AGE AND SOURCE VERIFIED PRECONDITIONED FEEDER CATTLE: COSTS AND VALUE

By

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CHAPTER I

THESIS OVERVIEW

One issue that remains the same throughout all facets of the supply chain is that of animal health. There is no one single disease that livestock producers concern themselves with, but in the feeder cattle industry, bovine respiratory disease (BRD), also known to many as "shipping fever", is a common concern. BRD is said to be the leading cause of morbidity and mortality for U.S. feeder cattle as "stresses due to weaning, marketing, and transportation, previous plane of nutrition, genetics, and health history interact with exposure to viral and bacterial agents" (Duff and Galyean, 2007, p. 824).

Although references will be made to other sectors of the beef industry, the focus of this thesis is on cow-calf producers and their ranch management practices. One preventative health practice that is thought to decrease BRD risk is that of preconditioning. Regarding morbidity, preconditioning is designed to improve the resistance to BRD and other contagious diseases while reducing stress around the time of transport from the ranch (Speer, Young, and Roeber, 2001). It has been claimed that this practice improves feeder cattle health prior to marketing by weaning calves from their dam, vaccinating, and providing a nutritional supplement. Knowledge of preconditioning has been around for quite some time, however due to the additional cost, labor and time many producers are still hesitant to adopt its requirements.

This thesis project was partially supported by a grant from The Samuel Roberts Noble Foundation, Inc. The foundation was endowed by Mr. Lloyd Noble whose vision was “influencing agriculture by exploring and improving production agriculture techniques and advancing plant science through research and discovery” ("About the Noble Foundation"). In an effort to fulfill his vision, the Noble Foundation (NF) Agricultural Division has developed an integrated beef production system (BPS) which is designed to assist producers in making sound farm management decisions.

Both Sections 1 and 2 of this thesis are a direct result of the success and recent growth of the NF BPS program. Section 1 is an essay pertaining to the preconditioning costs associated with the above mentioned BPS cattle. Actual BPS producer costs have been recorded for the past two years. Section 2 is an essay dealing with the value of cattle preconditioned according to BPS protocol. When sold at a traditional, public livestock auction, the market price received for NF calves can be compared to non-preconditioned feeder cattle. Results from the two sections will be jointly reviewed in the discussion and implications chapter. It is anticipated that the additional value (Section 2) resulting from BPS preconditioning practices will be greater than that of the additional costs (Section 1) incurred by BPS participants.

CHAPTER II

INTRODUCTION TO PRECONDITIONING

Brief History

In 1965, Dr. John Herrick, an Iowa State University extension veterinarian, coined the term “preconditioning” (Miksch, 1984; Thornsbury, 1991). Simply put, this phrase is the act of preparing feeder cattle to enter the stocker phase of the beef industry or to be directly placed in the feedlot. This process is subject to various management practices however, the most common practice is a health program that is implemented around the time of weaning (Dhuyvetter, Bryant, and Blasi, 2005; Schroeder, Jones, and Nichols, 1989). One common example of a preconditioning/health management program is the Oklahoma Quality Beef Network (OQBN). Supported by the Oklahoma Cattlemen’s Association and the Oklahoma Cooperative Extension Service, this program like many similar pharmaceutical programs is designed to add value to feeder cattle. OQBN requirements follow those of a VAC 45 program (created by the Texas A&M Ranch to Rail Program): 45-day minimum preconditioning period, weaning, castration of bull calves, dehorning, de-worming and vaccinations, and a supplemental nutrition program ("Oklahoma Quality Beef Network").

Although preconditioning is of interest to many producers today, the additional management is not a new concept to the beef industry. Animal science researchers have

repeatedly proven that preconditioning improves feeder cattle health and quality, and is beneficial towards animal performance by increasing feedlot placement weight and additional gains. It is said that upon leaving the ranch, preconditioned calves need less medication, experience less death loss, are more efficient performers, and have a higher potential carcass value (McCollum and Gill, 2000).

Industry Problems

There are many failures in the feeder cattle market. Communication of information such as preconditioning practices (e.g. weaning, vaccinations, and nutritional supplements) between buyers and seller at a public auction is limited. This information asymmetry or "information gap" between buyers and seller does not allow producers to capture the full value of preconditioning. It is expected that the market inefficiency between buyers and sellers in a typical livestock auction will be decreased when more information about a pen of cattle is available to the buyer.

In some cases however, even if preconditioning information is provided, buyers have little confidence in its accuracy. Therefore, buyers must assess the quality of feeder cattle very subjectively (i.e. fleshiness, bawling, drooped ears, nasal discharge). Many times, these subjective characteristics in combination with the reputation of the seller are what the buyer bases his or her bid on. Speer, Young, and Roeber (2001) explain in detail that this is because buyers only have a one in five chance that cattle have actually been vaccinated when little or no information is passed from seller to buyer.

Even if it can be proven time after time that preconditioning is of benefit to the livestock, the cost effectiveness of preconditioning on the overall industry is unknown.

Estimated budgets can include alternative assumptions to show that preconditioning benefits either are guaranteed or are not guaranteed to outweigh the costs associated with such intense management practices. This is due in part to several key factors affecting preconditioning returns such as animal weight gains, feed and medical costs, etc. This topic has yet again become a major focus in the beef industry due to high production costs (e.g. feed, vaccination, and labor). In the case of rising feed costs, one possible influencing factor is that of high corn prices due to an increased interest in the production of ethanol. Furthermore, literature has shown that there is a lack of true data pertaining to the cost of preconditioning. Many articles simply use estimated budgets when determining if the value of preconditioning exceeds the overall cost structure.

The Samuel Roberts Noble Foundation, Inc.

What is the Noble Foundation?

The Samuel Roberts Noble Foundation, Inc., headquartered in Ardmore, Oklahoma, was founded in 1945 by Mr. Lloyd Noble. Named in honor of his father, the foundation was originally developed to educate farmers and ranchers on land management and conservation practices. The driving force behind all Noble Foundation staff efforts is Mr. Noble's vision of "influencing agriculture by exploring and improving production agriculture techniques and advancing plant science through research and discovery" ("About the Noble Foundation"). Designed to uphold the company vision, the foundation operates three separate departments: Agricultural, Plant Biology, and Forage Improvement.

BPS Program Description

Industry concerns such as the unidentified value of preconditioning have led the Samuel Roberts Noble Foundation to fund graduate research in the area of agricultural economics. The Noble Foundation staff has developed what they call an integrated beef production system (BPS) designed to assist cooperators in meeting “their individual production, marketing and quality-of-life goals through multi-disciplinary consultation” as stated in the initial BPS brochure ("Integrated Beef Production System Brochure"). Specifically, producers are consulted in areas such as forages and rangeland management, animal production, economics and marketing, and wildlife conservation. BPS participants are hand-selected by Noble Foundation staff, and these cow-calf producers must operate within a 100 mile radius of NF headquarters. The following figure is a visual picture of the BPS consultation area. This program has had a tremendous amount of success as the program has grown from 1 cow-calf operation with approximately 500 head in 2003 to 31 producers with cow numbers approaching 5,400 head in the spring of 2006 (Whitley, 2006).

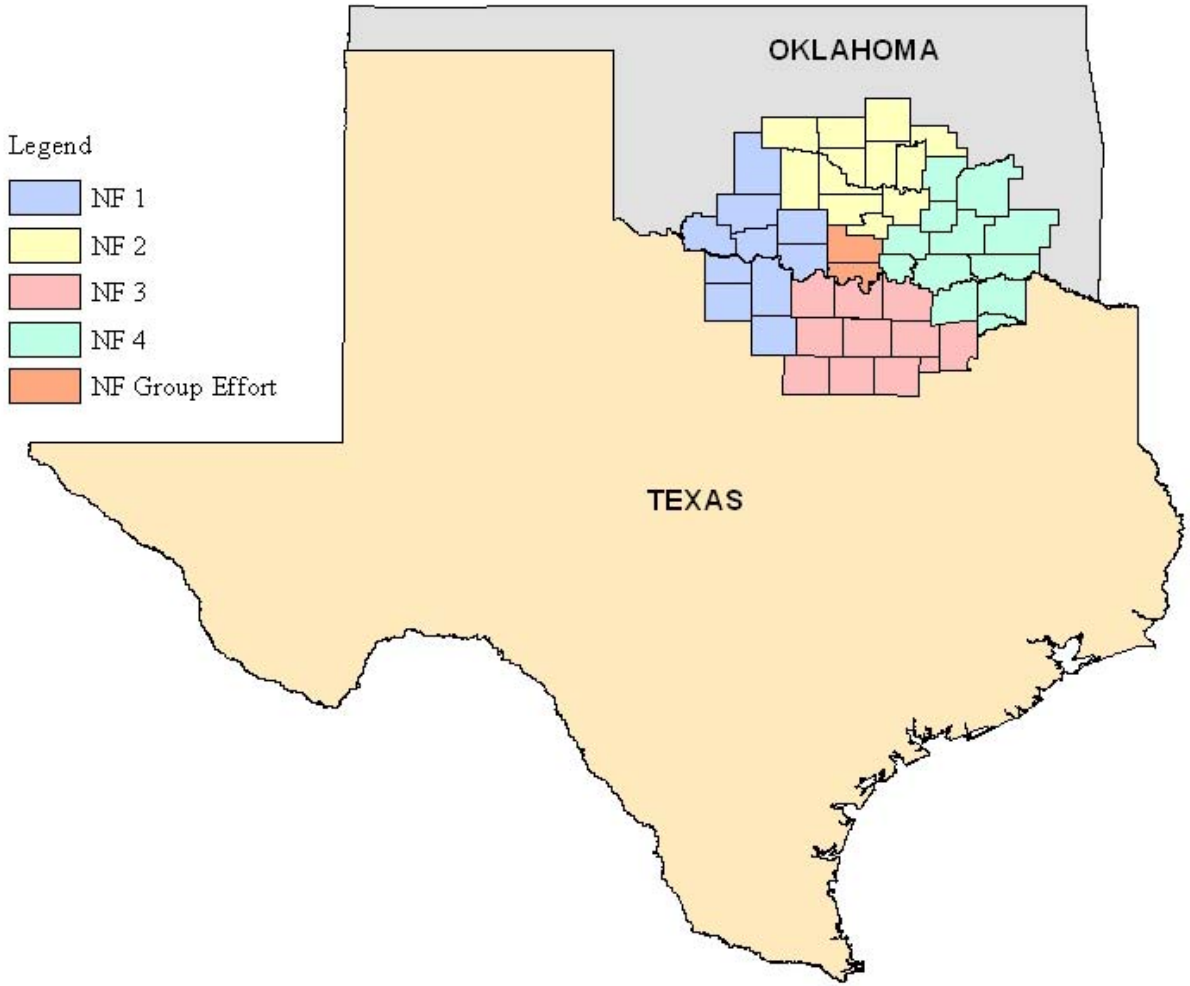

Figure II-1. Samuel Roberts Noble Foundation BPS Consultation Area by Consultation Team

It is the intent of this consultation effort to provide guaranteed source, process, and performance verified feeder cattle to the marketplace. Factors such as the dramatic increase in participation and the focus on producer returns have led the program directors to look to alternative market outlets. At the annual BPS producer meeting, goals for the year included to "identify and use markets other than livestock auctions" (Whitley, 2006). However, before such changes can occur, the board of directors must first evaluate the economic status of current marketing strategies. At this time, NF cooperators market their 45-day preconditioned feeder cattle at the largest public feeder calf market housed at the Oklahoma National Stockyards in Oklahoma City, Oklahoma. Information available to the cattle buyer for BPS calves include: number of days weaned, and de-worming and vaccination records (e.g. 2 shots: blackleg and 4-way respiratory). Buyers also have access to birth dates and genetics as well as any other pertinent information the Noble Foundation has collected. Currently, the only other programs to provide buyers with as much information are certified preconditioning programs (e.g. OQBN and animal pharmaceutical sponsored programs).

Purpose of Research

By providing preconditioning information, a buyer can better evaluate the quality of cattle presented at market by an individual cow-calf producer. It can be assumed that as the confidence in quality increases, the price the buyer is willing to pay should also increase; in essence, more premiums for the producer. That is why the predicted outcome for this thesis project is that feeder cattle receive a premium due to age verification, source verification, and preconditioning when sold under the guidance of the Noble

Foundation. If the above is true, then it is suggested that the preconditioning management practices implemented by the Noble Foundation are of more value than alternative feeder cattle management practices.

CHAPTER III

ECONOMIC FRAMEWORK

Profit Maximization Theory

It is assumed that for most firms (e.g. farmers and ranchers) financial success is a priority. The ability to turn a profit (returns minus costs) is the backbone of all marketing decisions. Thus, profit maximization is the underlying economic theory when concerning oneself with the choice of preconditioning. It is possible that production costs will increase when implementing preconditioning practices. The question is, however, are these additional costs greater than the additional returns?

Simply put, profit maximization theory determines the price and output level which returns the highest level of profits to the firm. The basic rule for this theory is to set marginal revenue equal to marginal cost. Marginal revenue ($\Delta TR/\Delta Q$) is defined as the additional benefit brought about by using one more unit of the control variable (i.e. quantity of output produced which is represented by Q) whereas marginal cost ($\Delta TC/\Delta Q$) is defined as the additional cost incurred by producing one more unit. The symbol Δ is to be read as "the change in". By applying basic mathematical applications:

(1) $$TR = Price\ (P) * Quantity\ (Q)$$

Equation 1 (above) can be rewritten as it equates to equation 2

(2) $$\pi = TR - TC$$

where profits (π) equal total revenue (TR) minus total costs (TC). General microeconomic principles (e.g. Baye, 2006; Pindyck and Rubinfeld, 2001; "Profit Maximization") reinforce the profit maximization theory and give way to the following mathematical proof:

(3) $$\frac{\Delta \pi}{\Delta Q} = \frac{\Delta TR}{\Delta Q} - \frac{\Delta TC}{\Delta Q} = 0$$

Simplified, the above equation is now referred to as:

(4) $$MR - MC = 0$$

Rearranging of terms allows for the following:

(5) $$MR = MC$$

Thus, the formulations provide proof that profit maximization occurs when the additional revenue created by selling one more unit of quantity equals the additional cost of producing the said quantity (i.e. when MR = MC).

In the economic realm, the agricultural industry is typically thought of as a market that experiences perfect competition. Perfect competition assumptions give way to the saying that “no single firm…exerts any influence on price” (Baye, 2006, p. 268). This being said, farmers and ranchers are known as price takers. Due to a competitive market structure (i.e. many firms, homogeneous product, and free entry/exit) producers do not have the ability to set market price, therefore, they must take the price presented to them if they wish to sell their product. Relative to Noble Foundation cooperators, no one single producer can determine what price his/her cattle will bring at a public auction. He/she can however influence the quantity, type, and quality of cattle presented at market due to the level of management put into practice at the ranch site (e.g. preconditioning). If deemed worthy, buyers will then pay a higher price for those cattle. By improving

these controllable production factors, the producer can indirectly influence his/her returns.

Hedonic Pricing Theory

Hedonic modeling dates back to 1928 (Taylor, 2003) and is frequently used to determine the marginal implicit price of feeder cattle characteristics (see several articles cited in Avent, Ward, and Lalman, 2004). By assigning dummy variables of either one or zero to several characteristics, hedonic modeling allows qualitative variables to be used in the estimation process. Rosen (1974) explains the economic foundation behind the hedonic theory and defines hedonic prices as the "implicit prices of attributes…from observed prices of differentiated products and the specific amounts of characteristics associated with them" (p. 34). In other words, hedonic pricing theory says that the price of an item is dependent upon the characteristics of that item. By assuming there is a separate market for each characteristic, the value or level of influence that each characteristic has on price can then be determined. Hedonic pricing theory is often used in the real estate market. For example, housing market value is dependent on characteristics such as the number of rooms' available, total square footage and location in the city.

Although they used a system of equations approach rather than a single-equation strategy, Coatney, Menkhaus, and Schmitz (1996) provide a basic overview of general hedonic modeling procedures by using the Ladd and Martin Input Characteristics Demand Model (ICM). This model is based on the fact that "the price of an input equals the sum of the money values of the input's characteristics to the buyer" (Coatney et al.,

1996, p. 193). Over the years, Ladd and Martin's theory has been built upon by many economists (e.g. Buccola, 1980; Schroeder et al., 1988; Turner, McKissick, and Dykes, 1993) saying that the price of a product is not only due to product characteristics but is also influenced by "fundamental market forces" (Schroeder et al., 1988, p. 72). Such market forces can include year or season marketed and commodity futures price.

The price of feeder cattle is dependent upon animal gender, average weight, and lot size as well as many other characteristics related to producer management styles. Borrowing heavily from Avent (2002), the economic framework for this thesis is that the market price (P) of a particular lot of cattle (i) at time (t) is:

$$P_{it} = \sum_{k} V_{ikt} C_{ikt} + \sum_{h} R_{ht} M_{ht} \tag{6}$$

given a set of cattle characteristics (k) (e.g. breed type, frame score, muscling, etc.), physical characteristics of the lot (C), market attributes (h) (e.g. number of head in the lot, futures prices, etc.), and market forces (M). V and R portray the marginal coefficients for the product's physical characteristics and the additional market forces that impact price. In order to avoid errors in the estimation process, one dummy variable from each of the physical characteristics (i.e. management, sex, breed type, flesh, muscling, frame score, uniformity, horns, and health) was omitted from the statistical analysis. In chapters that follow, these dropped variables will be termed the base variables. By estimating a hedonic model for feeder cattle, one can focus on the price premium available for more "progressive" management types while holding sex, breed type, frame score, muscling, and the presence of horns and health constant.

CHAPTER IV

LITERATURE REVIEW

Feeder Cattle Pricing Characteristics

Factors affecting the price of cattle have been a long time concern in the feeder cattle industry. That is why Lambert et al. (1989) conducted an intensive study regarding those management practices which the producer has control over and how these practices influence price. They collected data at 15 of the 77 licensed markets throughout Kansas over a ten-week period in late 1981. The authors used regression to estimate a model containing variables that were thought important and concluded that price increases as the size of the lot increases. However, this premium increases at a decreasing rate. Furthermore, Lambert et al. (1989) concluded that during this 10-week period, steers averaged a $6.85/cwt premium over heifers, and larger framed cattle typically generated more money in the sale ring than breeds perceived as smaller framed. Moreover, premiums were found for cattle which were dehorned, heavy muscled, and sold in the first half of the sale. While premiums have been consistently reported for certain physical characteristics (Lambert et al., 1989; Ward, Ratcliff, and Lalman, 2005) it is recommended that the producer find the “best”, most cost effective management program (Dhuyvetter, 2004; Dhuyvetter, Bryant, and Blasi, 2005).

