FEEDER CATTLE PREMIUMS FROM A CERTIFIED PRECONDITIONING PROGRAM

By

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PRECONDITIONING PROGRAM

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THESIS OVERVIEW

One thing which affects all sectors of the beef cattle industry is the bottom line on the financial statement. Many avenues exist for improving the bottom line. Packers focus on buy price and expected cutability of cattle purchased. For feedlots, buy price and sell price have been found to have the largest effect on profitability, but also of importance are input costs (feed costs, medical costs, etc.) (Langemeier, Schroeder and Mintert, 1992). In an attempt to minimize risk of medical costs and death loss, feedlots can buy preconditioned cattle which research suggests leads to healthier and higher performing cattle in the feedlot phase (Dhuyvetter, 2003, Roeber, et al., 2001). Research also suggests cattle buyers are willing to pay higher prices for preconditioned feeder cattle (Avent et al., 2004, Ward et al., 2003). This presents an important opportunity for the cow/calf producers in Oklahoma, where 77% have a herd size of less than fifty head (NASS-USDA, 2007). Small cow/calf producers do not have the advantage of economies of scale which allows large producers to offer larger more uniform lots to cattle buyers. For those relatively small producers who are looking for value-added marketing opportunities to maximize profits, preconditioning may be one such option. Further, auctioneers at livestock markets commonly announce whether lots of cattle have been vaccinated or weaned, but there is often little opportunity for buyers to verify this information. While asymmetric information is a real issue within the beef cattle industry, there exist certification programs that add value to cattle offered for sale by providing

assurance to cattle buyers about which management practices were used in production on the ranch.

The Oklahoma Quality Beef Network (OQBN) is one such program. OQBN is a collaborative effort between the Oklahoma Cattlemen's Association (OCA) and the Oklahoma Cooperative Extension Service (OCES) (McKinney, 2010). OQBN is a brand-neutral third-party health management certification program (VAC-45) for calves. OQBN certified calves are eligible to sell in certified preconditioned cattle auctions hosted by OQBN at participating livestock auction barns across the state.

This thesis project explores premiums received for calves participating in the 2010 Oklahoma Quality Beef Network (OQBN) and sold through OQBN sponsored sales. The premiums reflect the value of participation for producers. Specific project objectives include: developing a tool for rapid individual sale data analysis and information dissemination; quantifying the value for phenotypic traits; determining the existence and magnitude of price premiums for OQBN and individual management practices; and to determine if the overall price levels for OQBN sales were different than non-OQBN sales. The discussion to follow indicates how this project addresses these objectives.

The first paper, a journal article accepted for publication in the Journal of Extension, discusses the data collection process and the tool created for rapid analysis and dissemination of individual sale reports. This tool was created using Microsoft Excel 2007 and Microsoft Publisher 2007. It uses Excel database functions to derive individual price summaries for each sale where data was collected. The summaries report minimum and maximum price as well as the weighted average price for each defined weight range

and management category of cattle by gender. It also reports a summary of physical characteristics of lots sold in that particular sale. The tool aids extension educators and faculty by allowing for rapid analysis immediately after a sale, which can be dispensed to program participants, industry professionals, and other interested parties in a timely fashion.

The second paper, a journal manuscript, discusses premiums received by OQBN certified cattle as compared to calves presented for sale with other management practice combinations at local livestock auction markets in the state of Oklahoma. The primary goal of the chapter is to determine the premiums for participation in the OQBN VAC-45 program. A traditional hedonic model is used to estimate the values of characteristics which contribute to the sale price of a lot of cattle. Also explored is the value of certifying cattle which have been preconditioned. Following more recent research (Leupp et al., 2009), this study also includes a random effect in the hedonic model for each sale day to reduce unexplained variation of sale prices. Another important issue addressed is the lot size functional form. While a non-linear relationship between lot size and price has been found to exist (Faminow and Gum, 1986), the traditional quadratic function often used for modeling lot size effect allows the marginal value for increasing lot size to be negative in some ranges. This model uses the natural log function which eliminates this negative marginal value.

