunities are available for cow-calf producers to increase their revenues; however, the benefits must outweigh the costs in order for producers to adopt the practices.

Results of the research found that the practice of vaccinating has the highest probability of receiving a positive premium with probabilities ranging between 63% and 65%. Net returns for weaning saw probabilities between 61% and 64%. Dehorning calves yields a probability of positive net returns between 56% and 59%. Results also suggest that producers who at least wean, vaccinate, and dehorn their cattle will see positive economic returns over 70% of the time. This research provides information that should incentivize cow-calf producers to adopt value-added management practices, since these practices really do add value to calves.

Another study conducted by Ward, Ratcliff, and Lalman (2004) determined what attributes affect feeder calf values at livestock sales to improve producer knowledge for marketing and management strategies. The authors collected their data over the time period 2001-2003 from Oklahoma Quality Beef Network feeder calf sales. The data collection contains 35,000 feeder calf sales at 20 different sales in the state of Oklahoma. The researchers used a regression model to estimate feeder calf traits for each sale year. The authors found the mean value for these traits by summarizing premiums and discounts for the attributes in the sale years

and then they compiled them across the years. Attributes discussed in this study include weight, gender, frame, muscling, condition, horns, health, as well as sale lot uniformity and sale lot size.

The results of the study found feeder calf prices decreased as weight increased. On average over the twenty sales, large framed cattle received a discount of $1.68/cwt compared to medium framed cattle. Small framed cattle received a heavier discount on average ($3.50/cwt). In regards to the muscling attribute, cattle buyers discounted thinly muscled cattle at an average of $6.20/cwt and paid a small premium for heavily muscled cattle at an average of $0.52/cwt. The condition attribute saw an average discount of $1.78/cwt for fleshy or fat cattle, while the thin fleshed cattle had an average premium of $1.36/cwt. Horned cattle were discounted $1.56/cwt on average. Regarding the health attribute unhealthy cattle or cattle that appeared to be unhealthy received an average discount of $8.58/cwt. Buyers valued lot uniformity and paid on average a premium of $1.91/cwt. Prices may vary across sales and years, but an estimate of the value of attributes can be determined to help guide cow calf producers in making management and marketing decisions.

A study similar to the previous, looked at value added opportunities in the cow-calf sector and how they are valued at the market place. This study estimates the marginal value of value-added production practices on feeder calf prices in the Superior Livestock Auction (SLA) video market (Zimmerman, et al., 2012). Animal characteristics and value-added management practices such as health programs, implants, naturally raised, age and source verified, were evaluated to determine the effect on feeder cattle prices. What motivated the study was the benefits cow-calf producers would receive in having more information on the value management practices have in the market place. Cattle buyers also benefit from the information by gaining a better understanding of the market value of calves with specific attributes.

The researchers used a hedonic pricing model to estimate the attributes for each steers and heifers. The authors found as weight increased prices decreased. Discounts were paid for calves that originated in the Southeast and the West regions compared to calves in the South Central region due to transportation costs and specifically in the Southeast quality perceptions associated with cattle from this region (Zimmerman, et al., 2012). The researchers found that calf weaning and animal health programs offered the greatest value-added premiums. Age and source verified calves are also valued in the market place compared to calves without verification.

## 2.2 Risk Management in the Livestock Industry

A study on beef producers' risk management perceptions was conducted by Hall et al (2003). The authors wanted to determine what type of risk matters to producers and how they manage those risks. Institutionally endorsed risk management tools are rare for beef cattle producers, therefore, they manage risk with enhancements of basic herd management procedures (Hall et al., 2003). Researchers have found that livestock producers have a lower preference for risk management tools compared to crop producers. There are several possible reasons for this: livestock producers may perceive the risk management tools as inadequate, or there's a lack of training required to use the tools, or a lack of motivation (Hall et al., 2003). This study seeks to determine the risk management actions and attitudes of beef cattle producers to further help determine future risk management programs.

The authors surveyed Texas and Nebraska cattle producers in 2000, by classifying the producers in terms of the number of cattle on their operations: 50 to 499, 500 to 999, and 1,000 or more. The authors used the survey data to determine risk preferences of cattle producers, perceptions of the sources and importance of risk, and producers' perceived effectiveness of risk management strategies.

The results of the study found areas of risk that are of concern to producers. Drought and cattle prices were the most concern to producers as sources of risk, with variation in non-feed input prices, changes in government environmental programs, extremely cold weather, changes in government farm programs, hay price variability, disease, land price variability, variation in rented pasture availability, labor availability, and labor price following. Results found that producers believe the most effective way at managing risk is maintaining animal health followed by (in order of effectiveness) being a low cost producer, maintaining financial/credit reserves, off farm investments, specializing in a phase of cattle production, off farm employment, diversifying ranch/farm enterprises, forward contracting, futures and options. Researchers also found that producers see an interest in gaining more information about risk management specifically alternative pricing mechanisms, financial management, and herd health management.

A risk management strategy that beef producers use in the cow-calf sector is retaining ownership of their cattle through a longer phase of production. This can help improve returns since cow-calf producers are susceptible to low and volatile returns. Even though retained ownership has received considerable attention overtime which have illustrated increased returns, cow-calf producers have yet to adopt this longer phase of production (Pope et al., 2011). One reason why this might be is that cow-calf producers are risk averse, while retaining ownership increases risk. The researchers conducted this study to determine how producer risk preferences affect cow-calf retention at different stages of production 1) at weaning, 2) retaining through backgrounding then selling, and 3) retaining through finishing.

The researchers could have asked the producers through a survey the percentage of calves they typically market at each phase. However, a time frame must be defined and there would be substantial measurement error. Therefore, they asked survey participants to provide an ordinal

ranking to each marketing phase: 1) sell at weaning, 2) background, and 3) retain calves through finishing. For each phase the producers were provided with five ordinal choices: 1) never, 2) seldom, 3) sometimes, 4) often, or 5) always. The two-tiered approach resulted a set of multi-nomial ordered choice dependent variables. Researchers used an ordered probit model, allowing for correlation among the errors of the three choices since they are not independent of each other. The researchers estimated each equation separately and accounted for the cross equation correlation which resulted in efficient estimates. Explanatory variables used were producer characteristics, farm attributes, and management traits.

A contribution of their study was to incorporate an operator risk component. In previous literature, results suggested that risk concerns with retaining ownership center around price, animal performance, and health risks. MacCrimmon and Wehrung (1985) suggested that when including producer risk measurements its best to ask survey participants questions covering a variety of risky situations without redundancy and requiring a limited amount of time to complete. Fausti and Gillespie (2006) concluded that risk tolerance is situation dependent and different risk aversion rankings can result from different constructs.

The results of the study suggest that cow-calf producers are not uniformly risk averse. Even though producers are informed of the profit potential of retaining ownership of their calves, risk aversion is still a key driver of why they sell their calves at weaning.

The previous studies are more focused on risk management in the cow-calf sector. Factors affecting management practices in the stocker sector of the industry are very limited in scope. Thus, the motivation behind this research study, where researchers try and bridge the gap by determining the factors that influence the adoption of recommended management practices.

Researchers have identified that anabolic implants are one of the most cost-effective management practices, as they increases average daily gain by 10-15 percent and weight gain by 9-20 percent during the grazing season. Proper stocking rates are also an important management practice due to forage utilization being a critical cost to a stocking program. Management planning for a stocking program is critical due to the variable input and output prices, which are reflected in the purchase price of stocker cattle and the market price of feeder cattle. Griliches (1957), a pioneer in the research area of technology adoption, found that profitability was the biggest factor in the adoption of hybrid corn. In 1983, Rogers found that not only profitability, but relative advantage, compatibility, complexity, trialability, and observability are all factors that affect the adoption of management practices. Farm size has also been widely identified as a factor influencing adoption. The amount of off-farm work, a producer's net household income generated for the operation, specialization, diversification, human capital characteristics (age, education, experience), and heterogeneity of the resource base are all factors that research has found that affect adoption. Although management and technology adoption is widely researched, no studies specific to the stocker cattle industry have been investigated.

Researchers used a random utility model to represent a producer's decision to adopt technology. The attributes of a technology and a producer's characteristics are used as a liner function to model a producer's utility to adopt the certain technology. A binary logit model was used to estimate the decision to adopt a management practice. Explanatory variables included in the logit models were operation size, dependency upon operation income, producer age, education, extent of off-farm work, and value planed on operation objectives such as generating income to reduce off-farm work and choosing labor reducing management practices. Recommended management practices (RMPs) that were analyzed were implants, maintenance of

a proper stocking rate, administration of IM injections, marketing lot type, use of risk management tools, and presence of a long-term business plan for the stocker operation.

To conduct this research, a survey was issued to producers who received a copy of the Oklahoma Beef Cattle Manual. The survey focused on current management practices of stocker producers in Oklahoma specific to areas of production, forage, quality assurance and animal health, marketing and risk, genetics, and business planning management.

The authors found that operation size and higher education had a positive impact on whether producers will implant their cattle (Johnson, et al., 2010). Attributes including operation size, income dependency, off-farm work, and year-round and warm season grass stocking systems influenced accurate stocking rate management. These results were consistent with previous findings that producers were more likely to adopt practices that had immediate economic benefits. Operation size, income dependency, part-time off-farm work, and seasonal production systems all positively influenced the use of risk management tools (Johnson, et al., 2010). Operational characteristics had the biggest impact upon adoption probabilities.

In terms of managing risk in the beef industry by utilizing insurance products, there are not a lot of options for producers. One option that the Risk Management Agency (RMA) introduced due to the limited coverage provided by traditional insurance products for beef operations was Adjusted Gross Revenue-Lite (AGR-Lite). There are two traditional livestock insurance products, Livestock Risk Protection (LRP) and Livestock Gross Margin (LGM). LRP is a federally reinsured livestock product for swine, fed cattle, and feeder cattle. It is designed to protect producers against market prices falling below a predetermined coverage price (Williams et al., 2014). LGM encompasses cattle, swine and dairy. It protects gross margin (livestock market value minus feed costs), in which producers receive coverage equal to the difference

between actual gross margin and guaranteed gross margin if positive (Williams et al., 2014). RMA has put limits on these insurance products; however, crop insurance has no limits.

To determine AGR-Lite's presence and effectiveness on beef operations, researchers used detailed farm data concentrated on beef farms since this insurance product has the potential to provide more risk protection for beef producers than insurance products that have previously been provided. AGR-Lite is the first Federal Crop Insurance Corporation program to provide coverage for crops, animals, and other previously uninsurable commodities under one product by insuring whole-farm revenue (Williams et al., 2014). Researchers evaluated beef farms that generated more than 50% of their average total income from the beef operation (Williams et al., 2014). These farms were evaluated on net farm income variability.

Findings of the study suggest that risk reduction occurs on many beef farms. Factors that contribute to increased variability in net farm income but not gross income (which AGR-Lite covers) led to limitation in the effectiveness of the insurance product as a risk management tool (Williams et al., 2014). Thus, AGR-Lite might not be an effective management tool for some beef operations. This may be a reason why few policies have been sold despite that is does provide some risk-mitigation.

## 2.3 Stated Preference Valuation Methods

Choice experiments elicit preferences for goods and services by studying the choices made by respondents in survey settings (Wielgus et al., 2009). Respondents are given a number of choice sets, each containing alternatives described by unique combinations of attributes at different levels. A study conducted by Wielgus et al. (2009) examined the effects of choice experiments by including information on scenario risk in two different ways. One way is including probabilities for the occurrence of the valuation scenarios in the description of the

exercise. The second way was including ranges around mean values for that attributes. The authors wanted to determine the impact of goodness of fit, choice consistency, and WTP of including probabilistic information on realistic and credible scenarios in a valuation experiment. The term "risk" is used in their study since they included values for probabilities in their valuation scenarios (Wielgus et al., 2009). Risk presumes that the probabilities of random events are known (Wielgus et al., 2009). The researchers performed this study by surveying anglers and divers on the recreational value of marine resources in the Gulf of California and Mexico.

To conduct the study the authors included two blocks in their stated-preference valuation, in which one block included three versions: in version one there was no mention of the probability of occurrence, in version two the probability of occurrence was said to be 60%, and the third version included a statement in which the probability of occurrence was said to be 90%. The second block contained three versions as well. One version included attributes with no intervals, another version contained "narrow" intervals (mean ± 50%), and the last version contained "wide" intervals (mean ± 80%).

Information on scenario risk may increase WTP and it would be expected that survey versions that included any type of information on risk would have a higher WTP than "traditional" versions, in which no information is provided on risk (Wielgus et al., 2009). Under the neoclassical-economics framework of expected utility, individuals have knowledge about the probability of occurrence of different outcomes, and will select the outcome with the highest expected value (Wielgus et al., 2009). The WTP for scenarios of improvements would thus be expected to be higher in a version with a high probability of occurrence.

When choice sets do not contain the probability of success, respondents must infer their own probabilities which is unknown to the researcher, contribution to the random component of

utility. Survey versions which include values for the probability of occurrence of different scenarios should have a higher goodness of fit than traditional versions. However, in contrast (reviewed in Deshazo and Fermo, 2002) certain forms of information can lead to conduction and a cognitive burden for respondents. The inclusion of information on risk may impair model fit and choice consistency (Wielgus et al., 2009).

The results of the study suggest that including a statement on high probability of occurrence of the valuation scenario may improve goodness of fit and the consistency of choices. When they included a 90% probability of occurrence, results showed the goodness of fit measured as $p^2$ was significantly higher than the $p^2$ of a version with no information on probability and of a version mentioning a 60% probability of occurrence. The consistency of choices was also higher for the version with the highest probability. The version that contained the highest probability also had significant coefficients for attributes, indicating the information on scenario risk may be the type of information that contributes to information quality. If low risk increases WTP, as predicted by expected utility theory, it seems respondents assumed a probability of success greater than 90% in the traditional scenario, which had the highest WTP. Therefore, implying that a traditional choice experiment questions may substantially overestimate WTP. By providing realistic information on risk it may prompt respondents to state WTP values that are more consistent with economic theory of choosing under risk (Wielgus et al., 2009). Results also suggest that including information on risk in the form of intervals decreases goodness of fit, suggesting that using intervals for information on risk may increase the cognitive burden of responses (Wielgus et al., 2009). However, due to a relatively small sample size in their valuation survey, the results of their study cannot be considered conclusive.

Researchers Glenk and Colombo (2013) conducted a study on modelling outcome-related risk by adding it as an attribute in choice experiments. . When uncertainty over outcome exists it could lead to errors in conclusions drawn about welfare impacts of the subject of the choice experiment (Glenk & Colombo, 2013). When probabilities can be assigned to outcomes it is important to include it in descriptions around the stated preference scenario. This study sought to address three questions around modelling outcome-related risk including: Does the modelling approach impact the predictive performance of choice models? Does the modelling approach affect policy-relevant WTP estimates? How should findings from alternative modelling approaches be interpreted?

To address these questions the researchers analyzed the impacts of the different models on model fit, preference parameters, and WTP estimates. The researchers collected their data from a Scotland-wide choice experiment survey. Respondents were asked to choose between two possible outcomes and a status quo alternative for a 20-year 'soil carbon program.' The authors investigated the impact of explicitly including outcome-related risk. In order to do this, the choice sets included risk of failure to reduce emissions as an additional attribute. This attribute included the probability that the program may fail to deliver climate change mitigation benefits (Glenk & Colombo, 2013). Each respondent faced four choice sets. In the study outcome-related risk was described as probability of failure instead of probability of success to achieve the outcome (Glenk & Colombo, 2013).

Across the different specified models, parameters had the expected sign and were significantly different than zero. This suggests that respondents made use of the information on outcome-related risk when choosing between alternatives in the choice sets (Glenk & Colombo, 2013). The researchers found differences in WTP estimates across the scenarios; however, they

did not find significant difference across the scenarios for every pair of specifications tested. This study suggests that outcome-related risk does matter to survey participants, and therefore should be included in valuation studies (Glenk & Colombo, 2013).

In stated-preference valuations, the expected benefits of environmental policies are generally presented to respondents without reference to the fact that the predicted outcomes are rarely known with certainty (Glenk & Colombo, 2013). When reference to certainty is absent, it can make the valuation scenarios less accurate and less realistic and believable (Rolfe & Windle, 2015). There have been two approaches on how to include uncertainty outcome information into choice experiments. One way is to provide respondents a framed statement including outcomes that are not necessarily accurate (Rolfe & Windle, 2015). A number of studies have been done on how choice set selections are influenced by information disclosure. Studies have also shown that WTP estimates are lower for outcomes when the chance of occurrence was lowered. However, when using framing statements it can limit results because it does not allow for certainty of outcomes to vary with attributes and levels, or for heterogeneity in the way that respondents deal with certainty information to be identified (Rolfe & Windle, 2015). The second approach is to include uncertainty about outcomes directly into the choice set by incorporating certainty information into labels or attributes and levels (Rolfe & Windle, 2015). Studies have found that respondents' WTP is higher when information out outcome uncertainty is provided.

In a study conducted by Rolfe and Windle in 2015 information about outcome uncertainty was included as a standalone attribute in a choice experiment to elicit values to improve the environmental condition of the Great Barrier Reef in Australia. One of the key questions this study sought to answer was to identify if respondents incorporated information about uncertainty in the choices made (Rolfe & Windle, 2015). They found that models that

included the uncertainty information had a better model fit, concluding that respondents use information about certainty of outcomes when it is included (Rolfe & Windle, 2015).

Regarding measuring risk of agricultural producers using a mail survey the following study was conducted by Fausti and Gillespie (2006). One objective of the study is to determine the consistency of different risk-attitude measurement instruments (RAMI). The potential inconsistency of these instruments could be the result of question framing, violations of the axioms of expected utility, situational differences, strength of preference versus relative risk attitude, and the understanding of questions. Researchers suggest that RAMI in mail surveys rarely have the objective to define precise risk-attitude measures from survey respondents, but instead are used to define broader ratings of individual's risk preferences. Mail surveys generally include the interval approach to determine the interval of the coefficient of absolute risk aversion in which a respondent falls (King and Robison 1981), self-rank procedures, hypothetical choices, analysis of actual decisions involving risk, or the use of behavioral/attitudinal questions to develop indices of risk preferences. Research has found that self-ranking questions are inconsistent with the interval-approach due to the biasness toward less risk aversion (Fausti and Gillespie, 2006). The objective of this study is to determine if producer risk-attitude responses across RAMI are consistent when decision context or situational construct changes.

A mail survey was sent to Louisiana and South Dakota cow-calf producers. They used the interval approach, probability distributions, and sizes of gambles consistently across three expected utility-based RAMI designs. This design allowed for analysis within and across survey respondents to determine if changing the situational construct yielded consistent estimates of risk-attitude (Fausti & Gillespie, 2006). Survey questions incorporated the five different approaches of risk-attitude measurements. The first question was a self-rank question where

respondents were asked to indicate where they feel on a continuous line between two extremes, risk averse and risk taker. Question 2 provided respondents with a hypothetical choice of keeping their current job or taking an alternative employment opportunity, this framework was used as it follows the idea that risk aversion measures are based on income. Question 3 was framed to incorporate five differing expected returns and variances for a hypothetical investment scenario. Question 4 used the interval approach and question 5 was a hypothetical two-stage cattle marking scenario.

Analysis across the expected utility model questions (Questions 3, 4, and 5) resulted in no evidence of consistency (Fausti & Gillespie, 2006). The question framed to incorporate five differing expected returns and variances was best understood. The authors found that structural context does in fact affect risk-attitude measurements. Respondents indicated that some questions were difficult to understand. Even though there was no relationship found between the lack of understanding and the consistency of the respondent, this indication suggests that RAMI questions should be written so respondents can understand them (Fausti & Gillespie, 2006). Overall, this study did not find a RAMI procedure that was "best", but found that inconsistencies do exist with mail survey elicitation procedures (Fausti & Gillespie, 2006).

# Chapter 3 - Methodology

This chapter discusses the summary statistics for the survey data as well as estimated models and its specifications. This research uses survey data collected in 2014 from stocker cattle producers throughout the United States. A copy of the final survey instrument and cover letter are presented in the appendix.

## 3.1 Sample and Data Collection

An initial draft of the survey instrument was developed and distributed to stocker producers in attendance at K-State's Cattlemen's Day hosted by the Kansas State Animal Sciences and Industry Department on March 7, 2014. The answers to the questionnaire allowed for a better understanding of stocker cattle management, and resulted in some adjustments to the survey instrument. The final survey instrument was prepared in collaboration with BEEF Magazine. BEEF Magazine provided a distribution list specific to "Operations with any cattle sold as a stocker/grower, backgrounder or preconditioner." The survey instrument was developed based on the objectives of the study and following a review of the literature on stocker cattle management and stated preference valuations.

The survey instrument was mailed to producers from all regions of the United States on September 4, 2014. An explanatory cover letter and a dollar bill was included to potentially increase survey response rates (Gregory, 2008). Two weeks after the final mailing went out, on September 15, 2014, recipients were sent a reminder letter. Surveys were mailed to 2,000 producers; 554 surveys were returned for a response rate of 27.7%.

An online survey was also included in this study. Survey links were e-mailed out by BEEF Magazine to 20,000 producers on September 19, 2014. There was a total of 222 online surveys completed for a response rate of 1.11%. The entire survey response totaled 776 of which

557 were usable in the analysis. Survey responses were received from producers in 37 different states. Over half of the total responses were received from states located in the Midwest and Southwest regions. Table 3.1 displays the states in each region and the number of responses received from each region.

**Table 3-1 Survey Response Rate by Region**

| Region | N | Percentage of Total Responses |
|---|---|---|
| Southeast (FL, GA, AL, MS, AR, LA, KY, TN, NC, SC, VA, PA, WV, MD) | 17 | 3.05 % |
| Midwest (KS, MO, IA, MN, NE, IL) | 197 | 35.37 % |
| Southwest (TX, OK, AZ, NM) | 131 | 23.52 % |
| West (MT, WY, CO, SD, ND, ID) | 67 | 12.03 % |
| Others (AK,CT, DE, HA, IN, ME, MA, MI, NH, NJ, NY, OH, RI, VT, WI, CA, NV, UT, OR, WA) | 54 | 9.69 % |

### *3.1.1 Sample Summary Statistics and Demographics*

The comprehensive survey contained questions regarding various aspects of stocker cattle production, including management characteristics, stocker cattle source, production seasonality, risk management strategies and attitudes, ADG influencers, and base demographic questions. A section of the survey is devoted to choice experiment questions. These questions were used to determine producer preferences and estimate producers' willingness-to-pay (WTP) for cattle.

Table 3.2 provides summary statistics for operator characteristics for survey respondents. The mean age of the survey respondents was 57. The number of respondents reported in the tables for specific questions does not always sum up to the total number N ($\sum n \neq N$) due to instances where some questions were left unanswered by producers in some surveys. Therefore the frequency percentages are represent the total N.

**Table 3-2 Operation Characteristics Summary Statistics**

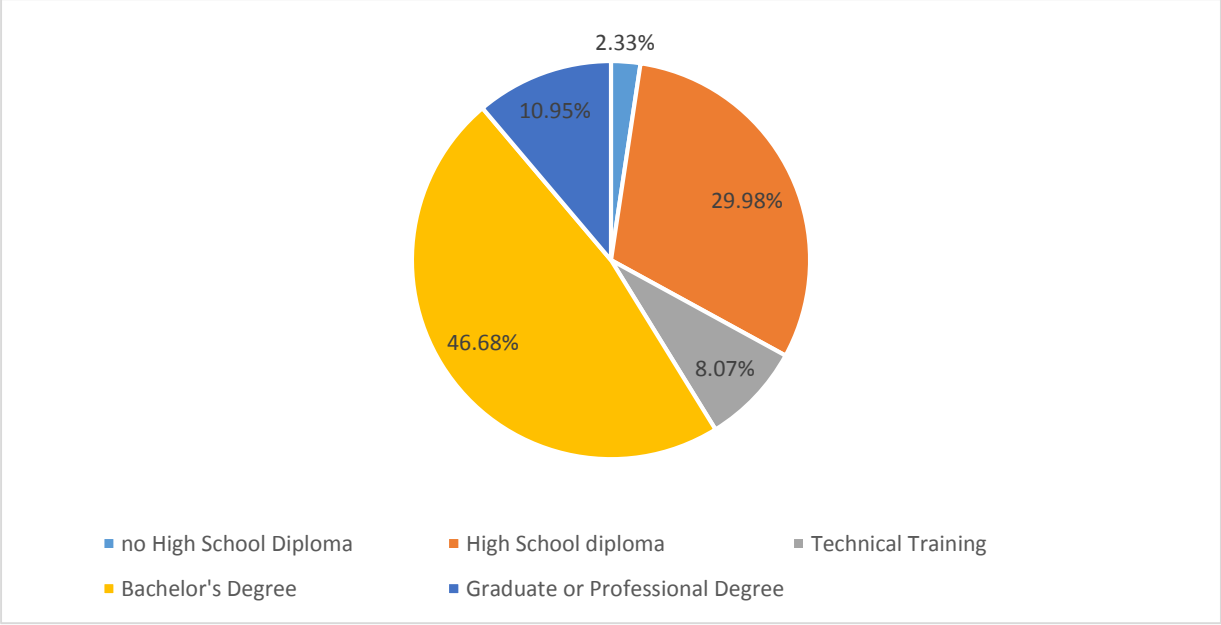
| Variable | Description | Frequency % | Mean | SD | N |
|---|---|---|---|---|---|
| **Gender** | Survey respondents gender | | | | 550 |
| *(Male)* | male | 96.2298 | 0.9623 | 0.1906 | 536 |
| *(Female)* | female | 2.5135 | 0.0251 | 0.1567 | 14 |
| **Age** | What is your age? | | 57.2226 | 14.5433 | 551 |
| **Education** *(EDU)* | The best description of your educational background is: | | | | 546 |
| *(NHS)* | did not obtain High School diploma | 2.3339 | 0.0233 | 0.1511 | 13 |
| *(HS)* | obtained a High School diploma | 29.9820 | 0.2998 | 0.4586 | 167 |
| *(TT)* | received technical training (Certification or Associates Degree) | 8.0790 | 0.0808 | 0.2728 | 45 |
| *(BS)* | received a Bachelor's (B.S. or B.A.) College Degree | 46.6786 | 0.4668 | 0.4993 | 260 |
| *(Grad)* | received a Graduate or Professional Degree (M.S., Ph.D., D.V.M., Law School) | 10.9515 | 0.1095 | 0.3126 | 61 |
| **Experience** *(YEARS)* | How many years have you been raising beef cattle | | | | 554 |
| *(LT10_yrs)* | less than 10 years | 4.1293 | 0.0413 | 0.1991 | 23 |
| *(B1120_yrs)* | 11 to 20 years | 10.2334 | 0.1023 | 0.3034 | 57 |
| *(B2130_yrs)* | 21 to 30 years | 12.9264 | 0.1293 | 0.3358 | 72 |
| *(O30_yrs)* | over 30 years | 72.1724 | 0.7217 | 0.4486 | 402 |

| Table 3-3 Operation Characteristics Summary Statistics, continued | | | | | |
|---|---|---|---|---|---|
| **Income** *(Inc)* | Please estimate your annual pre-tax household income: | | | | 524 |
| *(IncL25)* | less than $25,000 | 0.3591 | | | 2 |
| *(Inc25_49)* | $25,000 to $49,999 | 3.9497 | | | 22 |
| *(Inc50_74)* | $50,000 to $74,999 | 11.6697 | | | 65 |
| *(Inc75_99)* | $75,000 to $99,999 | 15.6194 | | | 87 |
| *(Inc100_124)* | $100,000 to $124,999 | 14.3627 | | | 80 |
| *(IncG125)* | $125,000 or more | 48.1149 | | | 268 |
| **Income from operation** *(FarmIncPer)* | Approximately what portion of your household income is from the beef cattle operation? | | | | 543 |
| *(FarmIncPerL25)* | less than 25% | 11.3106 | 0.6535 | 0.4763 | 63 |
| *(FarmIncPerB2650)* | 26-50% | 20.8259 | 2682.3680 | 5129.4515 | 116 |
| *(FarmIncPerB5175)* | 51-75% | 28.5458 | 2232.6427 | 4380.6547 | 159 |
| *(FarmIncPerO75)* | over 75% | 36.8043 | 0.0000 | 0.0000 | 205 |
| **Description of operation** *(DesCatOp)* | What is the most appropriate way to describe your cattle operation | | | | 554 |
| *(Stocker)* | 100% Stocker/Backgrounder | 23.5189 | 0.2352 | 0.1722 | 131 |
| *(SkBkCc)* | Stocker/Backgrounder with cow-calf operation | 45.0628 | 0.4506 | 0.2150 | 251 |
| *(SkBkFd)* | Stocker/Backgrounder with feedlot | 11.8492 | 0.1185 | 0.3582 | 66 |
| *(SkBkCcFd)* | Stocker/Backgrounder with both cow-calf and feedlot | 15.9785 | 0.1598 | 0.4188 | 89 |
| *(Other_Q1)* | Other | 3.0521 | 0.0305 | 0.3213 | 17 |

| Table 3-4 Operation Characteristics Summary Statistics, continued | | | | | |
|---|---|---|---|---|---|
| **Operator** *(OpOwnMan)* | Respondents position for the operation | | | | 552 |
| *(OwnMan)* | Owner and Manager | 81.6876 | 0.8169 | 0.3871 | 455 |
| *(Own)* | Owner | 9.1562 | 0.0916 | 0.2887 | 51 |
| *(Man)* | Manager | 6.4632 | 0.0646 | 0.2461 | 36 |
| *(Other_Q2)* | Other | 1.7953 | 0.0180 | 0.1329 | 10 |

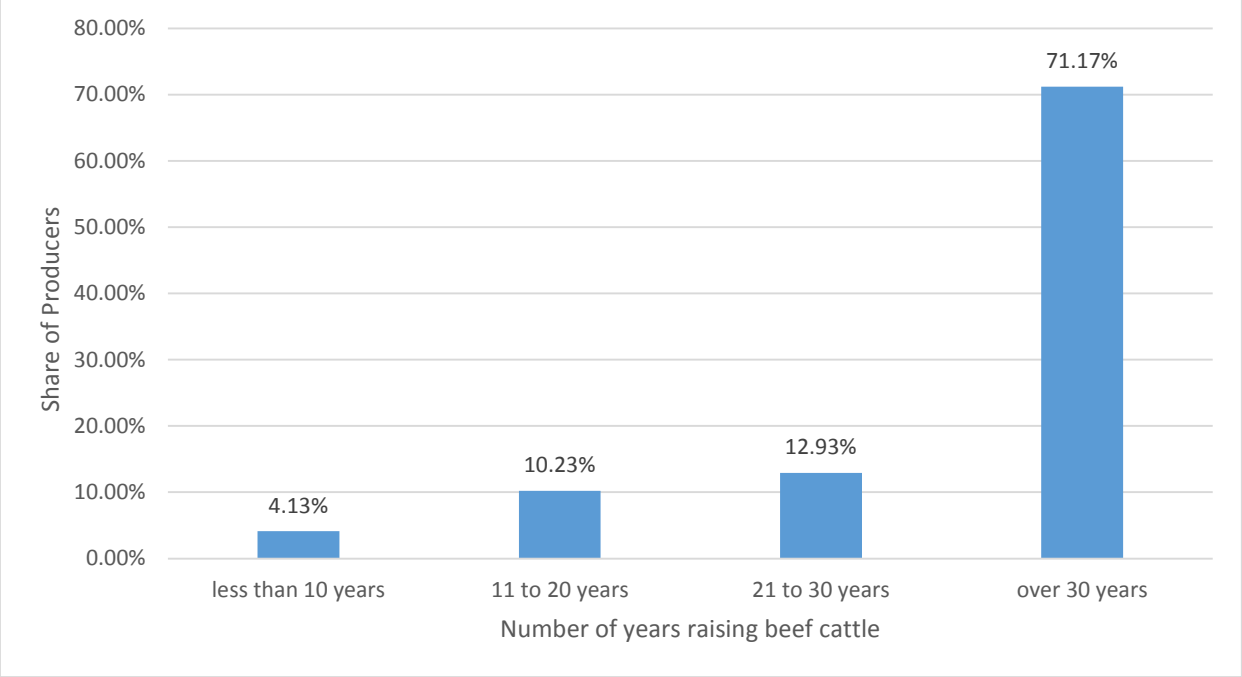
The majority of producers claimed they received at least a bachelor's college degree when asked about their educational background (Figure 3.1). This group of producers comprised 260 (46.68%) survey respondents. Those indicating they obtained a high school diploma totaled 167 (29.98%) survey respondents, which was followed by 61 (10.95%) producers designating they received a graduate or professional degree. Additionally, 45 (8.08%) and 13 (2.33%) survey respondents indicated they received technical training or did not obtain a high school diploma, respectively.