In addition to determining the physical characteristics that play a major role when marketing feeder cattle, Lambert et al. (1989, p. 13) looked at "within-day serial correlation" due to the fact that the data were collected over a period of time each sale day. They found this correlation to be positive suggesting that "auction price is dependent upon the 'mood' of the market". The research of Lambert et al. (1989) was reinforced in a study by Schroeder, Jones, and Nichols (1989). While this study pertains to the feeder pig industry, many similarities can be seen in the feeder cattle industry. They, too, found that physical characteristics related to producer management styles directly influence market price. For example, a large discount was assigned to unhealthy pigs.

Preconditioning

What management practices can cow-calf producers implement to increase returns? One such practice is that of preconditioning, which is sometimes referred to as backgrounding. To distinguish the two, preconditioning programs are typically thought of as on the ranch programs, whereas in backgrounding operations, cattle are usually held at an off-ranch site for a time period long enough to "boost" the immune system. The North Dakota State University Cooperative Extension Service defines preconditioning as "the preparation of a calf, which has been nursing its mother, to better withstand the stress of movement from its production site into the channels of markets and ultimately to the feedlot" (Tindall, 1983, p. 38).

Preconditioning programs can include, but are not limited to weaning, dehorning, castration, supplemental feeding, and cattle being trained to eat from a feed bunk as well

as confined with a hotwire. If one were to attend local livestock markets, they would hear phrases such as “long-time weaned”, “worked”, and “had all their shots” which give a loose indication that preconditioning practices were in fact preformed. It should be noted however, that these terms vary highly among regions and are used interchangeably.

While preconditioning is of interest to many producers today, the additional management is not a new concept to the beef industry. After a review of historical information, Tindall (1983) reports that Iowa held its first preconditioned feeder calf sale in 1965 and the first national preconditioning seminar was hosted two years later by Oklahoma State University in 1967. Although it can be demonstrated by animal science industry leaders and numerous practitioners of veterinary medicine that intensely managed preconditioning programs are of benefit to the health and performance of feeder cattle (Duff and Gaylean, 2007; Lalman and Smith, 2002), one must nevertheless wonder if the additional vaccinations, feed, and time spent is economically feasible for the producer.

Duff and Gaylean (2007) warn that the main benefit of a preconditioning program is the decreased incidence of BRD in the feedlot. The authors (Duff and Galyean, 2007) reviewed several articles pertaining to highly stressed feedlot cattle. Among them include a 2002 study which found that revenues for those calves treated once for BRD were $40.64/head less than healthy calves not needing treatment for BRD and dramatically increased to $291.93/head less revenue for those calves treated three times (Duff and Galyean, 2007). Plus, Pinchak et al. (2004) report the castration process and the pharmaceutical treatment of respiratory disease can account for losses in animal productivity ranging from 10% - 25%. These substantial losses can be avoided with the

proper use of preconditioning programs. Still, due to information inefficiencies in the supply chain, preconditioning returns "trickle down" to stocker operators and cow-calf producers. Buyers may pay smaller than justified premiums as it is only necessary to pay what the competition requires. That is why it is crucial for producers to evaluate the economics of their preconditioning program.

Further reservation for adopting preconditioning practices comes from the 1983 North American Symposium on Bovine Respiratory Disease where it is said that Dr. Andy Cole, a USDA scientist involved in the National Shipping Fever Research Project, was quoted saying "there is no economic advantage from the added expense and time involved in preconditioning" (Miksch, 1984, p. 344). Contradictorily, it is said that he went on to talk of how certain preconditioning practices such as weaning and feeding, or vaccinations could provide an alternative to preconditioning (Miksch, 1984). Comments such as these are just an example of what has made and continue to make preconditioning a controversial issue.

Preconditioning Costs

Budgeted preconditioning costs can range anywhere from $35 - $60/head (Lalman and Smith, 2002). Although lower costs are plausible (i.e. $24.22/head reported for the 30-day Southeast Pride Blue Tag Program (Neel et al., 2002)), many researchers are finding typical costs of preconditioning to be in the upper range of $60/head as stated by Avent, Ward, and Lalman (2004). The Alabama Cooperative Extension System uses a cost of $60.22/head for a 45-day preconditioning program (Prevatt and Rankins, 2004). This is reinforced by Dhuyvetter, Bryant, and Blasi (2005) who say producers should try

to keep preconditioning cost in the range of $0.90 to $1.35/head/day. Assuming maximum costs and a minimum of 45 days preconditioning, total cost of preconditioning to producers would be $60.75/head ($1.35*45 = $60.75).

A large proportion of the average $60 preconditioning cost is associated with feed and nutrition. Lalman and Smith (2002) gage that of the total budget 45% - 60% is spent on feed costs. In another publication, Dhuyvetter (2004) points out that as the cost of preconditioning exceeds the upper range of $1.35/head/day, preconditioning is less likely to be profitable. Therefore, maintaining control over costs is essential to a profitable preconditioning program.

Market Value of Preconditioning

Now that a general idea of the cost of preconditioning has been established, is the value of preconditioning large enough to cover the cost of the additional management? Dhuyvetter, Bryant, and Blasi (2005) collected data from Fall 1999 – Winter 2004 at the Holton Livestock Exchange, located in Holton, KS. Data included information collected from special vaccination sales (VACC) which are certified through the Livestock Marketing Association (LMA). Therefore, these preconditioning sales are referred to here as the "LMA-VACC sale" (Dhuyvetter, Bryant, and Blasi, 2005, p. 503). From their study, the authors concluded that for a 45-day preconditioning program, premiums were received at the rate of $4.63/cwt in the fall and $3.22/cwt in the winter which is above the price received for similar cattle sold at weaning.

Moreover, a similar study evaluating special preconditioning sales to conventional sales was conducted in Ontario, Canada. There, Macartney, Bateman, and Ribble (2003)

found that when holding all other factors constant, special auction participants received a $0.06/lb premium as compared to traditionally marketed cattle. Converted to American dollars, this is approximately $4.00/cwt (averaging beginning and ending sale dates for the two-year period). The authors also make a note that the study was conducted during a high price point in the cattle cycle which suggests that $4.00/cwt is possibly the largest premium producers should expect to see (Macartney, Bateman, and Ribble, 2003).

Although literature shows this is not the highest premium available, the premium of Macartney, Bateman, and Ribble (2003) is in the range of findings supported by Pfizer Animal Health and the Superior Livestock Auction (SLA). King et al. (2006) assessed feeder cattle prices on a little over 3 million head of calves sold through a livestock video auction. Over an eleven year period, (1995-2005), they concluded that premiums for VAC 34 and VAC 45 preconditioning programs were as follows: $0.99/cwt - $3.47/cwt, and $2.47/cwt - $7.91/cwt respectively. Additionally, the Southeast Pride Blue Tag program (Neel et al., 2002) used average market prices to estimate a 30-day preconditioning premium of $28.27/head; using their figures of 578 lb calves this equates to $4.89/cwt (i.e. $28.27/head divided by 578 lbs = $4.89/cwt).

Global Issues and Industry Advances

To expand on the topic of preconditioning, cow-calf producers now have the option to source verify (SV) their calves and have them third-party certified (TPC). This option could lead to solutions for two major issues in the feeder cattle industry. First, animal health outbreaks such as Foot and Mouth Disease (FMD) and Bovine Spongiform Encephalopathy (BSE) have occurred worldwide. Source verification programs could aid

in containing and/or tracing the diseases if an outbreak should occur again. Secondly, SV and TPC programs might decrease the amount of information asymmetry present in the market place. SV requires intense record keeping and leads to additional information for buyers.

Phrases such as age and source verification have come about primarily due to previous BSE outbreaks and U.S. trade restrictions that followed. For a producer to age and/or source verify their cattle, they must first enroll their calves in a Quality System Assessment (QSA) or a Process Verified Program (PVP). QSAs are typically thought only as a way to age and source verify cattle, whereas PVPs include additional information besides age and source requirements alone ("The ABCs of Beef Marketing Programs", 2006). The following comparison of verification programs is reproduced from the December 2006 issue of BEEF Magazine (Ishmael, 2006).

PVPs are generally more expensive than QSAs ("The ABCs of Beef Marketing Programs", 2006). Ishmael (2006 Marketing opportunity is the key, para. 9) says that “most estimates put the cost of qualifying cattle for age-verification through a PVP or QSA at less than $5/head, including the tag”. He goes on to say that without the program-compliant ID tag producers could expect participation costs in the range of $1.50 - $2.50/head (Ishmael, 2006).

Table IV–1. Comparison of USDA's PVP and QSA.

	Process Verified Program (PVP)	Quality System Assessment (QSA)
Eligibility — Age and/or Source PVP or QSA verified cattle are eligible for export verification programs	YES	YES
Marketing claims are chosen by each company	YES	YES
Marketing claims can include:	•Age •Source •Genetic verification •Feeding practices •Animal handling •Additional claims, as approved by USDA, AMS (such as conforming to NHTC requirements)	•Age •Source •Non-hormone treated cattle (NHTC)
Marketing the approved PVP or QSA	Approval is posted on USDA's Web site — can use the "USDA Process Verified" shield in company written marketing materials	Approval is posted on USDA's Web site — ONLY
Program-Compliant Tags — cattle can be marketed through unapproved and approved locations	YES	YES
Quality manual required	YES	YES
Requirements — ISO9001:2000	Requires specific information on all major elements and sub elements of the ISO9001	Does not require all elements of ISO9001
Requirements — USDA specific	YES	YES
Scope	Large scope requires more detail and covers a large range of marketing claims	Limited scope and very specific marketing claims
Supplier Evaluations — Do PVP and QSA require supplier evaluations and re-evaluations?	YES	YES
USDA Program Began	mid 1990s	2004 (modified version of PVP)

Source: IMI Global, Inc., based on USDA, Audit, Review and Compliance Branch's Q&A site: http://www.ams.usda.gov/lsg/arc/arcQA.htm

Many industry participants claim premiums are available for age and source verified programs. A recent survey by the Livestock Marketing Association and Global Animal Management claim that value-added programs equal more money. The survey of 100 livestock marketing managers concluded that premiums of up to $5.37/cwt for age and source verified calves that were third-party certified are experienced in their markets (Burt, 2007; "Opportunities Exist For Age, Source Verified Cattle" 2007; Rutherford, 2007).

To date, little academic research has been conducted regarding verification programs. Lawrence and Yeboah (2002, p. 118) define source verification as the "process of identifying the origin and ownership of cattle and the management practices utilized by the producer". They evaluated sales conducted at the Bloomfield, Iowa Auction Market during the fall of 1997 through 2000. Special source verified sales were overseen by the Iowa-Missouri Beef Improvement Organization (IMBIO). Lawrence and Yeboah (2002) concluded that the source verified process added as much as $1.30/cwt depending on the animals' weight classification. Yet there is a drawback to this conclusion as they went on to mention that breed type, weaning and preconditioning status, as well as producer reputation was not factored in when developing the feeder calf pricing model.

To complement Lawrence and Yeboahs' (2002) study about source verified preconditioning programs, another study at Iowa State University (ISU) (Bulut & Lawrence, 2006) dealt with the value of third-party certification. This study used data from 105 feeder cattle sales throughout the southern portion of Iowa from October 2005 - February 2006. After careful evaluation, Bulut and Lawrence (2006) concluded that TPC

preconditioned cattle received $6.15/cwt above cattle of similar characteristics which were sold at weaning. These findings are in line with those of King et al. (2006) who found that cattle preconditioned for a minimum of 45 days received a premium of an all-time high of $7.91/cwt in 2004. Conclusions from ISU (Bulut and Lawrence, 2006) also state that un-certified preconditioned cattle received a premium; but it was less than that of TPC cattle at $3.40/cwt.

Innovative Producers

In addition to source verified premiums, researchers are interested to evaluate the effect of "pooling" cattle into larger lot sizes (Bulut and Lawrence, 2006; Lawrence and Yeboah, 2002). Research by Lawrence and Yeboah (2002) shows that 700 pound steers can return $2.50/cwt more when sold in lots of 70 head as compared to smaller lots sizes. Other studies show that premiums increase "as the number of head in the lot reaches 78 head" (Bulut and Lawrence, 2006, p. 14) then the premium level declines. Lots of this size are considered to be about truckload in size, weighing approximately 50,000 pounds. This information suggests "pooling" or "co-mingling" opportunities could prove to be another profitable management practice for cow-calf producers.

The opportunity to present large, uniform lots of cattle at the marketplace brings about many differences in opinions. Popp and Parsch (1998) conducted a survey regarding marketing practices carried out by Arkansas cattle producers. They specified commingled calves as those cattle combined with calves from another producer. When asked about the negative aspects of commingling cattle with another producer, cow-calf producers ranked their concerns:

1. Knowledge about pooling
2. Flexibility regarding sale dates
3. Selling price based on average quality of the lot.

Although few respondents had previous experience in pooling calves, survey opinions showed that cow-calf and stocker/feeder producers alike agreed or strongly agreed that price premiums were available for larger, more uniform lots of cattle and also felt that there were opportunities to save on transportation costs (Popp and Parsch, 1998).

Considerations prior to Preconditioning

Before a producer rushes out to add value to his/her cattle, there are many preconditioning factors that need to be considered. A few questions to reflect on should include:

- Do I have the facilities and/or extra pasture to hold calves separately from the cow herd?
- What is the typical vaccination protocol?
- Will the banker support me waiting to sell calves later?
- What are the most common hindrances to preconditioning (e.g. weaning, feeding, and training to eat from a trough (Neel et al., 2002)?
- How long do calves need to be preconditioned?

Data from the well recognized Texas A&M Ranch-to-Rail program was studied to analyze the effect of animal health on the performance of fed cattle (Avent, 2002; Avent, Ward, and Lalman, 2004; McCollum and Gill, 2000; Neel et al., 2002). Conclusions of the program include that cattle preconditioned for at least 45 days required less medical

treatment and experienced greater production performance compared to cattle preconditioned 30 days or less (McCollum and Gill, 2000). The Southeast Blue Tag program supports Texas A&M findings as Tennessee trials indicate calves should be preconditioned for a minimum of 45 days prior to marketing (Neel et al., 2002).

Although previous literature has shown preconditioning to be a profitable enterprise, Avent, Ward, and Lalman (2004) point out that while preconditioning premiums exist, the price premium by itself is not enough to cover preconditioning marginal costs. One must keep in mind that the overall preconditioning benefit is a direct result of selling heavier weight calves (i.e. more pounds), selling into the seasonal price increase due to the length of preconditioning (i.e. selling preconditioned calves in December rather than selling weaned calves in October), and the preconditioning price premium (e.g. healthier calves). The sum of these are then compared to the additional costs incurred due to preconditioning which include but are not limited to costs such as feed, vaccinations, and additional labor.

Roeber and Umberger (2002) studied two preconditioning programs sponsored by the Kentucky Cattleman's Association. One was a "certified preconditioned for health" (Miksch, 1984, p. 342) program (CPH) and the other was the Kentucky gold tag program (GT). Miskch (1984) quotes a premium of $4 - $6/cwt for cattle sold through the Kentucky CPH special sales when compared to typical calves sold during regular weekly auctions. The validity of Kentucky preconditioning programs is supported by Roeber and Umberger (2002). They found cattle enrolled in these two programs brought to the feedlot a value of $46.83/head for CPH calves and $49.54/head for GT calves. The authors (Roeber and Umberger, 2002) found the premium is not the full value of

preconditioning as feedlot operators could pay an additional $8.50 - $9.00/cwt for 550 pound calves of the respective categories. Lalman and Smith (2002) report on a study by Cravey suggesting that buyers could afford to pay an additional $9.67/cwt for preconditioned cattle. This unseen premium relates to the logical thinking that cattle buyers only pay what the competition requires them to pay to purchase a pen of preconditioned calves.

Besides a monetary premium, Lalman and Smith (2002) say that preconditioning programs can improve a producer's reputation for producing high quality cattle. This is validated as Avent, Ward, and Lalman (2004) go on to state that a strong, positive reputation is necessary for the producer to receive the full premium for preconditioning. A study conducted by Turner, McKissick, and Dykes (1993) state that a sellers' reputation is just another form of product differentiation. Reputation selling is similar to distributing premiums for perceived quality according to desirable physical characteristics. However, it is based on the characteristics and integrity of the seller rather than the characteristics of the cattle. Also, the reputation of the market along with their regional managers can influence the price buyers are willing to pay (Bailey, Peterson, and Brorsen, 1991). Reputation selling is particularly of more influence when little information about a pen of cattle is passed from producer (e.g. seller) to the order buyer (Turner, McKissick, and Dykes, 1993).

This last statement leads to the Chymis et al. (2004) discussion of asymmetric information in the cattle market. Asymmetric information, in layman's terms, can be thought of as the sellers' information that is either kept from or simply not relayed to the buyer. It is possible that value-added marketing strategies such as preconditioning can

aid in providing the flow of management information across segments of the beef industry (Lalman and Smith, 2002).

Suggested by Chymis et al. (2004), three possible industry practices that could resolve the problem of asymmetric information at live cattle auctions are:

1. Traceability programs such as source verification
2. Certified preconditioning programs
3. Electronic and video auctions.

They conclude that the above management practices aid in but do not eliminate the problem of asymmetric information shared between buyers and sellers. That is why the authors allude to the fact that "direct cattle sales overcome the problem of asymmetric information" within the cattle market (Chymis et al., 2004, p. 8); however, one must be cautious of the implicitly high costs associated with price discovery in regards to conducting direct sales for preconditioned feeder cattle.

Impacts on Cattle Feeding

Preconditioning is a hot topic not only in the cow-calf industry but in the feedlot industry as well. In years past, much research has been conducted regarding BRD in feedlots and how health programs (e.g. preconditioning) influence the final outcome. Texas A&M Ranch to Rail studies show that 8% of costs are directly related to animal health and the cost of sickness approximated $111.38/sick animal (Griffin, Perino, and Wittum, 1995). The Ranch to Rail program also showed that sick animals returned $95 less revenue than cattle perceived as healthy (Speer, Young, and Roeber, 2001).