The general analysis of data is an important facet of OQBN and the Beef Extension program at Oklahoma State University. In Oklahoma, the beef cattle industry accounts for approximately 53 percent of Oklahoma agricultural production value. The roughly two million Oklahoma beef cows make up nearly 6.3 percent of the United States

cow herd. By providing value-added marketing opportunities for cow/calf producers, OQBN may have large impacts on the Oklahoma economy and on the profitability of individual producers. This thesis determines the existence and magnitude of premiums for cattle enrolled and sold through OQBN certified sales, which are then used to determine the impact of the OQBN program in 2010.

PAPER I

AN AUTOMATED DATA ANALYSIS TOOL FOR LIVESTOCK MARKET DATA

The following paper has been accepted for publication in the *Journal of Extension* and appears in this thesis with the journal's permission.

Introduction

In 2000, Oklahoma State University's Cooperative Extension Service, in cooperation with the Oklahoma Cattlemen's Association, launched the Oklahoma Quality Beef Network (OQBN) as an avenue to increase the value of Oklahoma calves. OQBN is a third-party health management certification program (VAC-45) for calves that meet program specifications for weaning, vaccinations, and other health management practices. Together, these practices constitute preconditioning. OQBN was re-launched in 2009 as a brand neutral preconditioning program allowing dual certification with industry VAC-45 certification programs. Program objectives are two-fold: (1) to create producer access to value added markets by hosting OQBN certified sales at local livestock markets; and (2) to educate Oklahoma cow/calf producers about existing value added marketing activities to encourage participation.

OQBN sales are facilitated through local auction barns as livestock market owners express interest in hosting an OQBN sale. Sales are typically held in conjunction with regular feeder cattle sales, though separate sale dates are sometimes arranged. Sale prices and cattle characteristics are collected on each lot of cattle sold at every sale. The information the data holds is important to livestock market owners, producers who participate in the sales, the interdisciplinary extension team, and other interested parties. Sale summaries need to be produced quickly to maintain the efficiency and credibility of the Extension program.

As OQBN grows, timely dispensation of sale results between extension personnel and their target audience has become increasingly difficult. Mallilo and Millar (1992) found that information exchange and dissemination are key factors that impact program success. Further, Vergot, Israel and Mayo (2005) found that cattlemen listed extension personnel as their second preferred source of information, behind other cattlemen. Additionally, extension publications ranked first and third as preferred channels of information. Rapid dissemination of information allows extension personnel to capture the program's fullest potential for educational opportunities with producers and other participants. As a remedy, an Excel spreadsheet coupled with a Microsoft Publisher template facilitates rapid data analysis for individual sales in a usable form that is easily distributed to extension personnel and livestock market owners within days of a particular sale. That information flow continues to cattleman who participated in the OQBN sale, to those contemplating future participation, and to industry professionals, such as bankers or veterinarians, who are interested in the benefits to producers. This connection between

biological practices and economic benefits is critical in encouraging adoption of new technology or management practices (Barao, 1992).

The number of value added calf programs has grown rapidly, with state and extension certified programs competing alongside industry certified programs (e.g. Montana, Kentucky, West Virginia, Iowa). Extension personnel in other states, such as Wisconsin, are analyzing livestock market data to assess the usefulness of implementing a statewide preconditioning program (Halfman, Lehmkuhler, & Cox, 2009). This template could be useful to program administrators who need quick analysis of auction data on the value of different management practices or to individual livestock auction barns who conduct value-added sales and want a quick assessment of impact for producers who consign their cattle. The template is easily modifiable to fit the specific data collected. Extension personnel could assist auction barn owners in learning how to utilize the benefits of this template.

Features

The data analysis tool produces sale summaries from data collected at OQBN hosted sales. Raw sale day data is collected via laptop computers in an Excel spreadsheet. A unique sale identification number is keyed into the spreadsheet's data analysis page to generate the sale summary. The summary is based on a template similar to USDA's Agricultural Marketing Service market report and reports calf prices by gender, by weight, and by management practice. This format facilitates producer understanding of the summary since many producers are familiar with this format. Prices are calculated as weighted averages based on lot size and the characteristics specified below. Minimum

and maximum prices for each weight category are also reported. Figure I-1 illustrates the process of sorting data to generate price reports.