**Figure 3-1 Producer's Educational Background**



Survey respondents were asked to indicate how many years they have been raising beef cattle. In this survey 72.17% (402 survey respondents) indicated they have been raising beef cattle for over 30 years (Figure 3.2). Following this was 12.93% (72 survey respondents) of producers who selected they have been raising beef cattle for 21 to 30 years. Additionally, 10.23% (57 survey respondents) of producers indicated 11 to 20 years is how long they have been raising beef cattle, which was followed by 4.13% (23 survey respondents) that indicated they have been raising beef for less than 10 years.

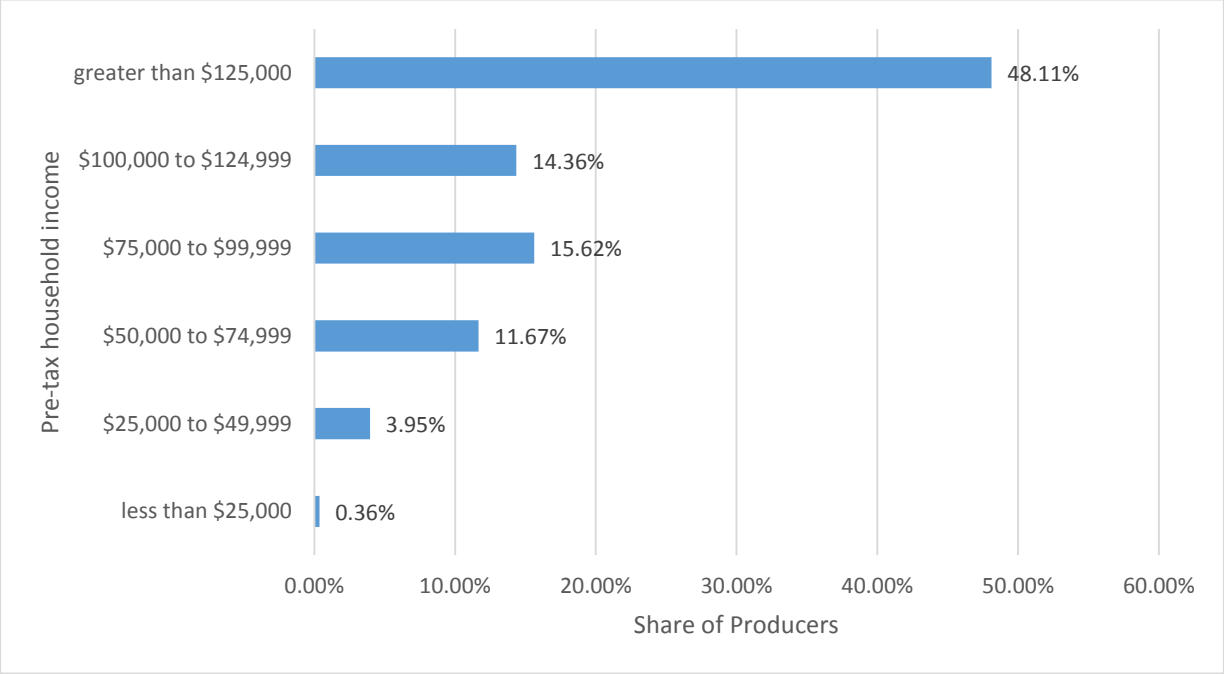
**Figure 3-2 Producer's Experience (Years)**




The most common response from producers who indicated their pre-tax household income was greater than $125,000 (Figure 3.3). This group of producers comprised 48.11% (268 survey respondents). Those that earn a pre-tax income of $75,000 to $99,999 encompassed 15.62% (87 survey respondents). Producers who indicated a pre-tax income of $100,000 to $124,999 was 14.36% (80 survey respondents) of all producers, which was followed by 11.67% (65 survey respondents) that indicated an income of $50,000 to $74,999. Additionally, 3.95% (22

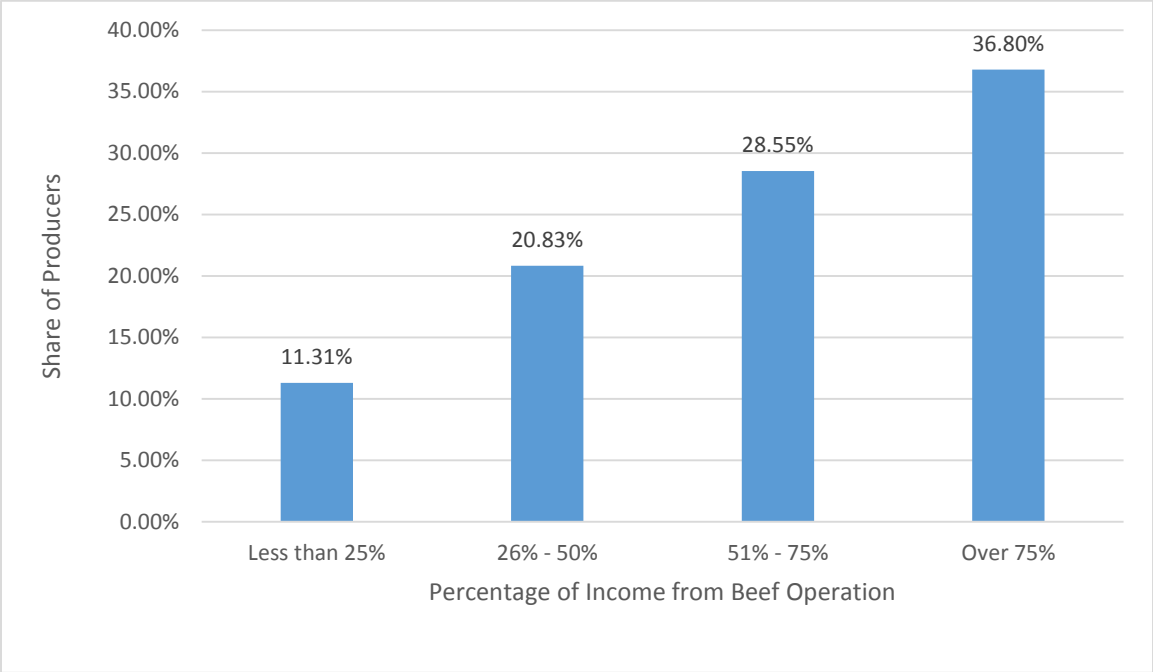
survey respondents) and 0.36% (2 survey respondents) of producers indicated their pre-tax household income is $25,000 to $49,999 or less than $25,000, respectively.

**Figure 3-3 Pre-tax Household Income ($)**



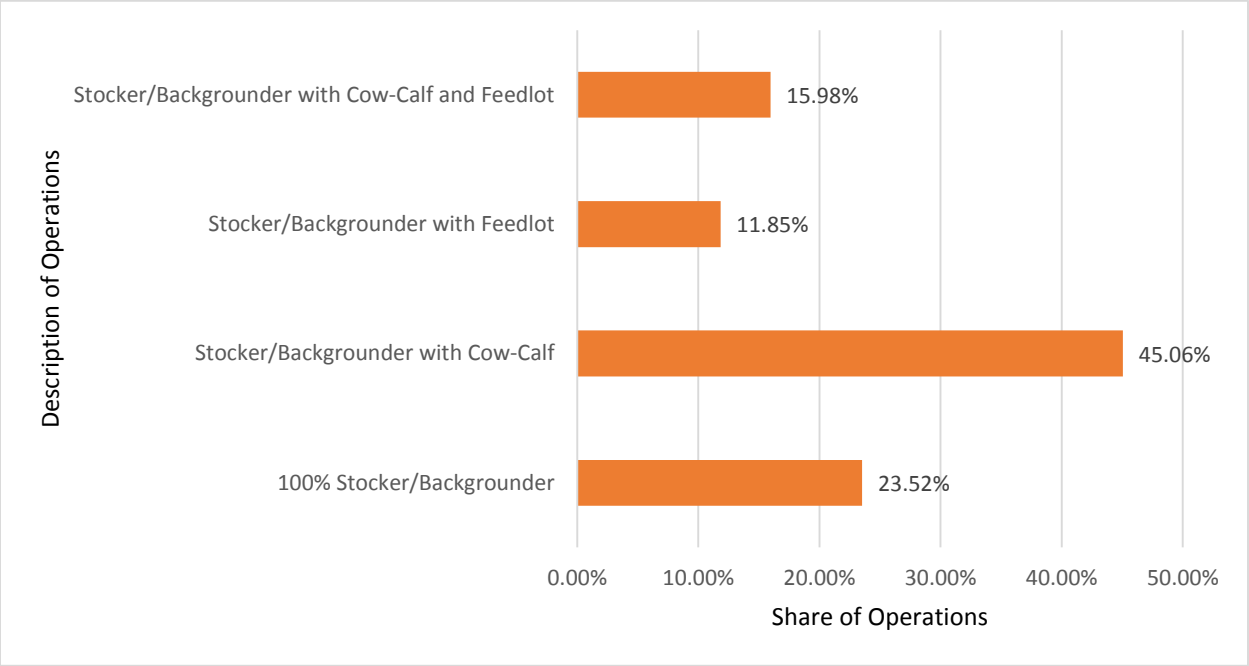

In this survey respondents were asked to share what portion of their household income is from the beef operation. As Figure 3.4 indicates 36.8% (205 survey respondents) designated that over 75% of their income comes from the beef cattle operation. This was followed by 28.55% (159 survey respondents) of producers indicating the portion of income from their beef operation makes up 51-75%. Additionally, 20.83% (116 survey respondents) indicated that 26-50% of their income comes from the beef operation, while 11.31% (63 survey respondents) indicated that less than 25% of their income is generated from the beef operation.

**Figure 3-4 Percentage of Income from Beef Operation**




The majority of producers claimed their operations as stocker/backgrounder with cow-calf. This group of producers comprised 251 (45.06%) of all responses (Figure 3.5).The group of producers that are solely stocker/backgrounder 131 (23.52%) was followed by operations that are stocker/backgrounder with both cow-calf and feedlot 89 (15.98%). Additionally, 66 (11.85%) producers operate a feedlot with stocking/backgrounding operations.

**Figure 3-5 Operation Classification**




Survey respondents were asked to indicate their title with regards to their operation. In this survey 455 (81.69%) producers indicated their title as both the owner and manager of the operation (Figure 3.6). This was followed by 51 (9.16%) respondents indicating their title as the owner of the operation. Additionally, there were 36 (6.46%) and 10 (1.8%) respondents who designated their title as manager or other, respectively.

**Figure 3-6 Respondent's Management Title**

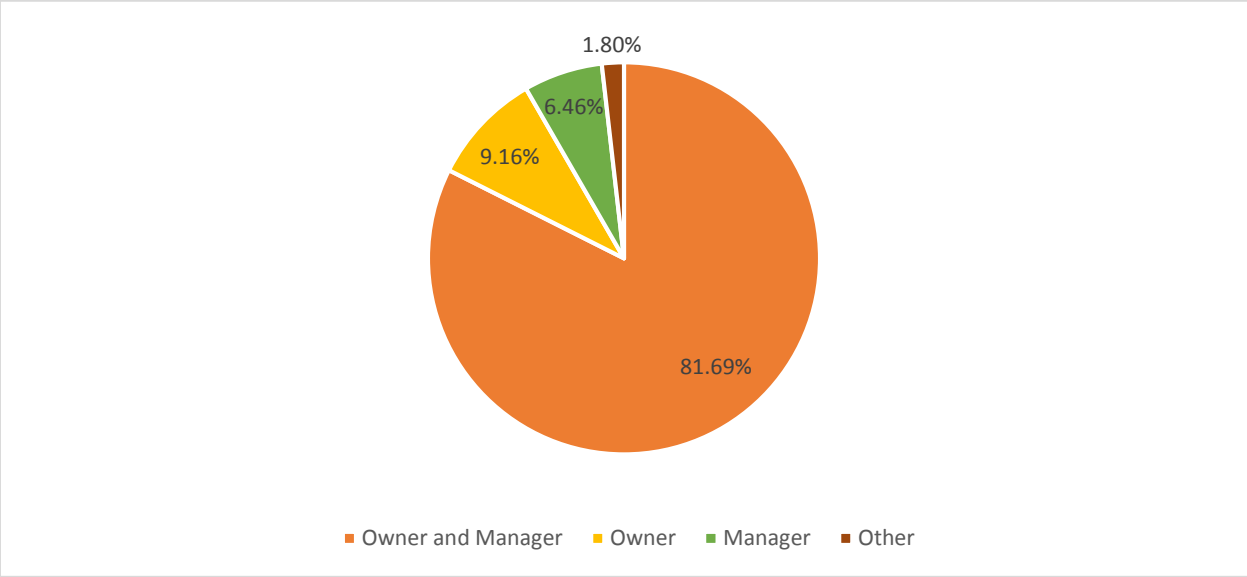



Table 3.3 summarizes operation and management details. Survey participants were asked questions regarding how many cattle they sold at each production stage on their operation in both 2013 and 2014. They were also asked management details regarding forage sources, the typical ADG they manage for, the length of time they own their stockers, where they source their cattle, and how often they place stocker cattle during the year.

**Table 3-5 Operation/Management Summary Statistics**

| Variable | Description | Frequency % | Mean | SD | N |
|---|---|---|---|---|---|
| **2013 Cattle** *(TotCtl_Sold13)* | How many cattle (# head) did your operation sell at the following production stages in 2013? | | | | |
| | cows | | 66.4417 | 216.9515 | 281 |
| | calves | | 230.4847 | 765.5117 | 216 |
| | yearlings | | 1288.5278 | 2244.9182 | 435 |
| | finished cattle | | 1096.9138 | 4139.2516 | 222 |

| Table 3-6 Operation/Management Summary Statistics, continued | | | | | |
|---|---|---|---|---|---|
| **2014 Cattle** *(TotCtl_Sold14)* | How many cattle (# head) did your operation sell at the following production stages in 2014? | | | | |
| | cows | | 375.2621 | 1253.3015 | 348 |
| | calves | | 444.0269 | 1056.2295 | 342 |
| | yearlings | | 898.7756 | 1982.6740 | 426 |
| | finished cattle | | 514.5781 | 2179.2724 | 174 |
| **Forage source** | In a typical year, what percentage of your total stocker/backgrounder cattle are on each of the following forage source categories? | | | | |
| *(CSPerc)* | cool season grass pasture (brome, fescue, perennial ryegrass, etc.) | | 29.0090 | 39.2235 | 274 |
| *(WSGPerc)* | warm season grass pasture (switchgrass, big bluestem, etc.) | | 25.8348 | 35.0601 | 276 |
| *(WSAPerc)* | warm season annual (annual planted specifically for cattle grazing such as Sudan) | | 2.8582 | 12.8742 | 52 |
| *(FCPerc)* | fall cereal pasture (cereal grain pastures such as winter wheat, oats, or ryegrass) | | 17.2837 | 30.1494 | 198 |
| | | | | | |

| **Table 3-7 Operation/Management Summary Statistics, continued** | | | | | |
|---|---|---|---|---|---|
| *(DWFPerc)* | dormant winter feed (stockpiled dormant forage and crop residue) | | 11.4470 | 26.6586 | 139 |
| *(DLPerc)* | dry lot (bunk fed storage, confined management of harvested feed) | | 36.4417 | 111.6616 | 293 |
| **Management time** *(Mantime)* | What length of time do you typically own/manage most stockers/backgrounders? | | | | 550 |
| *(Lt30)* | less than 30 days | 0.3591 | 0.0036 | 0.0599 | 2 |
| *(b3160)* | 31 to 60 days | 3.9497 | 0.0395 | 0.1949 | 22 |
| *(b6190)* | 61 to 90 days | 8.7971 | 0.0880 | 0.2835 | 49 |
| *(b91120)* | 91 to 120 days | 21.7235 | 0.2172 | 0.4127 | 121 |
| *(b121180)* | 121 to 180 days | 34.1113 | 0.3411 | 0.4745 | 190 |
| *(Gt180)* | more than 180 days | 29.8025 | 0.2980 | 0.4578 | 166 |
| **ADG** *(AADG)* | When placing cattle in your operation, what average daily gain (lbs/day) do you manage for? | | | | 550 |
| *(Lt125)* | less than 1.25 | 1.2567 | 0.0126 | 0.1115 | 7 |
| *(b126a15)* | 1.26 to 1.50 | 9.3357 | 0.0934 | 0.2912 | 52 |
| *(b151a175)* | 1.51 to 1.75 | 16.8761 | 0.1688 | 0.3749 | 94 |
| *(b176a20)* | 1.76 to 2.00 | 29.4434 | 0.2944 | 0.4562 | 164 |
| *(b201a225)* | 2.01 to 2.25 | 25.1346 | 0.2513 | 0.4342 | 140 |
| *(Gt225)* | more than 2.25 | 16.6966 | 0.1670 | 0.3733 | 93 |

| Table 3-8 Operation/Management Summary Statistics, continued | | | | | |
|---|---|---|---|---|---|
| **Native** | Stocker cattle respondents typically purchase/manage are native to | | | | |
| *(SEPerc)* | Southeast (FL, GA, AL, MS, AR, LA, KY, & TN) | | | | 182 |
| | 0% | 3.7702 | 0.0377 | 0.1906 | 21 |
| | 1 to 25% | 7.1813 | 0.0718 | 0.2584 | 40 |
| | 26 to 50% | 5.3860 | 0.0539 | 0.2259 | 30 |
| | 51 to 75% | 3.5907 | 0.0359 | 0.1862 | 20 |
| | 76 to 100% | 12.7469 | 0.1275 | 0.3338 | 71 |
| *(MAPerc)* | Mid-Atlantic (NC, SC, VA, PA, WV & MD) | | | | 67 |
| | 0% | 4.4883 | 0.0449 | 0.2072 | 25 |
| | 1 to 25% | 1.7953 | 0.0180 | 0.1329 | 10 |
| | 26 to 50% | 1.2567 | 0.0126 | 0.1115 | 7 |
| | 51 to 75% | 0.8977 | 0.0090 | 0.0944 | 5 |
| | 76 to 100% | 3.5907 | 0.0359 | 0.1862 | 20 |
| *(MWPerc)* | Midwest (KS, MO, IA, MN, NE & IL) | | | | 199 |
| | 0% | 2.6930 | 0.0269 | 0.1620 | 15 |
| | 1 to 25% | 5.5655 | 0.0557 | 0.2295 | 31 |
| | 26 to 50% | 5.5655 | 0.0557 | 0.2295 | 31 |
| | 51 to 75% | 4.8474 | 0.0485 | 0.2150 | 27 |
| | 76 to 100% | 17.0557 | 0.1706 | 0.3765 | 95 |

**Table 3-9 Operation/Management Summary Statistics, continued**

| | | | | | |
|---|---|---|---|---|---|
| *(SWPerc)* | Southwest (TX, OK, AZ & NM) | | | | 182 |
| | 0% | 2.8725 | 0.0287 | 0.1672 | 16 |
| | 1 to 25% | 6.1041 | 0.0610 | 0.2396 | 34 |
| | 26 to 50% | 5.9246 | 0.0592 | 0.2363 | 33 |
| | 51 to 75% | 3.0521 | 0.0305 | 0.1722 | 17 |
| | 76 to 100% | 14.7217 | 0.1472 | 0.3546 | 82 |
| *(WPerc)* | West (MT, WY, CO, SD, ND & ID) | | | | 155 |
| | 0% | 3.7702 | 0.0377 | 0.1906 | 21 |
| | 1 to 25% | 3.4111 | 0.0341 | 0.1817 | 19 |
| | 26 to 50% | 5.7451 | 0.0575 | 0.2329 | 32 |
| | 51 to 75% | 2.6930 | 0.0269 | 0.1620 | 15 |
| | 76 to 100% | 12.2083 | 0.1221 | 0.3277 | 68 |
| *(FWPerc)* | Far West (CA, NV, UT, OR & WA) | | | | 74 |
| | 0% | 4.6679 | 0.0467 | 0.2111 | 26 |
| | 1 to 25% | 1.7953 | 0.0180 | 0.1329 | 10 |
| | 26 to 50% | 1.0772 | 0.0108 | 0.1033 | 6 |
| | 51 to 75% | 1.0772 | 0.0108 | 0.1033 | 6 |
| | 76 to 100% | 4.6679 | 0.0467 | 0.2111 | 26 |
| *(MXPerc)* | Mexico | | | 0.6535 | 44 |
| | 0% | 4.4883 | 0.0449 | 0.2072 | 25 |
| | 1 to 25% | 1.0772 | 0.0108 | 0.1033 | 6 |
| | 26 to 50% | 1.0772 | 0.0108 | 0.1033 | 6 |
| | 51 to 75% | 0.5386 | 0.0054 | 0.0733 | 3 |
| | 76 to 100% | 0.7181 | 0.0072 | 0.0845 | 4 |

**Table 3-10 Operation/Management Summary Statistics, continued**

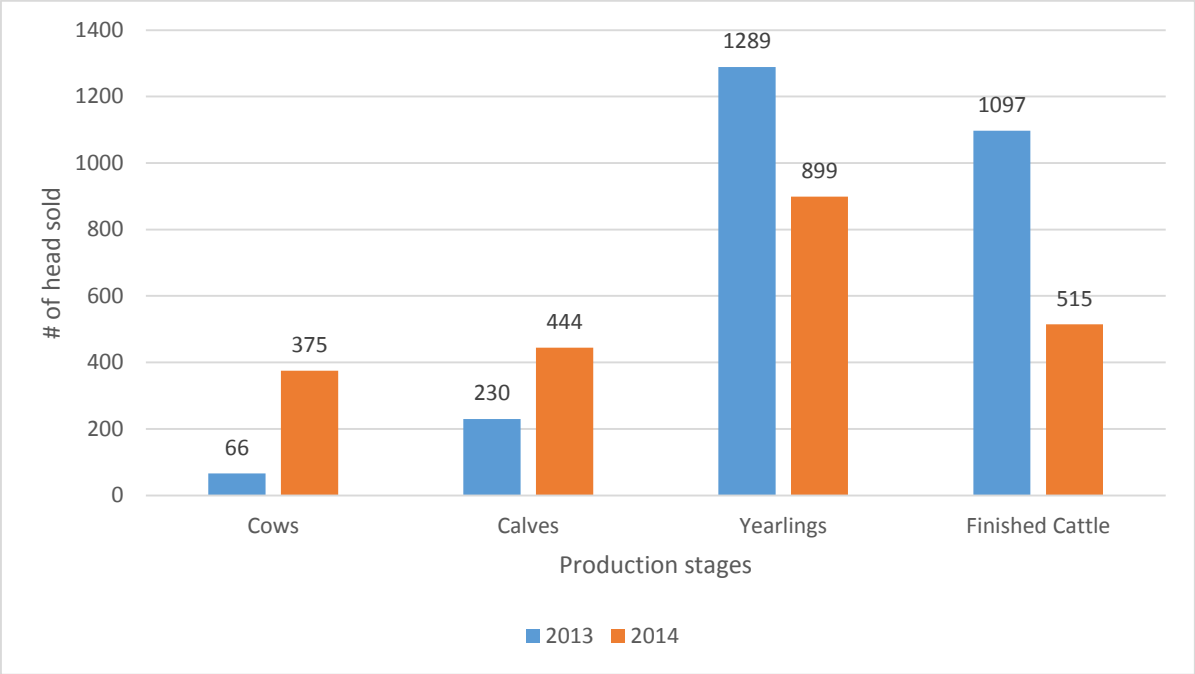
| | | | | | |
|---|---|---|---|---|---|
| *(CAPerc)* | Canada | | 0.0557 | 0.2790 | 27 |
| | 0% | 4.4883 | 0.0449 | 0.2072 | 25 |
| | 1 to 25% | 0.1795 | 0.0018 | 0.0424 | 1 |
| | 26 to 50% | 0.0000 | 0.0000 | 0.0000 | 0 |
| | 51 to 75% | 0.1795 | 0.0018 | 0.0424 | 1 |
| | 76 to 100% | 0.0000 | 0.0000 | 0.0000 | 0 |
| **Source** | Percentage of feeder cattle placed in operation do you typically source from each of the following sources? | | | | |
| *(RCCPerc)* | % Retained from my own cow-calf operation | | 27.0592 | 37.4222 | 298 |
| *(AMNPerc)* | % Purchased from auction market without knowledge of source ranches | | 38.6894 | 39.8279 | 336 |
| *(AMYPerc)* | % Purchased from auction market with knowledge of source ranches | | 13.9946 | 24.3916 | 213 |
| *(DCCPerc)* | % Purchased direct from individual cow-calf ranches | | 11.1140 | 22.1563 | 188 |
| *(IVAPerc)* | % Purchased from internet/video auctions | | 5.4982 | 16.1231 | 93 |

**Table 3-11 Operation/Management Summary Statistics, continued**

| | | | | | |
|---|---|---|---|---|---|
| **Seasonality** *(FreqSea)* | What best describes the frequency and seasonality of your backgrounder/stocker operation? | | | | 537 |
| *(FCS)* | typically place one set of feeder cattle in the spring | 5.9246 | 0.0592 | 0.2363 | 33 |
| *(MFCY)* | typically place multiple sets of feeder cattle within one year | 65.1706 | 0.6517 | 0.4769 | 363 |
| *(FCF)* | typically place one set of feeder cattle in the fall | 19.7487 | 0.1975 | 0.3985 | 110 |
| *(OFC)* | other | 5.5655 | 0.0557 | 0.2295 | 31 |

In this survey respondents were asked to share how many cattle were sold off their operation at different production stages in both 2013 and 2014. As Figure 3.7 indicates in 2013, of the 281 that sold cows the average was 66 cows. In 2014, 348 respondents indicated they sold cows, resulting in a mean of 375 cows. In regards to the number of calves sold in 2013, 216 respondents indicated they sold at this production stage resulting in a mean of 230 calves. As for 2014, 342 respondents took part in the question with a result of a mean of 444 calves. Additionally, for yearlings sold in 2013 a mean of 1,289 yearlings resulted from 435 respondents participating in the question and in 2014 a mean of 899 resulted from 425 respondents indicating they sold at this production stage. The number of head sold as finish cattle averaged 1,097 in 2013 from 222 participants. For the same production stage in 2014, a mean of 515 cattle sold resulted from 174 participants indicating they sold at this production stage.