The relationship of health treatments and carcass merit has historically received little attention. That is why Busby et al. (2004) evaluated "the effect of postweaning health on feedlot gain and carcass quality" at eight feedlots located throughout Iowa (p. 1). The data set used consisted of 6,618 calves that were fed to harvest with a visual assessment for fat cover of 0.4 inches. Busby et al. (2004) were able to show that respiratory disease was the main reason cattle received treatments.

Busby et al. (2004) found that cattle receiving health treatments were significant at the 1% level having a lower average daily gain (ADG) than those cattle not treated for respiratory problems. Further investigation led them to find that "calves not requiring treatment had a significantly higher marbling score than those treated once, which also had a higher marbling score than those treated twice" (Busby et al., 2004, p. 1). Although, they could not determine how marbling deposition is affected by heath treatments, the authors were able to make a strong conclusion saying "postweaning calf health clearly reduced feedlot performance and carcass quality grade resulting in lost weight gain and reduced carcass value" (Busby et al., 2004, p. 2).

Abidoye and Lawrence (2006) expanded on the topic of preconditioning and how it influences the feedlot sector of the beef industry. They obtained data from the previous study conducted by Busby et al. (2004) and the Tri-County Steer Carcass Futurity (TCSCF); thus including a much larger data set. They defined preconditioned cattle as those calves that have had all necessary management practices completed prior to being commingled with other calves at the feedlot whereas backgrounded cattle are those that have first been commingled then transferred to a separate facility to perform

preconditioning management practices. Also, they defined single source calves as pens of cattle that are made up of only one owner as compared to multiple owner pens.

The authors (Abidoye and Lawrence, 2006) concluded that backgrounded cattle were healthier than calves commingled at the feedlot but that cattle of a single source were healthier than both of the above. Single source cattle had a higher average daily gain than backgrounded cattle. When it comes to carcass characteristics, Abidoye and Lawrence (2006) found an increased probability of grading choice for the group of single source cattle, the group of backgrounded cattle, and then the group of cattle commingled at the feedyard. They also found that single source cattle had a larger chance of having a higher yield grade as compared to all commingled cattle. Findings such as these can provide feedlot managers with quality information when making purchasing decisions and pen assignments on a day to day basis.

CHAPTER V

PRECONDITIONING COSTS

As the price of corn and other production costs continue to rise, producers become aware that if the additional cost of maintaining ownership post-weaning is greater than the additional revenue then preconditioning is not a feasible enterprise. When based on previous research alone, producers experience economic risk since many university studies reference estimated or projected budgets (e.g. Avent, Ward, and Lalman, 2004; Dhuyvetter, Bryant, and Blasi, 2005; Prevatt and Rankins, 2004 just to name a few). The Noble Foundation has access to 11 and 29 producers' actual preconditioning receipts for the respective years 2004 and 2005. This information can aid in understanding the economics of preconditioning programs.

Objectives

The primary objective of this part of the study was to establish the average cost of the NF's BPS preconditioning program while determining key factors influencing costs and returns. The specific objective was to determine if added cost of production exceeds added market value of NF preconditioned feeder cattle.

Data

Over the past two years, the Noble Foundation staff has collected data regarding the cost of producing preconditioned cattle. The cost portion of the data set includes feed and mineral, hay, vaccinations, additional labor, the implicit opportunity cost, and marketing costs. Additional performance information is also provided including animal weights, days preconditioned, average daily gain, and actual shrink. Furthermore, the data set is separated by animal sex (i.e. steers vs. heifers). Little variation is present however, due to the fact that many NF cooperators preconditioned both steers and heifers in a single group.

As expected with any data entry project, data complications arose once examined. First, due to the rapidly expanding BPS program and new growth of NF cooperators, the Noble Foundation staff was unable to obtain complete records for every producer. Therefore when necessary, average costs were used to fill in missing values. For example, if a producer did not have information pertaining to the cost of feed and mineral, the average of all other producers' feed and mineral cost was used to fill in the missing data. This method was used for all cost categories. Second, data limitations exist in the additional labor variable. This variable includes common livestock activities such as gathering, sorting and working cattle, and transportation to market. Many NF cooperators report lower than actual additional labor costs since NF consultation staff provide labor assistance at no direct cost as a courtesy for supplying valuable information.

Procedures

Means and Frequencies

Once data cleanup was completed, the Statistical Analysis Software (SAS) package (SAS Institute, 2002-2003) was used to evaluate the means and frequencies for available preconditioning data. Data were sorted according to animal sex and preconditioning year. The means and amount of data collected for each preconditioning variable can be viewed in Tables V-1 and V-2.

More information relative to preconditioning variables sorted by animal sex and preconditioning year can be found in Appendix Tables IX-1, IX-2, IX-3, and IX-4. As stated earlier, many steers and heifers were preconditioned in a group setting, therefore the main difference in preconditioning steers and heifers lies in performance information (e.g. weights and average daily gain) and not in individual costs.

Modeling

Preconditioning Model

As discussed in the economic framework section, the preconditioning costs chapter is based upon the profit maximization theory. The costs discussed in Chapter V represent the marginal costs associated with preconditioning while the returns represent the marginal returns to preconditioning. A model was generated to determine and identify key factors relative to preconditioning. The model was estimated using the Feasible Generalized Least Squares (FGLS) regression method due to heteroskedasticity

Table V–1. Summary Statistics for Preconditioning Variables by Sex, 2004-2005.

Variable	Sex	Mean	Std. Dev.	Minimum	Maximum
Lot Size	Steers	63.125	68.546	8.000	323.000
	Heifers	59.975	62.209	9.000	303.000
Est. Weaning Weight	Steers	520.187	61.325	401.000	648.784
	Heifers	503.047	58.376	409.860	625.048
Days Preconditioned	Steers	52.375	10.359	36.000	80.000
	Heifers	52.400	10.347	36.000	80.000
Average Daily Gain	Steers	1.438	0.604	-0.341	2.985
	Heifers	1.316	0.544	0.195	2.664
Actual Shrink	Steers	0.019	0.034	-0.056	0.113
	Heifers	0.032	0.035	-0.040	0.150
Preconditioning Weight after Shrink	Steers	632.841	67.279	465.000	776.000
	Heifers	600.377	60.261	460.560	750.000
Preconditioning Price	Steers	119.674	6.451	107.000	134.000
	Heifers	112.418	4.138	104.000	119.000
Marketing Costs	Steers	22.794	3.343	15.360	27.060
	Heifers	22.327	3.507	15.360	27.060
Feed and Mineral Costs	Steers	22.997	6.244	13.220	50.160
	Heifers	22.997	6.244	13.220	50.160
Feed Costs/Ton	Steers	178.464	23.250	116.460	236.000
	Heifers	178.464	23.250	116.460	236.000
Hay Costs	Steers	10.027	5.911	2.837	28.000
	Heifers	10.027	5.911	2.837	28.000
Vaccination Costs	Steers	8.234	3.961	3.523	24.920
	Heifers	8.234	3.961	3.523	24.920
Additional Labor Costs	Steers	1.995	1.028	0.580	5.690
	Heifers	1.995	1.028	0.580	5.690
Tot. Preconditioning Costs	Steers	43.149	9.064	28.330	65.690
	Heifers	43.201	9.022	28.330	65.690
Net Margin Based on No. Head Sold	Steers	67.745	38.542	-52.326	165.772
	Heifers	55.916	33.563	-21.874	132.933
Opportunity Costs	Steers	6.461	1.356	4.184	9.684
	Heifers	5.769	1.205	3.860	8.817

Table V–2. Number of Lots for Preconditioning Variables by Sex and Year.

	Steers		Heifers	
	2004	**2005**	**2004**	**2005**
Total	11	29	11	29
Lot Size (head)				
<50	5	20	7	19
50-100	4	4	1	5
100-150	1	3	2	3
>150	1	2	1	2
Estimated Weaning Weight (pounds)				
400-500	4	13	6	15
500-600	5	11	4	12
>600	2	5	1	2
Days Preconditioned				
<45	6	3	6	3
45-55	5	11	5	11
55-65	0	10	0	10
>65	0	5	0	5
Average Daily Gain (pounds/day)				
<1	2	4	3	4
1-2	9	20	8	20
2-3	0	5	0	5
Actual Shrink after Preconditioning				
<1%	2	13	2	9
1-3%	6	6	6	4
3-5%	2	5	2	9
>5%	1	5	1	7
Preconditioning Weight after Shrink (pounds)				
400-500	1	1	0	1
500-600	4	6	6	17
600-700	5	15	5	9
>700	1	7	0	2
Preconditioning Price				
<$115	5	3	8	17
$115-120	4	9	3	12
$120-125	1	10	0	0
$125-130	0	5	0	0
$130-135	1	2	0	0
Marketing Costs				
$15-20	0	5	1	5
$20-25	11	10	10	10
>$25	0	14	0	14
Feed and Mineral Costs ($/head)				
<$15	1	2	1	2
$15-20	5	1	5	1
$20-25	1	10	1	10
$25-30	4	12	4	12
>$30	0	4	0	4

Table V--2. Number of Lots for Preconditioning Variables by Sex and Year. (continued)

	Steers		Heifers	
	2004	**2005**	**2004**	**2005**
Feed Costs Per Ton ($/ton)				
<$150	3	2	3	2
$150-200	6	24	6	24
>$200	2	3	2	3
Hay Costs ($/head)				
<$5	1	5	1	5
$5-15	9	19	9	19
>$15	1	5	1	5
Vaccination Costs ($/head)				
<$5	0	1	0	1
$5-10	9	21	9	21
>$10	2	7	2	7
Additional Labor Costs ($/head)				
<$1	1	5	1	5
$1-3	9	21	9	21
>$3	1	3	1	3
Total Preconditioning Costs ($/head)				
<$35	3	4	3	4
$35-45	7	7	7	7
>$45	1	18	1	18
Net Margin Based on No. Head Sold				
<$30	2	2	1	6
$30-50	3	4	4	6
$50-80	6	8	6	10
$80-100	0	7	0	3
>$100	0	8	0	4
Opportunity Costs				
<$6	5	1	6	4
$6-7	4	5	5	9
>$7	2	23	0	16

of the error terms when estimated with Ordinary Least Squares (OLS) regression. The general preconditioning model is:

$$Mgn\_hd_i = \alpha + \beta_1 WWT_i + \beta_2 DAYS_i + \beta_3 ADG_i + \beta_4 FDMIN_i + \beta_5 HAY_i + \beta_6 VACCS_i + \beta_7 ADLBR_i + \sum_{j=1}^{2} \beta_8 YR2_{ij} + \varepsilon_i \quad (7)$$

where net margins on a per head basis (*Mgn_hd*) is a function of variables relating to animal performance (i.e. estimated weaning weight (WWT), length of preconditioning

period (DAYS), and average daily gain (ADG) as well as variables describing a producer's cost structure (i.e. feed and mineral cost (FDMIN), hay costs (HAY), vaccination and medical costs (VACCS), and additional labor (ADLBR) for the i^{th} observation. Complete variable definitions are given in Table V-3. The variable *YR2* is included in equation 7 since the data includes two years of preconditioning information. Thus, the variable year two (*YR2*) is used to account for any difference between time periods.

Table V–3. Preconditioning Variable Definitions.

Variable	Unit	Description
Mgn_hd	$/head	Preconditioning Payweight Revenue less Estimated Weaning Payweight Revenue less Total Preconditioning Costs
WWT	Pounds	Weaning Weight after accounting for estimated shrink
DAYS	Number of Days	Length of Preconditioning
ADG	Pounds	Average Daily Gain
FDMIN	$/head	Feed and Mineral Costs
HAY	$/head	Hay Costs
VACCS	$/head	Vaccination/Medical Costs
ADLBR	$/head	Additional Labor Costs
YR2	1	Year 2004 Dummy Variable
	2	Year 2005 Dummy Variable

Besides production costs in the estimated model, producers incur other costs such as opportunity cost, marketing costs, and the actual shrink incurred due to transportation. Opportunity cost was omitted from the model as it is directly correlated to the length of preconditioning and placement weight and is linked to a common interest rate across all producers. Marketing costs after preconditioning are also omitted from the model as these costs are a direct result of pay weight (i.e. animal weight after calculating percent

shrink). Additionally, actual shrink was omitted from the model as observations were quite variable throughout the data set, and proper interpretation or understanding of the variability was unclear. Barnes, Smith, and Lalman (2002) reinforce the importance of shrink and provide a detailed explanation of the importance of managing the variables impacting feeder calf shrink. Alabama Extension personnel estimate that non-preconditioned cattle can lose 10% of body weight due to gathering, sorting, and transportation as compared to an estimated 5% shrink for preconditioned cattle (Prevatt and Rankins, 2004).

Results

Preconditioning Model

The base model, when evaluated according to the Feasible Generalized Least Squares regression procedure, explained 51.7% of the variability in the returns to preconditioning. Results for the preconditioning model are in Table V-4.

The FGLS results show the average preconditioning margin to be $42.96/head when all other model characteristics are at their average. Results also show that days preconditioned and average daily gain has a significant impact on net margins from preconditioning. If a producer were to increase the length of preconditioning by one day, he/she would return $0.99/head. Also, producers received $21.31/head for every additional pound gained per day during the preconditioning phase. If one were to increase average daily gain by 0.2, then one would contribute approximately $4.25/head to net margins. Costs associated with animal nutrition had the largest influence on preconditioning costs. Each $1 increase in feed and mineral costs have a $1.47/head

decline in net returns, while for hay the negative effect is $2.31/head. The estimated cost of vaccinations and additional labor were not significant which was not expected. Possible explanations for insignificant variables include limited data observations (i.e. 80 total observations) and missing observations which were filled in with the average of all other producers in that specific category.

Table V–4. Regression Results for Preconditioning.

Dependent Variable	**Variable Definition**
Net Margin ($/head)	Marginal returns to preconditioning
Independent Variable	**Coefficients ($/head)**
Intercept	42.959*
	(1.70)
Actual Weaning Weight	-0.017
	(0.42)
Days Preconditioned	0.991***
	(3.65)
Average Daily Gain	21.314***
	(3.60)
Feed and Mineral	-1.470**
	(2.34)
Hay	-2.308***
	(4.08)
Vaccinations	-0.397
	(0.52)
Additional Labor	-0.501
	(0.22)
Year 2	10.625
	(1.57)
Number of Observations	80
Adjusted R^2	51.740

Numbers in parentheses are absolute values of calculated t statistics; * = 0.10, ** = 0.05, and *** = 0.01 significance level.

Once again, the preconditioning chapter of this thesis shows that key factors such as average daily gain, feed and mineral costs, and the cost of hay are influential in net

returns to preconditioning. It has been found that the average marginal return to preconditioning is approximately $43.00/head when animal shrink, marketing costs, and opportunity costs are not included in the model. When these factors are considered, Noble Foundation BPS cooperators report average preconditioning margins of $62.00/head. However, there is a large standard deviation associated with this value. This is in combination with the fact that the $62.00/head margin does not account for typical additional labor costs as BPS cooperators receive additional assistance by Noble Foundation staff at no direct cost.

CHAPTER VI

MARKET VALUE OF PRECONDITIONED FEEDER CATTLE

Preconditioning can be either profitable or unprofitable depending on the producer's cost structure and factors affecting returns. This chapter builds on past research and uses previous findings as a guide to estimate the influence market factors and cattle characteristics have on price received for feeder cattle sold from the Samuel Roberts Noble Foundation's BPS program.

Objectives

The general objective is to reduce the asymmetric market information between buyers and sellers regarding feeder cattle quality characteristics and management practices. Specifically, this study seeks to determine the price differentials for Noble Foundation versus alternative preconditioning management practices. One can think of the specific objective as determining the premium received for producing feeder cattle according to the Noble Foundations' integrated beef production system (BPS) guidelines.

Data

Two years of data were collected at the Oklahoma National Stockyards on four sales where Noble Foundation BPS cattle were sold. Information relative to the four sales was recorded by Noble Foundation staff, Oklahoma State University faculty, and an Oklahoma State University graduate student. The cross-sectional data includes

information on a per lot basis such as the number of head, average weight, price received, level of management, sex, breed type, fleshing ability, muscling, frame score, uniformity, the presence of horns, and overall lot health. Data collectors were as consistent as possible in recording information during a sale, however collection consistency cannot be guaranteed across the four sales. The three variables in which collection results are most likely to differ include animal health, fleshiness, and muscling.

First, it should be noted that this data and findings were confined to feeder cattle in the weight range of 400 to 850 pounds. In an effort to obtain evenly distributed data, information was collected on cattle not sold under the Noble Foundation BPS program (non-Noble Foundation calves) both prior to and after Noble Foundation cattle entered the sale ring. Due to the nature of the OKC National Stockyards, all sales occurred on Monday. Sale 1 occurred on December 5, 2005. Data set 1 is the largest of the four sales with information collected on a total of 343 sale lots, of which 75 lots were Noble Foundation BPS cattle. The sale on January 30, 2006, referred to as sale 2, was a much smaller sale and included 172 total lots, 11 of which were NF calves. Sale 3 occurred on October 16, 2006. The data set for sale 3 included 35 NF lots out of a total of 177 lots. Sale 4 occurred on December 4, 2006 with data set 4 including 72 total lots, 27 of which were affiliated with the Noble Foundation. Table VI-1 summarizes data collected on a per head basis. For further classification of data collected at all four sales see Table IX-5 in the appendix. Sales 1 and 2 refer to calves sold from the 2005 spring calf crop and Sales 3 and 4, from the 2006 calf crop.

Table VI–1. Sale Market Summary (Number of Head).

Sale Date	Closing Market Report	Total Data Collected	Noble Foundation Cattle
1. 12-5-05	12,200	7,100	1,984
2. 1-30-06	9,700	3,250	418
3. 10-16-06	7,400	2,495	1,063
4. 12-4-06	6,000	1,123	538

Note: Closing market report information for each Oklahoma National Stockyard sale was obtained from the USDA Agricultural Marketing Service (website: www.ams.usda.gov).

Sales 1 and 3, the first sale of each season, were the primary sales for the Noble Foundation BPS program. The date for sale 1 was picked by Noble Foundation economists and their colleagues according to historical Oklahoma National Stockyard market report data. They found that prices received for cattle of similar weight tended to be higher for the first Monday sale in December. However, the analysis above was not used for the third sale. Sale 3 was chosen out of necessity due to intense drought conditions affecting Ardmore and the Noble Foundation consultation area during the summer and fall of 2006. Producers were forced to early wean calves and in doing so sold calves much earlier than the previous year. Some producers however chose not to sell their calves on the primary sales dates. Therefore, sales 2 and 4 may be considered "secondary sales" for each year. One possible explanation is that these producers held lighter weight calves in an effort to increase gains prior to marketing. Due to seasonal patterns, limited number of cattle available and timing issues, categories were unable to be grouped exactly the same across all four sales when estimating pricing models.