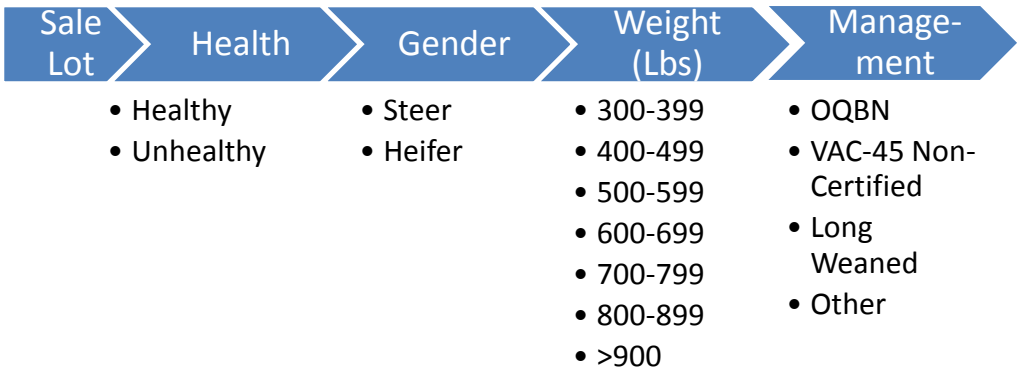

Figure I-1. Breakdown process of price report

For appropriate comparison, visibly unhealthy cattle are excluded. Data are then sorted by the gender since a price differential generally exists between steers and heifers. Finally, data are sorted by weight and by management practice. This allows weighted average prices to be reported for different bundles of management practices. Microsoft Excel's database commands are used as the sorting mechanism. As shown in figure I 2, each sale is coded with a unique sale identification number. Those cells are linked to a single cell where the sale identification code is easily changed to create the summary for any sale.

OQBN CALVES			STEERS				
Sale ID	AvgWT	AvgWT	Health	Sex	Vac	Wean	Cert
1	>299	<400	1	1	1	1	1
Sale ID	AvgWT	AvgWT	Health	Sex	Vac	Wean	Cert
1	>399	<500	1	1	1	1	1
Sale ID	AvgWT	AvgWT	Health	Sex	Vac	Wean	Cert
1	>499	<600	1	1	1	1	1
Sale ID	AvgWT	AvgWT	Health	Sex	Vac	Wean	Cert
1	>599	<700	1	1	1	1	1
Sale ID	AvgWT	AvgWT	Health	Sex	Vac	Wean	Cert
1	>699	<800	1	1	1	1	1
Sale ID	AvgWT	AvgWT	Health	Sex	Vac	Wean	Cert
1	>799	<900	1	1	1	1	1
Sale ID	AvgWT	AvgWT	Health	Sex	Vac	Wean	Cert
1	>899		1	1	1	1	1

Figure I-2. Excel database command code example

Figure I-3 shows the price summary in Excel which mimics weekly price reports from Agricultural Marketing Service. This format is one that producers, extension personnel, and other interested parties are accustomed to interpreting. A link to Microsoft Publisher generates the sale summary with specific sale date and location in a distributable form for an individual OQBN sale.

Sale ID of desired report	5

Price Breakdowns by Weight (Steers)

Head	Wt Range (lbs)	Avg Weight (lbs)	OQBN Price Range	OQBN Avg Price	Vac-45 Non-Cert Price Range	Vac-45 Non-Cert Avg Price	Long-Weaned Price Range	Long Weaned Avg Price	Other Price Range	Other Avg Price
85	300-399	355	135.00 - 135.00	135.00	124.00 - 147.00	136.46	123.00 - 136.00	127.16	81.00 - 81.00	81.00
242	400-499	456	85.00 - 132.00	129.67	112.00 - 137.00	122.84	117.00 - 141.00	128.04	81.00 - 132.00	115.19
543	500-599	554	85.00 - 121.00	117.71	94.00 - 131.50	120.34	87.00 - 133.00	113.61	105.50 - 118.00	116.07
773	600-699	644	103.00 - 115.00	110.94	100.00 - 116.00	109.06	105.50 - 115.00	108.52	92.00 - 108.00	106.70
104	700-799	745	102.00 - 108.00	107.36	107.00 - 108.00	107.37	105.00 - 105.00	105.00	-	
29	800-899	828	-		115.50 - 115.50	115.50	-		-	
0	>900		-		-		-		-	