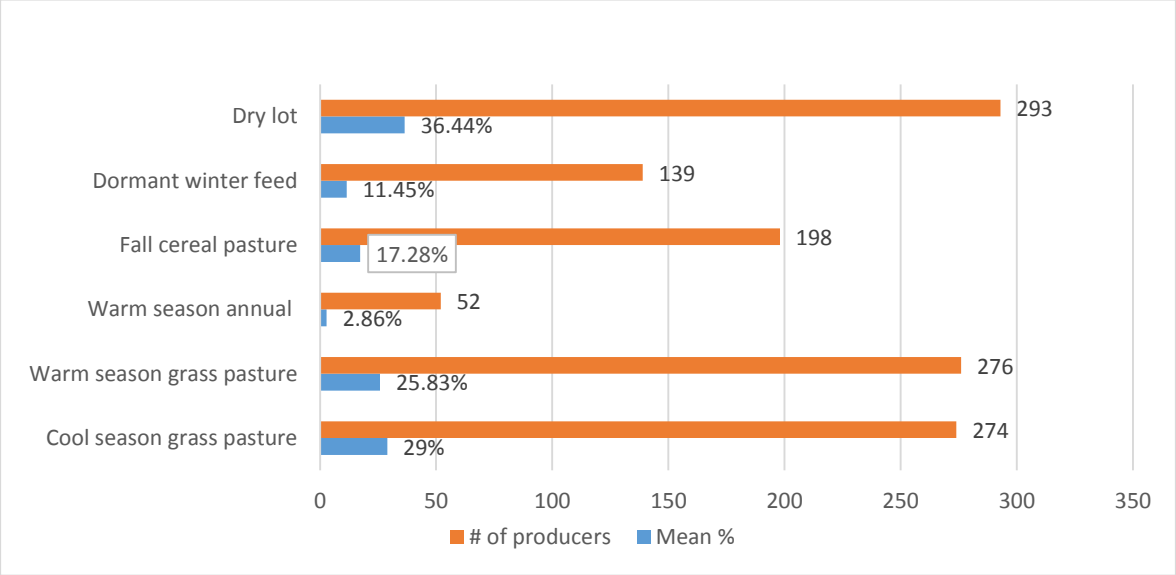
**Figure 3-7 2013 & 2014 Cattle Sold (# of head)**




To obtain information regarding different forage sources used by stocker producers, respondents were asked to indicate what percentage of their total stocker/backrounder cattle are on six different forage sources that were provided in the survey (Table 3.3). As Figure 3.8 indicates, the most popular forage source for survey respondents is dry lot (bunk fed storage, confined management of harvested feed). This group of producers comprised 293 respondents who indicated a mean of 36.44% of their total cattle are on dry lot feed. The group of producers (274) who indicated a mean of 29.0% of their total cattle are on cool season grass pasture was followed by 276 producers indicating a mean of 25.83% of their cattle graze warm season grass pasture. Fall cereal pasture (cereal grain pastures such as winter wheat, oats, or ryegrass) was indicated as a forage source by 198 producers who indicated 17.28% of their total cattle graze this feed source. Additionally, 139 producers indicated a mean of 11.44% of their cattle are fed dormant winter feed (stockpiled dormant forage and crop residue) and 52 producers indicated a

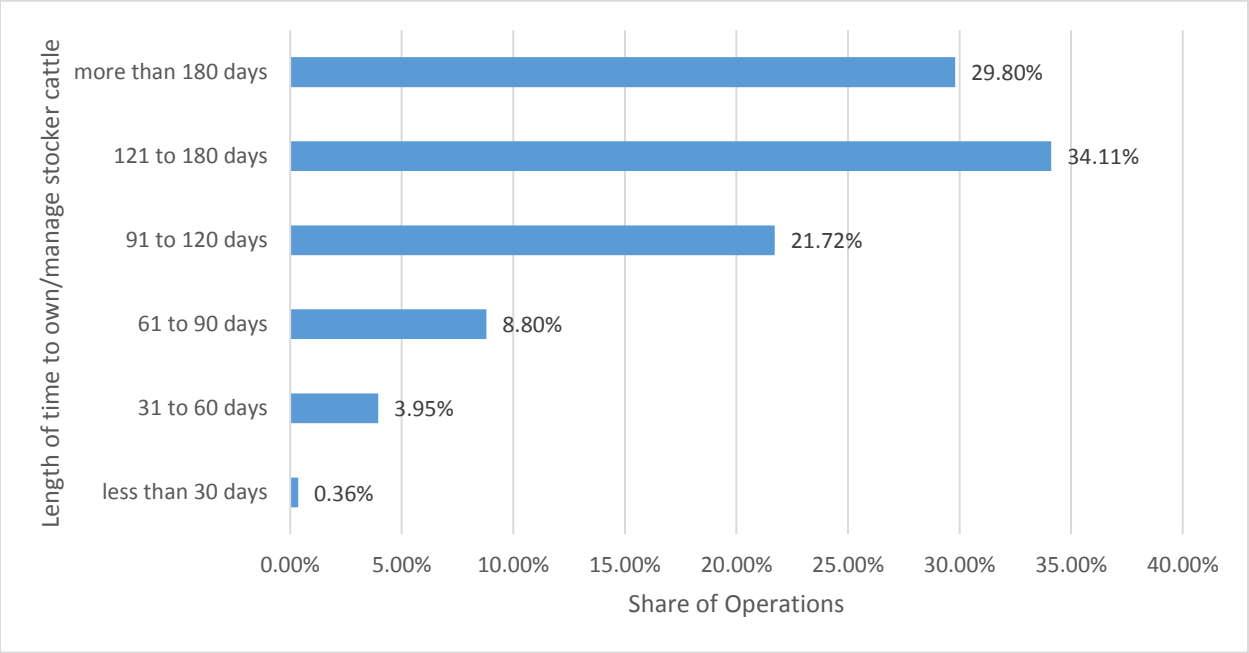
mean of 2.86% of their total cattle graze warm season annual forage (annual planted specifically for cattle grazing such as Sudan).

**Figure 3-8 Forage Source**



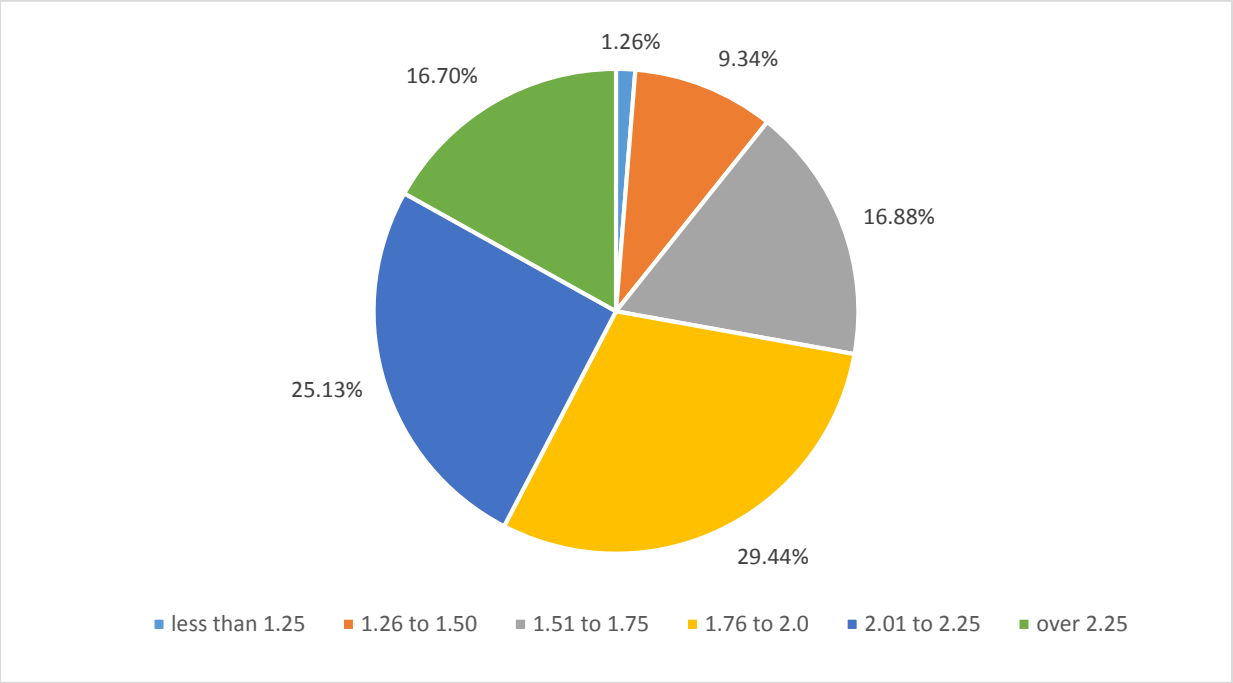

The most common response regarding feeding operations was, producers indicating they own/manage stocker cattle for 121 to 180 days. This group of producers comprised 190 (34.11%) of all responses (Figure 3.9). The group of producers that typically own or manage stocker cattle for more than 180 days 166 (29.8%) was followed by operations that own/manage cattle for 91 to 120 days 121 (21.72%). Additionally, 49 (8.8%), 22 (3.95%), and 2 (0.36%) respondents manage/own cattle for 61 to 90 days, 31 to 60 days, and less than 30 days respectively. The weighted average of days based on midpoints of the ranges provided in the survey is 141 days owning/managing stocker cattle.

**Figure 3-9 Days Owning/Managing Stocker Cattle**




Survey respondents were asked to indicate what average daily gain they typically manage for. In this survey 164 (29.44%) of producers indicated they typically manage for 1.76 to 2.00 ADG (Figure 3.10). The operations who indicated they manage for an ADG of 2.01 to 2.25 were 25.13% of respondents (140 survey respondents), followed by 16.78% (94 survey respondents) designating they manage for 1.51 to 1.75 ADG. Producers who indicated they manage their stocker cattle to achieve more than 2.25 ADG were 16.70% of survey respondents (93 survey respondents). Additionally, there were 52 (9.34%) and seven (1.26%) respondents designated they manage for an ADG of 1.26 or 1.50 and less than 1.25, respectively. The weighted ADG value based on midpoints of the ranges provided in the survey is 1.90.

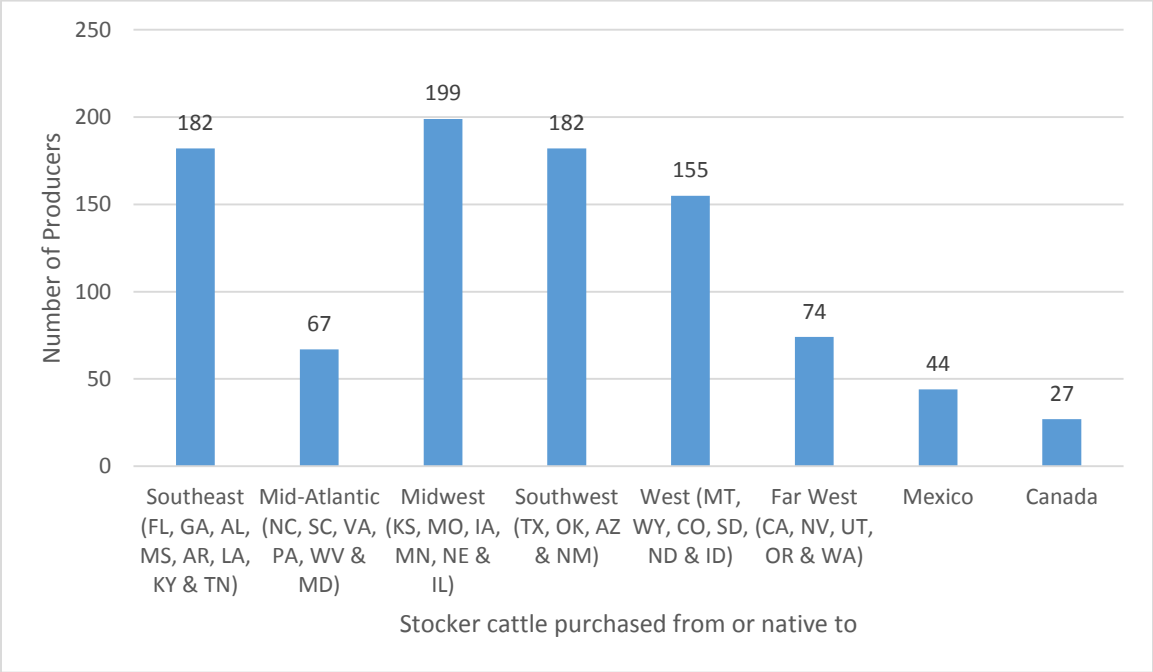
**Figure 3-10 ADG (lbs/day) Operations Manage For**




Survey respondents were asked to indicate what percentage range represents the native source of their stocker cattle they purchase or manage. As Figure 3.11 indicates, 199 (35.73%) producers designated that they purchased cattle native to the Midwest (KS, MO, IA, MN, NE & IL). Of the 199 producers who indicated they purchase cattle native to the Midwest, 95 producers designated 76-100%, 31 producers indicated that 1-25% and 26-50%, 27 producers indicated 51-75%, and 15 producers indicated 0% of their total cattle came from the Midwest. This was followed by 182 (32.68%) producers indicating that they purchased cattle native to both the Southwest (TX, OK, AZ & NM) and the Southeast (FL, GA, AL, MS, AR, LA, KY & TN). In this survey 155 (27.83%) producers indicated they purchased cattle from the West (MT, WY, CO, SD, ND & ID). Additionally, 74 (13.29%) and 67 (12.03%) producers designated they purchased cattle from the Far West (CA, NV, UT, OR & WA) or the Mid-Atlantic (NC, SC, VA, PA, WV & MD), respectively. Canada and Mexico were also indicated as native sources for stocker cattle as 44 (7.90%) and 27 (4.85%) producers indicated this, respectively.

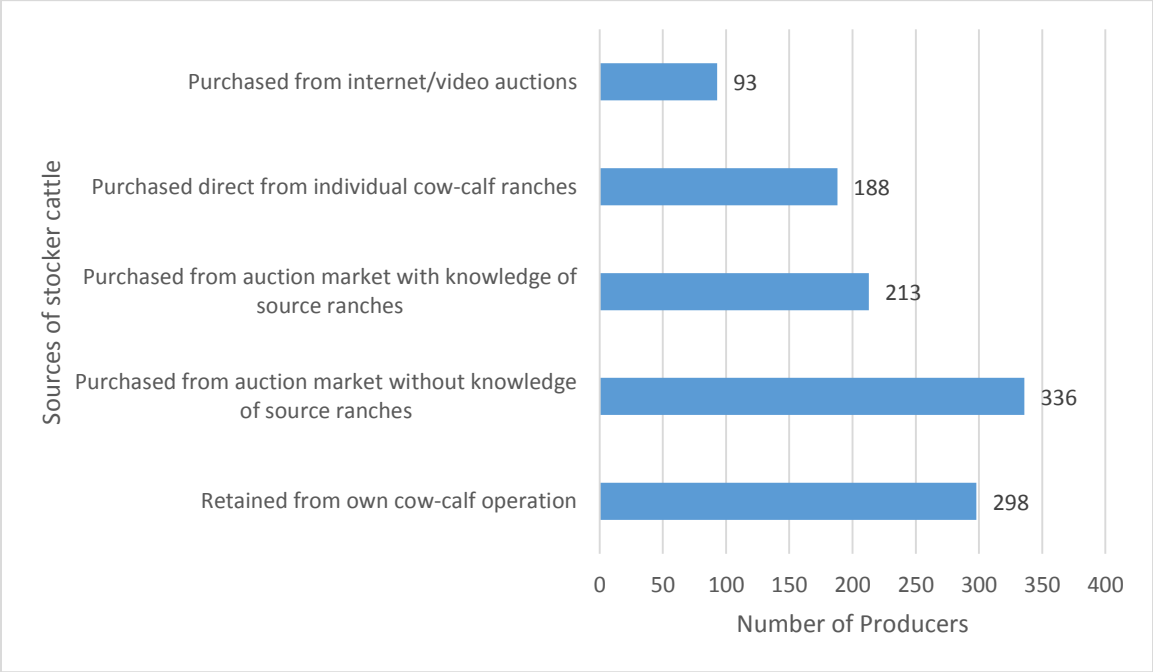
Using midpoints of ranges we derived a weighted average conditional on producers who bought from the various regions given. Of those (182 producers) that indicated they purchase/manage cattle native to the Southeast the weighted average for how many cattle on their operation are sourced from there is 50.15%. Producers (67) that indicated they source from the Mid-Atlantic, source an average of 36.73% of their cattle from this region. Of the 199 producers that source from the Midwest the average sourced from this area is 58.35%. Producers (182) that source from the Southwest source a weighted average of 54.66% of their cattle from this region. Of the 155 producers that source from the West a weighted average of 54.02% of their cattle come from this region. Of those (74 producers) that source from the Far West, they average 40.74% of their cattle sourced from this region. Producers (44) that source from Mexico source an average of 19.12% of their cattle from Mexico. Of the 27 producers that source their cattle from Canada source an average of 2.775% of their cattle from here.

**Figure 3-11 Where Stocker Operations Source Their Cattle**



Beyond region in this survey, producers were also asked to indicate which sources they use to typically source their cattle. The most common response from producers was purchasing their cattle form an auction market without knowledge of source ranches. This group of producers comprised 336 respondents (Figure 3.12). The group of producers (298 respondents) who claimed they retain stocker cattle from their own cow-calf operation was followed by 213 producers who claimed they purchase cattle from auction markets with knowledge of source ranches. Additionally, 188 producers indicated they purchase directly from individual cow-calf ranches and 93 producers designated they purchase cattle from internet or video auctions.

**Figure 3-12 Stocker Cattle Sources**




The majority of producers claimed that they typically place multiple sets of feeder cattle within one year. This group of producers is comprised of 65.17% (363 survey respondents) (Figure 3.13). Those that indicated they typically place one set of feeder cattle in the fall comprised 19.75%

(110 survey respondents). This was followed by 5.92% (33 survey respondents) of producers who selected they place one set of feeder cattle in the spring.

**Figure 3-13 Seasonality of Stocker Operations**

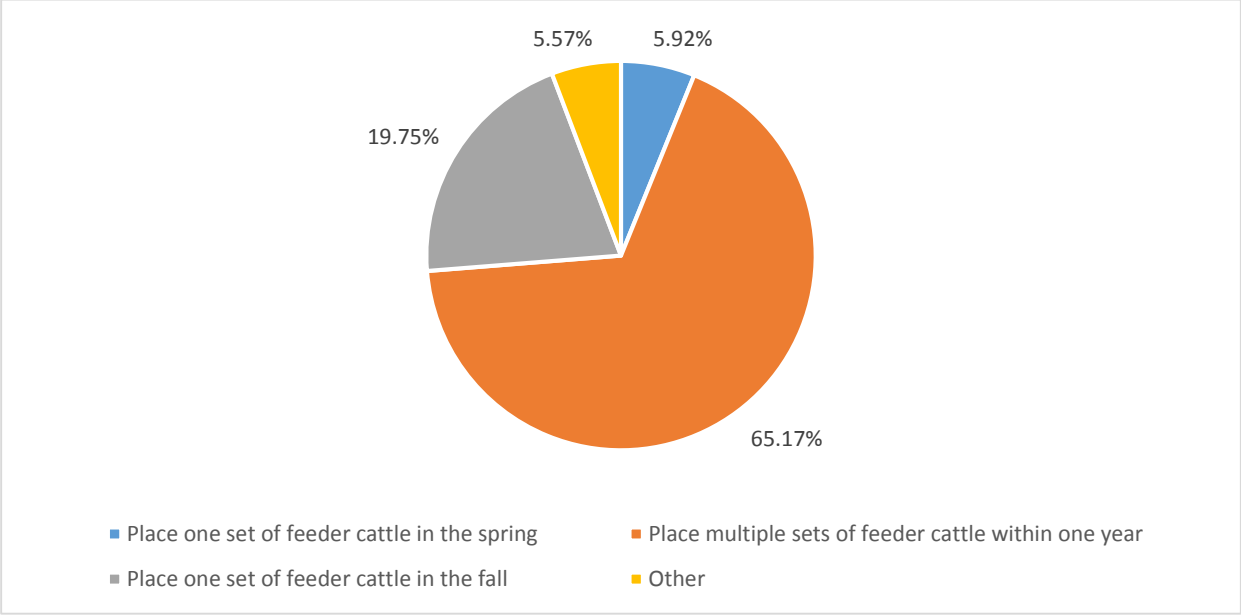



Table 3.4 addresses ADG and net return/loss over a 10 year period on an operation that regularly places 500 lb. steers in October and sells in February. Producers were asked to identify the average ADG, worst ADG, and best ADG for the operation. Additionally, they are asked what they believe to be the average net return, worst net return, and best net return on the operation. Out of 471 producers that indicated an average ADG over the 10 year period the mean resulted in 2.04 (lbs/day) which is similar to the weighted ADG of 1.90 that we determined from midpoints in the ranges given to producers when they were asked what ADG they manage for. Out of 548 producers that indicated ADG in the worst lot/group over the 10 year period resulted in a mean of 1.06 (lbs/day). Additionally, 454 producers indicated what they believe to be the best ADG over the 10 year period which resulted in an ADG mean of 2.78 (lbs/day). To determine symmetry between

average and worst as well as best and average we took the difference between average and worst (2.04 - 1.06) resulting in 0.98. The difference between best and average (2.78 – 2.04) resulted in 0.74. The difference between average and worst is greater than the difference between best and average.

As for net return, 394 producers indicated an average net return which resulted in a mean of $107.32 per head. Worst net return for a 10 year period, indicated by 553 producers resulted in a mean of -$10.73 per head. Furthermore, 369 producers indicated what they believe to be the best net return which resulted in a mean of $238.03 per head. Like ADG, we looked at symmetry in Net Return. The difference between average and worst resulted in $118.05 per head. The difference between best and average resulted in $130.71 per head. Net Return appears more symmetric than ADG here.

**Table 3-12 ADG and Net Return**

| Variable | Description | Frequency % | Mean | SD | N |
|---|---|---|---|---|---|
| **ADG** | Consider an operation similar to yours that regularly places 500 lb. steers in its backgrounder/stocker operation in October and typically sells at heavier weights about 120 days later in February.<br>Over the past 10 years, what do you believe the average daily gain (ADG), worst ADG, and best ADG have been for this operation? | | | | |
| *(AVG_ADG_N)* | Average ADG (lbs/day) | | 2.0386 | 0.4643 | 471 |
| *(Worst_ADG_N)* | Worst ADG (lbs/day) | | 1.0610 | 0.7275 | 548 |
| *(Best_ADG_N)* | Best ADG (lbs/day) | | 2.7810 | 0.6606 | 454 |

**Table 3-13 ADG and Net Return, continued**

| | | | | | |
|---|---|---|---|---|---|
| **Average Return** | For the same operation placing 500 lb. steers in October and selling in February, over the past 10 years of placement what do you believe the average net return, worst net return, and the best net return have been? | | | | |
| *(AVG_Ret_N)* | Average net return ($/head) | | 107.3212 | 73.4966 | 394 |
| *(Worst_Ret_N)* | Worst net return ($/head) | | -10.7280 | 83.5646 | 553 |
| *(Best_Ret_N)* | Best net return ($/head) | | 238.0289 | 114.7082 | 369 |
| **Return/Loss** *(Q_15)* | Given the best and worst case potential outcome from marketing your stocker/backgrounder cattle, which net return/loss prospect would you most prefer from the four listed? | | | | 517 |
| *(ARetLos)* | $20/head return best case; $0/head loss worst case | 12.0287 | 0.1203 | 0.3256 | 67 |
| *(BRetLos)* | $35/head return best case; $20/head loss worst case | 7.5404 | 0.0754 | 0.2643 | 42 |
| *(CRetLos)* | $65/head return best case; $35/head loss worst case | 41.4722 | 0.4147 | 0.4931 | 231 |
| *(DRetLos)* | $100/head return best case; $75/head loss worst case | 31.7774 | 0.3178 | 0.4660 | 177 |

**Table 3-14 ADG and Net Return, continued**

| | | | | | |
|---|---|---|---|---|---|
| **Return/Loss** *(Q_16)* | Suppose the situation changes altering the set of net return/loss prospects. Which would you most prefer from the four listed? | | | | 501 |
| *(ERetLos)* | $20/head return best case; $10/head loss worst case | 13.8241 | 0.1382 | 0.3455 | 77 |
| *(FRetLos)* | $35/head return best case; $30/head loss worst case | 12.5673 | 0.0754 | 0.2643 | 70 |
| *(GRetLos)* | $65/head return best case; $45/head loss worst case | 43.4470 | 0.4147 | 0.4931 | 242 |
| *(HRetLos)* | $100/head return best case; $85/head loss worst case | 20.1077 | 0.3178 | 0.4660 | 112 |
| **ADG change** | Suppose the following protocols or feeder cattle characteristics are implemented on a stocker operation. What best describes the change in realized ADG you would expect? | | | | |
| *(Stmt1)* | Cattle administered vaccinations consistent with most VAC 45 claims prior to stocker placement | | | | 500 |
| | no change in ADG | 5.2065 | 0.0521 | 0.2224 | 29 |
| | 1-10% higher ADG | 34.2908 | 0.3429 | 0.4751 | 191 |
| | 11-20% higher ADG | 25.1346 | 0.2513 | 0.4342 | 140 |
| | 21-30% higher ADG | 14.5422 | 0.1454 | 0.3528 | 81 |
| | over 30% higher ADG | 10.5925 | 0.1059 | 0.3080 | 59 |

| **Table 3-15 ADG and Net Return, continued** | | | | | |
|---|---|---|---|---|---|
| *(Stmt2)* | Cattle purchased from a known and/or limited set of ranches/operations | | | | 452 |
| | no change in ADG | 7.7199 | 0.0772 | 0.1329 | 43 |
| | 1-10% higher ADG | 26.2118 | 0.2621 | 0.3957 | 146 |
| | 11-20% higher ADG | 31.2388 | 0.3124 | 0.4578 | 174 |
| | 21-30% higher ADG | 15.9785 | 0.1598 | 0.4278 | 89 |
| | over 30% higher ADG | 7.7199 | 0.0772 | 0.3492 | 43 |
| *(Stmt3)* | Cattle weaned, dehorned, and castrated at least 45 days prior to placement in stocker operation | | | | 497 |
| | no change in ADG | 1.7953 | 0.0180 | 0.1329 | 10 |
| | 1-10% higher ADG | 19.3896 | 0.1939 | 0.3957 | 108 |
| | 11-20% higher ADG | 29.8025 | 0.2980 | 0.4578 | 166 |
| | 21-30% higher ADG | 24.0575 | 0.2406 | 0.4278 | 134 |
| | over 30% higher ADG | 14.1831 | 0.1418 | 0.3492 | 79 |
| *(Stmt4)* | Stocker operation provides average or better quality of feedstuffs and mineral supplementation | | | | 498 |
| | no change in ADG | 2.6930 | 0.0269 | 0.1620 | 15 |
| | 1-10% higher ADG | 14.0036 | 0.1400 | 0.3473 | 78 |
| | 11-20% higher ADG | 29.6230 | 0.2962 | 0.4570 | 165 |
| | 21-30% higher ADG | 24.9551 | 0.2496 | 0.4331 | 139 |
| | over 30% higher ADG | 18.1329 | 0.1813 | 0.3856 | 101 |

**Table 3-16 ADG and Net Return, continued**

| | | | | | |
|---|---|---|---|---|---|
| *(Stmt5)* | Stocker operation uses standard and/or conservative stocking rates (head/acre) | | | | 492 |
| | no change in ADG | 7.5404 | 0.0754 | 0.2643 | 42 |
| | 1-10% higher ADG | 26.5709 | 0.2657 | 0.4421 | 148 |
| | 11-20% higher ADG | 26.9300 | 0.2693 | 0.4440 | 150 |
| | 21-30% higher ADG | 19.9282 | 0.1993 | 0.3998 | 111 |
| | over 30% higher ADG | 7.3609 | 0.0736 | 0.2614 | 41 |

As table 3.4 indicates survey respondents were asked to indicate which potential marketing outcome they would prefer from four different scenarios. In the question following, the situation changes resulting in less desirable worst case outcomes. The survey respondents were asked to again indicate which potential marketing outcome they would prefer. These questions were asked to determine producers risk attitude (risk averse or risk taking) toward marketing situations. Most commonly, producers indicated their preferred outcome in both questions is $65/head return best case; $35/head loss worst case or $45/head loss worst case (Figure 3.14). This group of producers comprised 231 survey respondents in the first scenario and 242 survey respondents in the second scenario when the worst case loss increased. In the first scenario 177 producers indicated they preferred the potential outcome of $100/head return best case; $75/head loss worst case. In the second scenario when the worst case loss increased by $10/head, 112 producers indicated they prefer the potential outcome of $100/head return best case; $85/head loss worst case. Additionally, 67 producers indicated in the first scenario they prefer the potential marketing outcome of $20/head return best case; $0/head loss worst case, when the worst case outcome increased by $10/head 77 producers indicated they prefer the same dollar per head return with a potential outcome of

$10/head loss worst case. The group of producers who indicated they would prefer the potential market outcome of $35/head return best case; $20/head loss worst case totaled 42 producers. When the scenario changed resulting in a $10/head loss increase the scenario with the same dollar per head return and a $30/head loss in the worst case was indicated by 70 producers. These comparisons suggest there are 150 (27.78% of survey respondents) risk adverse producers.