Procedures

Means and Frequencies

When lots were sorted based on their affiliation with the Noble Foundation, the means procedure showed there was an average price differential of $3.89/cwt for NF cattle as compared to Non-NF cattle. A more detailed look at price differentials regarding NF and Non-NF cattle can be seen in Table VI-2. An additional table (Table IX-6) of means is provided in the appendix. Moreover, the percent frequencies for BPS sale characteristics are shown in Table VI-3.

Data were also sorted by sex and average weight between NF and non-NF cattle. The price differential is larger for lighter weight calves than it is for heavier weight calves. Results show that the average price for 400-500 pound Noble Foundation steers was $6.77/cwt higher in Sale 1 than non-NF calves. This price difference increased to $14.69/cwt for Sale 4. This price differential averaged $12.32/cwt across three of the four sales (excluding sale 2 because information was not available for 400 - 500 pound steers). On the other hand, the price differential for Noble Foundation steers weighing greater than 700 pounds averaged $2.98/cwt. This comparison suggests that buyers place a higher value on preconditioned calves at lighter weights as compared to similar preconditioned calves of a heavier weight. To view more information regarding price differentials received for lighter weight calves and the possibility of price differences when marketing heifers see Appendix Table IX-7.

Table VI–2. Summary statistics for Beef Production System Sales by NF and Non-NF.

	Mean	Standard Deviation	Minimum	Maximum
12-5-05				
Price ($/cwt)				
NF	117.64	8.37	106.50	148.00
Non-NF	114.95	10.06	85.00	156.50
Average Weight (lbs)				
NF	616.61	91.56	408.75	805.00
Non-NF	618.56	107.30	401.67	850.23
Lot Size (No. Head)				
NF	26.45	25.48	3.00	114.00
Non-NF	19.09	16.99	3.00	117.00
1-30-06				
Price ($/cwt)				
NF	113.40	7.55	102.50	127.00
Non-NF	111.23	11.90	81.00	143.00
Average Weight (lbs)				
NF	667.88	57.38	552.19	739.17
Non-NF	678.39	109.21	403.75	849.32
Lot Size (No. Head)				
NF	38.00	33.35	6.00	122.00
Non-NF	17.55	14.64	3.00	86.00
10-16-06				
Price ($/cwt)				
NF	117.55	11.88	101.00	147.10
Non-NF	106.99	10.54	66.00	141.00
Average Weight (lbs)				
NF	531.43	80.84	402.00	711.00
Non-NF	559.28	102.00	401.00	811.00
Lot Size (No. Head)				
NF	30.29	26.58	4.00	103.00
Non-NF	10.09	8.69	3.00	48.00
12-4-06				
Price ($/cwt)				
NF	106.00	7.94	96.50	129.50
Non-NF	105.88	9.02	90.00	132.50
Average Weight (lbs)				
NF	610.81	93.11	401.00	726.00
Non-NF	549.93	92.98	400.00	764.00
Lot Size (No. Head)				
NF	19.81	16.90	3.00	67.00
Non-NF	13.09	13.02	3.00	68.00

Table VI–3. Percent Frequency of Beef Production System Calf Attributes and Sale Data by Sale Date.

	12-5-05		1-30-06		10-16-06		12-4-06	
	NF	**Non-NF**	**NF**	**Non-NF**	**NF**	**Non-NF**	**NF**	**Non-NF**
No. of Lots	75	268	11	161	35	142	27	45
% of Total	21.87	78.13	6.40	93.60	19.77	80.23	37.50	62.50
Lot Size								
<10	28.00	32.46	18.18	34.78	22.86	64.79	22.22	53.33
10-20	25.33	31.34	18.18	34.78	20.00	23.94	40.74	26.67
20-30	16.00	18.28	18.18	14.29	22.86	6.34	14.81	11.11
30-40	6.67	7.84	9.09	9.32	5.71	2.82	11.11	4.44
40-50	8.00	3.73	9.09	1.86	5.71	2.11	3.70	0.00
50 plus	16.00	6.34	27.27	4.97	22.86	0.00	7.41	4.44
Weight (lbs)								
400-500	10.67	14.93	0.00	6.83	40.00	35.21	14.81	33.33
500-600	30.67	29.48	9.09	18.01	40.00	33.80	29.63	40.00
600-700	36.00	32.46	54.55	25.47	17.14	19.72	40.74	17.78
700 plus	22.67	23.13	36.36	49.69	2.86	11.27	14.81	8.89
Sex								
Steer	49.33	52.61	45.45	53.42	54.29	50.00	48.15	57.78
Heifer	50.67	42.54	54.55	42.24	45.71	41.55	51.85	40.00
Bull / Mixed	0.00	4.85	0.00	4.35	0.00	8.45	0.00	2.22
Breed								
Angus / Angus-X	84.00	62.41	54.55	65.22	48.57	54.23	77.78	71.11
Exotics / Exotic-X	16.00	29.32	45.45	29.19	51.43	28.17	22.22	24.44
Brahman / Hereford / Holstein	0.00	4.14	0.00	2.48	0.00	16.20	0.00	4.44
Longhorn	0.00	4.14	0.00	3.11	0.00	1.41	0.00	0.00
Frame								
Large	5.33	13.16	63.64	52.80	71.43	63.38	29.63	31.11
Medium	94.67	85.71	36.36	47.20	28.57	36.62	70.37	68.89
Small	0.00	1.13	0.00	0.00	0.00	0.00	0.00	0.00

Table VI--3. Percent Frequency of Beef Production System Calf Attributes and Sale Data by Sale Date. (continued)

	12-5-05		1-30-06		10-16-06		12-4-06	
	NF	**Non-NF**	**NF**	**Non-NF**	**NF**	**Non-NF**	**NF**	**Non-NF**
Muscle								
Thick	0.00	1.88	27.27	18.01	40.00	10.56	11.11	11.11
Average	96.00	93.23	72.73	76.40	60.00	76.76	88.89	84.44
Thin / Slightly Thin	4.00	4.89	0.00	5.59	0.00	12.68	0.00	4.44
Flesh								
Thin	0.00	20.68	0.00	1.24	0.00	9.86	0.00	20.00
Average	50.67	66.92	18.18	73.91	82.86	66.90	66.67	68.89
Fleshy	49.33	12.41	81.82	24.84	17.14	23.24	33.33	11.11
Horns								
Polled	86.67	68.05	81.82	63.35	100.00	67.61	100.00	77.78
Horned / Unhealed Mixed	13.33	31.95	18.18	36.65	0.00	32.39	0.00	22.22
Health								
Healthy	100.00	98.12	100.00	98.14	100.00	100.00	100.00	100.00
Non-Healthy	0.00	1.88	0.00	1.86	0.00	0.00	0.00	0.00
Uniformity								
Uniform	76.00	80.45	100.00	84.47	100.00	63.38	100.00	80.00
Uneven	24.00	19.55	0.00	15.53	0.00	36.62	0.00	20.00
Management								
Vaccination & Weaning Unknown	0.00	36.57	0.00	44.72	0.00	69.72	0.00	51.11
Vaccinated & Non-Weaned	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00
Weaned & Vaccination Unknown	0.00	30.60	0.00	36.02	0.00	9.86	0.00	44.44
Vaccinated & Weaned Not-Certified	100.00	25.37	100.00	19.25	0.00	16.20	0.00	0.00
Other Certified Preconditioning Program	0.00	6.72	0.00	0.00	0.00	4.23	0.00	4.44
NF: PVP & QSA Certified	NA	NA	NA	NA	80.00	0.00	44.44	0.00
NF: Non-PVP / QSA status	NA	NA	NA	NA	20.00	0.00	55.56	0.00

Hedonic Model

General Model Form

The primary procedure, hedonic pricing theory, is to estimate price received as a function of market factors and cattle characteristics. To accomplish this objective, two models were generated. The general form of both models is:

$$
\begin{aligned}
MP_i = {} & \alpha + \beta_1 HD_i + \beta_2 HD_i^2 + \beta_3 AW_i + \beta_4 AW_i^2 + \sum_{j=1}^{4} \beta_{5j} BD_{ij} \\
& + \sum_{j=1}^{3} \beta_{6j} SX_{ij} + \sum_{j=1}^{2} \beta_{7j} HR_{ij} + \sum_{j=1}^{3} \beta_{8j} FL_{ij} + \sum_{j=1}^{3} \beta_{9j} MU_{ij} + \sum_{j=1}^{2} \beta_{10j} HL_{ij} \\
& + \sum_{j=1}^{2} \beta_{11j} UN_{ij} + \sum_{j=1}^{3} \beta_{12j} FR_{ij} + \sum_{j=1}^{8} \beta_{13j} MGMT_{ij} + \varepsilon_i
\end{aligned} \tag{8}
$$

where MP is the price received for the i^{th} lot, HD is the number of cattle, AW is the average weight, BD is the breed type, SX is animal sex, HR is the presence of horns, FL is the level of fleshiness, MU is the degree of muscling, HL is overall lot health, UN is lot uniformity, FR is the animals frame score, and MGMT is the level of management implemented at the ranch for the i^{th} lot and the j^{th} sale. Data pertaining to cattle characteristics is categorical; therefore dummy variables were assigned for several of the above variables. Complete variable definitions can be found in Table VI-4.

The variable of relevance to age and source verification and preconditioning is management. The model attempts to hold constant many variables affecting feeder cattle prices. When done so, the coefficient for Noble Foundation management practices can be compared to the coefficient for non-Noble Foundation management practices. If the Noble Foundation coefficient is significantly larger than the coefficient for non-Noble

Foundation management practices, buyers paid a premium for preconditioning (in $/cwt) including age and source verification.

Table VI–4. Dummy Variable Coding.

Characteristic	Code	Description
Management (*MGMT*)	1	Vaccinations Unknown; Weaning Unknown
	2	Vaccinated; Weaning Unknown
	3	Vaccinations Unknown; Weaned
	4	Vaccinated; Weaned; Not Certified
	5	OQBN Certified
	6	Other Certified Preconditioning Program
	7	NF: PVP or QSA Certified*
	8	NF: Non-PVP or QSA Certified*
Sex (*SX*)	1	Steers
	2	Heifers
	3	Bulls; Mixed
Breed Type (*BD*)	1	Angus; Angus Cross; English
	2	Exotics; Exotic Cross
	3	Brahman Influence; Herefords; Holsteins
	4	Longhorns
Fleshiness (*FL*)	1	Thin
	2	Average
	3	Fleshy; Above Average
Muscling (*MU*)	1	Thick
	2	Medium
	3	Thin
Frame Score (*FR*)	1	Large
	2	Medium
	3	Small
Uniformity (*UN*)	1	Uniform
	2	Uneven
Horns (*HR*)	1	Polled; Dehorned
	2	Horns; Unhealed; Mixed
Health (*HL*)	1	Healthy
	2	Unhealthy

*Management 7 and 8 were only applicable for BPS sales 3 and 4.

Therefore, the primary differences between model 1 and model 2 lie in the management variable. Model 1 compares each management classification to the category with the least information passed to buyers (i.e. weaning and vaccinations unknown). Model 2, however, compares the Noble Foundation variable to all other management classifications. It is Model 2 that is of primary importance to the Noble Foundation as it tells how much NF cattle are valued above all other cattle sold at market on the same day. Although the methods and procedures used can capture the value a buyer places on preconditioning management practices, one should keep in mind that it cannot specifically account for the value buyers place on the reputation of the Noble Foundation.

When estimating both models 1 and 2, data limitations and few observations for certain categories caused statistical difficulties. In an effort to avoid biased estimates, some categories needed to be re-grouped. For example, due to limited observations, categories in the breed type and sex variables could not be modeled independently. To correct for these estimation problems, certain variables are aggregated or combined into similar groupings. For instance, in the breed type category few Longhorns were observed on sale day thus, were combined with the group for Brahman influence, Herefords, and Holsteins. In addition, the variable health was left out of both sales 3 and 4 due to a limited number of unhealthy observations in the data set.

Misspecification tests were conducted to evaluate if multicollinearity and heteroskedasticity problems exist. Within SAS, the Variance Inflation Factor (VIF) was used to determine if the predictor variables are correlated to one another and the SAS AUTOREG procedure in combination with the Engle Lagrange Multiplier (LM) test was used to judge if error variance is constant or non-constant. The tests prove that

multicollinearity does not exist in the Ordinary Least Squares (OLS) regression models. However as expected, heteroskedasticity of the error terms was found. Therefore, the Feasible Generalized Least Squares (FGLS) regression procedure in SAS was used to correct for non-constant error variance.

Differences in Sales 1 & 2 and Sales 3 & 4

Due to categorical characteristics, feeder cattle can be sorted into similar groupings as well as by their association with the Noble Foundation. As the beef industry and the NF's BPS program expand, so did this thesis project. During the time period of sales 1 and 2, all Noble Foundation cattle were categorized under the management option as calves that have been vaccinated and weaned. They were not recognized in the beef industry as being managed under a certified preconditioning program. During the course of the sale, non-NF calves were also assigned this management classification. Therefore for modeling purposes, the fourth management classification (non-certified, preconditioned calves) was sorted according to Noble Foundation involvement.

Prior to sales 3 and 4, Noble Foundation staff and cooperators took the needed steps to become PVP and/or QSA certified. Thus, for sales 3 and 4, Noble Foundation cattle that were PVP and/or QSA certified were categorized separately from those calves that were not certified under a PVP and/or QSA program. In addition to modeling PVP/QSA and Non-PVP/QSA management groups independently, these two groups were combined to gain a perspective for the overall value of the 2006 BPS program year. The method of combining Noble Foundation management groups allow for the overall value

of the BPS program to be determined. In doing so, sales 1 and 2 either can or cannot be directly compared to sales 3 and 4.

Pooled Sales

After modeling each sale independently, we pooled all four data sets due to a wide range in individual sale results. In evaluating the BPS program over a two-year period of time, an additional variable was inserted into the general form of models 1 and 2. The "Nearby Futures" price is necessary to account for the time between marketing dates. This information was obtained from the Livestock Marketing Information Center (LMIC). It represents the nearby futures contract price for each actual live marketing date. For example, if one were to market calves on October 25th the nearest contract price would be that of a November futures contract. After pooling the data for all four sales, the management categories had to be re-classified. By grouping all Noble Foundation calves (BPS Management Categories 4, 7, and 8) across the four sales, the market value of the BPS program can be determined for the previous two year period.

The completion of pooling sales 1 through 4 led to interest in combining only the primary data sets (i.e. Sales 1 and 3). This procedure provides insight to the premium for the overall BPS program during the two larger sales (i.e. the first sale for each marketing year). Historically, sale 3 which occurred in October would be at a low price point in the seasonal pattern. However, due to drought conditions and increased corn demand for ethanol production, Noble Foundation BPS cooperators who sold cattle sold cattle in October did so during a seasonal high for the fall 2006 marketing year. Complementing the steps performed during the pooling procedure, both models 1 (i.e. comparing calves

managed under the NF BPS program to calves sold with the least amount of information provided) and 2 (i.e. comparing NF calves to all other cattle presented at market) were generated.

Larger NF Sale Lots

After generating values for models 1 and 2 independently and collectively across all sales, it became interesting to determine the effects of selling larger lots of properly managed feeder cattle. Data were sorted with sale lots of 20 head or more, for which cattle were polled, healthy, uniform, and managed according to NF specifications. These lots were labeled as large Noble Foundation sale lots (*LGNF*).

A model similar to models 1 and 2 was estimated comparing the larger lot sizes managed according to recommended practices with all other feeder cattle sold at each sale. The LGNF model was estimated for each sale independently (Sales 1, 2, 3, and 4) as well as pooled collectively across all four sales and the primary sales. When data were pooled, an additional variable (i.e. futures price) was included in the model to account for varying time periods as described above.

Results

As discussed previously, due to the nature of the data (i.e. cross-sectional/categorical), heteroskedasticity was found to exist in all hedonic OLS models. Therefore, the Feasible Generalized Least Squares (FGLS) regression was chosen to correct for non-constant error variance. All reported results are based on FGLS statistics and the comparison group is identified as the base in the tables. Since the management

variable is of primary importance to Noble Foundation cooperators and staff, it will be discussed in detail whereas other lot characteristic findings are briefly mentioned.

Model 1 – Independent Sale Results

The FGLS regression procedure was able to respectively explain 71.9%, 90.4%, 80.3%, and 77.8% of the variation for sales 1, 2, 3, and 4 with Model 1 (Tables VI-5 and VI-6). Estimated models include two continuous variables related to market forces: animal weight and lot size. The quadratic form of weight and lot size is used to aid in determining the directional effect of heavier cattle and/or larger lots. For example, during sale 1 the parameter estimate for animal weight is -0.186, while the quadratic estimate for animal weight is 0.0001. When evaluated together, these estimates allow for the conclusion that sale price decreases for heavier weight cattle at a decreasing rate. Lot size can also be evaluated in the same manner. The lot size estimate for sale 1 is 0.113 while the quadratic lot size estimate is negative 0.0008. The estimates suggest the price received for cattle sold in larger lots increases at a decreasing rate. Relative to the Noble Foundation's situation, producers can capitalize on lot size effect through ranch management practices. Figure VI-1 shows the effect of lot size on feeder calf price for all four independent sales as well as when all data sets were pooled together. Variability in curve shape from sale to sale is dependent on items such as the total number of cattle sold at market, the average lot size, the number and level of buying power, and quantity demanded among bidders, and weather in combination with many other influential market factors. This figure visually shows were the lot size effect is maximized in relation to feeder cattle pricing. Example, Figure VI-1 suggests that cattle return the most

revenue to producers when sold in lots of approximately 70 head for sale 1. Additional Model 1 results relating to cattle characteristics are as follows:

- **Horns:** The discount present for horned lots was only significant for Sale 2. Buyers discounted horned cattle $0.93/cwt compared with polled/dehorned and healed cattle.
- **Health:** During sale 2, unhealthy cattle were discounted $2.83/cwt compared with healthy cattle. For sale 1, cattle perceived as unhealthy were not significantly different compared to healthy cattle. Unhealthy cattle were not observed for sales 3 and 4.
- **Sex:** Heifers were significantly discounted compared to steers for sales 1, 2, and 3. Averaged over the first three sales, the discount level is approximated to be $9.31/cwt. Sale 4 was omitted in this value as heifers were grouped with bulls in order to obtain un-biased model estimates. Bull calves were not significantly discounted compared to steers for sales 1 and 2. They were discounted $6.21/cwt for sale 3 and when combined with heifers were discounted $8.13/cwt for sale 4.
- **Breed:** Continental type cattle (e.g. Charolais, Limousin, etc.) were significantly discounted in the two primary sales (i.e. sales 1 and 3) $0.87/cwt and $3.09/cwt, respectively. As expected, Brahman, Hereford, Holstein, and Longhorn breed types were significantly discounted, though the discount varied among sales. The only exception was sale 4 where breed categories were not significantly different.