Price Breakdowns by Weight (Heifers)

Head	Wt Range (lbs)	Avg Weight (lbs)	OQBN Price Range	OQBN Avg Price	Vac-45 Non-Cert Price Range	Vac-45 Non-Cert Avg Price	Long-Weaned Price Range	Long Weaned Avg Price	Other Price Range	Other Avg Price
68	300-399	360	115.00 - 115.00	115.00	93.00 - 115.00	105.83	93.00 - 117.00	100.81	110.00 - 124.00	120.50
587	400-499	450	75.00 - 117.50	115.47	100.00 - 120.00	112.18	84.00 - 116.00	106.36	105.00 - 114.00	109.90
798	500-599	554	100.00 - 107.50	105.03	103.00 - 115.00	107.28	77.00 - 112.00	103.03	97.00 - 100.00	99.44
322	600-699	638	100.00 - 104.50	104.00	100.00 - 107.50	105.21	90.00 - 100.00	95.04	-	
1	700-799	795	90.00 - 90.00	90.00	-		-		-	
0	800-899		-		-		-		-	
0	>900		-		-		-		-	

Figure I-3. Price summary template in excel

Summary

Cattle producers use sale summaries to evaluate program validity and whether OQBN participation resulted in premiums. Previous research done in Iowa found evidence of premiums ranging anywhere from $1.30/cwt (Lawrence & Yeboah, 2002) to $6.12/cwt (Bulut & Lawrence, 2007). Avent, Ward and Lalman (2004) concluded existence of a $3.30/cwt premium for Vac-45 cattle at a Joplin, Missouri market. The sale summaries enable extension personnel and participants to quickly assess whether evidence of an OQBN premium at a particular sale exists. This information is used to educate non-participating producers about the opportunities offered by participation in OQBN.

As extension programs grow and target audiences become larger, Extension educators are faced with the task of quick and precise data analysis and dissemination. The data analysis tool discussed here facilitates rapid evaluation of large amounts of primary livestock auction data so that the value of the extension program (Oklahoma Quality Beef Network) can be communicated easily to appropriate audiences. The tool is easily modified to fit specific informational needs.

PAPER II

PRICE PREMIUMS OF THE OKLAHOMA QUALITY BEEF NETWORK

Introduction

Preconditioning feeder cattle entails a variety of different management practices on the ranch beyond weaning. These practices involve administering vaccinations, castrating, dehorning, and weaning a minimum of 30 days, along with other common management practices. The purpose of preconditioning is to boost the immune system of calves before they are exposed to future stressors in the feedlot (Dhuyvetter, 2003). Research has shown that when cattle have been preconditioned, feedlot and carcass performance increase and medication costs decrease, resulting in added profits for feedlot operators (Roeber, et al., 2001). Knowing the increased value this brings to the beef industry, extension personnel as well as animal health companies have encouraged producers to adopt alternative management practices and to participate in these preconditioning programs.

Adding value to cattle is an important issue in Oklahoma. According to the 2007 U.S. Agricultural Census, 96.9 percent of the cows in Oklahoma were beef cows, with numbers totaling over two million head (USDA). This makes up approximately 6.28 percent of the United States cow herd. The cattle produced by approximately forty-seven

thousand beef cattle producers in Oklahoma contribute nearly 53 percent of Oklahoma's agricultural production value.