**Figure 3-14 Scenarios for Potential Market Outcome**

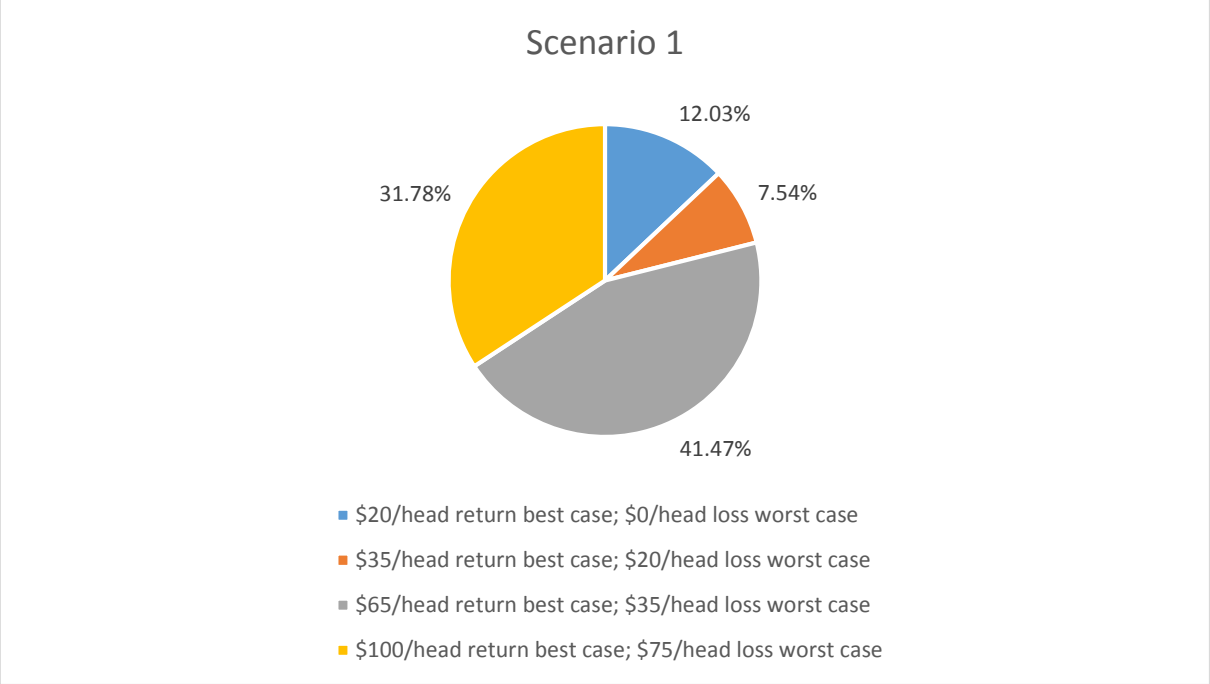
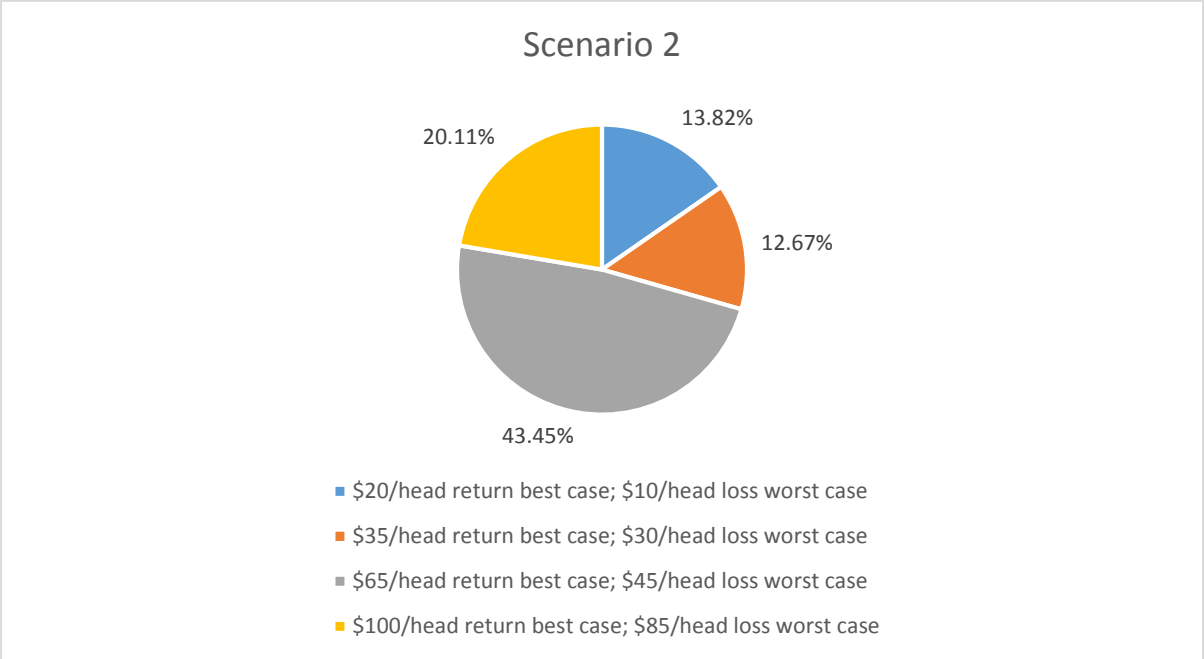


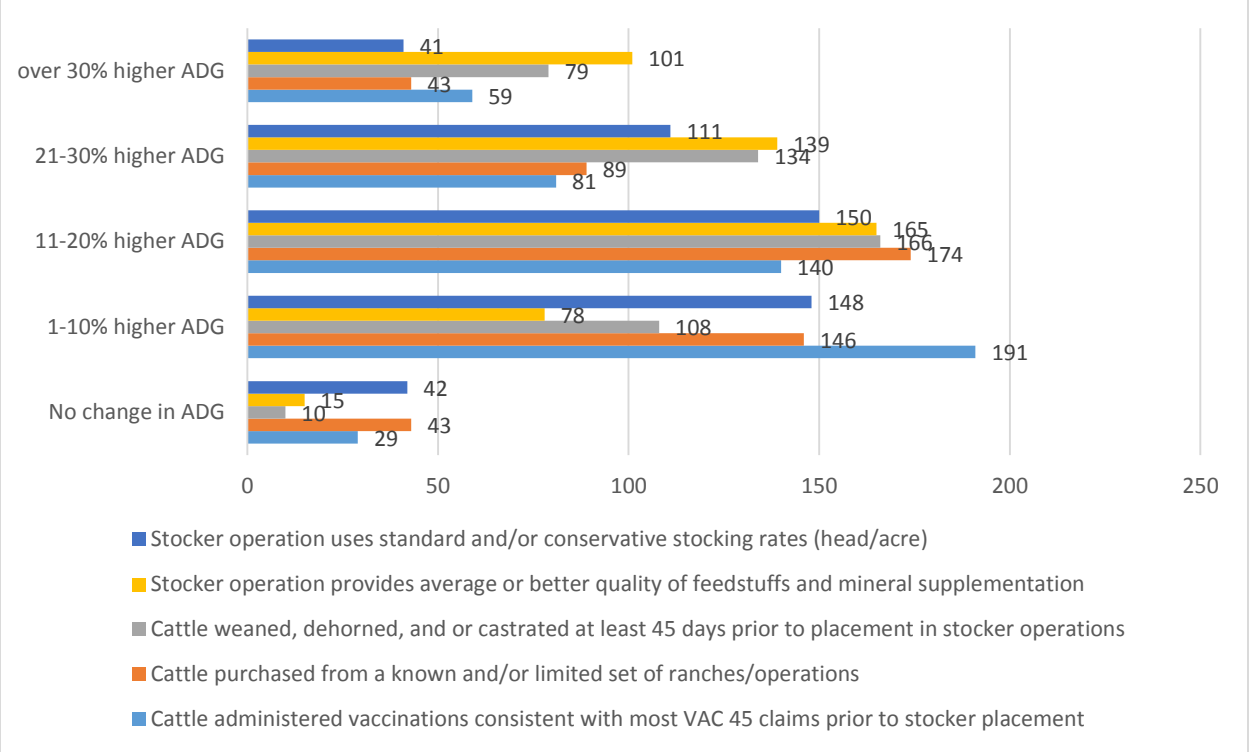
**Figure 3-15 Scenarios for Potential Market Outcome, continue**




Producers were also asked to indicate the range in percentage they think ADG would increase if various feeder cattle characteristics are implemented. As Figure 3.15 indicates, when presented with the protocol "cattle administered vaccinations consistent with most VAC 45 claims prior to stocker placement" 191 survey respondents designated that this protocol would increase ADG by 1-10%, this was followed by 140 indicating 11-20% higher ADG. Additionally, 81, 59, and 29 survey respondents indicated ADG would increase by 21-30%, over 30%, or no change in ADG, respectively. As indicated by table 3.4, additional protocols presented to producers which required them to specify the percentage increase in ADG were "cattle purchased from a known and/or limited set of ranches/operations", "cattle weaned, dehorned, and castrated at least 45 days prior to placement in stocker operation", "stocker operation provides average or better quality of feedstuffs and mineral supplementations", and "stocker operation uses standard and/or conservative stocking rates (heads/acre). Using weighted averages based on midpoints of the ranges given we were able to rank the feeder cattle

characteristics in terms of their impact. The following are ranked in order of the greatest impact to least impact on ADG: “stocker operation provides average or better quality of feedstuffs and mineral supplementation,” “cattle weaned, dehorned, and castrated at least 45 days prior to placement in stocker operation,” “stocker operation uses standard and/or conservative stocking rates (head/acre),” “cattle administered vaccinations consistent with most VAC 45 claims prior to stocker placement,” and “cattle purchased from a known and/or limited set of ranches/operations.”

**Figure 3-16 Change in ADG across Feeder Cattle Characteristics**




In regards to risk management strategies table 3.5 addresses what practices producers generally use to manage market or price risk. Included in the table are statements in which producers are asked to rate their agreement from strongly agree to strongly disagree.

**Table 3-17 Risk Preferences and Practices**

| Variable | Description | Frequency % | Mean | SD | N |
|---|---|---|---|---|---|
| **Risk** | Rate agreement on these statements: (Scaling from 1-5. 1 being strongly agree and 5 being strongly disagree) | | | | |
| *(SPrin)* | I usually like "playing it safe" (locking in a price) instead of taking risks for market prices for my cattle. | | | | 523 |
| | =1 if strongly agree | 16.5171 | | | 92 |
| | =2 | 13.4650 | | | 75 |
| | =3 | 29.8025 | | | 166 |
| | =4 | 19.2101 | | | 107 |
| | =5 if strongly disagree | 12.9264 | | | 72 |
| | =6 if don’t know | 1.9749 | | | 11 |
| *(FCPrin)* | When selling/marketing my cattle, I prefer financial certainty to financial uncertainty. | | | | 524 |
| | =1 if strongly agree | 31.2388 | | | 174 |
| | =2 | 24.2370 | | | 135 |
| | =3 | 23.5189 | | | 131 |
| | =4 | 9.3357 | | | 52 |
| | =5 if strongly disagree | 3.9497 | | | 22 |
| | =6 if don’t know | 1.7953 | | | 10 |

**Table 3-18 Risk Preferences and Practices, continued**

| | | | | | |
|---|---|---|---|---|---|
| *(HFRPrin)* | When selling/marketing my cattle, I am willing to take higher financial risks in order to realize higher average returns. | | | | 527 |
| | =1 if strongly agree | 12.5673 | | | 70 |
| | =2 | 25.6732 | | | 143 |
| | =3 | 24.7756 | | | 138 |
| | =4 | 18.6715 | | | 104 |
| | =5 if strongly disagree | 12.3878 | | | 69 |
| | =6 if don't know | 0.5386 | | | 3 |
| *(FRPrin)* | I like taking financial risk with my cattle business. | | | | 525 |
| | =1 if strongly agree | 4.3088 | | | 24 |
| | =2 | 10.2334 | | | 57 |
| | =3 | 18.8510 | | | 105 |
| | =4 | 25.4937 | | | 142 |
| | =5 if strongly disagree | 33.5727 | | | 187 |
| | =6 if don't know | 1.7953 | | | 10 |
| *(MRPrin)* | I accept more risk in my cattle business than other cattle producers. | | | | 525 |
| | =1 if strongly agree | 7.3609 | | | 41 |
| | =2 | 17.0557 | | | 95 |
| | =3 | 24.4165 | | | 136 |
| | =4 | 19.3896 | | | 108 |
| | =5 if strongly disagree | 22.9803 | | | 128 |
| | =6 if don't know | 3.0521 | | | 17 |

**Table 3-19 Risk Preferences and Practices, continued**

| | | | | | |
|---|---|---|---|---|---|
| *(DRPrin)* | With respect to the conduct of business, I dislike risk. | | | | 519 |
| | =1 if strongly agree | 16.1580 | | | 90 |
| | =2 | 20.4668 | | | 114 |
| | =3 | 27.6481 | | | 154 |
| | =4 | 17.9533 | | | 100 |
| | =5 if strongly disagree | 9.8743 | | | 55 |
| | =6 if don't know | 1.0772 | | | 6 |
| **Risk Management** | Which practices do you typically use to manage market or price risk? | | | | |
| *(N_BHQRisk)* | Buying high quality cattle | 56.0144 | 0.5601 | 0.4968 | 312 |
| *(N_LCPRisk)* | Focus on low cost production | 67.3250 | 0.6732 | 0.4694 | 375 |
| *(N_BLPRisk)* | Buying lower priced cattle | 31.0592 | 0.3106 | 0.4632 | 173 |
| *(N_ROFRisk)* | Retained ownership to feedyard | 27.8276 | 0.2783 | 0.4486 | 155 |
| *(N_FCIRisk)* | Forward contracting inputs/outputs | 33.2136 | 0.3321 | 0.4714 | 185 |
| *(N_FMCRisk)* | Futures market contracts | 37.3429 | 0.3734 | 0.4841 | 208 |
| *(N_OFMRisk)* | Options on futures market contracts | 26.5709 | 0.2657 | 0.4421 | 148 |
| *(N_LRPRisk)* | Livestock Risk Protection (LRP) Insurance | 7.0018 | 0.0700 | 0.2554 | 39 |
| *(N_LGMRisk)* | Livestock Gross Margin (LGM) Insurance | 0.8977 | 0.0090 | 0.0944 | 5 |

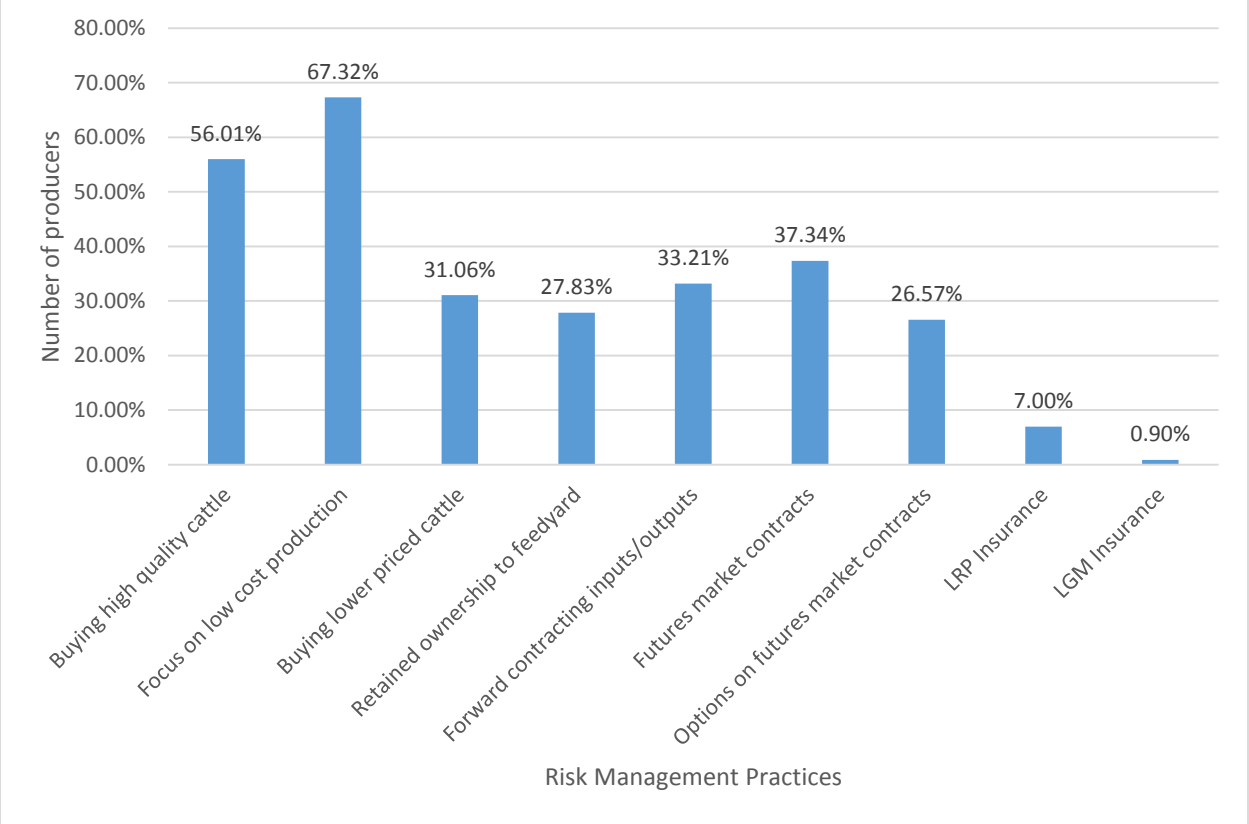
Producers were asked their risk preference rating on several statements listed in Table 3.5. These questions were developed to measure risk attitude of producers (Franken, Pennings, and Garcia, 2014). Of the 523 producers that answered "I usually like "playing it safe" (for instance, "locking in a price") instead of taking risks for market prices for my cattle," 92 (16.52%) producers selected they strongly agree, 72 (12.93%) selected they strongly disagree with 348 (62.48%) producers selecting a rating somewhere in the middle. Additionally, 11 (1.97%) producers selected

"Don't Know." Of the 524 producers that answered "When selling/marketing my cattle, I prefer financial certainty to financial uncertainty," 174 (31.24%) producers selected they strongly agree, 22 (3.95%) producers selected they strongly disagree with 318 (57.09%) producers selecting a rating in the middle. Additionally, 10 (1.80%) producers selected "Don't Know." Of the 527 producers that answered "When selling/marketing my cattle, I am willing to take higher financial risks in order to realize higher average returns," 70 (12.57%) producers selected they strongly agree, 69 (12.39%) producers selected they strongly disagree, 385 (69.12%) selected a rating in the middle, and 3 (.54%) producers selected "Don't Know." Of the 525 producers that answered "I like taking financial risk with my cattle business," 24 (4.31%) producers chose that they strongly agree, 187 (33.57%) choose they strongly disagree, 304 (54.78%) producers selected a rating in the middle, and 10 (1.80%) producers selected "Don't Know." Of the 525 producers that selected a rating for "I accept more risk in my cattle business than other cattle producers," 41 (7.36%) chose they strongly agree, 128 (22.98%) chose they strongly disagree, 339 (60.86%) producers selected a rating in the midrange, and 17 (3.05%) selected "Don't Know." Of the 519 producers that selected a rating for "With respect to the conduct of business, I dislike risk," 90 (16.16%) producers selected they strongly agree, 55 (9.87%) producers selected they strongly disagree, 368 (66.07%) producers selected a rating in the middle, and 6 (1.08%) producers selected "Don't Know."

Focusing on low cost production is a practice that most producers claimed that they use to manage risk. This group of producers totaled 375 (67.33%) (Figure 3.16). Buying high quality cattle is also a popular practice in which 312 (56.01%) producers indicated is a management tool they use in mitigating risk. Those that indicated they typically use futures market contracts as risk management comprised of 208 (37.34%) producers. A group of 185 (33.21%) producers claimed they use forward contracting inputs/outputs as a way to manage risk was followed by 173 (31.06%)

producers who claimed buying lower priced cattle is a risk management tool for their operation. Retaining ownership to feedyard and using options on futures market contracts to mitigate risk were indicated by 155 (27.83%) producers and 148 (26.57%) producers, respectively. Additionally, 39 (7.0%) and 5 (0.90%) producers indicated they use Livestock Risk Protection (LRP) Insurance or Livestock Gross Margin (LGM) Insurance, respectively.

**Figure 3-17 Risk Management Practices**




In regards to the choice experiment questions, table 3.6 includes the price and ADG attribute levels presented to producers in the survey. Expected ADG is ranked from lowest to highest profile in both treatment groups. If a respondent used a weighted average based on the midpoint of the presented ranges and probabilities, the expected ADG (lbs/day) of the three profiles in each Treatment Group are listed in order. Under this approach, in Treatment Group A, profile 1's expected ADG is 1.94 lbs/day, profile 2 has an expected ADG of 2.1 lbs/day, and

profile 3's expected ADG is 2.26 lbs/day. In Treatment Group B (profile 4 to 6) the expected ADGs are 1.9, 2.1 and 2.3, respectively.

**Table 3-20 Price and ADG Attribute Levels**

| **Attribute** | **Levels** | | |
|---|---|---|---|
| **Price** | $197/cwt<br>$227/cwt<br>$257/cwt | | |
| | | | |
| **ADG (Treatment A)** | <1.7 | 1.7 to 2.5 | >2.5 |
| ▪ Profile 1 | 40% probability | 40% probability | 20% probability |
| ▪ Profile 2 | 20% probability | 60% probability | 20% probability |
| ▪ Profile 3 | 20% probability | 40% probability | 40% probability |
| | | | |
| **ADG (Treatment B)** | 20% probability | 60% probability | 20% probability |
| ▪ Profile 4 | <1.5 | 1.5 to 2.3 | >2.3 |
| ▪ Profile 5 | <1.7 | 1.7 to 2.5 | >2.5 |
| ▪ Profile 6 | <1.9 | 1.9 to 2.7 | >2.7 |

Survey participants were given three choice experiment scenario questions in their survey and there were four different versions of the survey. Therefore, there were a total of 12 different scenarios. Versions 1, 2, 3, and 4 were sent via e-mail, while versions 5, 6, 7, and 8 were mail surveys. Versions 1, 2, 5 and 6 use Treatment Group A scenarios with varying probabilities and fixed ADG ranges (scenario 1-6). Versions 3, 4, 7, and 8 are in Treatment Group B scenarios with

varying ADG ranges and fixed probabilities (scenario 7-12). These versions along with how producers responded to the choice experiments are detailed in the following tables.

**Table 3-21 Choice Experiment Question Version 1 & 2 (e-mail), Treatment A**

| | **Description** | **Frequency %** | **N** |
|---|---|---|---|
| **Scenario 1** | Indicate which lot you would buy | | 16 |
| | Lot A ($257/cwt, ADG Profile 1) | 0.0000 | 0 |
| | Lot B ($257/cwt, ADG Profile 2) | 75.0000 | 12 |
| | Option C | 18.7500 | 3 |
| **Scenario 2** | Indicate which lot you would buy | | 16 |
| | Lot A ($227/cwt, ADG Profile 3) | 43.7500 | 7 |
| | Lot B ($227/cwt, ADG Profile 2) | 37.5000 | 6 |
| | Option C | 12.5000 | 2 |
| **Scenario 3** | Indicate which lot you would buy | | 16 |
| | Lot A ($197/cwt, ADG Profile 1) | 12.5000 | 2 |
| | Lot B ($227/cwt, ADG Profile 3) | 68.7500 | 11 |
| | Option C | 12.5000 | 2 |
| **Scenario 4** | Indicate which lot you would buy | | 24 |
| | Lot A ($257/cwt, ADG Profile 2) | 54.1667 | 13 |
| | Lot B ($227/cwt, ADG Profile 1) | 16.6667 | 4 |
| | Option C | 20.8333 | 5 |
| **Scenario 5** | Indicate which lot you would buy | | 24 |
| | Lot A ($197/cwt, ADG Profile 3) | 75.0000 | 18 |
| | Lot B ($257/cwt, ADG Profile 1) | 4.1667 | 1 |
| | Option C | 16.6667 | 4 |
| **Scenario 6** | Indicate which lot you would buy | | 24 |
| | Lot A ($227/cwt, ADG Profile 2) | 50.0000 | 12 |
| | Lot B ($257/cwt, ADG Profile 3) | 33.3333 | 8 |
| | Option C | 8.3333 | 2 |

**Table 3-22 Choice Experiment Question Version 1 & 2 (e-mail), Treatment A, continued**

| | | | |
|---|---|---|---|
| **Choice Experiment Response Version 1** | Which best describes your response to the Choice Experiment question sequence presented | | 16 |
| | the questions were easy and straight-forward to understand. Accordingly I am confident in my selections. | 50.0000 | 8 |
| | the questions were easy and straight-forward to understand. However, I am not confident in my selections. | 25.0000 | 4 |
| | the questions were not easy and straight-forward to understand. However I am confident in my selections. | 6.2500 | 1 |
| | the questions were not easy and straight-forward to understand. Accordingly I am not confident in my selections. | 18.7500 | 3 |

**Table 3-23 Choice Experiment Question Version 1 & 2 (e-mail), Treatment A, continued**

| | | | |
|---|---|---|---|
| **Choice Experiment Response Version 2** | Which best describes your response to the Choice Experiment question sequence presented | | 24 |
| | the questions were easy and straight-forward to understand. Accordingly I am confident in my selections. | 33.3333 | 8 |
| | the questions were easy and straight-forward to understand. However, I am not confident in my selections. | 16.6667 | 4 |
| | the questions were not easy and straight-forward to understand. However I am confident in my selections. | 20.8333 | 5 |
| | the questions were not easy and straight-forward to understand. Accordingly I am not confident in my selections. | 16.6667 | 4 |

Of the 16 survey respondents that answered Version 1, 0 respondents selected Lot A (1.94 expected ADG) 12 (75%) respondents selected Lot B (2.1 expected ADG) in the first scenario over the other options and three (18.75%) respondents selected Option C (I would choose not to purchase Lot A or Lot B) (Table 3.7). In scenario two, seven (43.75%) respondents selected Lot A (2.26 expected ADG), six (36.5%) respondents selected Lot B (2.1 expected ADG), and two (12.5%) respondents selected Option C. In scenario three, 2 (12.5%) respondents selected Lot A

(1.94 expected ADG), 11 (68.75%) respondents selected Lot B (2.26 expected ADG), and two (12.5%) respondents selected Option C.