- **Fleshiness:** Fleshiness was not a significant characteristic in sales 1 and 2 but was in sales 3 and 4. Thin fleshed calves received a $6.10/cwt discount in sale 3 while for sale 4 fleshier/fatter calves received a $3.21/cwt premium compared to calves of average flesh. It is speculated that thin calves in sale 3 received a discount due to drought conditions and limited forage as opposed to years with normal rainfall where these calves would typically receive a premium due to compensatory gain opportunities.
- **Muscling:** Calves perceived as above average/thick muscled were discounted $1.89/cwt and $2.53/cwt for sales 3 and 4 respectively. Prices for heavier muscled calves were not significantly different for sales 1 and 2. Thin muscled calves were discounted in sales 1 and 3 (i.e. primary sales). Discounts ranged from $2.55/cwt to $6.71/cwt.
- **Uniformity:** Lots classified as uniform were done so on the basis of animal height and weight (e.g. roughly the same size animal) and not based on hide color or breed type. Lot uniformity was only significant during sale 4. The discount for non-uniform sale lots was $3.40/cwt.
- **Frame Score:** Frame score was not significant in any of the four sales.

Once again, the focus of this study is on the level of producer management implemented at the ranch. The premium value and significance level associated with the management category varied widely across all four sales. However, in three of the four sales, NF BPS cattle received a statistically significant premium compared to feeder cattle sold with little or no information (i.e. weaning and vaccinations unknown). Sale 2

(January 30, 2006) was the only sale where none of the management variables were significantly different. This may have been due to fewer observations. During sale 1, NF BPS calves received a $3.27/cwt premium compared to calves where no information was known about weaning or vaccinations. Calves categorized as being managed according to certified preconditioning programs (e.g. OQBN/pharmaceutical programs) received a significant $0.50/cwt premium above NF calves at $3.77/cwt. One possible explanation is that sale 1 (December 5, 2005) was the first sale where NF calves produced under the BPS guidelines were marketed to the public. Other certified programs may have earned higher prices based on established reputations.

The management variable for sales 3 and 4 must be interpreted with caution. Remember, NF calves were sorted based upon PVP/QSA status. It was assumed that this separation would allow for the value of age and source verification to be determined. However, significant findings are not consistent across the two sales. For sale 3, cattle enrolled in PVP and/or QSA programs received a $4.72/cwt premium while non-PVP/QSA calves were not found to be significantly different when compared to calves sold with no information. For sale 4, findings were reversed. Non-PVP/QSA cattle received a $5.13/cwt premium while cattle managed under a PVP and/or QSA program were not significantly different than non-weaned, non-vaccinated cattle. More detailed results can be found in Tables VI-5 and VI-6.

Table VI–5. Regression Results for BPS Sales 1 and 2 Comparing NF Cattle with Other Management Programs (Model 1).

Dependent Variable	**Variable Definition**
Market Price (MP)	Sale lot transaction price

Independent Variable	**12-5-05 Coefficients**	**1-30-06 Coefficients**
Intercept	192.562***	223.652***
	(25.49)	(37.72)
No. Head	0.113***	0.161***
	(3.80)	(4.01)
No. Head2	-0.0008**	-0.002***
	(2.56)	(2.82)
Average Weight	-0.186***	-0.242***
	(8.01)	(14.74)
Average Weight2	0.0001***	0.0001***
	(5.71)	(10.24)
Breed Type		
Angus / Angus-X	Base	Base
Exotics / Exotic-X	-0.871*	-0.425
	(1.82)	(0.76)
Brahman / Hereford / Holstein	-6.881***	-4.476
	(4.32)	(0.89)
Longhorn	-10.688***	-24.443**
	(3.12)	(2.51)
Sex		
Steer	Base	Base
Heifer	-8.282***	-7.560***
	(19.06)	(14.11)
Bulls / Mixed	-0.583	-0.440
	(0.50)	(0.35)
Horns		
Polled	Base	Base
Horned / Unhealed / Mixed	-0.712	-0.931*
	(1.56)	(1.85)
Flesh		
Thin	-0.391	5.242
	(0.48)	(0.59)
Average	Base	Base
Fleshy	0.217	0.077
	(0.41)	(0.15)

Table VI--5.. Regression Results for BPS Sales 1 and 2 Comparing NF Cattle with Other Management Programs (Model 1). (continued)

Dependent Variable	**Variable Definition**
Market Price (MP)	Sale lot transaction price

Independent Variable	**12-5-05 Coefficients**	**1-30-06 Coefficients**
Muscle		
Thick	-7.885	-0.343
	(1.00)	(0.65)
Average	Base	Base
Thin	-2.548**	-6.680
	(2.15)	(1.33)
Lot Uniformity		
Uniform	Base	Base
Uneven	-0.522	-0.449
	(0.87)	(0.66)
Frame Score		
Large	0.195	0.171
	(0.27)	(0.33)
Medium	Base	Base
Small	1.826	NA
	(1.20)	NA
Management		
Vaccination & Weaning Unknown	Base	Base
Vaccinated & Weaning Unknown	2.192**	NA
	(2.05)	NA
Vaccination Unknown & Weaned	1.730**	0.103
	(2.27)	(0.19)
NF cattle; Vaccinated & Weaned Not-Certified	3.271***	0.258
	(4.33)	(0.25)
Non-NF cattle; Vaccinated & Weaned Not-Certified	1.650**	0.309
	(2.14)	(0.33)
Other Certified Preconditioning Program	3.770***	NA
	(3.31)	NA
Health		
Healthy	Base	Base
Unhealthy	-1.461	-2.829*
	(0.31)	(1.68)
Number of Observations	369	199
Adjusted R^2	71.950	90.410

Numbers in parenthesis are absolute values of calculated t statistics; * = 0.10, ** = 0.05, and *** = 0.01 significance level.

Table VI–6. Regression Results for BPS Sales 3 and 4 Comparing NF Cattle with Other Management Programs (Model 1).

Dependent Variable	**Variable Definition**
Market Price (MP)	Sale lot transaction price

Independent Variable	**10-16-06 Coefficients**	**12-4-06 Coefficients**
Intercept	195.334***	228.641***
	(16.99)	(9.86)
No. Head	0.191***	0.220**
	(3.25)	(2.07)
No. Head2	-0.001*	-0.003*
	(1.84)	(1.94)
Average Weight	-0.229***	-0.365***
	(5.75)	(4.51)
Average Weight2	0.0001***	0.0003***
	(4.29)	(3.81)
Breed Type		
Angus / Angus-X	Base	Base
Exotics / Exotic-X	-3.091***	-1.501
	(3.02)	(1.31)
Brahman / Hereford / Holstein	-8.091***	-1.645
	(6.50)	(0.47)
Longhorn		NA
		NA
Sex		
Steer	Base	Base
Heifer	-12.075***	-8.128***
	(16.19)	(9.26)
Bulls / Mixed	-6.208***	
	(4.34)	
Horns		
Polled	Base	Base
Horned / Unhealed / Mixed	0.277	1.959
	(0.25)	(1.48)
Flesh		
Thin	-6.104**	-1.751
	(2.27)	(0.65)
Average	Base	Base
Fleshy	-0.395	3.207*
	(0.41)	(1.92)

Table VI--6. Regression Results for BPS Sales 3 and 4 Comparing NF Cattle with Other Management Programs (Model 1). (continued)

Dependent Variable	**Variable Definition**	
Market Price (MP)	Sale lot transaction price	
Independent Variable	**10-16-06 Coefficients**	**12-4-06 Coefficients**
Muscle		
Thick	-1.885*	-2.534**
	(1.78)	(2.31)
Average	Base	Base
Thin	-6.713***	-2.426
	(3.46)	(0.80)
Lot Uniformity		
Uniform	Base	Base
Uneven	-1.124	-3.396***
	(1.33)	(3.28)
Frame Score		
Large	0.916	0.593
	(1.10)	(0.54)
Medium	Base	Base
Small	NA	NA
	NA	NA
Management		
Vaccination & Weaning Unknown	Base	Base
Vaccinated & Weaning Unknown	NA	NA
	NA	NA
Vaccination Unknown & Weaned	0.399	1.496
	(0.36)	(0.97)
Non-NF cattle; Vaccinated & Weaned Not-Certified	4.392***	NA
	(4.68)	NA
Other Certified Preconditioning Program	3.048	-2.922
	(1.40)	(0.47)
NF cattle; PVP & QSA certified	4.719***	2.343
	(3.19)	(1.17)
NF cattle; Non-PVP & QSA certified	5.791	5.128***
	(1.53)	(3.02)
Health		
Healthy	NA	NA
Unhealthy	NA	NA
Number of Observations	177	72
Adjusted R^2	80.280	77.820

Numbers in parenthesis are absolute values of calculated t statistics; * = 0.10, ** = 0.05, and *** = 0.01 significance level.

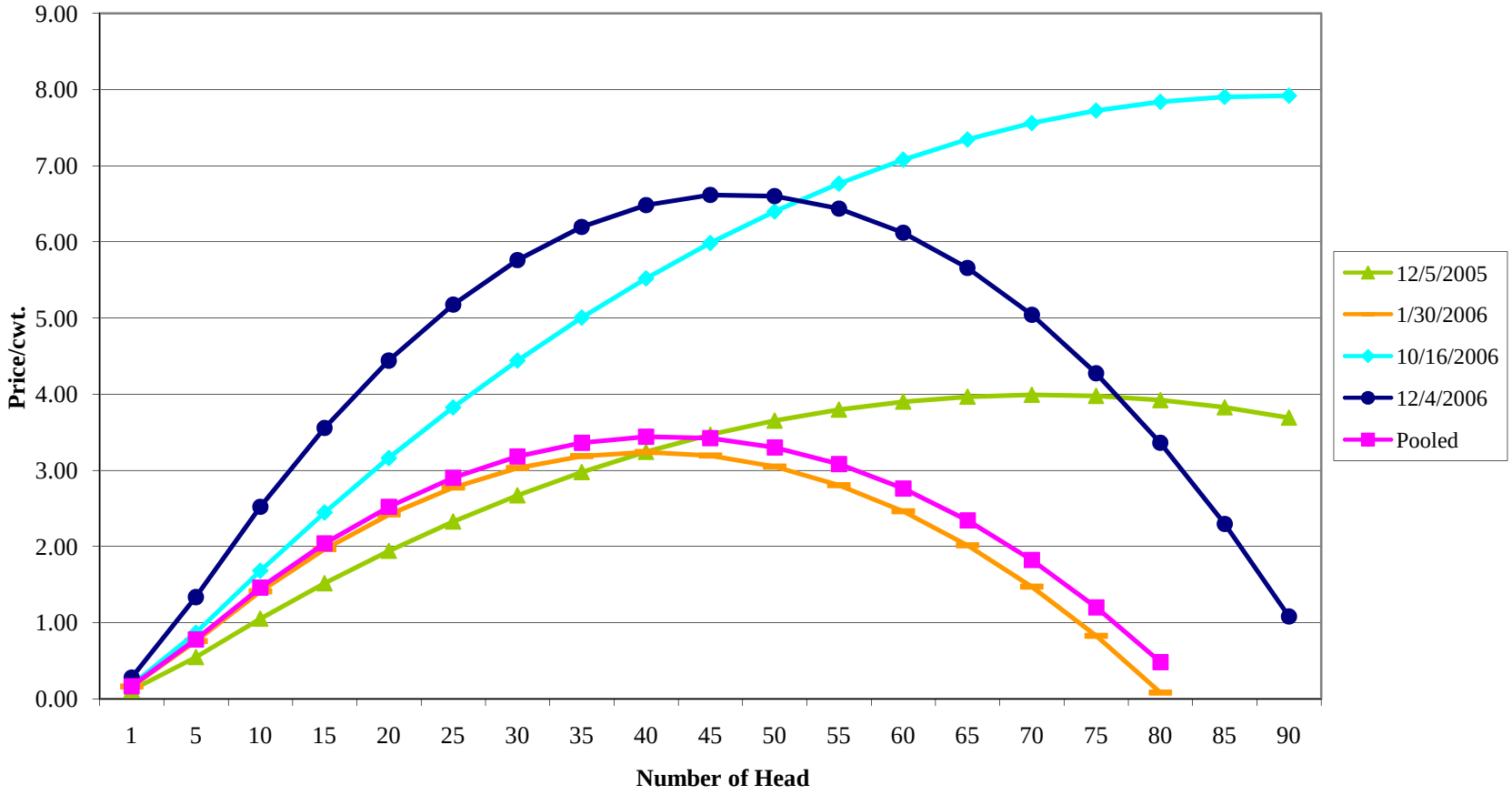

Figure VI-1. Lot Size and Price Relationship Model 1

Model 1 – Combined NF Management Groups

As stated previously, Noble Foundation calves that were PVP/QSA certified were combined with Noble Foundation calves that were not PVP/QSA certified for sales 3 and 4. In doing so, the overall value of the BPS program can be determined for the 2006 preconditioning year. Combining NF management groups for sales 3 and 4 explained 78.6% and 77.5% of pricing variation respectively. For model 1 (i.e. comparing all management variables to the least information available), Noble Foundation cooperators realized a premium of $5.19/cwt compared to non-weaned, non-vaccinated cattle in sale 3. During sale 4, premium levels were slightly lower at $4.54/cwt. Appendix Table IX-8 shows the results for model 1 when NF management practices are combined.

Model 1 – Pooled Results

When all four sales were collectively grouped, the FGLS regression procedure explained 72.7% of the variation in feeder cattle sale price. The BPS premium was $2.80/cwt when compared to non-weaned, non-vaccinated cattle. Other non-certified preconditioned feeder cattle received a premium of $1.82/cwt when compared to cattle sold with little or no information regarding weaning or vaccination practices. Other certified preconditioning programs were not significantly different.

The FGLS procedure explained 69.5% of feeder cattle sale price variation when only the primary sales were combined. When pooling two sales as compared to four, BPS premiums increased to $4.28/cwt when compared to cattle sold with the least information available. Noble Foundation premiums were larger than both non-certified and other certified preconditioning premiums which received $2.08/cwt and $3.85/cwt

respectively. A complete summary of regression results for pooled sales is shown in Appendix Table IX-9.

Model 2 – Independent Sale Results

Model 2 explained 70.0%, 90.4%, 70.9%, and 91.5% of the variation in market price for sales 1, 2, 3, and 4 respectively (Tables VI-7 and VI-8). Results for variables associated with cattle characteristics were generally similar as those for Model 1. As explained earlier, the results relative to the management variable for model 2 are of primary importance. NF BPS cattle received a premium when compared to all other management classifications for all sales with the exception of sale 2. Prior to imposing age and source verifications, BPS preconditioned cattle received a $1.86/cwt premium during sale 1. During sale 3 (October 16, 2006) cattle enrolled in a PVP/QSA program received a premium of $2.86/cwt while during sale 4 (December 4, 2006) non-PVP/QSA cattle received a premium of $3.39/cwt. One possibility for PVP/QSA cattle receiving a premium in one sale and not in another could be due to the fact that more PVP/QSA cattle were sold in sale 3 than non-PVP/QSA cattle. In sale 4, the reverse occurred and non-PVP/QSA calves out numbered PVP/QSA calves. Tables VI-7 and VI-8 illustrate the estimated parameters for all four individual sales.

Table VI–7. Regression Results for BPS Sales 1 and 2 Comparing NF Cattle with All Other Cattle (Model 2).

Dependent Variable	**Variable Definition**	
Market Price (MP)	Sale lot transaction price	
Independent Variable	**12-5-05 Coefficients**	**1-30-06 Coefficients**
Intercept	194.398***	225.107***
	(24.35)	(39.09)
No. Head	0.128***	0.149***
	(4.38)	(3.73)
No. Head2	-0.0010***	-0.001**
	(3.02)	(2.56)
Average Weight	-0.190***	-0.245***
	(7.76)	(15.19)
Average Weight2	0.0001***	0.0001***
	(5.67)	(10.51)
Breed Type		
Angus / Angus-X	Base	Base
Exotics / Exotic-X	-1.036**	-0.360
	(2.18)	(0.64)
Brahman / Hereford / Holstein	-7.203***	-3.650
	(4.49)	(0.74)
Longhorn	-11.177***	-24.750**
	(3.19)	(2.54)
Sex		
Steer	Base	Base
Heifer	-8.305***	-7.783***
	(18.88)	(14.33)
Bulls / Mixed	-1.737	-0.453
	(1.00)	(0.36)
Horns		
Polled	Base	Base
Horned / Unhealed / Mixed	-0.718	-1.008**
	(1.54)	(1.98)
Flesh		
Thin	-0.116	5.439
	(0.14)	(0.61)
Average	Base	Base
Fleshy	0.300	0.128
	(0.56)	(0.24)

Table VI--7. Regression Results for BPS Sales 1 and 2 Comparing NF Cattle with All Other Cattle (Model 2). (continued)

Dependent Variable	**Variable Definition**	
Market Price (MP)	Sale lot transaction price	
Independent Variable	**12-5-05 Coefficients**	**1-30-06 Coefficients**
Muscle		
Thick	-7.592	-0.443
	(0.96)	(0.82)
Average	Base	Base
Thin	-2.860**	-6.260
	(2.40)	(1.27)
Lot Uniformity		
Uniform	Base	Base
Uneven	-0.492	-0.563
	(0.82)	(0.82)
Frame Score		
Large	0.112	0.217
	(0.15)	(0.41)
Medium	Base	Base
Small	2.458	NA
	(1.63)	NA
Management		
All other management classifications	Base	Base
NF cattle; Vaccinated & Weaned Not-Certified	1.861***	0.054
	(3.48)	(0.05)
Health		
Healthy	Base	Base
Unhealthy	-1.870	-3.106*
	(0.39)	(1.85)
Number of Observations	369	199
Adjusted R^2	70.000	90.390

Numbers in parenthesis are absolute values of calculated t statistics; * = 0.10, ** = 0.05, and *** = 0.01 significance level.