Numerous studies have examined the factors which affect feeder cattle price differentials (Buccola, 1980; Menkhaus and Kearl, 1976; Schroeder, et al., 1988; Bailey, Peterson and Brorsen, 1991). Initial research focused on the physical characteristics of the cattle being sold, as well as market characteristics associated with the cattle. Research has explored how different management practices influence prices received for feeder cattle at the time of sale, and more specifically, the values of the practices of weaning and vaccinating and the combination of the two, otherwise known as preconditioning. While research has shown that preconditioning makes an impact on calf performance (Bach et al., 2004; Lalman and Smith, 2001), asymmetric information exists in the cattle marketing chain, making it hard for buyers to verify that producers are in fact vaccinating and weaning their calves before the time of sale.

The response to this asymmetric information was the creation of certification programs to verify enrollment and implementation of preconditioning protocols. The Oklahoma Quality Beef Network (OQBN) is one such program. OQBN is a collaborative effort between the Oklahoma Cattlemen's Association (OCA) and the Oklahoma Cooperative Extension Service (OCES) (McKinney, 2010). OQBN is a brand-neutral third-party health management certification program (VAC-45) for calves. (See table II-1 for specific requirements and recommendations.) OQBN certified calves are eligible to sell in certified preconditioned cattle auctions hosted by OQBN at participating livestock auction barns across the state.

Table II-1. Certification Requirements for the Oklahoma Quality Beef Network

OQBN Vac-45	
Eligibility	Home-raised claves qualify as long as all OQBN requirements are met.
Pre-enrollment	The enrollment and verification process must be completed within 21 days of the sale date or shipping event.
Castration	Bulls must have been castrated (knife cut or banded) and healed prior to the sale date or shipping event,
Dehorning	Calves must be dehorned and healed prior to the sale date or shipping event. No horns allowed.
Weaning	Calves must be weaned a minimum of 45 prior to sale date or shipping event.
Concentrate feeding	It is recommended, but not a requirement to feed a concentrate feed source for 7 days after weaning to train calves to eat out of a feed bunk.
Deworming	Deworming is recommended, but not a requirement for the treatment of internal and external parasites.
Implants	Recommended, but not required, that calves not be implanted within 70 days of the sale or shipping event. However, if the calves have been implanted, the product used and date implanted must be indicated on the enrollment form.
BQA Guidelines	Producers should follow Beef Quality Assurance Guidelines indicated in the enrollment packet.
Vaccinations	Select and follow one of the three vaccination schedules on the enrollment form.
Third-party verification	Third-party verification requires a signature of an OQBN representative. A phone audit and/or ranch visit is optional and at the discretion of the OQBN representative.
Preconditioning Verification	The enrollment form is submitted to the OQBN office where an OQBN representative will complete the enrollment process. The OQBN representative clears the application. The verification process must be completed a minimum of 21 days prior to the sale date or shipping event.

As certification programs became more prevalent, research began focusing on the value of certification. Physical factors analyzed typically include gender, breed, muscle

score, frame size, horn or polled status, and health. Market characteristics considered important are lot size, number of cattle sold at each auction, and time of sale.

For example, a study analyzing sale data collected at Joplin Regional Stockyards in Joplin, Missouri found that buyers placed a premium of $3.30 per hundredweight (cwt) on cattle which had been sold in the certified VAC-45 special sale[1] (Avent, Ward and Lalman, 2004). A more recent study conducted by Bulut and Lawrence (2007) used data from sale barns in southern and western Iowa. Sale data included 105 sales, some of which were strictly for preconditioned cattle. They concluded a premium of $6.12/cwt existed for calves with certified vaccination and at least thirty days weaning over calves which had no vaccinations or weaning.

OQBN also offers a source and age verification program in conjunction with the certified preconditioned program. Bovine spongiform encephalopathy (BSE) breakouts in the early 2000s resulted in certification premiums for source and age verification. Pressures from importers of American beef prompted the United States to put this system in place to ensure availability of a safe product for export. Though source and age verification is a relatively low cost effort, without a premium, cattle producers would be hesitant to adopt this program. Lawrence and Yeboah (2002) estimated the value of source verified cattle at an auction in Bloomfield, Iowa. They found that cattle weighing less than 650 pounds received a premium of $1.30/cwt, while cattle heavier than 650 pounds received no significant premium. The findings of Kellom et al. (2008) suggest that a 600 pound third-party certified age and source calf received a premium of $12.83/cwt on Superior Livestock video auctions in 2007.