In Version 2, of the 24 respondents that answered, 13 (54.17%) respondents selected Lot A (2.1 expected ADG) in their first scenario (Scenario 4), four (16.67%) respondents selected Lot B (1.94 expected ADG), and five (20.83%) respondents selected Option C. In their second scenario (Scenario 5) 18 (75%) respondents selected Lot A (2.26 expected ADG), one (4.167%) selected Lot B (1.94 expected ADG), and four (16.67%) respondents selected Option C. In their third scenario (Scenario 6), 12 (50%) respondents selected Lot A (2.1 expected ADG), eight (33.34%) respondents selected Lot B (2.26 expected ADG), and two (8.34%) respondents selected Option C.

Producers were asked a follow up question after the three choice experiment questions regarding how confident their responses were and how straight-forward the questions asked were. In Version 1, eight (50%) respondents selected "the questions were easy and straight-forward to understand. Accordingly I am confident in my selections", four (25%) respondents selected "the questions were easy and straight-forward to understand. However, I am not confident in my selections", one (6.25%) respondent selected "the questions were not easy and straight-forward to understand. However I am confident in my selections", and three (18.75%) respondents selected "the questions were not easy and straight-forward to understand. Accordingly I am not confident in my selections." The following tables can be interpreted the same way.

**Table 3-24 Choice Experiment Question Version 5 & 6 (mail), Treatment A**

| | Description | Frequency % | N |
|---|---|---|---|
| **Scenario 1** | Indicate which lot you would buy | | 104 |
| | Lot A ($257/cwt, ADG Profile 1) | 4.8077 | 5 |
| | Lot B ($257/cwt, ADG Profile 2) | 64.4231 | 67 |
| | Option C | 14.4231 | 15 |
| **Scenario 2** | Indicate which lot you would buy | | 104 |
| | Lot A ($227/cwt, ADG Profile 3) | 28.8462 | 30 |
| | Lot B ($227/cwt, ADG Profile 2) | 48.0769 | 50 |
| | Option C | 5.7692 | 6 |
| **Scenario 3** | Indicate which lot you would buy | | 104 |
| | Lot A ($197/cwt, ADG Profile 1) | 18.2692 | 19 |
| | Lot B ($227/cwt, ADG Profile 3) | 54.8077 | 57 |
| | Option C | 9.6154 | 10 |
| **Scenario 4** | Indicate which lot you would buy | | 120 |
| | Lot A ($257/cwt, ADG Profile 2) | 33.3333 | 40 |
| | Lot B ($227/cwt, ADG Profile 1) | 30.8333 | 37 |
| | Option C | 20.8333 | 25 |
| **Scenario 5** | Indicate which lot you would buy | | 120 |
| | Lot A ($197/cwt, ADG Profile 3) | 70.8333 | 85 |
| | Lot B ($257/cwt, ADG Profile 1) | 5.0000 | 6 |
| | Option C | 7.5000 | 9 |
| **Scenario 6** | Indicate which lot you would buy | | 120 |
| | Lot A ($227/cwt, ADG Profile 2) | 53.3333 | 64 |
| | Lot B ($257/cwt, ADG Profile 3) | 21.6667 | 26 |
| | Option C | 8.3333 | 10 |
| | | | |

**Table 3-25 Choice Experiment Question Version 5 & 6 (mail), Treatment A, continued**

| | | | |
|---|---|---|---|
| **Choice Experiment Response Version 5** | Which best describes your response to the Choice Experiment question sequence presented | | 104 |
| | the questions were easy and straight-forward to understand. Accordingly I am confident in my selections. | 48.0769 | 50 |
| | the questions were easy and straight-forward to understand. However, I am not confident in my selections. | 10.5769 | 11 |
| | the questions were not easy and straight-forward to understand. However I am confident in my selections. | 13.4615 | 14 |
| | the questions were not easy and straight-forward to understand. Accordingly I am not confident in my selections. | 16.3462 | 17 |
| **Choice Experiment Response Version 6** | Which best describes your response to the Choice Experiment question sequence presented | | 120 |
| | the questions were easy and straight-forward to understand. Accordingly I am confident in my selections. | 34.1667 | 41 |

**Table 3-26 Choice Experiment Question Version 5 & 6 (mail), Treatment A, continued**

| | | | |
|---|---|---|---|
| | the questions were easy and straight-forward to understand. However, I am not confident in my selections. | 20.0000 | 24 |
| | the questions were not easy and straight-forward to understand. However I am confident in my selections. | 17.5000 | 21 |
| | the questions were not easy and straight-forward to understand. Accordingly I am not confident in my selections. | 18.3333 | 22 |

**Table 3-27 Choice Experiment Question Version 3 & 4 (e-mail), Treatment B**

| | **Description** | **Frequency %** | **N** |
|---|---|---|---|
| **Scenario 7** | Indicate which lot you would buy | | 26 |
| | Lot A ($257/cwt, ADG Profile 4) | 7.6923 | 2 |
| | Lot B ($257/cwt, ADG Profile 5) | 53.8462 | 14 |
| | Option C | 30.7692 | 8 |
| **Scenario 8** | Indicate which lot you would buy | | 26 |
| | Lot A ($227/cwt, ADG Profile 6) | 57.6923 | 15 |
| | Lot B ($227/cwt, ADG Profile 5) | 7.6923 | 2 |
| | Option C | 23.0769 | 6 |
| **Scenario 9** | Indicate which lot you would buy | | 26 |
| | Lot A ($197/cwt, ADG Profile 4) | 23.0769 | 6 |
| | Lot B ($227/cwt, ADG Profile 6) | 50.0000 | 13 |
| | Option C | 19.2308 | 5 |

**Table 3-28 Choice Experiment Question Version 3 & 4 (e-mail), Treatment B, continued**

| | | | |
|---|---|---|---|
| **Scenario 10** | Indicate which lot you would buy | | 34 |
| | Lot A ($257/cwt, ADG Profile 5) | 32.3529 | 11 |
| | Lot B ($227/cwt, ADG Profile 4) | 50.0000 | 17 |
| | Option C | 17.6471 | 6 |
| **Scenario 11** | Indicate which lot you would buy | | 34 |
| | Lot A ($197/cwt, ADG Profile 6) | 82.3529 | 28 |
| | Lot B ($257/cwt, ADG Profile 4) | 5.8824 | 2 |
| | Option C | 11.7647 | 4 |
| **Scenario 12** | Indicate which lot you would buy | | 34 |
| | Lot A ($227/cwt, ADG Profile 5) | 44.1176 | 15 |
| | Lot B ($257/cwt, ADG Profile 6) | 32.3529 | 11 |
| | Option C | 17.6471 | 6 |
| | | | |
| **Choice Experiment Response Version 3** | Which best describes your response to the Choice Experiment question sequence presented | | 26 |
| | the questions were easy and straight-forward to understand. Accordingly I am confident in my selections. | 50.0000 | 13 |
| | the questions were easy and straight-forward to understand. However, I am not confident in my selections. | 23.0769 | 6 |

**Table 3-29 Choice Experiment Question Version 3 & 4 (e-mail), Treatment B, continued**

| | | | |
|---|---|---|---|
| | the questions were not easy and straight-forward to understand. However I am confident in my selections. | 11.5385 | 3 |
| | the questions were not easy and straight-forward to understand. Accordingly I am not confident in my selections. | 7.6923 | 2 |
| **Choice Experiment Response Version 4** | Which best describes your response to the Choice Experiment question sequence presented | | 34 |
| | the questions were easy and straight-forward to understand. Accordingly I am confident in my selections. | 44.1176 | 15 |
| | the questions were easy and straight-forward to understand. However, I am not confident in my selections. | 17.6471 | 6 |
| | the questions were not easy and straight-forward to understand. However I am confident in my selections. | 26.4706 | 9 |
| | the questions were not easy and straight-forward to understand. Accordingly I am not confident in my selections. | 11.7647 | 4 |

**Table 3-30 Choice Experiment Question Version 7 & 8 (mail), Treatment B**

| | Description | Frequency % | N |
|---|---|---|---|
| **Scenario 7** | Indicate which lot you would buy | | 120 |
| | Lot A ($257/cwt, ADG Profile 4) | 2.5000 | 3 |
| | Lot B ($257/cwt, ADG Profile 5) | 57.5000 | 69 |
| | Option C | 20.0000 | 24 |
| **Scenario 8** | Indicate which lot you would buy | | 120 |
| | Lot A ($227/cwt, ADG Profile 6) | 46.6667 | 56 |
| | Lot B ($227/cwt, ADG Profile 5) | 19.1667 | 23 |
| | Option C | 12.5000 | 15 |
| **Scenario 9** | Indicate which lot you would buy | | 120 |
| | Lot A ($197/cwt, ADG Profile 4) | 30.8333 | 37 |
| | Lot B ($227/cwt, ADG Profile 6) | 35.0000 | 42 |
| | Option C | 10.0000 | 12 |
| **Scenario 10** | Indicate which lot you would buy | | 113 |
| | Lot A ($257/cwt, ADG Profile 5) | 17.6991 | 20 |
| | Lot B ($227/cwt, ADG Profile 4) | 45.1327 | 51 |
| | Option C | 17.6991 | 20 |
| **Scenario 11** | Indicate which lot you would buy | | 113 |
| | Lot A ($197/cwt, ADG Profile 6) | 65.4867 | 74 |
| | Lot B ($257/cwt, ADG Profile 4) | 4.4248 | 5 |
| | Option C | 11.5044 | 13 |
| **Scenario 12** | Indicate which lot you would buy | | 113 |
| | Lot A ($227/cwt, ADG Profile 5) | 50.4425 | 57 |
| | Lot B ($257/cwt, ADG Profile 6) | 14.1593 | 16 |
| | Option C | 14.1593 | 16 |
| | | | |

**Table 3-31 Choice Experiment Question Version 7 & 8 (mail), Treatment B, continued**

| | | | |
|---|---|---|---|
| **Choice Experiment Response Version 7** | Which best describes your response to the Choice Experiment question sequence presented | | 120 |
| | the questions were easy and straight-forward to understand. Accordingly I am confident in my selections. | 35.8333 | 43 |
| | the questions were easy and straight-forward to understand. However, I am not confident in my selections. | 14.1667 | 17 |
| | the questions were not easy and straight-forward to understand. However I am confident in my selections. | 17.5000 | 21 |
| | the questions were not easy and straight-forward to understand. Accordingly I am not confident in my selections. | 20.0000 | 24 |
| **Choice Experiment Response Version 8** | Which best describes your response to the Choice Experiment question sequence presented | | 113 |
| | the questions were easy and straight-forward to understand. Accordingly I am confident in my selections. | 36.2832 | 41 |
| | the questions were easy and straight-forward to understand. However, I am not confident in my selections. | 14.1593 | 16 |

**Table 3-32 Choice Experiment Question Version 7 & 8 (mail), Treatment B, continued**

| | | | |
|---|---|---|---|
| | the questions were not easy and straight-forward to understand. However I am confident in my selections. | 14.1593 | 16 |
| | the questions were not easy and straight-forward to understand. Accordingly I am not confident in my selections. | 20.3540 | 23 |

## 3.2 Models

### *3.2.1 Choice Experiment*

Choice experiments are hypothetical questions designed to mimic real-world purchasing situations without the actual exchange of money, which allows for the assessment of tradeoffs among attributes. Producers' WTP for expected animal performance of three different levels across three different purchase prices was estimated. To reduce survey fatigue, survey respondents were randomly assigned to two treatment groups where they were asked to complete either the treatment group where probabilities for expected ADG changed across scenarios and ADG ranges were held constant, or the treatment group where ADG ranges changed across scenarios and the probabilities were held constant. The ability of the producer to process the scenarios is unknown; therefore, we can focus our effort on assessing the direct response to the two different approaches of presenting ADG information. Treatments A and B were completed by 371 and 404 respondents respectively.

Producers were presented with three choice experiment questions containing two lots of cattle and a third, opt out option. They were asked to select a lot of cattle from a set of options by evaluating each lot's set of characteristics. The two lots of cattle were offered at three different price levels ($197/cwt, $227/cwt, $257/cwt) selected to be consistent with current prices. In addition to purchase price, the lots varied by ADG (see table 3.6). An orthogonal fractional design (Kuhfeld, Tobias, and Garratt, 1994) was used to select scenarios in which price and average daily gain levels are uncorrelated. A final design of 12 scenarios was identified and blocked into two treatment groups with two blocks of three questions. This process also allowed the choice experiment to be of reasonable size for survey participants.

Producers were presented the following up-front text before being asked three choice experiment questions:

"Consider an operation similar to yours that regularly places 500 lb. steers in its backgrounder/stocker operation in October and typically sells at heavier weights about 120 days later in February. Varying only purchase price and average daily gain (ADG) information, please consider the following **three** questions and indicate which Lot (or neither) would best reflect your purchase decision in each case."

An example choice scenario for treatment A (varying probabilities, fixed ADG ranges) was:

**Figure 3-18 Choice Experiment Treatment A**

| Attributes | Lot A | Lot B | Option C |
|---|---|---|---|
| **Purchase Price ($/cwt)** | 257 | 227 | I would choose not to purchase either Lot A or Lot B |
| **ADG (lbs/day)** | 20% Chance: under 1.7 | 40% Chance: under 1.7 | |
| **Outcome** | 60% Chance: 1.7 to 2.5 | 40% Chance: 1.7 to 2.5 | |
| | 20% Chance: over 2.5 | 20% Chance: over 2.5 | |
| ***I would choose:*** | _____ | _____ | _____ |

An example choice scenario for treatment B (fixed probabilities, varying ADG ranges) was:

**Figure 3-19 Choice Experiment Treatment B**

| Attributes | Lot A | Lot B | Option C |
|---|---|---|---|
| **Purchase Price ($/cwt)** | 257 | 227 | I would choose not to purchase either Lot A or Lot B |
| **ADG (lbs/day)** | 20% Chance: under 1.7 | 20% Chance: under 1.5 | |
| **Outcome** | 60% Chance: 1.7 to 2.5 | 60% Chance: 1.5 to 2.3 | |
| | 20% Chance: over 2.5 | 20% Chance: over 2.3 | |
| ***I would choose:*** | _____ | _____ | _____ |

Stated preference methods such as choice experiments are based on the theory of utility maximization. When producers are presented with a choice set, they seek to maximize their expected utility by choosing the alternative with the combination of attributes that provides them with the highest utility. In this experiment producers were presented with three alternatives, two lots of cattle (with varying levels of ADG and purchase price) and an opt out option. The data from choice experiments is analyzed using multinomial logit (MNL) models (Schulz and Tonsor, 2010). Random utility theory can be employed by the following equation:

$$U_{jt} = v_{jt} + \varepsilon_{jt} \tag{3.1}$$

where $U_{jt}$ is the utility obtained from selecting alternative *j* in choice scenario *t*, $v_{jt}$ is the systematic portion of utility determined by attributes and their values, and $\varepsilon_{jt}$ is a random, unobservable component of logit models, independently and identically distributed over all alternatives and choice scenarios (Schulz and Tonsor, 2010). A producer will select alternative *j* if the utility for selecting *j* is greater than the utility for selecting alternative *k*, $U_{jt} > U_{kt}$ for all $j \neq k$. The probability of selecting alternative *j* is given by:

$$P_{jt} = P(v_{jt} + \varepsilon_{jt} > v_{kt} + \varepsilon_{kt}; j \neq k, \forall j \in C) \quad (3.2)$$

where $C$ is the choice set of all possible alternatives. The probability of a producer selecting alternative *j* is:

$$P_{jt} = \frac{e^{\mu\beta X_{ji}}}{\sum_{k \in C} e^{\mu\beta X_k}} \quad (3.3)$$

where $\mu$ is a scale parameter, which is inversely related to the variance of the error term (Lusk, Roosen, and Fox, 2003; Olynk, Tonsor, and Wolf, 2010) and $\beta$ is a vector of parameters. The scale parameter, $\mu$, is typically assumed to be equal to one because it is unidentifiable in any particular dataset (Lusk, Roosen, and Fox, 2003; Olynk, Tonsor, and Wolf, 2010). Assuming that the systematic portion of utility, $v_{jt}$, is linear in the parameters, the specification of the model can be expressed as:

$$v_{jt} = \beta_1 x_{j1} + \cdots + \beta_n x_{jn} \quad (3.4)$$

where $x_{jn}$is the nth attribute value for alternative *j*, and the $\beta$'s are parameters associated with the *n*th attributes of the *j*th alternative.

Multinomial logit models assume that all respondents share the same preferences for a given attribute. This assumption may be unrealistic if producers' preferences are heterogeneous instead of homogenous. More appropriate, is to apply a model that allows for heterogeneous preferences (Lusk, Roosen, and Fox, 2003). A model that allows for heterogeneous preferences is the random parameters logit model.

Using a log-likelihood ratio test we tested the multinomial logit (restricted) model against the random parameters logit (unrestricted) model. We fail to reject the multinomial model, because there is no statistically significant difference in the two, therefore we used the simpler model (MNL) for our research.

The producer's utility was specified for choosing one of two lots of cattle or "I would choose not to purchase either Lot A or Lot B" option with price and ADG levels, and it can be written as:

$$v_j = \beta_1 Price_j + \beta_2 ADG_{2j} + \beta_3 ADG_{3j} + \beta_4 OptOut_j \quad (3.5)$$

where $Price_j$ is the price of cattle in $\text{lot}_j$ and $OptOut$ is a constant equal to one used to describe the producers choice in selecting "I would choose to not purchase either Lot A or Lot B." This variable allowed for unconstrained choices. $ADG_{2j}$ and $ADG_{3j}$ are effects-coded terms that represent ADG profile two and ADG profile three relative to ADG profile one (see table 3.6). Since the variables are effects-coded they don't take on the usual dummy variable value of 0,1, but instead the attributes take on a -1,0,1 value. The attribute takes on the value of 1 when applicable, a value of -1 when the base category applies, and zero otherwise (Olynk, Tonsor, Wolf, 2010).

Due to effects coding of the terms, mean willingness-to-pay estimates for the model can be expressed as follows:

$$WTP_k = -\left(\frac{2 * \beta_k}{\beta_C}\right) \quad (3.6)$$

where $\beta_k$ is the coefficient on the ADG attribute and $\beta_C$ is the coefficient on price. Due to effects-coding the coefficient on the attribute *k* is multiplied by two in the WTP ratio (Lusk, Roosen, and Fox, 2003). Since *OptOut* is not effects coded, we derived WTP estimates using the standard equation without the 2 in the equation.

The delta method was used to construct 95% confidence intervals for WTP estimates. The delta method is used to estimate the variance of a non-linear function of two or more random variables. This is given by taking a first-order Taylor series expansion around the mean value of

the variables and calculating the variance for this expression (GreenE, 2003; Hole, 2007). The delta estimate of the variance of the WTP estimates is:

$$var\ (\widehat{WTP_k}) = var(\widehat{WTP_{\beta_k}})^2 var\left(\widehat{\beta_k}\right) + var(\widehat{WTP_{\beta_C}})^2 var\left(\widehat{\beta_C}\right) + 2 *\ \widehat{WTP_{\beta_k}} *$$

$$\widehat{WTP_{\beta_C}} * cov(\widehat{\beta_k}, \widehat{\beta_C}) = [\left(\frac{-2}{\widehat{\beta_k}}\right)^2 var\left(\widehat{\beta_k}\right) + \left(\frac{2\beta_k}{{\beta_C}^2}\right)^2 var\left(\widehat{\beta_C}\right) + 2 * \left(\frac{-2}{\widehat{\beta_k}}\right)\left(\frac{2\beta_k}{{\beta_C}^2}\right) cov(\widehat{\beta_k}, \widehat{\beta_C})] \quad (3.7)$$

where $\widehat{WTP_{\beta_k}}$ and $\widehat{WTP_{\beta_C}}$ are the partial derivatives of the estimated WTP values for attribute *k* with respect to $\beta_k$ and $\beta_C$, respectively. Once the variance estimates are derived, the confidence intervals can be computed in the standard method:

$$\widehat{WTP_k} \pm z_{\alpha/2}\sqrt{var(\widehat{WTP_k})} \quad (3.8)$$

where $z$ is the critical value and $\alpha$ is the confidence level. In this case $z_{\alpha/2}$ is equal to 1.96 which is at a confidence interval of 95%.

### *3.2.2 Probit Model*

For models with binary endogenous variables, as in the case whether a producer chooses to manage market or price risk by selecting one of the practices provided in the survey, a probit model can be used for analysis. The dependent variable is defined as whether a producer selected a given yes/no question. The generic model can be expressed as follows (Greene, 2003):

$$Y_i = \alpha + \beta X_i + e_i, \quad (3.9)$$

where $Y_i$=0 if $Y^* \leq 0$ and $Y_i = 1$ if $Y_i^* > 0$, it follows that;

$$\text{Prob}(Y_i = 1) = P(Y_i^* > 0) = \text{Prob}(\alpha + \beta_1 X_i + e_i > 0) \quad (3.10)$$

$$Y_i = 1(Y^* > 0) = \{1\ if\ Y_i^* > 0, \text{otherwise}\} \quad (3.11)$$

where $i = 1,2,3,4, \ldots,$ n denoting the sample size, $\beta$ is the set of parameters that are to be estimated, $X_i$ is a vector of independent variables that affect whether producers answer yes or not

to a given question, and $e$ is a normally distributed error term that has a zero mean and a constant variance.

For future purposes an extensive review of previous literature to determine appropriate explanatory variables should be conducted as that may yield additional, more complete insight. This approach was first applied to examine the factors impacting a producer using different risk management strategies (table 3.5) The list of variables we intended on using as explanatory variables included: *Stocker, Own, Man, CSPerc, WSGPerc, WSAPerc, FCPerc, DWFPerc, DLPerc, Mantime, AADG, SEPerc, MAPerc, SWPerc, WPerc, FWPerc, MXPerc, CAPerc, AMNPerc, AMYPerc, DCCPerc, IVAPerc, FCS, FCF, AVG_ADG_N, AVG_Ret_N, N_BHQRisk, N_BLPRisk, N_ROFRisk, N_FCIRisk, N_FMCRisk, N_OFMRisk, N_LRPRisk, N_LGMRisk, Q15Q16RA, Age, Southeast, Southwest, West, Others, NHS, HS, TT, Grad, LT10_yrs, B1120_yrs, B2130_yrs, Inc, FarmIncPer,* and *TotCtl_Sold14.* However, when we tested for correlation among these variables we found that many variables were correlated with each other (beyond a threshold value of 0.50) therefore, we narrowed down the explanatory variable sets to: *Stocker, Own, Man, CSPerc, WSGPerc, WSAPer,c DWFPerc, DLPerc, Mantime, SEPerc, MAPerc, MXPerc, CAPerc, AMNPerc, AMYPerc, DCCPerc, IVAPerc, FCS, FCF, AVG_ADG_N, AVG_Ret_N, Q15Q16RA, Southeast, Southwest, West, Others, NHS, HS, TT, Grad, LT10_yrs, B1120_yrs, B2130_yrs, Inc, FarmIncPer,* and *TotCtl_Sold14.*

For example, in considering the role of buying high quality cattle for risk management, the model that is specified shows the choice of whether producers employ this strategy as a function of producer and operation characteristics.

$$Y_i = \alpha + \beta_1 Stocker + \beta_2 Own + \beta_3 Man + \beta_4 Forage + \beta_5 Mantime + \beta_6 Native +$$
$$\beta_7 Source + \beta_8 Seasonality + \beta_9 AVG\_ADG\_N + \beta_{10} AVG\_Ret\_N + \beta_{11} Q15Q16RA +$$

$\beta_{12}Region + \beta_{13}Education + \beta_{14}Experience + \beta_{15}Inc + \beta_{16}FarmIncPer +$

$\beta_{17}TotCtl\_Sold14$ (3.12)

The variables are defined as follows:

- *Stocker*: is the description of the producer's cattle operation (100% Stocker/Backgrounder). The other types of operations (Stocker/Backgrounder with cow-calf operation, Stocker/Backgrounder with feedlot, Stocker/Backgrounder with both cow-calf and feedlot) are used as reference operations to which *Stocker* is compared.
- *Own* and *Man:* is the description of the survey respondents' title for the operation. *Own* is the owner and *Man* is the manager. These variables are used to which someone with a title of Owner/Manager is compared.
- *Forage:* refers to the type of forage cattle producers' use in a typical year. To avoid multicollinearity one of the variables (*FCPerc*) was dropped while the following explanatory variables were used: *CSPerc* (cool season grass pasture), *WSGPerc* (warm season grass pasture), *WSAPerc* (warm season annual), *DWFPerc* (dormant winter feed), and *DLPerc* (dry lot).
- *Mantime:* refers to the length of time producers' typically own/manage most of their stockers/backgrounders.
- *Native:* refers to the region native to the stocker cattle producers' generally purchase/manage. Used in this probit model are the variables: *SEPerc* (Southeast), *MAPerc* (Mid-Atlantic), *MXPerc* (Mexico), and *CAPerc* (Canada).
- *Source:* refers to the percentage of feeder cattle purchased for background/stocker operation from various market sources. Used in this probit model are the variables: *AMNPerc* (purchased from auction market without knowledge of source ranches),

*AMYPerc* (purchased from auction market with knowledge of source ranches), *DCCPerc* (purchased direct from individual cow-calf ranches), *IVAPerc* (purchased from internet/video auctions).

- *Seasonality:* refers to the typical yearly frequency and seasonality of the stocker/backgrounder operation. Used in this probit model are the variables: *FCS* (typically place of set of feeder cattle in the spring) and *FCF* (typically place one set of feeder cattle in the fall).
- *AVG_ADG_N:* refers to the average ADG across all lots/groups of stockers over the past 10 years.
- *AVG_Ret_N:* refers to the average Net Return across all lots/groups of stockers over the past 10 years.
- *Q15Q16RA:* is a measurement of risk aversion. This variable accounts for producers who became more conservative or more risk seeking in their selections for Q16 compared to their selections in Q15 (table 3-4).
- *Region:* refers to the region when the operation is located. Variables related to Region used in this probit model include: *Southeast, Southwest, West,* and *Others.*
- *Education:* refers to the description of the survey respondents' educational background. Used in this probit model are the variables: *NHS* (did not obtain high school diploma), *HS* (high school diploma), *TT* (technical training), and *Grad* (graduate or professional degree).
- *Experience:* refers to the amount of time producers' have been raising beef cattle. Included in the probit model are the variables: *LT10_yrs* (less than 10 years), *B1120_yrs* (between 11 and 20 years), and *B2130_yrs* (between 21 and 30 years).

- *Inc:* refers to the annual pre-tax household income for producers.
- *FarmIncPer:* refers to the portion of household income from the beef cattle operation.
- *TotCtl_Sold14:* refers to the number of head sold off the operation at various production stages in 2014.

This model was repeated seven times to explain the different practices of managing market and price risk. Including: Buying high quality cattle (*BHQRisk),* focusing on low cost production (*LCPRisk*), buying lower priced cattle (*BLPRisk),* retaining ownership to feedyard (*ROFRisk),* forward contracting inputs/outputs (*FCIRisk*), futures market contracts (*FMCRisk),* and options on futures market contracts (*OFMRisk).* Signs for the independent variables will vary among the seven different explanatory variables. For instance, a 100% stocker/backgrounder producer may use the risk management strategy of buying high quality cattle and not use focus on low cost production as a risk management strategy. Whereas a stocker/backgrounder with feedlot may use the risk management strategy of focusing on low cost production instead of the strategy of buying high quality cattle. In this case we would expect the sign on 100% stocker/backgrounder to be positive for buying high quality cattle and the sign on stocker/backgounder with feedlot to be positive for focusing on low cost production.

# Chapter 4 - Results

This chapter begins by presenting results of multiple models estimated using the choice experiment response data. We begin by presenting models differentiated only by the two treatment groups (A vs. B as described in the prior chapter) to examine impacts on willingness-to-pay (WTP) estimates. We also analyze how WTP estimates change with producers' confidence in the way they answered the choice experiment questions to gain additional insight into the treatment effect of varying ADG or probability information within the presented scenarios.

For each choice experiment treatment, we also derive WTP estimates based on the ADG producers manage for, length of time producers typically manage their stocker cattle, and the region where their operations are located to examine how these situational differences impact preferences for stocker cattle. Later in this chapter another section focuses on what characteristics likely may be drivers of whether producers choose to practice different risk management strategies.