Table VI–8. Regression Results for BPS Sales 3 and 4 Comparing NF Cattle with All Other Cattle (Model 2).

Dependent Variable	**Variable Definition**
Market Price (MP)	Sale lot transaction price

Independent Variable	**10-16-06 Coefficients**	**12-4-06 Coefficients**
Intercept	194.506***	303.564***
	(15.29)	(12.82)
No. Head	0.291***	0.396***
	(4.02)	(3.73)
No. Head2	-0.002**	-0.005***
	(2.19)	(3.83)
Average Weight	-0.232***	-0.631***
	(5.21)	(7.60)
Average Weight2	0.0002***	0.0005***
	(4.05)	(7.01)
Breed Type		
Angus / Angus-X	Base	Base
Exotics / Exotic-X	-3.377***	-1.525
	(2.85)	(1.17)
Brahman / Hereford / Holstein	-6.704***	-1.996
	(3.89)	(0.65)
Longhorn		NA
		NA
Sex		
Steer	Base	Base
Heifer	-11.942***	-7.007***
	(12.71)	(8.60)
Bulls / Mixed	-6.733***	
	(3.78)	
Horns		
Polled	Base	Base
Horned / Unhealed / Mixed	-0.573	3.167***
	(0.46)	(3.33)
Flesh		
Thin	-1.863	-4.156
	(0.69)	(1.60)
Average	Base	Base
Fleshy	0.747	3.393***
	(0.61)	(2.92)

Table VI--8. Regression Results for BPS Sales 3 and 4 Comparing NF Cattle with All Other Cattle (Model 2). (continued)

Dependent Variable	**Variable Definition**	
Market Price (MP)	Sale lot transaction price	
Independent Variable	**10-16-06 Coefficients**	**12-4-06 Coefficients**
Muscle		
Thick	-0.712	-4.508***
	(0.54)	(3.85)
Average	Base	Base
Thin	-7.363***	-3.296
	(2.87)	(1.07)
Lot Uniformity		
Uniform	Base	Base
Uneven	-2.045*	-3.215***
	(1.93)	(3.43)
Frame Score		
Large	-0.168	-0.589
	(0.16)	(0.54)
Medium	Base	Base
Small	NA	NA
	NA	NA
Management		
All other management classifications	Base	Base
NF cattle; PVP &QSA Certified	2.861**	-0.332
	(2.14)	(0.23)
NF cattle; Non-PVP & QSA Certified	3.472	3.387**
	(0.86)	(2.21)
Health		
Healthy	NA	NA
Unhealthy	NA	NA
Number of Observations	177	72
Adjusted R^2	70.920	91.520

Numbers in parenthesis are absolute values of calculated t statistics; * = 0.10, ** = 0.05, and *** = 0.01 significance level.

As with model 1, the effect that lot size has on feeder cattle prices was evaluated. Figure VI-2 depicts Model 2 lot size effects. Four of the five data sets show that cattle receive a premium when sold in lot sizes of 65-85 head.

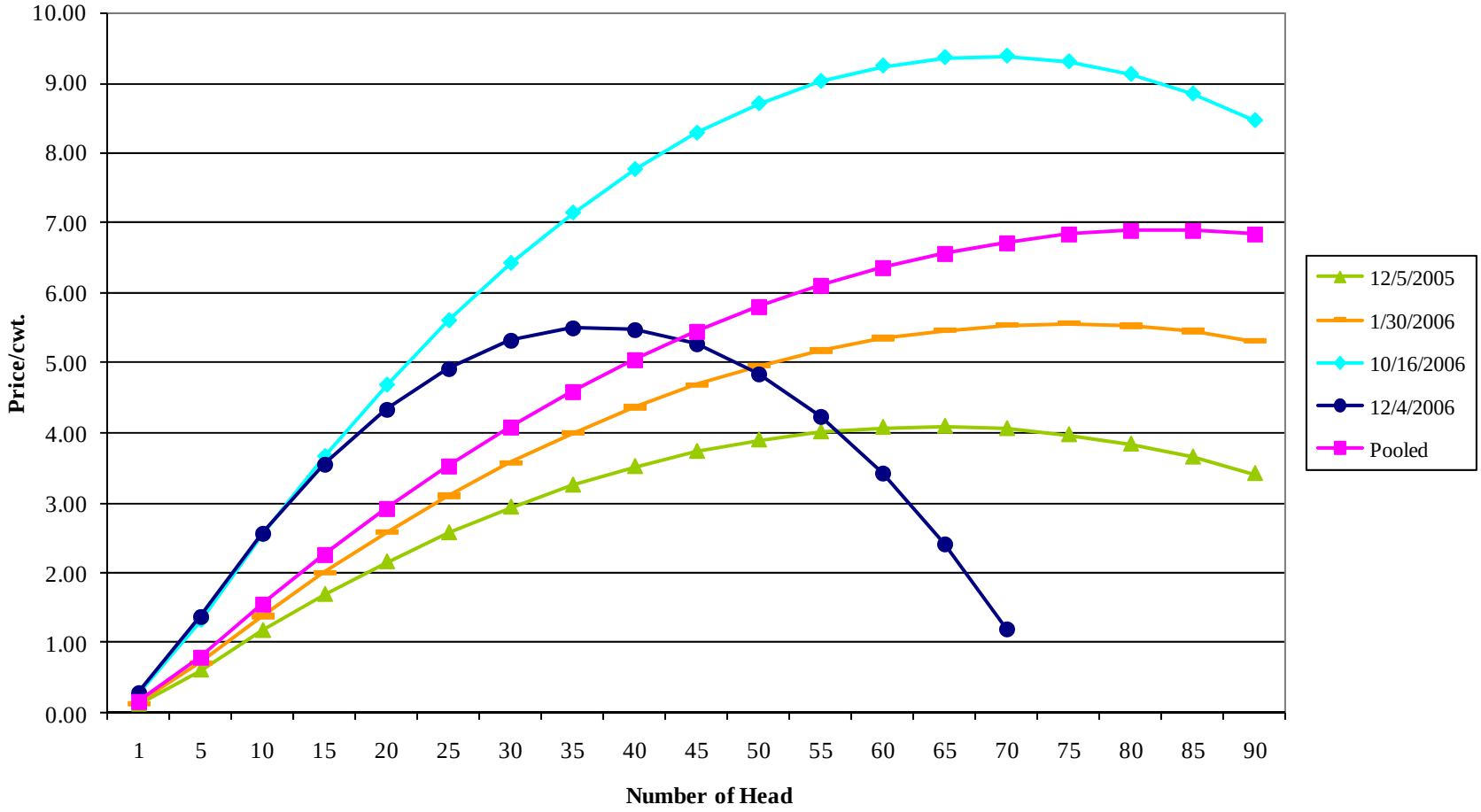

Figure VI-2. Lot Size and Price Relationship Model 2

Model 2 – Combined NF Management Groups

The management groups pertaining to PVP and/or QSA programs were grouped together for the 2006 marketing year. FGLS procedures explained 70.0% and 81.3% of the variation in feeder calf prices for sales 3 and 4 respectively. Noble Foundation cattle sold in sale 3 returned $3.58/cwt higher prices than all other cattle presented at the Oklahoma National Stockyards on October 16, 2006. However, for sale 4, this premium was slightly lower at $2.92/cwt. More detailed results can be found in Appendix Table IX-10.

Model 2 – Pooled Results

The FGLS regression procedure explained 72.5% of the variation in feeder calf prices when all four data sets were pooled together. This method shows that Noble Foundation cooperators received a $1.80/cwt premium when compared to all other possible management classifications. 66.9% of price variation was explained when only sales 1 and 3 (i.e. primary sales) were combined. When analyzing only the primary sales, BPS cattle received a premium of $3.02/cwt as compared to all other cattle sold at market. Complete results for the pooled model can be found in Appendix Table IX-11.

Larger NF Sale Lots

Results for combining large lot sizes (i.e. 20 head or more) of healthy, properly managed feeder cattle is dependent upon sale dates. The LGNF method explained 68.8%, 87.1%, 67.1%, and 64.2% of variation in feeder cattle pricing for the respective

sales 1, 2, 3, and 4 when modeled with FGLS procedures. When compared to all other cattle, the premium for LGNF lots ranged from $2.70/cwt to $8.58/cwt.

Data were also combined to determine the value of LGNF lots across a two year time period. Results show that larger, properly managed, uniform lots received $3.91/cwt more than all other cattle sold in smaller lots. Pooling all data sets explained 68.3% of the variation in market price when using FGLS regression procedures. When only combining the primary data sets (i.e. sales 1 and 3), the large Noble Foundation procedure explained 65.8% of price variation. The results from this method show that NF producers who sold lots of 20 head or more experienced a premium of $5.41/cwt as compared to cattle sold in lots of 19 head or less. Further evaluation of the effects that the LGNF model had on feeder calf price can be seen in Appendix Tables IX-12 and IX-13.

CHAPTER VII

DISCUSSION AND IMPLICATIONS

The lack of knowledge on preconditioning cost effectiveness decreases the opportunity for producers to capitalize on the benefits of preconditioning. Moreover, information asymmetry present between buyers and sellers at a public market may result in buyers not paying full value to sellers for preconditioned cattle. Solutions to these problems can be influenced by production management practices implemented at the cow-calf level of the beef industry. The Noble Foundation staff and cooperating producers have developed an integrated beef production system (BPS) that utilizes a variety of preconditioning practices including age and source verification in an effort to increase returns to the cow-calf producer.

The use of producer data has allowed an in depth analysis of how preconditioning costs affect producer returns. For the two-year time period, Noble Foundation cooperators experienced on average a total cost of $43.15/head and $43.20/head for preconditioning steers and heifers respectively. This value should be carefully interpreted as two major NF cost variables are of concern: additional labor costs and marketing costs. Noble Foundation cooperators reported average additional labor costs of $2.00/head which is considerably lower than anticipated additional labor costs in preconditioning budgets (Avent, Ward, and Lalman, 2004; Dhuyvetter, Bryant, and Blasi, 2005). NF cooperators report lower additional costs because much of the additional labor

needed during gathering, sorting, working, and transportation is provided by NF consultation staff for no direct cost to the producer. This is done as a courtesy for providing detailed information and participating in the BPS program.

The second variable, marketing costs, also raises questions. Total cost of preconditioning was roughly $43.00/head. Over the same two-year period, producers associated with the BPS program reported approximate marketing costs of $22.50/head. This is significantly higher than budgeted marketing costs from Avent, Ward, and Lalman (2004), Ward (*Beef Cattle Manual*, 2004), and Dhuyvetter, Bryant, and Blasi (2005). NF marketing costs are notably larger than the $5.00/head cost associated with tags, commission, etc. Yardage and feed costs as well as freight charges are believed to be a large portion of the Noble Foundation's high marketing cost as cooperators transported cattle to the Oklahoma National Stockyards on the Sunday prior to a Monday auction. Sometimes, BPS cattle were transported from Texas ranches where mileage approaches 250 miles to the Oklahoma City area.

This study found that number of days preconditioned, average daily gain, and the cost of hay as well as feed and mineral significantly impacted the net margin after preconditioning. Findings from this study show the average preconditioning margin to be approximately $43.00/head when all other model characteristics (i.e. estimated weaning weight, days preconditioned, average daily gain, and the cost of feed and mineral, hay, vaccinations, and additional labor) are at their average. Noble Foundation BPS cooperators, when accounting for other variables such as animal shrink, marketing costs, and opportunity costs, report average margins approaching $62.00/head. Once again, limitations exist with this value as the Noble Foundation provides additional labor at no

direct cost. More data would certainly strengthen the analysis of costs and returns for preconditioning.

The market value chapter of this thesis analyzed if and at what level premiums were available for feeder cattle preconditioned according to BPS requirements. It was determined that an average premium of $2.70/cwt (i.e. average of Model 2 significant coefficients for BPS sales 1-4) is available for Noble Foundation calves when compared to all other cattle. When only compared to cattle sold with the least information available (i.e. non-weaned, non-vaccinated), the premium for feeder cattle operated under the intensely managed BPS program increased to $4.37/cwt when averaged among the significant coefficients for sales 1-4. These NF premium levels are not as large as feedlot managers of the Texas Cattle Feeders Association (TCFA) estimated the value of preconditioning to be. The TCFA survey, conducted by Avent, Ward, and Lalman (2004), report that feedlot operators believe preconditioned cattle are $5.35/cwt more valuable than non-preconditioned cattle.

However, the Noble Foundation premiums are similar to the $3.36/cwt premium received at the Joplin Regional Stockyards in December 2000 (Avent, Ward, and Lalman, 2003; *Beef Cattle Manual*, 2004). Noble Foundation preconditioning premiums are also comparable to the previously studied Oklahoma Quality Beef Network (OQBN) program. Ward describes an estimated average premium of $3.11/cwt during the fall of 2001 and 2002 (*Beef Cattle Manual*, 2004). The following table is a summary of premiums and/or discounts associated with each management category for the market value models 1 and 2, as well as for the larger NF sale lots model.

Table VII–1. Management Coefficient Summary for Market Value of Noble Foundation BPS Calves.

Model	BPS 1 12-5-05	BPS 2 1-30-06	BPS 3 10-16-06	BPS 4 12-4-06	All Pooled	Primary Pooled	BPS 3 Combo NF Mgmt 7 & 8	BPS 4 Combo NF Mgmt 7 & 8
Model 1								
1	Base	Base	Base	Base	Base	Base	Base	Base
2	2.19**	NA	NA	NA	2.54**	2.77	NA	NA
3	1.73**	0.10	0.40	1.50	0.52	1.01	0.25	1.38
4a	1.65**	0.31	4.39***	NA	1.82***	2.08***	4.55***	NA
6	3.77***	NA	3.05	-2.92	1.74	3.85***	3.09	-1.38
4	3.27***	0.26	NA	NA			NA	NA
7	NA	NA	4.72***	2.34	2.80***	4.28***		
8	NA	NA	5.79	5.13***			5.19***	4.54**
Model 2								
10	Base	Base	Base	Base	Base	Base	Base	Base
4	1.86***	0.05	NA	NA			NA	NA
7	NA	NA	2.86**	-0.33	1.80***	3.02***		
8	NA	NA	3.47	3.39**			3.58**	2.92***
LGNF								
10	Base	Base	Base	Base	Base	Base	Base	Base
9	3.42***	4.67***	8.58***	2.70**	3.91***	5.41***	NA	NA

Code Definitions: 1. Vaccinations unknown; Weaning unknown, 2. Vaccinated; weaning unknown, 3. Weaned; vaccination unknown, 4. NF: Vaccinated and weaned; preconditioning not certified, 4a. Non-NF: Vaccinated and weaned; preconditioning not certified, 6. Other certified preconditioning programs, 7. NF: PVP and/or QSA certified, 8. NF: Non-certified PVP and/or QSA, 9. LGNF; >20 head, polled, healthy, uniform, 10. All other calves.

Smaller Noble Foundation producers may have the opportunity to gain a marketing edge and increase price premiums if they take advantage of pooling or co-mingling opportunities. The average herd size in Oklahoma is approximately 40 head (*Beef Cattle Manual*, 2004), thus many producers do not have the ability to capture the price differential paid for larger, more uniform lots. If producers join together, they may have the potential to effectively market larger lots, up to 50,000 lb. truckload lots, and receive a substantial premium (Avent, Ward, and Lalman, 2004; *Beef Cattle Manual*, 2004).

Relative to lot size and the Noble Foundations' BPS program, cow-calf producers experienced positive marginal returns for lots containing 65-85 head for four of the five data sets when compared to all other cattle sold at market (i.e. Model 2). The effect of lot size on producer premiums was illustrated previously in Figures VI-1 and VI-2. Moreover, when compared to all other cattle sold at market, Noble Foundation cooperators who sold larger lots (i.e. 20 head or more) of polled, uniform, healthy cattle experienced premiums of $4.84/cwt when averaged across BPS sales 1-4.

Future BPS Considerations

NF BPS staff and cooperators need to consider alternative marketing strategies if they are to ensure success for the Noble Foundation integrated beef production system. Four possible recommendations include:

1. Co-mingling cattle from smaller producers
2. Direct selling and/or hosting a special BPS sale
3. Educate buyers on true value of preconditioning to grow the BPS program

4. Provide larger number of BPS cattle at auction.

The first recommendation, co-mingling smaller producers, has already been mentioned briefly. Research shows buyers pay premiums for truckload sized lots (Avent, Ward, and Lalman, 2004; Bulut and Lawrence, 2006; Lawrence and Yeboah, 2002). Smaller Noble Foundation producers may be able to increase preconditioning returns by selling cattle in larger lot sizes. Returns may increase especially when sold in combination with proper management practices including vaccinations, dehorning, and auctioned in uniform weight groups.

Selling direct and/or hosting a special sale is also a viable marketing option for NF staff and cooperators. As the reputation of the BPS program continues to grow, so will buyer interest in feeder cattle managed under its guidelines. Recommendation two, however, is one option that requires much work and more consideration. The risk of price discovery is high (i.e. setting feeder cattle price) when selling direct to order buyers. Also, factors such as advertising, marketing, sale location, auctioneer, insurance, veterinary services, etc. must be considered prior to hosting a NF production sale.

The third recommendation, educate buyers on true value of preconditioning, is harder to implement. To keep purchase costs low, buyers will only pay what it takes (i.e. will only bid up to the level of competition) to purchase a pen of calves; even if buyers are aware of the value preconditioning provides. Training sessions, educational fliers, research conferences hosted by accredited universities, etc. may lead buyers to pay closer to the full value of preconditioning.

The final recommendation, providing a larger number of BPS cattle at auction, may entice more buyers to attend BPS preconditioning sales. More buyers in one

location may lead to increased competition among bidders, equating to higher prices. Also, more data observations are available for research when more BPS calves are offered at market. More data observations could strengthen findings if NF staff chooses to re-create this thesis study.

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APPENDIXES

APPENDIX A – TABLES RELATED TO CHAPTER V PRECONDITIONING COSTS

Table IX–1. Summary Statistics for Steer Preconditioning Variables by Year.