[1] A VAC-45 special sale is a sale in which all cattle offered for sale that day have been vaccinated and weaned a minimum of 45 days.

While these findings solidify a value for various certification programs, it is important for the OQBN program as well as for backers of industry-led preconditioning programs to know if buyers are paying a premium for certified preconditioned calves in Oklahoma. More importantly, and the focus of this paper, do buyers pay certification premiums for cattle certified as preconditioned through the 2010 Oklahoma Quality Beef Network? The overall goal of this research is to determine price premiums received by cattle certified as OQBN preconditioned cattle and marketed through OQBN certified auctions during fall 2010. The objectives are: 1) to determine the existence and magnitude of premiums for OQBN cattle sold at an OQBN certified auction relative to cattle with no vaccinations or weaning; 2) to quantify the magnitude of sale value for specific phenotypic traits; and 3) to determine if overall price levels are higher during OQBN hosted sales.

In the initial years of the OQBN program, premiums of $1.51/cwt, $3.95/cwt, and $5.89/cwt were found over non-preconditioned cattle for the years 2001-2003 respectively (Ward, et al., 2003). Donnell (2007) found that cattle enrolled in the 2005 Integrity Beef Production System (BPS)[2], a preconditioning program hosted by the Samuel Roberts Noble Foundation, received a premium that ranged from $2.80/cwt to $4.28/cwt over non-preconditioned cattle.

The common approach for establishing whether or not premiums exist is to use a hedonic pricing model. This model allows dissection of prices into values for different characteristics such as breed, sex, etc. while holding all other factors constant. Hedonic modeling has been used to estimate values in a variety of disciplines. Examples include

[2] The BPS program is similar to OQBN but cattle are age and source verified and meet additional genetic requirements.

the values of wheat characteristics in Kansas (Espinosa and Goodwin, 1991) and the values buyers place on the characteristics of fish in Hawaiian fish markets (McConnell and Strand, 2000). It is also extensively used to differentiate the characteristics of real estate (Anderson and West, 2006; Goodman, 1978)

Theory and Methodology

The law of one price states that prices across time, form, and space should differ by no more than the transaction costs. If the law holds true, then price will be a function of time, form, and space, represented by:

1) $$Price = f(time, form, space).$$

In the case of feeder calf price differentials, time and space can be held constant while analyzing how different forms of cattle affect the price received. Here, different forms of cattle are defined as having different physical characteristics, different management practices administered at the originating ranch, and different levels of certification.

Ladd and Martin's Input Characteristics Model (ICM), gives us the framework for assessing how different lot characteristics for cattle impact the sale price of the lot (1976). The ICM denotes the price of an input equals the summation of the money values of the individual characteristics which make up an input. Following Schroeder at al. (1988), the price of a lot of feeder cattle should be a function of physical characteristics (*C*), management practices (*Y*) associated with the cattle in the lot and fundamental market forces (*M*), written as:

2) $$Price_{it} = \sum_k V_{ikt}\, C_{ikt} + \sum_j G_{jt} Y_{jt} + \sum_h R_{ht} M_{ht},$$

where i refers to lot of cattle, t represents the auction date, k refers to specific animal trait, j corresponds to management practices, and h refers to market influence. The values of each specific animal trait and the management practices are represented by V and G respectively, while R is the price effect of the market forces.