## 4.1 Choice Experiment: WTP Estimates

**Table 4-1 Log-Likelihood Ratio Tests**

| Unrestricted Model | | Restricted Model | | DF | Critical Value | | LR | Outcome |
|---|---|---|---|---|---|---|---|---|
| V1+2 | -91.1892 | V12 | -91.8474 | 4 | 9.488 | > | 1.3164 | Restricted Model |
| V5+6 | -448.0659 | V56 | -518.0708 | 4 | 9.488 | < | 140.0099 | Unrestricted Model |
| V1+2+5+6 | -539.2551 | V1256 | -555.4090 | 12 | 21.026 | < | 32.3079 | Unrestricted Model |
| V3+4 | -151.2645 | V34 | -155.4862 | 4 | 9.488 | > | 8.4434 | Restricted Model |
| V7+8 | -472.8378 | V78 | -571.0520 | 4 | 9.488 | < | 196.4283 | Unrestricted Model |
| V3+4+7+8 | -624.1023 | V3478 | -645.3796 | 12 | 26.296 | < | 42.5546 | Unrestricted Model |

**Table 4-2 Log-Likelihood Ratio Tests, continued**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| V1256 Mixed | -555.0319 | V1256 CL | -555.4090 | 2 | 5.99 | > | 0.7544 | Restricted Model |
| V3478 Mixed | -645.3779 | V3478 CL | -645.3796 | 2 | 5.99 | > | 0.0035 | Restricted Model |

We ran models for each choice experiment version by themselves as well as models pooling versions to conduct likelihood ratio tests which determine which model to use and interpret results for. Versions 1 and 2 were pooled since they contained the e-mail sample in Treatment Group A and Versions 5 and 6 were also pooled together because they contained the mail sample in this same treatment group. We originally ran the models version by version, then added the log-likelihood values from each version to get a value for the unrestricted model and compared it against the pooled versions (restricted model where coefficients are equal across versions in the pooled data). As you can see in table 4.1, a 95% confidence level (for each degrees of freedom) is used to obtain the critical value. When the critical value is greater than the Likelihood-Ratio test statistic value the restricted model is recommended to use. That is, if we fail to reject the restricted model it is identified as preferred. Throughout this chapter we present results from conditional logit (CL) models because we failed to reject it versus the mixed logit.

**Table 4-3 Choice Experiment: Stated WTP ($/cwt) Estimates**

| Version | WTP- CDum | WTP- 2 vs 1 | WTP- 3 vs 1 | Log-Likelihood Value |
|---|---|---|---|---|
| **1&2** | -285.20 | 95.90 | 109.22 | -91.8474 |
| | [-619.60, 49.21] | [-16.71, 208.51] | [-19.69, 238.13] | |
| **5&6** | -276.53 | 45.02 | 34.89 | -518.0708 |
| | [-363.63, -189.43] | [30.85, 59.19] | [23.44, 46.35] | |
| **1,2,5&6** | -277.77 | 49.51 | 41.50 | -555.4090 |
| | [-362.42, -193.12] | [34.39, 64.62] | [28.45, 54.56] | |
| **3&4** | -265.65 | 0.47 | 54.94 | -155.4862 |
| | [ -401.41, -129.90] | [-105.08, 106.01] | [26.61, 83.28] | |
| **7&8** | -259.74 | 15.87 | 24.75 | -571.0520 |
| | [-318.03, -201.46] | [11.88, 19.86] | [18.92, 30.58] | |
| **3,4,7&8** | -261.06 | 13.12 | 30.18 | -645.3796 |
| | [-314.75, -207.37] | [9.86, 16.36] | [23.78, 36.59] | |
| ***Notes:*** numbers in brackets represent 95% confidence intervals derived by delta method | | | | |

Table 4.2 does not show logit coefficients, but instead shows WTP values which are ratios of the coefficients. We derived WTP estimates for producers opting out (choosing neither Lot A or Lot B), in the table above, which is represented by the variable CDum. In the different treatment groups we also derived WTP estimates for ADG Profiles. We used ADG Profile 1 as a base in both treatment groups, therefore our estimates are what producers are willing-to-pay for ADG Profiles 2 and 3 over the base profile of 1.

Since Versions 1, 2, 3, and 4 were the online versions, which had a small respondent sample resulting in wide confidence intervals, we did not put much weight on the WTP interpretations of these versions when pooled by themselves.

In addition to WTP point estimates, Table 4.2 presents 95% confidence intervals derived using the delta method to determine if WTP values are statistically different from zero. Pooled

versions 1 and 2 were not interpreted due to no significance in the confidence intervals for the WTP estimates.

In pooled versions 5 and 6, producers value buying cattle by $276.53/cwt. That is, all else equal respondents prefer to purchase cattle (e.g. not select the Neither option in our scenarios). Given consistency with cash prices for 550 lb steers at the time, this $276.53/cwt value is the first of multiple indicators that respondents likely took the survey serious and provided legitimate responses. Producers are also willing-to-pay $45.02/cwt more for ADG Profile 2 versus ADG Profile 1 and $34.89/cwt more for ADG Profile 3 versus ADG Profile 1.

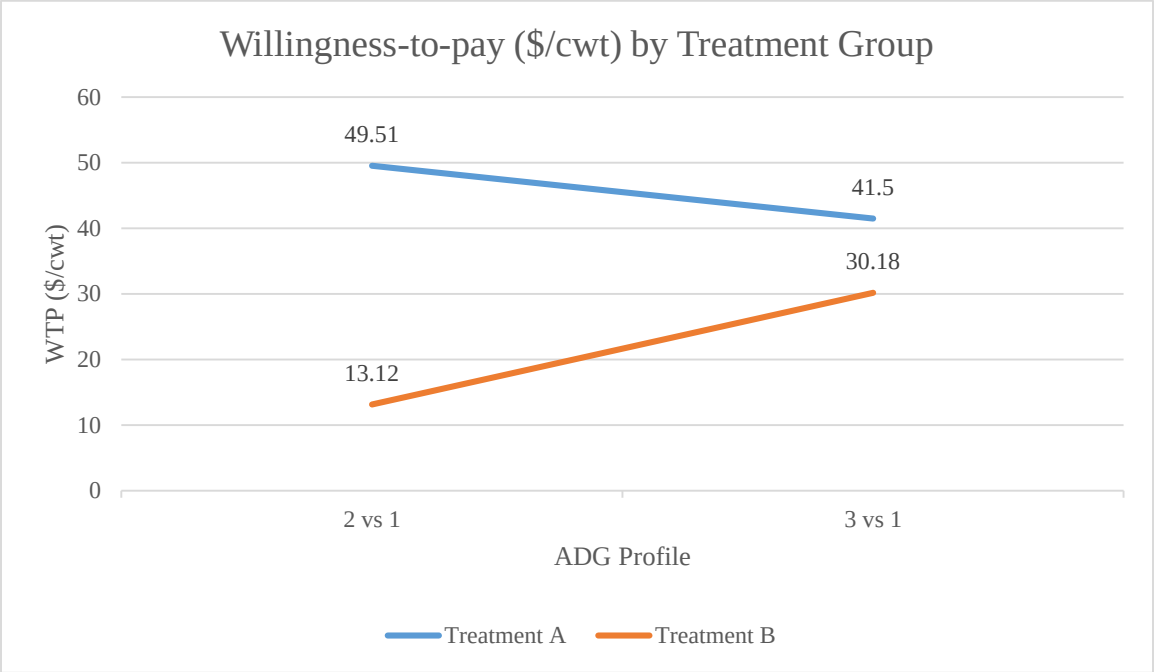
When Treatment Group A is pooled (versions 1, 2, 5, and 6) producers value buying cattle by $277.77/cwt, are willing-to-pay $49.51/cwt for ADG Profile 2 versus ADG Profile 1, and $41.50/cwt for ADG Profile 3 versus ADG Profile 1. These values being very similar to those from models based only on versions 5 and 6 reflects the larger number of mail than email responses received as outlined in the prior chapter.

When pooling versions 3 and 4 together in Treatment Group B we found that producers value buying cattle by $265.65/cwt. These producers have a WTP of $54.94/cwt for ADG Profile 3 versus ADG Profile 1 but no significant preference for ADG profile 2 over 1.

In pooled versions 7 and 8 producers value buying cattle by $259.74/cwt, have a WTP of $15.87/cwt more for ADG Profile 2 versus ADG Profile 1, and are willing-to-pay $24.75/cwt more for ADG Profile 3 versus ADG Profile 1.

When all versions of Treatment Group B (versions 3, 4, 7, and 8) are pooled together we find that producers value buying cattle by $261.06/cwt, have a WTP of $13.12/cwt more for ADG Profile 2 over ADG Profile 1, and have a WTP of $30.18/cwt more for ADG Profile 3 over ADG Profile 1.

**Figure 4-1 Willingness-to-pay ($/cwt) by Treatment Group**




To further understand the main findings, Figure 4.1 shows the point estimates for WTP ADG Profile 2 over 1 and ADG Profile 3 over 1 for both treatment groups. In Treatment Group A, producer's WTP decreases for Profile 3 over 1 compared to 2 over 1. This could be due to producers valuing a higher cost of gain for those additional expected pounds of yield compared to their worth. In Treatment Group B WTP for ADG Profile 3 over 1 is over twice as much as producer's WTP for ADG 2 over 1. This reversal in order, when the only difference is in how ADG information is conveyed, is a key finding our split sample choice experiment approach.

**Table 4-4 Log-Likelihood Ratio Tests by Variable**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Table 4-3 Log-Likelihood** | **CE Resp** | **-540.3814** | **V1256 CL** | **-555.4090** | **16** | **26.296** | **<** | **30.05534** | **Unrestricted model** |
| | ADG | -543.2350 | V1256 CL | -555.4090 | 24 | 36.415 | > | 24.34806 | Restricted Model |
| | Mantime | -527.2485 | V1256 CL | -555.4090 | 24 | 36.415 | < | 56.321019 | Unrestricted Model |
| | Region | -533.0031 | V1256CL | -555.4090 | 20 | 31.4 | < | 44.81186 | Unrestricted Model |
| **Treatment Group B** | CE Resp | -624.8178 | V3478 CL | -645.3796 | 16 | 26.296 | < | 41.12368 | Unrestricted Model |
| | ADG | -624.2731 | V3478 CL | -645.3796 | 20 | 31.41 | < | 42.21298 | Unrestricted Model |
| | Mantime | -631.8595 | V3478 CL | -645.3796 | 24 | 35.415 | > | 27.040218 | Restricted Model |
| | Region | -633.5705 | V3478 CL | -645.3796 | 20 | 31.41 | > | 23.61832 | Restricted Model |

We wanted to derive WTP estimates separately for respondents who varied in confidence in their response to the choice experiment questions, the ADG they manage for, the length of time producers typically manage their stocker cattle, and the region where producers live. The four different variables (*CEResp, ADG, Mantime, and Region)* were chosen to determine if they drove differences in producer selections in the choice experiment questions. Table 4.3 presents hypothesis test information from the simple logit models we ran on these variables to explore heterogeneous preferences. The simple logit models that result because the pooled conditional logit was rejected (per likelihood ratio tests) in favor of models differentiated by *CEResp, Mantime,* and *Region* for Treatment Group A. Likewise likelihood ratio test reject pooled models in favor of those estimated separately by *CEResp* and *ADG* responses for Treatment Group B. These models will be included in our analysis of WTP estimates in subsequent tables.

### *4.1.1 Treatment Group A*

**Table 4-5 Choice Experiment WTP by *CEResp*, Treatment Group A**

| Response | WTP- CDum | WTP- 2 vs 1 | WTP- 3 vs 1 | Log-Likelihood Value |
|---|---|---|---|---|
| **0** | -247.74 | 17.12 | 20.00 | -3.6698 |
| | [-39272.21, 38776.74] | [-3060.23, 3094.47] | [-3459.50, 3499.50] | |
| **1** | -284.41 | 47.18 | 32.38 | -234.8407 |
| | [-407.90, -160.92] | [26.60, 67.76] | [17.60, 47.15] | |
| **2** | -273.12 | 30.63 | 54.53 | -92.3109 |
| | [-429.47, -116.77] | [13.01, 48.25] | [22.59, 86.47] | |
| **3** | -321.20 | 110.90 | 79.62 | -95.6363 |
| | [-771.04, 128.64] | [-44.47, 266.26] | [-33.02, 192.26] | |
| **4** | -246.29 | 51.41 | 35.84 | -113.9237 |
| | [-429.00, -63.58] | [13.19, 89.63] | [8.22, 63.46] | |
| ***Notes:*** numbers in brackets represent 95% confidence intervals derived by delta method | | | | |

Table 4.4 shows results from models estimated separately by confidence of respondent's selections to the choice experiment questions. A value of 0 for *CEResp* represents survey respondents who did not answer the question regarding their response to the choice experiment questions. The WTP values in this response group are all insignificant, therefore there is no interpretation for this response.

When producers selected "*The questions were easy and straight-forward to understand. Accordingly I am confident in my selections."* (Response 1 in table 4.5) as a response to the choice experiment questions in Treatment Group A, we found that producers value buying cattle by $284.41/cwt, have a WTP of $47.18/cwt more for ADG Profile 2 over ADG Profile 1, and have a WTP of $32.28/cwt more for ADG Profile 3 over ADG Profile 1. We find respondents who are more confident in their responses value buying cattle more, have a lower WTP for ADG

Profile 2 over 1 and ADG Profile 3 over 1 compared to the pooled group as a whole for Treatment Group A.

When producers selected "*The questions were easy and straight-forward to understand. However I am not confident in my selections."* (Response 2) as a response to the choice experiment questions they were presented, we found that producers value buying cattle by $273.12/cwt, have a WTP of $30.63/cwt for ADG Profile 2 over ADG Profile 1, and have a WTP of $54.53/cwt for ADG Profile 3 over ADG Profile 1. We find respondents who are not confident in their selections but find them to be easy and straight forward value buying cattle less, have a lower WTP for ADG Profile 2 over 1, and a higher WTP for ADG Profile 3 over 1 compared to respondents who are confident (Response 1) in their choice experiment selections. Perhaps this non-linear increase in WTP for Profile 3 and decline in WTP for Profile 2 reflects a risk averse component to respondent selections.

Response 3 "*The questions were not easy and straight-forward to understand. However I am confident in my selections."* has no significant WTP estimates, therefore will not be interpreted. A very small percentage of survey respondents selected response 3 (table 3.7 & 3.8).

When producers selected "*The questions were not easy and straight-forward to understand. Accordingly I am not confident in my selections."* (Response 4) in response to the choice experiment questions they were presented, we found that producers value buying cattle by $246.29/cwt, have a WTP of $51.41/cwt for ADG Profile 2 over ADG Profile 1, and have a WTP of $35.84/cwt for ADG Profile 3 over ADG Profile 1. We find respondents who are not confident in their selections and found them to not be easy and straight-forward to understand value buying cattle less, have a higher WTP for ADG Profile 2 over 1, and a higher WTP for ADG Profile 3 over 1 compared to respondents who are confident in their choice experiment

selections. Perhaps this lower valuation on buying cattle (e.g. not selecting the Neither option) reflects the least overall confidence and understanding among our broader respondent sample making these producers closer to being indifferent between selecting a lot of cattle or not.

**Table 4-6 Choice Experiment WTP by *Mantime*, Treatment Group A**

| Response | WTP- CDum | WTP- 2 vs 1 | WTP- 3 vs 1 | Log-Likelihood Value |
|---|---|---|---|---|
| **3** | -263.18 | 14.17 | 50.15 | -29.5802 |
| | [-443.80, -82.56] | [3.92, 24.41] | [14.41, 85.89] | |
| **4** | -266.20 | 53.98 | 35.86 | -134.7346 |
| | [-439.10, -93.31] | [18.85, 89.10] | [11.61, 60.12] | |
| **5** | -290.71 | 54.94 | 22.67 | -179.8793 |
| | [-439.70, -141.71] | [26.68, 83.20] | [9.77, 35.57] | |
| **6** | -261.63 | 46.54 | 59.60 | -176.1922 |
| | [-419.89, -103.38] | [18.35, 74.73] | [23.00, 96.21] | |
| ***Notes:*** numbers in brackets represent 95% confidence intervals derived by delta method | | | | |

Table 4.5 shows results from models estimated separately by the length of time operators manage or own their stocker cattle. We cannot estimate the models separate for *Mantime* for responses 1 and 2 due to the small response. In both cases, no survey respondent that selected response 1 or 2 choose to opt out (CDum) in the choice experiment scenarios. Therefore, the model cannot be estimated.

When producers selected "*61 to 90 days"* (Response 3 in Table 4.6) as a response to the length of time they typically own/manage their stocker cattle in Treatment Group A, we found that producers value buying cattle by $263.18/cwt, have a WTP of $14.17/cwt more for ADG

Profile 2 over ADG Profile 1, and have a WTP of $50.15/cwt more for ADG Profile 3 over ADG Profile 1.

When producers selected "*91 to 120 days"* (Response 4) in response to the length of time they typically own/manage their stocker cattle in Treatment Group A, we found that producers value buying cattle by $266.20/cwt, have a WTP of $53.98/cwt more for ADG Profile 2 over ADG Profile 1, and have a WTP of $35.86/cwt more for ADG Profile 3 over ADG Profile 1.

When producers selected "*121 to 180 days"* (Response 5) in response to the length of time they typically own/manage their stocker cattle in Treatment Group A, we found that producers value buying cattle by $290.71/cwt, have a WTP of $54.94/cwt more for ADG Profile 2 over ADG Profile 1, and have a WTP of $22.67/cwt more for ADG Profile 3 over ADG Profile 1.

When producers selected "*More than 180 days"* (Response 6) in response to the length of time they typically own/manage their stocker cattle in Treatment Group A, we found that producers value buying cattle by $261.63/cwt, have a WTP of $46.54/cwt more for ADG Profile 2 over ADG Profile 1, and have a WTP of $59.60/cwt more for ADG Profile 3 over ADG Profile 1.

While there is evidence of collective joint differences in underlying models, combined these results suggest there is no consistent pattern among WTP estimates as respondents increase in the duration they typically own/manage their stocker cattle for.

**Table 4-7 Choice Experiment WTP by Region, Treatment Group A**

| Response | WTP- CDum | WTP- 2 vs 1 | WTP- 3 vs 1 | Log-Likelihood Value |
|---|---|---|---|---|
| **0** | -238.01 | -51.43 | -68.12 | -78.7789 |
| | [-797.66, 321.64] | [-123.44, 20.59] | [-127.49, -8.76] | |
| **1** | -594.50 | 686.92 | 312.61 | -211.3397 |
| | [-4714.82, 3525.82] | [-4141.28, 5515.12] | [-1856.25, 2481.47] | |
| **2** | -277.24 | 33.97 | 43.56 | -96.6609 |
| | [-391.64, -162.83] | [19.96, 47.98] | [24.98, 62.14] | |
| **3** | -266.93 | 46.39 | 23.88 | -49.9049 |
| | [-415.23, -118.63] | [20.34, 72.44] | [9.38, 38.37] | |
| **4** | -230.52 | 60.24 | 23.79 | -52.7831 |
| | [-416.87, -44.16] | [11.04, 109.44] | [2.99, 44.58] | |
| **5** | -282.51 | 11.95 | 65.13 | -533.0031 |
| | [-503.69, -61.32] | [1.57, 22.33] | [13.39, 116.86] | |
| ***Notes:*** numbers in brackets represent 95% confidence intervals derived by delta method | | | | |

Table 4.6 shows results from models estimated separately by region of respondent's operations. Region 0 represents survey respondents who did not answer the question regarding what state they are from. Therefore, we are not interpreting this response even though WTP between ADG Profile 3 and 1 is statistically significant. Since the sample of survey respondents who did not answer the question regarding what state their operation is located is less than 5% of all survey respondents we do not want to place weight on this interpretation.

Response 1, which represents producers living in the Southeast, has no significant WTP estimates, and therefore will not be interpreted.

Producers living in the Midwest (Response 2) value buying cattle by $277.24/cwt, have a WTP of $33.97/cwt for ADG Profile 2 over ADG Profile 1, and have a WTP of $43.56/cwt for ADG Profile 3 over ADG Profile 1 (table 4.7).

Producers living in the Southwest (Response 3) value buying cattle by $266.93/cwt, have a WTP of $46.39/cwt for ADG Profile 2 over ADG Profile 1, and have a WTP of $23.88/cwt for ADG Profile 3 over ADG Profile 1.

Producers living in the West (Response 4) value buying cattle by $230.52/cwt, have a WTP of $60.24/cwt for ADG Profile 2 over ADG Profile 1, and have a WTP of $23.79/cwt for ADG Profile 3 over ADG Profile 1.

Producers living in states designated by the region of "Others" (Response 5) listed in table 3.1, value buying cattle by $282.51/cwt, have a WTP of $11.95/cwt for ADG Profile 2 over ADG Profile 1, and have a WTP of $65.13/cwt for ADG Profile 3 over ADG Profile 1.

Results from the models estimated separately by region of respondent's operations show that operations in Region 5 ("Others") place the most value on buying cattle, have a lower WTP for ADG Profile 2 over 1, and a higher WTP for ADG 3 over 1 compared to the other regions. The states listed in the "Others" region include Alaska, Connecticut, Deleware, Hawaii, Indianace, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Rhode Island, Vermont, Wisconsin, California, Nevada, Utah, Oregon, and Washington. We did not expect to get the results we did for this region; however, only 9.69% of respondents are in this region so we do not place a significant value of weight on these interpretations.

### *4.1.2 Treatment Group B*

**Table 4-8 Choice Experiment WTP by *CEResp*, Treatment Group B**

| Response | WTP- CDum | WTP- 2 vs 1 | WTP- 3 vs 1 | Log-Likelihood Value |
|---|---|---|---|---|
| **0** | 124.76 | 692.26 | 636.44 | -12.3396 |
| | [-1404.10, 1653.62] | [-1376.85, 2761.36] | [-1366.30, 2639.18] | |
| **1** | -270.67 | 12.10 | 32.03 | -290.3604 |
| | [-355.74, -185.59] | [7.42, 16.78] | [21.64, 42.43] | |
| **2** | -286.21 | 6.83 | 28.01 | -93.8457 |
| | [-433.96, -138.47] | [-0.21, 13.87] | [12.85, 43.17] | |
| **3** | -254.68 | 7.39 | 33.12 | -127.3781 |
| | [-366.65, -142.70] | [0.70, 14.09] | [18.16, 48.08] | |
| **4** | -235.02 | 24.57 | 22.27 | -100.8941 |
| | [-345.25, -124.78] | [12.35, 36.79] | [11.44, 33.11] | |
| ***Notes:*** numbers in brackets represent 95% confidence intervals derived by delta method | | | | |

Table 4.7 shows results from models in Treatment Group B estimated separately by confidence of respondent's selections to the choice experiment questions. CEResp 0 represents survey respondents who did not answer the question regarding their response to the choice experiment questions. The values in this response group are all insignificant, therefore there is no interpretation for this response.

When producers selected "*The questions were easy and straight-forward to understand. Accordingly I am confident in my selections."* (Response 1 in table 4.8) in response to the choice experiment questions in Treatment Group B we found that producers value buying cattle by $270.67/cwt, have a WTP of $12.10/cwt more for ADG Profile 2 over ADG Profile 1, and have a WTP of $32.08/cwt more for ADG Profile 3 over ADG Profile 1. We find respondents who are confident in their choice experiment selections value buying cattle more, have a lower WTP for

ADG Profile 2 over 1, and a higher WTP for ADG Profile 3 over 1 compared to the pooled group as a whole in Treatment Group B.

When producers selected "*The questions were easy and straight-forward to understand. However I am not confident in my selections."* (Response 2) in response to the choice experiment questions in Treatment Group B we found that producers value buying cattle by $286.21/cwt and have a WTP of $28.01/cwt more for ADG Profile 3 over ADG Profile 1. We find respondents who were not confident in their choice experiment selections but found them to be easy and straight-forward value buying cattle more and have a lower WTP for ADG Profile 3 over 1 compared to respondents who were confident in their selections.

When producers selected "*The questions were not easy and straight-forward to understand. However I am confident in my selections."* (Response 3) in response to the choice experiment questions in Treatment Group B, we found that producers value buying cattle by $254.68/cwt, have a WTP of $7.39/cwt more for ADG Profile 2 over ADG Profile 1, and have a WTP of $33.12/cwt more for ADG Profile 3 over ADG Profile 1. We find respondents who were confident in their choice experiment selections but found them to not be easy and straight-forward value buying cattle less, have a lower WTP for ADG Profile 2 over 1, and a higher WTP for ADG Profile 3 over 1 compared to respondents who were confident in their selections.

When producers selected "*The questions were not easy and straight-forward to understand. Accordingly I am not confident in my selections."* (Response 4) in response to the choice experiment questions in Treatment Group B, we found that producers value buying cattle by $235.02/cwt, have a WTP of $24.57/cwt more for ADG Profile 2 over ADG Profile 1, and have a WTP of $22.27/cwt more for ADG Profile 3 over ADG Profile 1. We find respondents who were not confident in their choice experiment selections and found them to not be easy and straight-

forward value buying cattle less, have a higher WTP for ADG Profile 2 over 1, and a lower WTP for ADG Profile 3 over 1 compared to respondents who were confident in their selections.

While there is evidence of collective joint differences in underlying models, combined these results suggest there is no consistent pattern among WTP estimates as respondents are more confident in their answers to the choice experiment questions.

**Table 4-9 Choice Experiment WTP by *ADG*, Treatment Group B**

| Response | WTP- CDum | WTP- 2 vs 1 | WTP- 3 vs 1 | Log-Likelihood Value |
|---|---|---|---|---|
| **1** | -266.28 | 1.94 | -21.30 | 0.0000 |
| | [-87250.99, 86718.43] | [-23523.88, 23527.77] | [-5972.16, 5929.57] | |
| **2** | -309.93 | 10.86 | 40.23 | -51.8260 |
| | [-600.84, -19.03] | [-2.79, 24.51] | [2.05, 78.41] | |
| **3** | -297.03 | 14.77 | 52.86 | -89.3201 |
| | [-484.61, -109.44] | [4.53, 25.02] | [18.95, 86.77] | |
| **4** | -259.41 | 9.07 | 25.61 | -189.9348 |
| | [-347.12, -171.71] | [4.43, 13.70] | [16.47, 34.75] | |
| **5** | -258.27 | 12.71 | 25.71 | -182.2267 |
| | [-347.71, -168.82] | [7.35, 18.06] | [16.37, 35.06] | |
| **6** | -227.11 | 23.51 | 29.34 | -110.9655 |
| | [-360.46, -93.76] | [8.72, 38.30] | [11.96, 46.72] | |
| ***Notes:*** numbers in brackets represent 95% confidence intervals derived by delta method | | | | |

Table 4.8 shows results from models estimated separately by the ADG operators manage their stocker cattle for. ADG 1 represents survey respondents who selected "*Less than 1.25"* in response to the ADG they typically mange for. The values in this response group are all insignificant, therefore there is no interpretation for this response.

When producers selected *"1.26 to 1.50"* (Response 2 in table 4.9) in response to the ADG they typically manage for in Treatment Group B, we found that producers value buying cattle by $309.93/cwt and have a WTP of $40.23/cwt more for ADG Profile 3 over ADG Profile 1.

When producers selected *"1.51 to 1.75"* (Response 3) in response to ADG they typically manage for in Treatment Group B, we found that producers value buying cattle by $297.03/cwt, have a WTP of $14.77/cwt more for ADG Profile 2 over ADG Profile 1, and have a WTP of $52.86/cwt more for ADG Profile 3 over ADG Profile 1.

When producers selected *"1.76 to 2.00"* (Response 4) in response to ADG they typically manage for in Treatment Group B, we found that producers value buying cattle by $259.41/cwt, have a WTP of $9.07/cwt more for ADG Profile 2 over ADG Profile 1, and have a WTP of $25.61/cwt more for ADG Profile 3 over ADG Profile 1.

When producers selected *"2.01 to 2.25"* (Response 5) in response to ADG they typically manage for in Treatment Group B, we found that producers value buying cattle by $258.27/cwt, have a WTP of $12.71/cwt more for ADG Profile 2 over ADG Profile 1, and have a WTP of $25.71/cwt more for ADG Profile 3 over ADG Profile 1.

When producers selected *"More than 2.25"* (Response 6) in response to ADG they typically manage for in Treatment Group B, we found that producers value buying cattle by $227.11/cwt, have a WTP of $23.51/cwt more for ADG Profile 2 over ADG Profile 1, and have a WTP of $29.34/cwt more for ADG Profile 3 over ADG Profile 1.

With evidence of collective joint differences in underlying models, combined these results suggest there that producers increase how much they value buying cattle as ADG they manage for

increases. However, this is no consistent pattern among WTP estimates for the ADG Profiles as respondents increase the ADG they manage for.