Variable	Year	Mean	Std. Dev.	Minimum	Maximum
Lot Size	2004	73.909	78.176	17.000	286.000
	2005	59.034	65.564	8.000	323.000
Estimated Weaning Weight	2004	517.455	61.763	401.000	610.000
	2005	521.224	62.224	438.840	648.784
Days Preconditioned	2004	44.000	5.675	36.000	53.000
	2005	55.552	9.999	41.000	80.000
Average Daily Gain	2004	1.219	0.273	0.820	1.690
	2005	1.521	0.675	-0.341	2.985
Actual Shrink	2004	0.021	0.024	-0.040	0.056
	2005	0.015	0.037	-0.056	0.113
Preconditioning Weight after Shrink	2004	615.182	63.884	498.000	705.000
	2005	639.540	68.397	465.000	776.000
Preconditioning Price	2004	115.364	6.727	107.000	130.000
	2005	121.309	5.633	111.670	134.000
Marketing Costs	2004	22.179	1.194	19.390	23.660
	2005	23.027	3.853	15.360	27.060
Feed and Mineral Costs	2004	19.916	4.786	13.220	24.410
	2005	24.166	6.402	13.640	50.160
Feed Costs/Ton	2004	177.370	37.216	116.460	236.000
	2005	178.879	16.051	135.930	208.000
Hay Costs	2004	8.119	4.971	3.010	21.810
	2005	10.750	6.154	2.837	28.000
Vaccination Costs	2004	8.613	6.062	4.230	24.920
	2005	8.090	2.941	3.523	14.800
Additional Labor Costs	2004	2.073	1.326	0.580	5.690
	2005	1.966	0.917	0.816	4.340

Table IX--1. Summary Statistics for Steer Preconditioning Variables by Year. (continued)

Variable	Year	Mean	Std. Dev.	Minimum	Maximum
Tot. Preconditioning Costs	2004	38.344	8.752	28.330	62.270
	2005	44.972	8.635	30.740	65.690
Net Margin Based on No. Head Sold	2004	48.722	15.958	18.670	77.410
	2005	74.960	42.214	-52.326	165.772
Opportunity Costs	2004	5.221	0.768	4.184	6.208
	2005	6.961	1.232	4.890	9.684

Table IX–2. Summary Statistics for Heifer Preconditioning Variables by Year.

Variable	Year	Mean	Std. Dev.	Minimum	Maximum
Lot Size	2004	68.818	65.726	18.000	227.000
	2005	56.621	61.685	9.000	303.000
Estimated Weaning Weight	2004	503.545	59.445	421.000	602.000
	2005	502.858	59.029	409.860	625.048
Days Preconditioned	2004	44.000	5.675	36.000	53.000
	2005	55.586	9.970	41.000	80.000
Average Daily Gain	2004	1.024	0.294	0.550	1.630
	2005	1.427	0.579	0.195	2.664
Actual Shrink	2004	0.021	0.024	-0.040	0.056
	2005	0.036	0.038	-0.010	0.150
Preconditioning Weight after Shrink	2004	591.364	59.723	510.000	669.000
	2005	603.795	61.156	460.560	750.000
Preconditioning Price	2004	110.182	5.326	104.000	118.000
	2005	113.266	3.317	106.130	119.000
Marketing Costs	2004	20.482	1.111	19.000	22.290
	2005	23.027	3.853	15.360	27.060
Feed and Mineral Costs	2004	19.916	4.786	13.220	27.410
	2005	24.166	6.402	13.640	50.160
Feed Costs/Ton	2004	177.370	37.216	116.460	236.000
	2005	178.879	16.051	135.930	208.000
Hay Costs	2004	8.119	4.971	3.010	21.810
	2005	10.750	6.154	2.837	28.000
Vaccination Costs	2004	8.613	6.062	4.230	24.920
	2005	8.090	2.941	3.523	14.800
Additional Labor Costs	2004	2.073	1.326	0.580	5.690
	2005	1.966	0.917	0.816	4.340
Tot. Preconditioning Costs	2004	38.532	8.697	28.330	62.270
	2005	44.972	8.635	30.740	65.690
Net Margin Based on No. Head Sold	2004	50.846	14.909	13.930	71.740
	2005	57.839	38.415	-21.874	132.933
Opportunity Costs	2004	4.738	0.721	3.860	5.814
	2005	6.159	1.124	4.055	8.817

Table IX–3. Percent Frequency for Preconditioning Variables by Sex, 2004-2005.

	Steers	Heifers
Total No. Lots	40	40
Lot Size (head)		
<50	62.50	65.00
50-100	20.00	15.00
100-150	10.00	12.50
>150	7.50	7.50
Estimated Weaning Weight (pounds)		
400-500	42.50	52.50
500-600	40.00	40.00
>600	17.50	7.50
Days Preconditioned		
<45	22.50	22.50
45-55	40.00	40.00
55-65	25.00	25.00
>65	12.50	12.50
Average Daily Gain (pounds/day)		
<1	15.00	17.50
1-2	72.50	70.00
2-3	12.50	12.50
Actual Shrink		
<1%	37.50	27.50
1-3%	30.00	25.00
3-5%	17.50	27.50
>5%	15.00	20.00
Preconditioning Weight after Shrink (pounds)		
400-500	5.00	2.50
500-600	25.00	57.50
600-700	50.00	35.00
>700	20.00	5.00
Preconditioning Price		
<$115	20.00	62.50
$115-120	32.50	37.50
$120-125	27.50	0.00
$125-130	12.50	0.00
$130-135	7.50	0.00
Preconditioning Marketing Costs		
$15-20	12.50	15.00
$20-25	52.50	50.00
>$25	35.00	35.00

Table IX--3. Percent Frequency for Preconditioning Variables by Sex, 2004-2005. (continued)

	Steers	Heifers
Feed and Mineral Costs ($/head)		
<$15	7.50	7.50
$15-20	15.00	15.00
$20-25	27.50	27.50
$25-30	40.00	40.00
>$30	10.00	10.00
Feed Costs Per Ton ($/ton)		
<$150	12.50	12.50
$150-200	75.00	75.00
>$200	12.50	12.50
Hay Costs ($/head)		
<$5	15.00	15.00
$5-15	70.00	70.00
>$15	15.00	15.00
Vaccination Costs ($/head)		
<$5	2.50	2.50
$5-10	75.00	75.00
>$10	22.50	22.50
Additional Labor Costs ($/head)		
<$1	15.00	15.00
$1-3	75.00	75.00
>$3	10.00	10.00
Total Preconditioning Costs ($/head)		
<$35	17.50	17.50
$35-45	35.00	35.00
>$45	47.50	47.50
Net Margin Based on No. Head Sold		
<$30	10.00	17.50
$30-50	17.50	25.00
$50-80	35.00	40.00
$80-100	17.50	7.50
>$100	20.00	10.00
Opportunity Costs		
<$6	15.00	25.00
$6-7	22.50	35.00
>$7	62.50	40.00

Table IX–4. Percent Frequency for Preconditioning Variables by Sex and Year.

	Steers		Heifers	
	2004	**2005**	**2004**	**2005**
Total No. Lots	11	29	11	29
Lot Size (head)				
<50	45.45	68.97	63.64	65.52
50-100	36.36	13.79	9.09	17.24
100-150	9.09	10.34	18.18	10.34
>150	9.09	6.90	9.09	6.90
Estimated Weaning Weight (pounds)				
400-500	36.36	44.83	54.55	51.72
500-600	45.45	37.93	36.36	41.38
>600	18.18	17.24	9.09	6.90
Days Preconditioned				
<45	54.55	10.34	54.55	10.34
45-55	45.45	37.93	45.45	37.93
55-65	0.00	34.48	0.00	34.48
>65	0.00	17.24	0.00	17.24
Average Daily Gain (pounds/day)				
<1	18.18	13.79	27.27	13.79
1-2	81.82	68.97	72.73	68.97
2-3	0.00	17.24	0.00	17.24
Actual Shrink				
<1%	18.18	44.83	18.18	31.03
1-3%	54.55	20.69	54.55	13.79
3-5%	18.18	17.24	18.18	31.03
>5%	9.09	17.24	9.09	24.14
Preconditioning Weight after Shrink (pounds)				
400-500	9.09	3.45	0.00	3.45
500-600	36.36	20.69	54.55	58.62
600-700	45.45	51.72	45.45	31.03
>700	9.09	24.14	0.00	6.90

Table IX--4. Percent Frequency for Preconditioning Variables by Sex and Year. (continued)

	Steers		Heifers	
	2004	**2005**	**2004**	**2005**
Preconditioning Price				
<$115	45.45	10.34	72.73	58.62
$115-120	36.36	31.03	27.27	41.38
$120-125	9.09	34.48	0.00	0.00
$125-130	0.00	17.24	0.00	0.00
$130-135	9.09	6.90	0.00	0.00
Marketing Costs				
$15-20	0.00	17.24	9.09	17.24
$20-25	100.00	34.48	90.91	34.48
>$25	0.00	48.28	0.00	48.28
Feed and Mineral Costs ($/head)				
<$15	9.09	6.90	9.09	6.90
$15-20	45.45	3.45	45.45	3.45
$20-25	9.09	34.48	9.09	34.48
$25-30	36.36	41.38	36.36	41.38
>$30	0.00	13.79	0.00	13.79
Feed Costs Per Ton ($/ton)				
<$150	27.27	6.90	27.27	6.90
$150-200	54.55	82.76	54.55	82.76
>$200	18.18	10.34	18.18	10.34
Hay Costs ($/head)				
<$5	9.09	17.24	9.09	17.24
$5-15	81.82	65.52	81.82	65.52
>$15	9.09	17.24	9.09	17.24
Vaccination Costs ($/head)				
<$5	0.00	3.45	0.00	3.45
$5-10	81.82	72.41	81.82	72.41
>$10	18.18	24.14	18.18	24.14
Additional Labor Costs ($/head)				
<$1	9.09	17.24	9.09	17.24
$1-3	81.82	72.41	81.82	72.41
>$3	9.09	10.34	9.09	10.34

Table IX--4. Percent Frequency for Preconditioning Variables by Sex and Year. (continued)

	Steers		Heifers	
	2004	**2005**	**2004**	**2005**
Total Preconditioning Costs ($/head)				
<$35	27.27	13.79	27.27	13.79
$35-45	63.64	24.14	63.64	24.14
>$45	9.09	62.07	9.09	62.07
Net Margin Based on No. Head Sold				
<$30	18.18	6.90	9.09	20.69
$30-50	27.27	13.79	36.36	20.69
$50-80	54.55	27.59	54.55	34.48
$80-100	0.00	24.14	0.00	10.34
>$100	0.00	27.59	0.00	13.79
Opportunity Costs				
<$6	45.45	3.45	54.55	13.79
$6-7	36.36	17.24	45.45	31.03
>$7	18.18	79.31	0.00	55.17

APPENDIX B – TABLES RELATED TO CHAPTER VI MARKET VALUE OF PRECONDITIONED FEEDER CATTLE

Table IX–5. Number of Lots for the Beef Production System Variables by Sale.

	12-5-05	1-30-06	10-16-06	12-4-06
Total No. of Lots	343	172	177	72
Management				
Vaccination & Weaning Unknown	98	72	99	23
Vaccinated; Weaning Unknown	2	0	0	0
Vaccination Unknown; Weaned	82	58	14	20
Vaccinated & Weaned; Not Certified	143	42	23	0
NF	75	11	NA	NA
Non-NF	68	31	23	0
Other Certified Preconditioning Programs	18	0	6	2
NF: PVP & QSA Certified	NA	NA	28	12
NF: Non-PVP / QSA Status	NA	NA	7	15
Sex				
Steers	178	91	90	39
Heifers	152	74	75	32
Bulls; Mixed Lots	13	7	12	1
Breed				
English	229	111	94	53
Exotic	90	52	58	17
Brahman; Hereford; Holstein	11	4	23	2
Longhorn	11	5	2	0
Flesh				
Thin	55	2	14	9
Average	216	121	124	49
Fleshy	70	49	39	14
Muscle				
Thick	5	32	29	8
Average	320	131	130	62
Thin	16	9	18	2
Frame				
Large	39	92	115	22
Medium	299	80	62	50
Small	3	0	0	0
Uniform				
Uniform	271	147	125	63
Uneven	70	25	52	9
Horns				
Polled	246	111	131	62
Horned	95	61	46	10
Health				
Healthy	336	169	177	100
Unhealthy	5	3	0	0

Table IX–6. Summary Statistics for the Beef Production system (all data collected).

	Mean	Standard Deviation	Minimum	Maximum
12-5-05				
Price ($/cwt)	115.54	9.76	85.00	156.50
Average Weight (lbs)	618.14	103.94	401.67	850.23
Lot Size (No. Head)	20.70	19.37	3.00	117.00
1-30-06				
Price ($/cwt)	111.37	11.66	81.00	143.00
Average Weight (lbs)	677.72	106.57	403.75	849.32
Lot Size (No. Head)	18.86	17.05	3.00	122.00
10-16-06				
Price ($/cwt)	109.08	11.57	66.00	147.10
Average Weight (lbs)	553.77	98.60	401.00	811.00
Lot Size (No. Head)	14.08	16.19	3.00	103.00
12-4-06				
Price ($/cwt)	105.93	8.57	90.00	132.50
Average Weight (lbs)	572.76	97.02	400.00	764.00
Lot Size (No. Head)	15.61	14.85	3.00	68.00

Table IX–7. Summary Statistics by Sex and Weight of Cattle.

	12-5-05		1-30-06		10-16-06		12-4-06	
	NF	**Non-NF**	**NF**	**Non-NF**	**NF**	**Non-NF**	**NF**	**Non-NF**
Steers 400-500#								
Price ($/cwt)	143.00	136.23	NA	139.50	133.09	117.60	129.50	114.81
Lot Size (no. hd)	8.50	12.06	NA	10.00	21.57	9.54	5.00	9.13
Weight (lbs)	468.37	452.51	NA	473.90	465.57	460.46	482.00	467.86
Steers 500-600#								
Price ($/cwt)	127.94	120.57	NA	125.40	119.96	108.12	113.63	111.00
Lot Size (no. hd)	21.27	18.76	NA	14.92	38.57	10.19	11.50	12.50
Weight (lbs)	550.27	554.86	NA	555.79	548.71	559.38	555.50	538.90
Steers 600-700#								
Price ($/cwt)	118.74	114.61	118.33	111.11	117.71	107.86	105.04	100.10
Lot Size (no. hd)	31.79	22.47	51.33	14.65	31.50	14.50	30.80	21.67
Weight (lbs)	641.85	649.78	652.85	649.16	644.75	649.06	683.20	650.83
Steers >700#								
Price ($/cwt)	114.46	111.40	111.63	107.35	107.00	105.45	103.17	100.13
Lot Size (no. hd)	35.80	25.27	31.50	19.15	6.00	7.40	16.67	36.50
Weight (lbs)	743.38	768.91	733.29	771.80	711.00	746.70	717.00	741.50
Heifers 400-500#								
Price ($/cwt)	123.50	121.74	NA	133.75	113.68	103.50	113.00	108.18
Lot Size (no. hd)	6.33	9.10	NA	18.20	22.00	9.32	4.67	6.57
Weight (lbs)	450.63	455.67	NA	430.33	443.71	446.68	441.67	442.86

Table IX—7. Summary Statistics by Sex and Weight of Cattle. (continued)

	12-5-05		1-30-06		10-16-06		12-4-06	
	NF	**Non-NF**	**NF**	**Non-NF**	**NF**	**Non-NF**	**NF**	**Non-NF**
Heifers 500-600#								
Price ($/cwt)	114.06	111.12	127.00	118.63	108.30	104.00	101.56	97.79
Lot Size (no. hd)	21.75	19.63	64.00	24.07	35.14	10.96	14.00	12.86
Weight (lbs)	559.03	551.26	552.19	552.26	549.57	549.83	557.00	558.14
Heifers 600-700#								
Price ($/cwt)	111.89	108.65	111.53	106.19	105.55	99.84	99.25	94.50
Lot Size (no. hd)	33.85	19.74	30.33	15.12	53.50	11.22	32.17	18.50
Weight (lbs)	637.31	641.95	642.68	652.85	628.50	650.22	657.00	611.00
Heifers >700#								
Price ($/cwt)	108.34	106.67	103.75	101.71	NA	97.87	102.75	96.25
Lot Size (no. hd)	27.29	17.81	23.00	18.90	NA	9.60	17.00	739.00
Weight (lbs)	734.15	757.03	720.65	762.47	NA	751.60	726.00	4.50
Bulls/Mix 400-500#								
Price ($/cwt)	NA	129.67	NA	134.00	NA	115.50	NA	NA
Lot Size (no. hd)	NA	9.33	NA	8.50	NA	5.00	NA	NA
Weight (lbs)	NA	474.80	NA	471.52	NA	447.00	NA	NA
Bulls/Mix 500-600#								
Price ($/cwt)	NA	114.00	NA	128.50	NA	106.38	NA	112.00
Lot Size (no. hd)	NA	13.50	NA	10.00	NA	7.75	NA	6.00
Weight (lbs)	NA	576.03	NA	558.50	NA	549.00	NA	520.00

Table IX—7. Summary Statistics by Sex and Weight of Cattle. (continued)

	12-5-05		1-30-06		10-16-06		12-4-06	
	NF	**Non-NF**	**NF**	**Non-NF**	**NF**	**Non-NF**	**NF**	**Non-NF**
Bull/Mix 600-700#								
Price ($/cwt)	NA	108.75	NA	117.00	NA	96.83	NA	NA
Lot Size (no. hd)	NA	12.33	NA	10.00	NA	6.00	NA	NA
Weight (lbs)	NA	661.92	NA	634.50	NA	663.33	NA	NA
Bulls/Mix >700#								
Price ($/cwt)	NA	NA	NA	98.75	NA	85.00	NA	NA
Lot Size (no. hd)	NA	NA	NA	14.00	NA	9.00	NA	NA
Weight (lbs)	NA	NA	NA	786.57	NA	711.00	NA	NA

Table IX–8. Regression Results for BPS Sales 3 and 4 when Combined NF Management Categories 7 and 8 (Model 1).