## 4.2 Probit Models

To determine the characteristics of producers and their operations that use different risk management practices, we estimated multiple probit models with the dependent variables being those found in Table 3.5 under Risk Management. Models for the first seven variables were analyzed (*BHQRisk, LCPRisk, BLPRisk, ROFRisk, FCIRisk, FMCRisk, and OFMRisk)* since response rates were greater than 25% for these variables, providing sufficient variation to estimate probit models. A full model was estimated using all the variables expressed in equation 3.12. We also estimated three different models as a subset of each full model to test three common hypotheses. Model 1 contains variables from the full model with the exception of region variables. Comparing Model 1 to the full model provides a test on the joint significance of the region an operation resides in. Model 2 leaves out all operation characteristics (region, education, experience, income, income from the operation, and total cattle sold in 2014). Comparing Model 2 to the full model provides a test on the joint significance of the broader operation characteristics including region. Model 3 leaves out management characteristics (management time and a risk aversion measurement). Comparing Model 3 to the full model provides a test on the joint significance of a producer's management characteristics. We derived log-likelihood ratios for the three subset models (restricted model) compared to the full model (unrestricted model.) For all the different risk management strategies we only interpret the marginal effects of the statistically significant variables in the full model.

**Table 4-10 Risk Management Strategy of Buying High Quality Cattle**

| | Full Model | | Model 1 | Model 2 | Model 3 | Marginal Effect Full Model |
|---|---|---|---|---|---|---|
| **Variables** | **Parameter** | | **Parameter** | **Parameter** | **Parameter** | |
| **Intercept** | 1.1134 | | 1.5124 | 1.1508 | 0.4900 | |
| **Stocker** | 0.0080 | | 0.0030 | -0.0296 | 0.0220 | 0.0073 |
| **Own** | -0.1037 | | -0.0425 | -0.0121 | -0.1224 | -0.0410 |
| **Man** | 0.1640 | | 0.0963 | 0.1167 | 0.1602 | 0.0532 |
| **CSPerc** | -0.0005 | | 0.0003 | 0.0005 | -0.0004 | -0.0001 |
| **WSGPerc** | -0.0038 | | -0.0034 | -0.0035 | -0.0035 | -0.0013 |
| **WSAPerc** | -0.0023 | | -0.0028 | -0.0035 | -0.0018 | -0.0007 |
| **DWFPerc** | -0.0003 | | -0.0002 | -0.0002 | -0.0001 | -0.0001 |
| **DLPerc** | 0.0000 | | 0.0004 | 0.0003 | 0.0002 | 0.0000 |
| **Mantime** | -0.1032 | | -0.1313 | -0.1380 | | -0.0350 |
| **SEPerc** | -0.1439 | * | -0.0452 | -0.0515 | -0.1386 | -0.0478 |
| **MAPerc** | -0.1179 | | -0.0302 | -0.0337 | -0.1022 | -0.0387 |
| **MXPerc** | -0.1261 | | -0.1789 | -0.1848 | -0.1173 | -0.0463 |
| **CAPerc** | 0.7508 | * | 0.5576 | 0.5208 | 0.7925 | 0.2508 |
| **AMNPerc** | 0.0022 | | 0.0019 | 0.0019 | 0.0020 | 0.0007 |
| **AMYPerc** | 0.0076 | * | 0.0078 | 0.0073 | 0.0071 | 0.0025 |
| **DCCPerc** | 0.0223 | * | 0.0217 | 0.0218 | 0.0219 | 0.0073 |
| **IVAPerc** | 0.0137 | * | 0.0114 | 0.0115 | 0.0133 | 0.0045 |
| **FCS** | 0.3678 | | 0.2746 | 0.2661 | 0.3406 | 0.1253 |
| **FCF** | -0.0501 | | 0.0193 | 0.0292 | -0.0475 | -0.0159 |
| **AVG_ADG_N** | -0.1596 | | -0.3104 | -0.3461 | -0.1229 | -0.0558 |
| **AVG_Ret_N** | 0.0005 | | 0.0008 | 0.0009 | 0.0002 | 0.0002 |
| **Q15Q16RA** | -0.2071 | | -0.2166 | -0.1888 | | -0.0701 |
| **Southeast** | 1.0330 | * | | | 1.0603 | 0.3436 |
| **Southwest** | 0.2386 | | | | 0.2548 | 0.0818 |
| **West** | 0.3742 | | | | 0.4054 | 0.1247 |

**Table 4-11 Risk Management Strategy of Buying High Quality Cattle, continued**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Others** | -0.2551 | | | | -0.2710 | -0.0832 |
| **NHS** | -0.3131 | | -0.3239 | | -0.3298 | -0.1037 |
| **HS** | -0.2566 | | -0.3167 | | -0.2351 | -0.0862 |
| **TT** | 0.1974 | | 0.1031 | | 0.2323 | 0.0665 |
| **Grad** | -0.2916 | | -0.2143 | | -0.2807 | -0.0987 |
| **LT10_yrs** | -0.3089 | | -0.1845 | | -0.3167 | -0.1008 |
| **B1120_yrs** | -0.0726 | | -0.0386 | | -0.0485 | -0.0247 |
| **B2130_yrs** | -0.0754 | | -0.0781 | | -0.0315 | -0.0245 |
| **Inc** | -0.0513 | | -0.0361 | | -0.0534 | -0.0179 |
| **FarmIncPer** | -0.0545 | | -0.0513 | | -0.0570 | -0.0194 |
| **TotCtl_Sold14** | 0.00001 | | 0.0000 | | 0.0000 | 0.0000 |
| **Log-Likelihood Value** | -214.1630 | | -222.2588 | -225.0284 | -216.0875 | |
| ***Notes:*** Significant values at 95% confidence level are indicated by * | | | | | | |

In examining the risk management strategy of buying high quality cattle, there are six independent (*SEPerc, CAPerc, AMYPerc, DCCPerc, IVAPerc, and Southeast*) variables significant at the 95% confidence level shown by the asterisk in table 4.9. To interpret these values we use marginal effects derived by SAS. Using proc mdc, SAS reports a marginal effect for each respondent; we took the mean of all the respondent's marginal effects to get an average marginal effect value.

Producers that source 1% more cattle from the Southeast and Canada are 4.78% less likely and 25.08% more likely, respectively, to buy high quality cattle as a risk management strategy compared to producers from the Midwest, Southwest, West, and Far West, which is the combined reference group. Producers that source 1% more cattle from auction markets with knowledge of source ranches are 0.25% more likely to buy high quality cattle as a risk management strategy compared to producers that retain from their own cow-calf operation.

Producers that source 1% more cattle direct from individual cow-calf producers are 0.73% more likely to buy high quality cattle as a risk management strategy compared to producers that retain from their own cow-calf operation. Producers that source 1% more cattle from internet/video auctions are 0.45% more likely to buy high quality cattle as a risk management strategy compared to producers that retain from their own cow-calf operation. Producers that live in the Southeast region are 34.36% more likely to buy high quality cattle as a risk management strategy compared to producers that live in the Midwest or West. Combined this suggest how producers source cattle for their operation is the key determinant of whether buying high quality cattle is part of their risk management strategy.

**Table 4-12 Risk Management Strategy of Focusing on Low Cost Production**

| | **Full Model** | **Model 1** | **Model 2** | **Model 3** | **Marginal Effect Full Model** |
|---|---|---|---|---|---|
| **Variables** | **Parameter** | **Parameter** | **Parameter** | **Parameter** | |
| **Intercept** | -0.5355 | -0.6383 | -0.3622 | 0.0735 | |
| **Stocker** | 0.0095 | -0.0009 | -0.0255 | 0.0051 | 0.0029 |
| **Own** | -0.4211 | -0.4543 | -0.4166 | -0.3943 | -0.1265 |
| **Man** | -0.5326 | -0.5096 | -0.4243 | -0.5289 | -0.1600 |
| **CSPerc** | -0.0027 | -0.0021 | -0.0021 | -0.0029 | -0.0008 |
| **WSGPerc** | 0.0019 | 0.0015 | 0.0012 | 0.0017 | 0.0006 |
| **WSAPerc** | 0.0045 | 0.0042 | 0.0032 | 0.0039 | 0.0013 |
| **DWFPerc** | -0.0012 | -0.0011 | -0.0002 | -0.0012 | -0.0004 |
| **DLPerc** | -0.0009 | -0.0007 | -0.0012 | -0.0012 | -0.0003 |
| **Mantime** | 0.1099 | 0.1207 | 0.1240 | | 0.0330 |
| **SEPerc** | 0.1100 | 0.0970 | 0.0834 | 0.1040 | 0.0330 |
| **MAPerc** | -0.0816 | -0.0897 | -0.0754 | -0.0936 | -0.0245 |
| **MXPerc** | -0.2240 | -0.1961 | -0.2026 | -0.2376 | -0.0673 |
| **CAPerc** | 0.1993 | 0.2065 | 0.1504 | 0.1505 | 0.0599 |
| **AMNPerc** | -0.0003 | -0.0005 | -0.0004 | -0.0001 | -0.0001 |

**Table 4-13 Risk Management Strategy of Focusing on Low Cost Production, continued**

| | | | | | |
|---|---|---|---|---|---|
| **AMYPerc** | -0.0022 | -0.0023 | -0.0033 | -0.0018 | -0.0007 |
| **DCCPerc** | 0.0032 | 0.0033 | 0.0023 | 0.0034 | 0.0010 |
| **IVAPerc** | -0.0050 | -0.0041 | -0.0043 | -0.0043 | -0.0015 |
| **FCS** | -0.2097 | -0.2063 | -0.2161 | -0.1881 | -0.0630 |
| **FCF** | 0.0916 | 0.0784 | 0.0297 | 0.0863 | 0.0275 |
| **AVG_ADG_N** | 0.2421 | 0.2726 | 0.2634 | 0.1964 | 0.0727 |
| **AVG_Ret_N** | 0.0004 | 0.0003 | 0.0001 | 0.0007 | 0.0001 |
| **Q15Q16RA** | 0.0948 | 0.0895 | 0.1043 | | 0.0285 |
| **Southeast** | -0.1705 | | | -0.1889 | -0.0512 |
| **Southwest** | -0.1868 | | | -0.2077 | -0.0561 |
| **West** | -0.1385 | | | -0.1574 | -0.0416 |
| **Others** | 0.1930 | | | 0.2142 | 0.0580 |
| **NHS** | -0.1992 | -0.1774 | | -0.1955 | -0.0598 |
| **HS** | -0.0045 | 0.0133 | | -0.0143 | -0.0014 |
| **TT** | 0.4158 | 0.4125 | | 0.3553 | 0.1249 |
| **Grad** | 0.4443 | 0.4042 | | 0.4454 | 0.1334 |
| **LT10_yrs** | 0.7212 | 0.6836 | | 0.7371 | 0.2166 |
| **B1120_yrs** | -0.4562 | -0.4639 | | -0.4740 | -0.1370 |
| **B2130_yrs** | -0.1486 | -0.1473 | | -0.1740 | -0.0446 |
| **Inc** | -0.0343 | -0.0441 | | -0.0315 | -0.0103 |
| **FarmIncPer** | 0.1361 | 0.1310 | | 0.1395 | 0.0409 |
| **TotCtl_Sold14** | 0.0000 | 0.0000 | | 0.0000 | 0.0000 |
| **Log-Likelihood Value** | -197.2574 | -198.1742 | -204.9102 | -198.5328 | |

In examining the risk management strategy of focusing on low cost production, there are no significant parameters in the full model for interpretation (table 4.10).

**Table 4-14 Risk Management Strategy of Buying Lower Priced Cattle**

| | Full Model | | Model 1 | Model 2 | Model 3 | Marginal Effect Full Model |
|---|---|---|---|---|---|---|
| **Variables** | **Parameter** | | **Parameter** | **Parameter** | **Parameter** | |
| **Intercept** | -0.9509 | | -1.3020 | -1.1419 | -0.8952 | |
| **Stocker** | -0.2509 | | -0.2192 | -0.1606 | -0.2391 | -0.0770 |
| **Own** | -0.4358 | | -0.4744 | -0.4514 | -0.4580 | -0.1320 |
| **Man** | 0.4582 | | 0.4000 | 0.3697 | 0.4140 | 0.1388 |
| **CSPerc** | 0.0016 | | 0.0014 | 0.0011 | 0.0018 | 0.0005 |
| **WSGPerc** | 0.0009 | | 0.0008 | 0.0011 | 0.0004 | 0.0003 |
| **WSAPerc** | -0.0007 | | -0.0005 | 0.0000 | -0.0007 | -0.0002 |
| **DWFPerc** | -0.0007 | | 0.0003 | -0.0004 | -0.0012 | -0.0002 |
| **DLPerc** | 0.0011 | | 0.0023 | 0.0026 | 0.0019 | 0.0003 |
| **Mantime** | -0.0360 | | 0.0055 | 0.0285 | | -0.0109 |
| **SEPerc** | 0.1678 | * | 0.0321 | 0.0299 | 0.1550 | 0.0508 |
| **MAPerc** | 0.1322 | | 0.0155 | 0.0317 | 0.1161 | 0.0401 |
| **MXPerc** | -0.1539 | | -0.0808 | -0.0481 | -0.1315 | -0.0466 |
| **CAPerc** | -0.7109 | | -0.4483 | -0.3670 | -0.6918 | -0.2153 |
| **AMNPerc** | 0.0090 | * | 0.0076 | 0.0078 | 0.0082 | 0.0027 |
| **AMYPerc** | 0.0005 | | 0.0003 | 0.0013 | 0.0004 | 0.0002 |
| **DCCPerc** | 0.0034 | | 0.0034 | 0.0028 | 0.0031 | 0.0010 |
| **IVAPerc** | -0.0046 | | -0.0019 | -0.0017 | -0.0054 | -0.0014 |
| **FCS** | -0.9908 | * | -0.8628 | -0.8634 | -1.0086 | -0.3001 |
| **FCF** | -0.1216 | | -0.1705 | -0.1669 | -0.1664 | -0.0368 |
| **AVG_ADG_N** | -0.2771 | | -0.0846 | -0.0447 | -0.2638 | -0.0839 |
| **AVG_Ret_N** | 0.0025 | * | 0.0018 | 0.0015 | 0.0023 | 0.0008 |
| **Q15Q16RA** | 0.4196 | * | 0.3326 | 0.3263 | | 0.1271 |
| **Southeast** | -1.1936 | * | | | -1.1569 | -0.3615 |
| **Southwest** | -0.3796 | | | | -0.3241 | -0.1150 |
| **West** | 0.3595 | | | | 0.3084 | 0.1089 |

**Table 4-15 Risk Management Strategy of Buying Lower Priced Cattle, continued**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Others** | 0.4414 | | | | 0.3794 | 0.1337 |
| **NHS** | 0.8540 | | 0.7488 | | 0.8659 | 0.2587 |
| **HS** | 0.2386 | | 0.2326 | | 0.2290 | 0.0723 |
| **TT** | -0.5660 | | -0.4941 | | -0.5413 | -0.1714 |
| **Grad** | 0.2584 | | 0.0853 | | 0.2702 | 0.0783 |
| **LT10_yrs** | 0.1282 | | 0.0487 | | 0.1033 | 0.0388 |
| **B1120_yrs** | -0.0085 | | 0.0313 | | -0.0204 | -0.0026 |
| **B2130_yrs** | 0.0374 | | 0.0023 | | 0.0045 | 0.0113 |
| **Inc** | 0.0408 | | 0.0270 | | 0.0317 | 0.0124 |
| **FarmIncPer** | 0.0577 | | 0.0517 | | 0.0532 | 0.0175 |
| **TotCtl_Sold14** | 0.0000 | | 0.0000 | | 0.0000 | 0.0000 |
| **Log-Likelihood Value** | -201.1096 | | -212.9678 | -217.4435 | -204.3124 | |
| ***Notes:*** Significant values at 95% confidence level are indicated by * | | | | | | |

In examining the risk management strategy of buying lower price cattle, there are six parameters (*SEPerc, AMNPerc, FCS, AVG_Ret_N, Q15Q16RA, and Southeast*) that are statistically significant at the 95% confidence interval in the full model where the endogenous variable was a strategy of buying lower priced cattle for risk management (table 4.11). Producers that source 1% more cattle from the Southeast are 5.08% more likely to buy lower priced cattle as a risk management strategy compared to those that from the Midwest, Southwest, West, or Far West. Producers that purchase 1% more cattle from auctions markets without knowledge of source ranchers are 0.27% more likely to buy lower priced cattle as a risk management strategy compared to those that retain from their own cow-calf operation. Producers that typically place one set of feeder cattle in the spring are 30.01% less likely to buy lower priced cattle as a risk management strategy compared to those that typically place multiple sets of feeder cattle within

one year. Producers that saw a one unit increase in their average net returns over a ten year period are 0.08% more likely to buy lower priced cattle as a risk management strategy. Producers that are risk averse are 12.71% more likely to buy lower priced cattle as a risk management strategy. Producers from the Southeast are 36.15% less likely to buy lower priced cattle as a risk management strategy compared to producers that live in the Midwest or West.

**Table 4-16 Risk Management Strategy of Retaining Ownership to Feedyard**

| | **Full Model** | | **Model 1** | **Model 2** | **Model 3** | **Marginal** |
|---|---|---|---|---|---|---|
| **Variables** | **Parameter** | | **Parameter** | **Parameter** | **Parameter** | **Effect Full Model** |
| **Intercept** | -0.9061 | | -0.8998 | -1.2351 | -0.0679 | |
| **Stocker** | -0.4514 | * | -0.4439 | -0.4705 | -0.4719 | -0.1324 |
| **Own** | -0.3252 | | -0.3231 | -0.0723 | -0.2757 | -0.0963 |
| **Man** | 0.2333 | | 0.2309 | 0.1975 | 0.2757 | 0.0691 |
| **CSPerc** | -0.0023 | | -0.0027 | -0.0018 | -0.0025 | -0.0007 |
| **WSGPerc** | -0.0025 | | -0.0023 | -0.0017 | -0.0026 | -0.0007 |
| **WSAPerc** | -0.0118 | | -0.0114 | -0.0108 | -0.0118 | -0.0035 |
| **DWFPerc** | -0.0010 | | -0.0008 | -0.0015 | -0.0004 | -0.0003 |
| **DLPerc** | 0.0009 | | 0.0011 | 0.0003 | -0.0003 | 0.0003 |
| **Mantime** | 0.1850 | * | 0.1823 | 0.1893 | | 0.0548 |
| **SEPerc** | -0.0304 | | -0.0385 | -0.0233 | -0.0235 | -0.0090 |
| **MAPerc** | -0.0940 | | -0.0950 | -0.0903 | -0.0934 | -0.0278 |
| **MXPerc** | 0.0329 | | 0.0166 | 0.1048 | -0.0060 | 0.0098 |
| **CAPerc** | 0.2200 | | 0.2437 | 0.1779 | 0.1220 | 0.0651 |
| **AMNPerc** | 0.0024 | | 0.0025 | 0.0026 | 0.0031 | 0.0007 |
| **AMYPerc** | 0.0004 | | 0.0007 | 0.0022 | 0.0006 | 0.0001 |
| **DCCPerc** | -0.0019 | | -0.0021 | 0.0001 | -0.0015 | -0.0006 |
| **IVAPerc** | -0.0015 | | -0.0016 | -0.0007 | 0.0001 | -0.0004 |
| **FCS** | -0.2144 | | -0.2024 | -0.3096 | -0.1701 | -0.0635 |
| **FCF** | -0.0850 | | -0.0806 | -0.0901 | -0.0602 | -0.0252 |

**Table 4-17 Risk Management Strategy of Retaining Ownership to Feedyard, continued**

| | | | | | | |
|---|---|---|---|---|---|---|
| **AVG_ADG_N** | -0.0778 | | -0.0817 | 0.0670 | -0.1267 | -0.0230 |
| **AVG_Ret_N** | -0.0017 | | -0.0018 | -0.0022 | -0.0011 | -0.0005 |
| **Q15Q16RA** | -0.2345 | | -0.2423 | -0.2096 | | -0.0694 |
| **Southeast** | -0.0972 | | | | -0.1581 | -0.0288 |
| **Southwest** | -0.0424 | | | | -0.0750 | -0.0125 |
| **West** | 0.0560 | | | | 0.1102 | 0.0166 |
| **Others** | -0.1963 | | | | -0.1083 | -0.0581 |
| **NHS** | 0.1673 | | 0.1565 | | 0.1541 | 0.0495 |
| **HS** | -0.0067 | | -0.0055 | | -0.0226 | -0.0020 |
| **TT** | -0.1325 | | -0.1345 | | -0.3101 | -0.0392 |
| **Grad** | 0.0994 | | 0.0873 | | 0.0856 | 0.0294 |
| **LT10_yrs** | -0.7808 | | -0.7788 | | -0.6725 | -0.2312 |
| **B1120_yrs** | -0.3697 | | -0.3892 | | -0.3820 | -0.1095 |
| **B2130_yrs** | 0.1912 | | 0.1742 | | 0.1740 | 0.0566 |
| **Inc** | 0.0689 | | 0.0690 | | 0.0730 | 0.0204 |
| **FarmIncPer** | -0.1180 | | -0.1177 | | -0.1144 | -0.0349 |
| **TotCtl_Sold14** | 0.0000 | | 0.0000 | | 0.0000 | 0.0000 |
| **Log-Likelihood Value** | -192.7253 | | -193.0100 | -201.8791 | -196.5409 | |
| ***Notes:*** Significant values at 95% confidence level are indicated by * | | | | | | |

In examining the risk management strategy of retaining ownership to the feedyard, there are two parameters (*Stocker, Mantime*) that are statistically significant at the 95% confidence level in the full model where the endogenous variable was whether a producer used a risk management strategy of retaining ownership to feedyard (table 4.17). A cattle producer that is 100% stocker/backgrounder is 13.24% less likely to retain ownership to the feedyard as a risk management strategy compared to cattle producers that are stocker/backgrounder with cow-calf,

stocker/backgrounder with feedlot, or stocker/backgrounder with both cow-calf and feedlot. Producers that increase by one unit the time they own/manage stocker cattle are 5.48% more likely to retain ownership to feedyard as a risk management strategy. We expected this outcome; the longer stocker producers own their cattle the more likely they are to retain them to the next phase of production.

**Table 4-18 Risk Management Strategy of Forward Contracting Inputs/Outputs**

| | **Full Model** | | **Model 1** | **Model 2** | **Model 3** | **Marginal Effect Full Model** |
|---|---|---|---|---|---|---|
| **Variables** | **Parameter** | | **Parameter** | **Parameter** | **Parameter** | |
| **Intercept** | -1.9247 | * | -1.7839 | -1.1613 | -1.6237 | |
| **Stocker** | -0.2067 | | -0.2344 | -0.3009 | -0.2156 | -0.0641 |
| **Own** | 0.1347 | | 0.1408 | 0.1337 | 0.1513 | 0.0421 |
| **Man** | 0.0491 | | 0.0582 | 0.1297 | 0.0623 | 0.0154 |
| **CSPerc** | 0.0003 | | 0.0007 | 0.0012 | 0.0003 | 0.0001 |
| **WSGPerc** | -0.0044 | | -0.0044 | -0.0030 | -0.0044 | -0.0014 |
| **WSAPerc** | 0.0073 | | 0.0069 | 0.0056 | 0.0073 | 0.0023 |
| **DWFPerc** | 0.0013 | | 0.0005 | 0.0013 | 0.0015 | 0.0004 |
| **DLPerc** | 0.0038 | | 0.0024 | 0.0018 | 0.0033 | 0.0012 |
| **Mantime** | 0.0672 | | 0.0641 | 0.0420 | | 0.0210 |
| **SEPerc** | -0.0064 | | 0.0110 | 0.0071 | -0.0035 | -0.0020 |
| **MAPerc** | -0.0609 | | -0.0758 | -0.0761 | -0.0575 | -0.0190 |
| **MXPerc** | 0.3544 | * | 0.3889 | 0.3369 | 0.3397 | 0.1108 |
| **CAPerc** | 0.4118 | | 0.4124 | 0.3456 | 0.3671 | 0.1287 |
| **AMNPerc** | 0.0096 | * | 0.0093 | 0.0079 | 0.0098 | 0.0030 |
| **AMYPerc** | 0.0114 | * | 0.0095 | 0.0067 | 0.0115 | 0.0036 |
| **DCCPerc** | 0.0134 | * | 0.0136 | 0.0119 | 0.0136 | 0.0042 |
| **IVAPerc** | 0.0173 | * | 0.0171 | 0.0152 | 0.0178 | 0.0054 |
| **FCS** | 0.1192 | | 0.0591 | 0.0104 | 0.1387 | 0.0373 |
| **FCF** | -0.5964 | | -0.6020 | -0.6047 | -0.5843 | -0.1865 |

**Table 4-19 Risk Management Strategy of Forward Contracting Inputs/Outputs, continued**

| | | | | | | |
|---|---|---|---|---|---|---|
| **AVG_ADG_N** | 0.0668 | | 0.0867 | 0.0676 | 0.0501 | 0.0209 |
| **AVG_Ret_N** | -0.0018 | | -0.0014 | -0.0015 | -0.0015 | -0.0005 |
| **Q15Q16RA** | -0.0895 | | -0.0744 | -0.0807 | | -0.0280 |
| **Southeast** | 0.2515 | | | | 0.2243 | 0.0786 |
| **Southwest** | 0.3170 | | | | 0.2998 | 0.0991 |
| **West** | -0.1996 | | | | -0.1926 | -0.0624 |
| **Others** | 0.7541 | * | | | 0.7659 | 0.2357 |
| **NHS** | -0.5614 | | -0.5115 | | -0.5580 | -0.1755 |
| **HS** | -0.3166 | | -0.2863 | | -0.3207 | -0.0990 |
| **TT** | 0.0079 | | 0.0560 | | -0.0433 | 0.0025 |
| **Grad** | 0.3349 | | 0.3689 | | 0.3341 | 0.1047 |
| **LT10_yrs** | -0.4062 | | -0.4462 | | -0.3720 | -0.1270 |
| **B1120_yrs** | 0.2711 | | 0.3197 | | 0.2646 | 0.0848 |
| **B2130_yrs** | 0.1031 | | 0.1308 | | 0.0993 | 0.0322 |
| **Inc** | 0.0073 | | 0.0048 | | 0.0091 | 0.0023 |
| **FarmIncPer** | 0.1068 | | 0.1120 | | 0.1067 | 0.0334 |
| **TotCtl_Sold14** | 0.0000 | | 0.0000 | | 0.0000 | 0.0000 |
| **Log-Likelihood Value** | -202.5437 | | -207.1698 | -214.0210 | -203.0932 | |
| ***Notes:*** Significant values at 95% confidence level are indicated by * | | | | | | |

In examining the risk management strategy of forward contracting inputs/outputs, there are six parameters (*MXPerc, AMNPerc, AMYPerc, DCCPerc, IVAPerc, and Others)* that are statistically significant (table 4.17). Producers that source 1% more cattle from Mexico are 11.08% more likely to forward contract inputs/outputs as a risk management strategy compared to producers that source from the Midwest, Southwest, West, or Far West. Producers that purchase 1% more from auction markets without knowledge of source ranches, from auction

markets with knowledge of source ranches, direct for cow-calf ranches, and from internet/video auctions are 0.30%, 0.36%, 0.42%, and 0.54% respectively more likely to forward contract input/outputs as a risk management strategy compared to producers that retain from their own cow-calf operation. Producers that live in the states deemed as "Others" (AK,CT, DE, HA, IN, ME, MA, MI, NH, NJ, NY, OH, RI, VT, WI, CA, NV, UT, OR, WA) are 23.57% more likely to forward contract inputs/outputs as a risk management strategy compared to producers that live in the Midwest or West.

**Table 4-20 Risk Management Strategy of using Futures Market Contracts**

| | **Full Model** | | **Model 1** | **Model 2** | **Model 3** | **Marginal** |
|---|---|---|---|---|---|---|
| **Variables** | **Parameter** | | **Parameter** | **Parameter** | **Parameter** | **Effect Full Model** |
| **Intercept** | -1.4860 | * | -1.5411 | -1.1585 | -1.0045 | |
| **Stocker** | -0.3112 | | -0.3060 | -0.3775 | -0.3190 | -0.1071 |
| **Own** | 0.1041 | | 0.0979 | 0.1341 | 0.1138 | 0.0357 |
| **Man** | 0.0424 | | 0.0463 | 0.0109 | 0.0407 | 0.0145 |
| **CSPerc** | -0.0016 | | -0.0017 | -0.0010 | -0.0016 | -0.0006 |
| **WSGPerc** | 0.0014 | | 0.0014 | 0.0022 | 0.0012 | 0.0005 |
| **WSAPerc** | -0.0065 | | -0.0066 | -0.0074 | -0.0072 | -0.0022 |
| **DWFPerc** | -0.0015 | | -0.0014 | -0.0012 | -0.0013 | -0.0005 |
| **DLPerc** | 0.0028 | | 0.0030 | 0.0023 | 0.0026 | 0.0010 |
| **Mantime** | 0.0855 | | 0.0875 | 0.1035 | | 0.0293 |
| **SEPerc** | 0.0584 | | 0.0468 | 0.0609 | 0.0574 | 0.0200 |
| **MAPerc** | -0.0314 | | -0.0366 | -0.0519 | -0.0400 | -0.0108 |
| **MXPerc** | 0.1324 | | 0.1274 | 0.1633 | 0.1253 | 0.0454 |
| **CAPerc** | 0.0623 | | 0.0856 | 0.0396 | 0.0173 | 0.0214 |
| **AMNPerc** | 0.0075 | * | 0.0075 | 0.0078 | 0.0076 | 0.0026 |
| **AMYPerc** | 0.0041 | | 0.0043 | 0.0035 | 0.0045 | 0.0014 |
| **DCCPerc** | -0.0040 | | -0.0041 | -0.0023 | -0.0037 | -0.0014 |

**Table 4-21 Risk Management Strategy of using Futures Market Contracts, continued**

| | | | | | | |
|---|---|---|---|---|---|---|
| **IVAPerc** | 0.0072 | | 0.0073 | 0.0085 | 0.0076 | 0.0025 |
| **FCS** | 0.0535 | | 0.0705 | 0.0165 | 0.0628 | 0.0183 |
| **FCF** | -0.1952 | | -0.1942 | -0.2769 | -0.1915 | -0.0670 |
| **AVG_ADG_N** | -0.0575 | | -0.0460 | 0.0475 | -0.0874 | -0.0197 |
| **AVG_Ret_N** | -0.0010 | | -0.0011 | -0.0010 | -0.0008 | -0.0003 |
| **Q15Q16RA** | 0.1183 | | 0.1151 | 0.0905 | | 0.0406 |
| **Southeast** | -0.1367 | | | | -0.1619 | -0.0469 |
| **Southwest** | -0.0877 | | | | -0.0908 | -0.0301 |
| **West** | 0.0027 | | | | -0.0137 | 0.0009 |
| **Others** | -0.1011 | | | | -0.0903 | -0.0347 |
| **NHS** | -0.8186 | | -0.8217 | | -0.8110 | -0.2809 |
| **HS** | -0.2157 | | -0.2147 | | -0.2301 | -0.0740 |
| **TT** | -0.0650 | | -0.0663 | | -0.1203 | -0.0223 |
| **Grad** | 0.0204 | | 0.0007 | | 0.0117 | 0.0070 |
| **LT10_yrs** | 0.2090 | | 0.2068 | | 0.2359 | 0.0717 |
| **B1120_yrs** | -0.0977 | | -0.1058 | | -0.1231 | -0.0335 |
| **B2130_yrs** | 0.2168 | | 0.2065 | | 0.1895 | 0.0744 |
| **Inc** | 0.0901 | | 0.0887 | | 0.0912 | 0.0309 |
| **FarmIncPer** | 0.0832 | | 0.0821 | | 0.0850 | 0.0285 |
| **TotCtl_Sold14** | 0.0000 | | 0.0000 | | 0.0000 | 0.0000 |
| **Log-Likelihood Value** | -223.0503 | | -223.2675 | -229.6056 | -224.0490 | |
| ***Notes:*** Significant values at 95% confidence level are indicated by * | | | | | | |

In examining the risk management strategy of using futures market contracts, there is one parameter (*AMNPerc)* that is statistically significant (table 4.18). Producers that source 1% more of their cattle from auction markets without knowledge of source ranches are 0.26% more likely

to use futures market contracts as a risk management strategy compared to producers that retain from their own cow-calf operation.

**Table 4-22 Risk Management Strategy of using Options on Futures Market Contracts**

| | Full Model | | Model 1 | Model 2 | Model 3 | Marginal Effect |
|---|---|---|---|---|---|---|
| **Variables** | **Parameter** | | **Parameter** | **Parameter** | **Parameter** | **Full Model** |
| **Intercept** | -0.8861 | | -0.9133 | -0.8237 | -1.2276 | |
| **Stocker** | -0.1347 | | -0.1296 | -0.1769 | -0.1304 | -0.0430 |
| **Own** | -0.1266 | | -0.1177 | -0.0450 | -0.1462 | -0.0406 |
| **Man** | 0.0681 | | 0.0646 | 0.0871 | 0.0575 | 0.0219 |
| **CSPerc** | -0.0010 | | -0.0020 | -0.0017 | -0.0009 | -0.0003 |
| **WSGPerc** | -0.0006 | | -0.0003 | -0.0006 | -0.0006 | -0.0002 |
| **WSAPerc** | 0.0041 | | 0.0047 | 0.0039 | 0.0042 | 0.0013 |
| **DWFPerc** | -0.0046 | | -0.0046 | -0.0038 | -0.0050 | -0.0015 |
| **DLPerc** | 0.0019 | | 0.0017 | 0.0014 | 0.0024 | 0.0006 |
| **Mantime** | -0.0772 | | -0.0795 | -0.0740 | | -0.0248 |
| **SEPerc** | 0.0650 | | 0.0393 | 0.0423 | 0.0623 | 0.0209 |
| **MAPerc** | 0.0810 | | 0.0643 | 0.0696 | 0.0826 | 0.0260 |
| **MXPerc** | 0.1648 | | 0.1420 | 0.1339 | 0.1758 | 0.0529 |
| **CAPerc** | -0.1157 | | -0.0557 | -0.1064 | -0.0708 | -0.0372 |
| **AMNPerc** | 0.0082 | * | 0.0085 | 0.0081 | 0.0079 | 0.0026 |
| **AMYPerc** | 0.0075 | * | 0.0078 | 0.0061 | 0.0073 | 0.0024 |
| **DCCPerc** | 0.0058 | | 0.0051 | 0.0053 | 0.0056 | 0.0018 |
| **IVAPerc** | 0.0134 | * | 0.0132 | 0.0128 | 0.0128 | 0.0043 |
| **FCS** | -0.2954 | | -0.2407 | -0.2449 | -0.3235 | -0.0949 |
| **FCF** | 0.2692 | | 0.2586 | 0.2179 | 0.2523 | 0.0864 |
| **AVG_ADG_N** | 0.2124 | | 0.2352 | 0.2047 | 0.2306 | 0.0682 |
| **AVG_Ret_N** | -0.0034 | * | -0.0035 | -0.0034 | -0.0036 | -0.0011 |
| **Q15Q16RA** | 0.0634 | | 0.0696 | 0.0843 | | 0.0204 |
| **Southeast** | -0.2693 | | | | -0.2462 | -0.0865 |
| **Southwest** | -0.0148 | | | | 0.0015 | -0.0047 |

**Table 4-23 Risk Management Strategy of using Options on Futures Market Contracts, continued**

| | | | | | | |
|---|---|---|---|---|---|---|
| **West** | 0.0200 | | | | 0.0083 | 0.0064 |
| **Others** | -0.3414 | | | | -0.3775 | -0.1096 |
| **NHS** | -0.2605 | | -0.2784 | | -0.2591 | -0.0836 |
| **HS** | -0.3152 | | -0.3086 | | -0.3080 | -0.1012 |
| **TT** | 0.2622 | | 0.2593 | | 0.3152 | 0.0842 |
| **Grad** | 0.2309 | | 0.2149 | | 0.2317 | 0.0742 |
| **LT10_yrs** | 0.2777 | | 0.2697 | | 0.2471 | 0.0892 |
| **B1120_yrs** | -0.2880 | | -0.3018 | | -0.2641 | -0.0925 |
| **B2130_yrs** | 0.0521 | | 0.0399 | | 0.0596 | 0.0167 |
| **Inc** | -0.0077 | | -0.0081 | | -0.0102 | -0.0025 |
| **FarmIncPer** | 0.0303 | | 0.0276 | | 0.0270 | 0.0097 |
| **TotCtl_Sold14** | 0.0000 | | 7.0203E-06 | | 5.5934E-06 | 0.0000 |
| **Log-Likelihood Value** | -208.1846 | | -209.0970 | -213.2471 | -208.7903 | |
| ***Notes:*** Significant values at 95% confidence level are indicated by * | | | | | | |

In examining the risk management strategy of using options on futures market contracts there are four parameters (*AMNPerc, AMYPerc, IVAPerc, and AVG_RET_N)* that are statistically significant (table 4.19). Producers that source 1% more of their cattle from auction markets without knowledge of source ranches, from auction markets with knowledge of source ranches, and from internet/video auctions are 0.26%, 0.24%, and 0.43% respectively more likely to use options on futures market contracts as a risk management strategy compared to producers that source cattle by retaining from their own cow-calf operation. Producers that saw a one unit increase in their average net returns over a ten year period are 0.11% less likely to use options on futures market contracts as a risk management strategy.

Results from the probit models suggest how producers source cattle for their operation, whether it is the region or the different markets they source from, are key determinants on whether producers practice the different risk management strategies for market and price risk.

# Chapter 5 - Conclusion

The stocker sector of the beef industry is important to the industry overall due to the high emphasis on cattle health management and nutrition during this phase of production. However, the stocker industry is not widely researched. One of the key issues is the lack of understanding of how buyers asses the value of cattle based on purchase price and expected Average Daily Gain (ADG). Thus, one of the focuses of this research was to identify the impact of cattle price and animal performance variability on placement purchasing decisions and producer preferences. Another focus of this research was to determine the characteristics of producers and their operations that use different risk management practices. A producer survey including producer demographics, management characteristics, and an assessment of how cattle price and animal performance variability is viewed was constructed and sent via mail and e-mail to stocker producers throughout the U.S.

To analyze how cattle price and animal performance variability is viewed and approached by stocker cattle producers, a stated preference valuation method was used to find willingness-to-pay estimates. We included outcome in the choice experiments with two different approaches, thus two different treatment groups. Treatment Group A provided an outcome probability where probabilities for expected ADG changed across scenarios and ADG ranges were held constant. Treatment Group B provided an outcome probability where probabilities for expected ADG remained constant across scenarios and ADG ranges were varied. The results of our study suggest that survey respondents process scenarios differently when presented in formats Treatment Group A versus Treatment Group B. The underlying reason for this is beyond identification in this study as respondent certainty and comfort as assessed in follow-up questions was similar across the treatments. Future choice experiment work should re-examine

with a focus on *why* respondents are impacted by how variation in uncertain outcomes is presented.

Results of the WTP estimates suggest that producers in Treatment Group A value buying cattle by $277.77/cwt, are willing-to-pay $49.51/cwt for ADG Profile 2 versus ADG Profile 1, and $41.50/cwt for ADG Profile 3 versus ADG Profile 1. In Treatment Group B producers value buying cattle by $261.06/cwt, have a WTP of $13.12/cwt more for ADG Profile 2 over ADG Profile 1, and have a WTP of $30.18/cwt more for ADG Profile 3 over ADG Profile 1.

The results indicate the producers value higher performing cattle; however, each additional pound is not valued the same. Producers should look at the costs associated with each additional pound to determine if paying $49.51/cwt more for ADG Profile 2 over 1 is feasible.

For each choice experiment treatment we derived WTP estimates based on producers' confidence in the way they answered the choice experiment questions, ADG producers manage for, length of time producers typically manage their stocker cattle, and the region where their operations are located. Even though the likelihood ratio tests favored models differentiated by *CEResp, Mantime,* and *Region* for Treatment Group A and models differentiated by *CEResp,* and *ADG* for Treatment Group B we did not find a clean and interpretable pattern among these WTP estimates.

To determine the characteristics of producers and their operations that use different risk management practices we estimated multiple probit models with the dependent variables being different risk management practices. Results from the probit models suggest how producers source cattle for their operation, whether it is the region or the different markets they source from, are key determinants on whether producers practice the different risk management strategies for market and price risk. For example, producers that source 1% more cattle from the

Southeast are 4.78% more likely to buy high quality cattle as a risk management strategy compared to producers that source from the Midwest, Southwest, West, and Far West. Producers that source 1% more cattle from auction markets with knowledge of source ranches are 0.25% more likely to buy high quality cattle as a risk management strategy compared to producers that retain from their own cow-calf operations.

Overall, the probit models were not a good fit. In the risk management strategies of focusing on low cost production and buying high quality cattle over 50% of producers indicated they use these strategies; however, of the 30 explanatory variables included in the model only six were significant for buying high quality cattle and there were no significant explanatory variables for focusing on low cost production. This suggests the model was not a good fit. This could be attributed to factors that our study does not explicitly observe; therefore it remains a knowledge gap for the industry.

## 5.1 Future Research

This study only looked at price and expected ADG in the stated preference valuation scenarios. It would be interesting to consider other components of cattle health and management to control for. For example, including a health certification program as a component in the choice experiment questions. WTP estimates would change when there are other components to control for.

This study used an e-mail and mail distribution list to conduct our survey; however, there are not very many studies focusing on surveying agriculture producers with mail and e-mail. It would be of interest to analyze how effective e-mail surveys are when surveying agricultural producers.

# Chapter 6 - Bibliography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# Appendix A - Survey Instrument

September 3, 2014

First Name Last Name
Address
City, State Zip

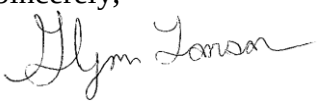
Dear First Name Last Name:

Enclosed you will find a short survey designed to obtain important information from U.S. beef stocker/backgrounder producers. This survey is focused on assessing producer perspectives and management approaches to a host of cattle price and performance variability issues. The survey is an essential part of a broader graduate student project. This project is being conducted in collaboration with *BEEF* magazine by a team composed of faculty and students at Kansas State University. We place a high value on your input as it helps us conduct the best research and draw appropriate conclusions regarding U.S. stocker/backgrounder producers. This project's key findings will appear widely throughout the industry in fact sheets and producer presentations and also will be further distributed by *BEEF* magazine. Accordingly your input is critical.

We want to emphasize that your participation in this survey is entirely voluntary and highly encouraged. All your responses will be kept in strict confidence. Although we would like you to answer all of the questions (please note there are questions on both sides of each page), you may choose to skip any question. Typical demographic questions are included to ensure our sample is representative of the industry and will remain strictly confidential. If you wish to provide comments please use the space at the end of the survey or attach additional materials.

We very much appreciate your assistance with this important project and look forward to receiving your completed survey. After completion, please mail your survey using the enclosed, postage-paid envelope. If you have any questions or comments regarding this survey, please feel free to contact Dr. Glynn Tonsor by email (*gtonsor@ksu.edu*) or by phone (785-532-1518).

Sincerely,



Glynn T. Tonsor
Kansas State University
Dept. of Agricultural Economics

# 2014 U.S. Stocker/Backgrounder Producer Survey

**Confidential Survey – For Research Purposes Only**

This survey is designed to be completed by the primary manager and decision maker on your operation.

1. What is the most appropriate way to describe your cattle operation?

- ☐ 100% Stocker/Backgrounder
- ☐ Stocker/Backgrounder with cow-calf operation
- ☐ Stocker/Backgrounder with feedlot
- ☐ Stocker/Backgrounder with both cow-calf and feedlot
- ☐ Other (*specify*):

If you selected *Other* and your operation is not a Stocker/Backgrounder, you may stop here - thank you.
If you have a Stocker/Backgrounder aspect to your operation, please proceed to complete our survey.

2. For this operation, I am the:

- ☐ Owner and Manager
- ☐ Owner
- ☐ Manager
- ☐ Other (*specify*):

3. In a typical year, what percentage of your total stocker/backgrounder cattle are on each of the following forage source categories?

| | Average % of Cattle |
|---|---|
| Cool season grass pasture (brome, fescue, perennial ryegrass, etc.) | |
| Warm season grass pasture (switchgrass, big bluestem, etc.) | |
| Warm season annual (annual planted specifically for cattle grazing such as Sudan) | |
| Fall cereal pasture (cereal grain pastures such as winter wheat, oats, or ryegrass) | |
| Dormant winter feed (stockpiled dormant forage and crop residue) | |
| Dry lot (bunk fed forage, confined management of harvested feed) | |
| Other (*specify*): _____ | |

4. What length of time do you typically own/manage most stockers/backgrounders? (*check one*)

- ☐ Less than 30 days
- ☐ 31 to 60 days
- ☐ 61 to 90 days
- ☐ 91 to 120 days
- ☐ 121 to 180 days
- ☐ More than 180 days

5. When placing cattle in your stocker/backgrounder operation, what average daily gain (lbs/day) do you typically manage for? (*check one*)

- ☐ Less than 1.25
- ☐ 1.26 to 1.50
- ☐ 1.51 to 1.75
- ☐ 1.76 to 2.00
- ☐ 2.01 to 2.25
- ☐ More than 2.25

6. What stocking rate (head/acre) do you typically use on your operation?
   _____

7. Has your stocking rate changed over the past 5 years? If so, please describe how:

---

8. The stocker cattle I typically purchase/manage are native to (indicate percentages):

| | 0% | 1 to 25% | 26 to 50% | 51% to 75% | 76 to 100% |
|---|---|---|---|---|---|
| Southeast (FL, GA, AL, MS, AR, LA, KY &TN) | | | | | |
| Mid-Atlantic (NC, SC, VA, PA, WV & MD) | | | | | |
| Midwest (KS, MO, IA, MN, NE & IL) | | | | | |
| Southwest (TX, OK, AZ & NM) | | | | | |
| West (MT, WY, CO, SD, ND & ID) | | | | | |
| Far West (CA, NV, UT, OR & WA) | | | | | |
| Mexico | | | | | |
| Canada | | | | | |
| Other (specify): _____ | | | | | |

9. What percentages of feeder cattle placed in your background/stocker operation do you typically source from each of the following sources:
   _____ % Retained from my own cow-calf operation
   _____ % Purchased from auction market without knowledge of source ranches
   _____ % Purchased from auction market with knowledge of source ranches
   _____ % Purchased direct from individual cow-calf ranches
   _____ % Purchased from internet/video auctions
   _____ % Other, please describe: _____
10. What best describes the frequency and seasonality of your backgrounder/stocker operation?

- ☐ Typically place one set of feeder cattle in the spring
- ☐ Typically place multiple sets of feeder cattle within one year
- ☐ Typically place one set of feeder cattle in the fall
- ☐ Other, please describe: _____

11. Consider an operation similar to yours that regularly places 500 lb. steers in its backgrounder/stocker operation in October and typically sells at heavier weights about 120 days later in February. Over the past 10 years, what do you believe the average daily gain (ADG), worst ADG, and best ADG have been for this operation?
    - Average ADG across all lots/groups over the past 10 years:_____ lbs/day
    - ADG in the worst lot/group over the past 10 years:_____ lbs/day
    - ADG in the best lot/group over the past 10 years:_____ lbs/day

12. For the same operation placing 500 lb. steers in October and selling in February, over the past 10 years of placement what do you believe the average net return, worst net return, and the best net return have been?
    - Average net return across all lots/groups over the past 10 years:_____ $/head
    - Net return in the worst lot/group over the past 10 years:_____ $/head
    - Net return in the best lot/group over the past 10 years:_____ $/head

13. Please rate your agreement with these statements (circle one number for each statement):

| | Strongly Agree | | | | Strongly Disagree | Don't Know |
|---|---|---|---|---|---|---|
| "I usually like "playing it safe" (for instance, "locking in a price") instead of taking risks for market prices for my cattle." | 1 | 2 | 3 | 4 | 5 | * |
| "When selling/marketing my cattle, I prefer financial certainty to financial uncertainty." | 1 | 2 | 3 | 4 | 5 | * |
| "When selling/marketing my cattle, I am willing to take higher financial risks in order to realize higher average returns." | 1 | 2 | 3 | 4 | 5 | * |
| "I like taking financial risk with my cattle business." | 1 | 2 | 3 | 4 | 5 | * |
| "I accept more risk in my cattle business than other cattle producers." | 1 | 2 | 3 | 4 | 5 | * |
| "With respect to the conduct of business, I dislike risk." | 1 | 2 | 3 | 4 | 5 | * |

14. Which practices do you typically use to manage market or price risk? (*check all that apply*)

| | | | |
|---|---|---|---|
| ☐ | Buying high quality cattle | ☐ | Futures market contracts |
| ☐ | Focus on low cost production | ☐ | Options on futures market contracts |
| ☐ | Buying lower priced cattle | ☐ | Livestock Risk Protection (LRP) Insurance |
| ☐ | Retained ownership to feedyard | ☐ | Livestock Gross Margin (LGM) Insurance |
| ☐ | Forward contracting inputs/outputs | ☐ | Other (*specify* ): |

15. Given the best and worst case potential outcome from marketing your stocker/backgrounder cattle, which net return/loss prospect would you most prefer from the four listed below?
    - ☐ $20/head return best case; $0/head loss worst case
    - ☐ $35/head return best case; $20/head loss worst case
    - ☐ $65/head return best case; $35/head loss worst case
    - ☐ $100/head return best case; $75/head loss worst case

16. Suppose the situation changes altering the set of net return/loss prospects. Which would you most prefer from the four listed below?
    - ☐ $20/head return best case; $10/head loss worst case
    - ☐ $35/head return best case; $30/head loss worst case
    - ☐ $65/head return best case; $45/head loss worst case
    - ☐ $100/head return best case; $85/head loss worst case

17. There are many different factors that influence the average daily gain (ADG) of feeder cattle in stocker operations. Please rank the following five protocols or feeder cattle characteristics relative to their effect on realized ADG in stocker operations. (*1 being most impact to 5 being least impact)*

_____ *Cattle administered vaccinations consistent with most VAC 45 claims prior to stocker placement*
_____ *Cattle purchased from a known and/or limited set of ranches/operations*
_____ *Cattle weaned, dehorned, and castrated at least 45 days prior to placement in stocker operation*
_____ *Stocker operation provides average or better quality of feedstuffs and mineral supplementation*
_____ *Stocker operation uses standard and/or conservative stocking rates (head/acre)*

18. Suppose the following protocols or feeder cattle characteristics are implemented on a stocker operation. What best describes the change in realized ADG you would expect?

| | *No Change in ADG* | *1-10% Higher ADG* | *11-20% Higher ADG* | *21-30% Higher ADG* | *Over 30% Higher ADG* |
|---|---|---|---|---|---|
| *Cattle administered vaccinations consistent with most VAC 45 claims prior to stocker placement* | | | | | |
| *Cattle purchased from a known and/or limited set of ranches/operations* | | | | | |
| *Cattle weaned, dehorned, and castrated at least 45 days prior to placement in stocker operation* | | | | | |
| *Stocker operation provides average or better quality of feedstuffs and mineral supplementation* | | | | | |
| *Stocker operation uses standard and/or conservative stocking rates (head/acre)* | | | | | |

Consider an operation similar to yours that regularly places 500 lb. steers in its backgrounder/stocker operation in October and typically sells at heavier weights about 120 days later in February. Varying only purchase price and average daily gain (ADG) information, please consider the following **three** questions and indicate which Lot (or neither) would best reflect your purchase decision in each case.

19. Indicate if you would buy Lot A, Lot B, or neither:

| Attributes | Lot A | Lot B | Option C |
|---|---|---|---|
| **Purchase Price ($/cwt)** | 257 | 257 | I would choose not to purchase either Lot A or Lot B |
| **ADG (lbs/day)** | 40% Chance: under 1.7 | 20% Chance: under 1.7 | |
| **Outcome** | 40% Chance: 1.7 to 2.5 | 60% Chance: 1.7 to 2.5 | |
| | 20% Chance: over 2.5 | 20% Chance: over 2.5 | |
| ***I would choose:*** | _____ | _____ | _____ |

20. Indicate if you would buy Lot A, Lot B, or neither:

| Attributes | Lot A | Lot B | Option C |
|---|---|---|---|
| **Purchase Price ($/cwt)** | 227 | 227 | I would choose not to purchase either Lot A or Lot B |
| **ADG (lbs/day)** | 20% Chance: under 1.7 | 20% Chance: under 1.7 | |
| **Outcome** | 40% Chance: 1.7 to 2.5 | 60% Chance: 1.7 to 2.5 | |
| | 40% Chance: over 2.5 | 20% Chance: over 2.5 | |
| ***I would choose:*** | _____ | _____ | _____ |

21. Indicate if you would buy Lot A, Lot B, or neither:

| Attributes | Lot A | Lot B | Option C |
|---|---|---|---|
| **Purchase Price ($/cwt)** | 197 | 227 | I would choose not to purchase either Lot A or Lot B |
| **ADG (lbs/day)** | 40% Chance: under 1.7 | 20% Chance: under 1.7 | |
| **Outcome** | 40% Chance: 1.7 to 2.5 | 40% Chance: 1.7 to 2.5 | |
| | 20% Chance: over 2.5 | 40% Chance: over 2.5 | |
| ***I would choose:*** | _____ | _____ | _____ |

22. Considering questions 19-21, what best describes your responses and the question sequence presented:

- ☐ The questions were easy and straight-forward to understand. Accordingly I am confident in my selections.
- ☐ The questions were easy and straight-forward to understand. However I am *not* confident in my selections.
- ☐ The questions were *not* easy and straight-forward to understand. However I am confident in my selections.
- ☐ The questions were *not* easy and straight-forward to understand. Accordingly I am *not* confident in my selections.

23. I am: Male _____ Female _____

24. I am _____ years old.

25. Your operation is located in which state? (if in multiple states, select primary state):_____

26. The best description of your educational background is:

- ☐ Did not obtain High School diploma
- ☐ High School diploma
- ☐ Technical training (Certification or Associates Degree)
- ☐ Bachelor's (B.S. or B.A.) College Degree
- ☐ Graduate or Professional Degree (M.S., Ph.D., D.V.M., Law School)
- ☐ Other: _____

27. How many years have you been raising beef cattle?

- ☐ Less than 10 years
- ☐ 11-20 years
- ☐ 21-30 years
- ☐ Over 30 years

28. Please estimate your annual pre-tax household income:

- ☐ Less than $25,000
- ☐ $25,000-$49,999
- ☐ $50,000-$74,999
- ☐ $75,000-$99,999
- ☐ $100,000-$124,999
- ☐ $125,000 or more

29. Approximately what portion of your household income is from the beef cattle operation?

- ☐ Less than 25%
- ☐ 26%-50%
- ☐ 51%-75%
- ☐ Over 75%

30. How many cattle (# head) did your operation sell at the following production stages in 2013 (*providing your best guess is fine*)?

Cows_____ Calves _____ Yearlings _____ Finished Cattle _____

31. How many cattle (# head) did your operation have in inventory at the following production stages on January 1st, 2014 (*providing your best guess is fine*)?

Cows_____ Calves _____ Yearlings _____ Finished Cattle _____

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Thank you for your time in completing this survey!

**Please mail us your completed survey using the enclosed, postage-paid envelope**.
Your input will strengthen our research and help obtain more accurate conclusions. Results and industry implications will be posted online (including to *www.agmanager.info*) and distributed widely both electronically and through multiple presentations to cattle producers. If you would like to directly receive results of this study please email Shelby Hill (*sehill@ksu.edu*) or Glynn Tonsor (*gtonsor@ksu.edu*). If you wish to provide any comments, please feel free to add them here or include additional paper as needed in the postage-paid return envelope.

KANSAS STATE UNIVERSITY | University Research Compliance Office

TO: Glynn Tonsor
Agricultural Economics
331-A Waters

Proposal Number: 7296

FROM: Rick Scheidt, Chair
Committee on Research Involving Human Subjects

DATE: 09/03/2014

RE: Proposal Entitled, "Assessing U.S. Stocker/Backgrounder Producer Preferences"

The Committee on Research Involving Human Subjects / Institutional Review Board (IRB) for Kansas State University has reviewed the proposal identified above and has determined that it is EXEMPT from further IRB review. This exemption applies only to the proposal - as written – and currently on file with the IRB. Any change potentially affecting human subjects must be approved by the IRB prior to implementation and may disqualify the proposal from exemption.

Based upon information provided to the IRB, this activity is exempt under the criteria set forth in the Federal Policy for the Protection of Human Subjects, **45 CFR §46.101, paragraph b, category: 2, subsection: ii.**

Certain research is exempt from the requirements of HHS/OHRP regulations. A determination that research is exempt does not imply that investigators have no ethical responsibilities to subjects in such research; it means only that the regulatory requirements related to IRB review, informed consent, and assurance of compliance do not apply to the research.

Any unanticipated problems involving risk to subjects or to others must be reported immediately to the Chair of the Committee on Research Involving Human Subjects, the University Research Compliance Office, and if the subjects are KSU students, to the Director of the Student Health Center.

203 Fairchild Hall, Lower Mezzanine, Manhattan, KS 66506-1103 | 785-532-3224 | fax 785-532-3278 | k-state.edu/research/comply