Dependent Variable	Variable Definition
Market Price (MP)	Sale lot transaction price

Independent Variable	10-16-06 Coefficients	12-4-06 Coefficients
Intercept	191.539***	233.820***
	(15.95)	(10.04)
No. Head	0.180***	0.239**
	(2.97)	(2.35)
No. Head2	-0.001*	-0.003**
	(1.76)	(2.11)
Average Weight	-0.216***	-0.378***
	(5.16)	(4.67)
Average Weight2	0.0001***	0.0002***
	(3.79)	(3.90)
Breed Type		
Angus / Angus-X	Base	Base
Exotics / Exotic-X	-2.918***	-1.044
	(2.85)	(0.88)
Brahman / Hereford / Holstein	-8.114***	-1.573
	(6.31)	(0.46)
Longhorn		NA
		NA
Sex		
Steer	Base	Base
Heifer	-12.216***	
	(15.80)	-8.873***
Bulls / Mixed	-6.166***	(9.56)
	(4.15)	
Horns		
Polled	Base	Base
Horned / Unhealed / Mixed	0.287	2.365*
	(0.26)	(1.89)
Flesh		
Thin	-6.045**	-1.229
	(2.25)	(0.44)
Average	Base	Base
Fleshy	-0.477	1.170
	(0.48)	(1.03)

Table IX—8. Regression Results for BPS Sales 3 and 4 when Combined NF Management Categories 7 and 8 (Model 1). (continued)

Dependent Variable	Variable Definition
Market Price (MP)	Sale lot transaction price

Independent Variable	10-16-06 Coefficients	12-4-06 Coefficients
Muscle		
Thick	-2.019*	-2.975**
	(1.82)	(2.23)
Average	Base	Base
Thin	-6.661***	-2.965
	(3.33)	(1.02)
Lot Uniformity		
Uniform	Base	Base
Uneven	-1.416	-3.571***
	(1.61)	(3.20)
Frame Score		
Large	0.619	0.183
	(0.72)	(0.17)
Medium	Base	Base
Small	NA	NA
	NA	NA
Health		
Healthy	NA	NA
Unhealthy	NA	NA
	NA	NA
Management		
Vaccination & Weaning Unknown	Base	Base
Vaccinated & Weaning Unknown	NA	NA
Vaccination Unknown & Weaned	0.254	1.382
	(0.23)	(0.78)
Non-NF Vaccinated & Weaned Not-Certified	4.554***	NA
	(4.65)	NA
Other Certified Preconditioning Program	3.087	-1.380
	(1.33)	(0.24)
NF cattle; PVP & QSA certified NF cattle; Non PVP & QSA certified	5.192***	4.541**
	(3.41)	(2.51)
Number of Observations	177	72
Adjusted R^2	78.640	77.540

Numbers in parenthesis are absolute values of calculated t statistics; * = 0.10, ** = 0.05, and *** = 0.01 significance level.

Table IX–9. Regression Results for Pooled BPS Sales Comparing NF Cattle with Other Management Programs (Model 1).

Dependent Variable	**Variable Definition**
Market Price (MP)	Sale lot transaction price

Independent Variable	**Sales 1-4 Coefficients**	**Sales 1&3 Coefficients**
Intercept	113.305***	101.421***
	(15.73)	(10.18)
No. Head	0.166***	0.149***
	(6.16)	(4.74)
No. Head2	-0.002***	-0.001***
	(4.72)	(3.62)
Average Weight	-0.178***	-0.187***
	(8.70)	(7.52)
Average Weight2	0.0001***	0.0001***
	(6.19)	(5.63)
Breed Type		
Angus / Angus-X	Base	Base
Exotics / Exotic-X	-1.088***	-1.070**
	(2.63)	(2.15)
Brahman / Hereford / Holstein	-6.894***	-5.409***
	(6.58)	(4.81)
Longhorn	-18.357***	-14.032***
	(6.31)	(2.94)
Sex		
Steer	Base	Base
Heifer	-8.265***	-9.213***
	(23.37)	(21.48)
Bulls / Mixed	-2.692**	-3.508**
	(2.13)	(2.51)
Horns		
Polled	Base	Base
Horned / Unhealed / Mixed	-0.275	-0.691
	(0.66)	(1.38)
Flesh		
Thin	-1.061	0.849
	(1.37)	(0.99)
Average	Base	Base
Fleshy	-0.504	-0.994*
	(1.27)	(1.92)

Table IX—9. Regression Results for Pooled BPS Sales Comparing NF Cattle with Other Management Programs (Model 1). (continued)

Dependent Variable	Variable Definition
Market Price (MP)	Sale lot transaction price

Independent Variable	Sales 1-4 Coefficients	Sales 1&3 Coefficients
Muscle		
Thick	-1.300**	-0.860
	(2.12)	(0.74)
Average	Base	Base
Thin	-4.614***	-4.320***
	(4.00)	(3.17)
Lot Uniformity		
Uniform	Base	Base
Uneven	-1.800***	-1.159**
	(3.88)	(2.21)
Frame Score		
Large	0.631	0.488
	(1.59)	(0.89)
Medium	Base	Base
Small	3.303	2.724
	(1.16)	(1.04)
Health		
Healthy	Base	Base
Unhealthy	0.105	-1.968
	(0.08)	(0.73)
Management		
Vaccination & Weaning Unknown	Base	Base
Vaccinated & Weaning Unknown	2.544**	2.767
	(1.98)	(1.51)
Vaccination Unknown & Weaned	0.522	1.010
	(1.03)	(1.54)
NF cattle; Vaccinated & Weaned Not-Certified	2.802***	4.283***
	(4.99)	(6.05)
Non-NF cattle; Vaccinated & Weaned Not-Certified	1.815***	2.080***
	(3.23)	(3.08)

Table IX—9. Regression Results for Pooled BPS Sales Comparing NF Cattle with Other Management Programs (Model 1). (continued)

Dependent Variable	**Variable Definition**
Market Price (MP)	Sale lot transaction price

Independent Variable	**Sales 1-4 Coefficients**	**Sales 1&3 Coefficients**
Other Certified Preconditioning Program	1.737	3.852***
	(1.35)	(2.80)
Nearby Futures Price	0.657***	0.752***
	(23.01)	(11.73)
Number of Observations	762	519
Adjusted R^2	72.690	69.540

Numbers in parenthesis are absolute values of calculated t statistics; * = 0.10, ** = 0.05, and *** = 0.01 significance level.

Table IX–10. Regression Results for BPS Sales 3 and 4 when Combined NF Management Categories 7 and 8 (Model 2).

Dependent Variable	**Variable Definition**
Market Price (MP)	Sale lot transaction price

Independent Variables	**10-16-06 Coefficients**	**12-4-06 Coefficients**
Intercept	193.442***	246.578***
	(14.97)	(11.60)
No. Head	0.274***	0.297***
	(3.82)	(3.41)
No. Head2	-0.002**	-0.004***
	(2.31)	(2.98)
Average Weight	-0.227***	-0.428***
	(5.03)	(5.77)
Average Weight2	0.0001***	0.0003***
	(3.91)	(5.02)
Breed Type		
Angus / Angus-X	Base	Base
Exotics / Exotic-X	-3.088**	-1.074
	(2.59)	(1.20)
Brahman / Hereford / Holstein		-0.599
	-6.599***	(0.22)
Longhorn	(3.86)	NA
		NA
Sex		
Steer	Base	Base
Heifer	-12.015***	
	(12.62)	-7.809***
Bulls / Mixed	-6.526***	(9.97)
	(3.69)	
Horns		
Polled	Base	Base
Horned / Unhealed / Mixed	-0.484	1.557
	(0.39)	(1.41)
Flesh		
Thin	-2.077	-0.172
	(0.71)	(0.07)
Average	Base	Base
Fleshy	0.529	1.393
	(0.43)	(1.45)

Table IX—10. Regression Results for BPS Sales 3 and 4 when Combined NF Management Categories 7 and 8 (Model 2). (continued)

Dependent Variable	**Variable Definition**
Market Price (MP)	Sale lot transaction price

Independent Variables	**10-16-06 Coefficients**	**12-4-06 Coefficients**
Muscle		
Thick	-1.229	-3.592***
	(0.86)	(3.49)
Average	Base	Base
Thin	-7.086***	-4.747*
	(2.82)	(1.72)
Lot Uniformity		
Uniform	Base	Base
Uneven	-1.984*	-2.774***
	(1.85)	(3.07)
Frame Score		
Large	-0.510	0.033
	(0.48)	(0.04)
Medium	Base	Base
Small	NA	NA
	NA	NA
Health		
Healthy	NA	NA
Unhealthy	NA	NA
	NA	NA
Management		
All other management classifications	Base	Base
NF cattle; PVP & QSA certified	3.575**	2.924***
NF cattle; Non PVP & QSA certified	(2.47)	(3.65)
Number of Observations	177	72
Adjusted R^2	69.970	81.290

Numbers in parenthesis are absolute values of calculated t statistics; * = 0.10, ** = 0.05, and *** = 0.01 significance level.

Table IX–11. Regression Results for Pooled BPS Sales Comparing NF Cattle with All Other Cattle (Model 2).

Dependent Variable	Variable Definition
Market Price (MP)	Sale lot transaction price

Independent Variable	Sales 1-4 Coefficients	Sales 1&3 Coefficients
Intercept	106.099***	104.546***
	(14.84)	(9.58)
No. Head	0.166***	0.188***
	(6.40)	(5.72)
No. Head2	-0.001***	-0.002***
	(4.43)	(4.14)
Average Weight	-0.161***	-0.195***
	(7.89)	(7.00)
Average Weight2	0.0001***	0.0001***
	(5.48)	(5.35)
Breed Type		
Angus / Angus-X	Base	Base
Exotics / Exotic-X	-0.857**	-0.856*
	(2.12)	(1.66)
Brahman / Hereford / Holstein	-7.492***	-6.004***
	(7.27)	(4.46)
Longhorn	-19.401***	-14.043***
	(6.37)	(2.70)
Sex		
Steer	Base	Base
Heifer	-7.947***	-9.260***
	(23.20)	(20.82)
Bulls / Mixed	-3.335**	-4.631***
	(2.26)	(3.10)
Horns		
Polled	Base	Base
Horned / Unhealed / Mixed	-0.679*	-1.156**
	(1.68)	(2.16)
Flesh		
Thin	-0.629	1.259
	(0.95)	(1.61)
Average	Base	Base
Fleshy	-0.352	-1.057*
	(0.90)	(1.86)

Table IX--11. Regression Results for Pooled BPS Sales Comparing NF Cattle with All Other Cattle (Model 2). (continued)

Dependent Variable	**Variable Definition**
Market Price (MP)	Sale lot transaction price

Independent Variable	**Sales 1-4 Coefficients**	**Sales 1&3 Coefficients**
Muscle		
Thick	-1.204**	-0.961
	(2.00)	(0.75)
Average	Base	Base
Thin	-3.708***	-4.302***
	(3.66)	(3.16)
Lot Uniformity		
Uniform	Base	Base
Uneven	-1.934***	-1.177**
	(4.60)	(2.21)
Frame Score		
Large	0.382	0.266
	(0.97)	(0.45)
Medium	Base	Base
Small	3.779***	3.311*
	(3.05)	(1.75)
Health		
Healthy	Base	Base
Unhealthy	0.002	-2.634
	(0.00)	(1.23)
Management		
All other management classifications	Base	Base
NF cattle; Vaccinated & Weaned Not-Certified	1.796***	3.022***
	(4.07)	(5.31)
Nearby Futures Price	0.669***	0.750***
	(23.79)	(11.16)
Number of Observations	762	519
Adjusted R^2	72.490	66.870

Numbers in parenthesis are absolute values of calculated t statistics; * = 0.10, ** = 0.05, and *** = 0.01 significance level.

Table IX–12. Regression Results for BPS Sales 1, 2, 3, and 4 Comparing Larger NF Sale Lots with All Other Cattle (LGNF).

Dependent Variable	Variable Definition
Market Price (MP)	Sale lot transaction price

Independent Variable	12-5-05 Coefficients	1-30-06 Coefficients	10-16-06 Coefficients	12-4-06 Coefficients
Intercept	190.281***	250.549***	175.679***	243.083***
	(18.33)	(22.05)	(13.37)	(9.250
Average Weight	-0.172***	-0.324***	-0.164***	-0.406***
	(5.42)	(9.75)	(3.66)	(4.57)
Average Weight2	0.0001***	0.0002***	0.0001***	0.0003***
	(3.81)	(7.52)	(2.62)	(3.95)
Breed Type				
Angus / Angus-X	Base	Base	Base	Base
Exotics / Exotic-X	-1.012**	-0.959*	-5.108***	-1.606
	(2.06)	(1.75)	(4.63)	(0.86)
Brahman / Hereford / Holstein	-6.057***	-5.886	-7.227***	-3.181
	(4.32)	(1.26)	(4.19)	(0.87)
Longhorn	-9.472***	-22.974**	-34.262***	NA
	(2.60)	(2.16)	(4.94)	NA
Sex				
Steer	Base	Base	Base	Base
Heifer	-8.284***	-7.088***	-10.457***	
	(18.17)	(13.35)	(11.13)	-8.076***
Bulls / Mixed	-2.189	-0.995	-6.367***	(6.97)
	(1.12)	(0.93)	(3.87)	
Flesh				
Thin	-0.272	6.819	-1.512	-0.690
	(0.31)	(0.69)	(0.44)	(0.23)
Average	Base	Base	Base	Base
Fleshy	0.675	-0.356	0.284	2.805**
	(1.29)	(0.64)	(0.24)	(2.38)
Muscle				
Thick	-7.223	-0.410	-0.927	-1.006
	(1.34)	(0.66)	(0.58)	(0.57)
Average	Base	Base	Base	Base
Thin	-2.645*	-6.898	-5.982***	-6.526**
	(1.83)	(1.48)	(3.23)	(2.00)

Table IX--12. Regression Results for BPS Sales 1, 2, 3, and 4 Comparing Larger NF Sale Lots with All Other Cattle (LGNF). (continued)

Dependent Variable	Variable Definition
Market Price (MP)	Sale lot transaction price

Independent Variable	12-5-05 Coefficients	1-30-06 Coefficients	10-16-06 Coefficients	12-4-06 Coefficients
Frame Score				
Large	0.077	0.511	0.493	1.562
	(0.14)	(0.93)	(0.49)	(0.79)
Medium	Base	Base	Base	Base
Small	1.918	NA	NA	NA
	(1.33)	NA	NA	NA
Management				
All other categories	Base	Base	Base	Base
LGNF	3.415***	4.671***	8.577***	2.702**
	(5.99)	(3.55)	(5.07)	(2.37)
Number of Observations	342	171	177	72
Adjusted R^2	68.830	87.140	67.100	64.180

Numbers in parentheses are absolute values of calculated t statistics; * = 0.10, ** = 0.05, and *** = 0.01 significance level.

Table IX–13. Regression Results for Pooled BPS Sales Comparing Larger NF Sale Lots with All Other Cattle (LGNF).

Dependent Variable	Variable Definition
Market Price (MP)	Sale lot transaction price

Independent Variable	Sales 1-4 Coefficients	Sales 1&3 Coefficients
Intercept	92.170***	77.438***
	(12.40)	(7.16)
Average Weight	-0.135***	-0.169***
	(6.55)	(6.21)
Average Weight2	0.0001***	0.0001***
	(4.18)	(4.46)
Breed Type		
Angus / Angus-X	Base	Base
Exotics / Exotic-X	-1.468***	-1.906***
	(3.75)	(3.98)
Brahman / Hereford / Holstein	-8.063***	-6.606***
	(6.99)	(4.79)
Longhorn	-16.737***	-14.131***
	(5.59)	(3.07)
Sex		
Steer	Base	Base
Heifer	-7.891***	-8.994***
	(21.50)	(19.52)
Bulls / Mixed	-4.500***	-6.264***
	(2.78)	(4.27)
Flesh		
Thin	-0.805	0.432
	(0.98)	(0.47)
Average	Base	Base
Fleshy	-0.307	-0.333
	(0.78)	(0.64)
Muscle		
Thick	-1.039*	-0.985
	(1.70)	(0.91)
Average	Base	Base
Thin	-3.942***	-3.776**
	(3.17)	(2.48)
Frame Score		
Large	0.338	0.217
	(0.81)	(0.38)
Medium	Base	Base
Small	3.697**	2.823
	(2.19)	(1.34)

Table IX--13.. Regression Results for Pooled BPS Sales Comparing Larger NF Sale Lots with All Other Cattle (LGNF). (continued)

Dependent Variable	Variable Definition
Market Price (MP)	Sale lot transaction price

Independent Variable	Sales 1-4 Coefficients	Sales 1&3 Coefficients
Management		
All other classifications	Base	Base
NF hd>20, healthy, polled, uniform	3.909***	5.407***
	(6.90)	(7.25)
Nearby Futures Price	0.737***	0.943***
	(22.42)	(14.52)
Number of Observations	762	519
Adjusted R^2	68.270	65.760

Numbers in parentheses are absolute values of calculated t statistics; * = 0.10, ** = 0.05, and *** = 0.01 significance level.

VITA

Jeri Denise Donnell

Candidate for the Degree of

Master of Science

Thesis: AGE AND SOURCE VERIFIED PRECONDITIONED FEEDER CATTLE: COSTS AND VALUE

Major Field: Agricultural Economics

Biographical:

Personal Data: Born in Frankfurt, Germany, on February 13, 1983, the daughter of John and Jean Donnell.

Education: Graduated from Wyandotte High School, Wyandotte, Oklahoma, May 2001; received an Associate of Science degree in Agriculture from Connors State College, Warner, Oklahoma, May 2003; received a Bachelor of Science degree in Animal Science from Oklahoma State University, Stillwater, Oklahoma, May 2005; completed the requirements for the Master of Science degree in Agricultural Economics at Oklahoma State University in May 2007.

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Name: Jeri Donnell Date of Degree: May, 2007

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: AGE AND SOURCE VERIFIED PRECONDITIONED FEEDER CATTLE: COSTS AND VALUE

Pages in Study: 110 Candidate for the Degree of Master of Science

Major Field: Agricultural Economics

Scope and Method of Study: The purpose was to: 1. Determine key factors influencing preconditioning cost and returns; 2. Determine the premium for age and source verified, preconditioned calves sold at a public livestock market. Data were provided by the Samuel Roberts Noble Foundation's integrated beef production system (BPS). Hedonic regression models were estimated using FGLS with SAS software.

Findings and Conclusions: Preconditioning returns depend significantly on number of days preconditioned, average daily gain, and cost of hay, feed, and mineral. Noble Foundation BPS cooperators received a premium for age and source verified, preconditioned feeder cattle when sold at market. Premium levels were dependent on cattle characteristics and market factors. Significant coefficients averaged across four sales conclude that BPS management practices receive a $2.70/cwt premium when compared to all other cattle sold at market. Additionally, premiums are available for cattle sold in truckload sized lots.

Advisor's Approval : Dr. Clement Ward