In feeder cattle, different characteristics affect feedlot performance, anticipated yield, quality grade, and overall quality of the animal. Therefore, individual characteristics have different values because of the end results associated with each characteristic. Several studies have explored what factors affect feeder cattle price differentials (Faminow and Gum, 1986; Halfman, et al., 2009; Schroeder, et al., 1988; Smith, et al., 1998). The model used here includes those characteristics deemed important by previous findings. This study builds on previous feeder cattle pricing studies that determine values of different sale lot characteristics using the hedonic pricing model (Avent, Ward and Lalman, 2004; Coatney, Menkhaus and Schmitz, 1996; Lawrence and Yeboah, 2002). We extend this approach by employing a mixed modeling approach. The hedonic pricing model used here includes a random effect variable, similar to the feeder cattle price study by Luepp et al. (2009). The basic model is:

3) $$\boldsymbol{Price = Xb + Zu + \varepsilon}$$

where $\boldsymbol{Price}$ is a vector of observations on the dependent variable, X is a matrix of explanatory variables, b is a vector of fixed effect parameters, Z is a matrix of indicator variables for sale, u is a sale random effect error vector and ε is the vector of overall error terms. In this case the vector b of fixed effects consists of the effects of lot characteristics, market influences and the management variables.

Data

Data was collected in the fall of 2010 at 16 feeder cattle auctions in seven different locations across the state of Oklahoma. Data was recorded at sales spanning from October 27, 2010 to December 13, 2010, on 2973 lots of cattle representing 25,839 head of cattle. OQBN cattle accounted for 833 lots (28.02%) and 7,332 head (28.38%) sold. OQBN data was recorded at eight of the 16 sales. Six OQBN sales were held in conjunction with regular feeder cattle sales, while two sales were conducted on special sale days where OQBN certified cattle were the only cattle sold. For each lot, the data contain sale price and information on physical characteristics, specific management practices, and market influences. The physical characteristics include number of head, average weight per calf, hide color, gender, fleshiness, frame score, uniformity, health and horned status, muscle score and fill. The management practices data component includes vaccinations, weaning, preconditioning certification and age and source certification. Market influences included in the data are sale location and a reference market price defined as the weekly average price for a 750 pound steer (Medium and Large #1) from the Oklahoma City, Oklahoma market (AMS-USDA, Report KO_LS155). Feeder cattle weight ranges were limited to 300-799 pounds as this was the range for the majority of OQBN data.

Agricultural economists and animal science personnel shadowed United States Department of Agriculture (USDA) Agriculture Marketing Service (AMS) professionals at AMS data collection sites prior to data collection to increase consistency, given the subjective nature of grading some cattle characteristics. Data collection was limited to five trained individuals to minimize variation in the collection process. To further

increase data consistency, data collection teams were employed in groups of two or three persons per sale. The data collection group included three professors with livestock extension appointments from the Agricultural Economics Department, one Agricultural Economics Master's student, and an Animal Science PhD student. Laptops were taken to sales and market price and lot characteristics were entered directly into a Microsoft Excel spreadsheet.

Following specific collection protocols, on OQBN sale days, data was recorded a minimum of one hour before the OQBN cattle sold and a minimum of one hour after OQBN calves had sold, averaging collection times of 4.2 hours per sale[3]. For days on which data was collected at non-OQBN certified sales, data collectors recorded data at similar midday times to reduce variability in the time of day effect. Average collection time was 3.2 hours per sale.

Hide color is primarily used, rather than breed type, to distinguish between cattle types. This is similar to more recent studies of this type (Bulut and Lawrence, 2007; Leupp, et al., 2009). The exceptions to categorizing by color rather than by breed or breed type are Hereford and Dairy/Longhorn. These breeds have distinct markings and have traditionally been subject to large discounts in the market. Solid color lots are deemed as black, red, or white/grey. Lots are recorded as black mixed or red mixed if lots contain $\leq 25\%$ of some other hide color. All other lots are deemed as mixed color lots or other[4]. Brahman influence was recorded separately and was used in conjunction

[3] Most OQBN certified sales were held midday with the exception of one, which was held mid-morning.
[4] Other hide colors for example include Belted Galloway, typical Shorthorn or others which would not fit in other categories.

with hide color. The threshold used was any visible Brahman characteristics on at least 25% of the lot.

Methods and Procedures

The basic model used in this study modifies the ICM (equation 2) to reflect the mixed model (equation 3). The resulting model is:

4) $$Basis_{jt} = \beta_0 + \sum_{i=1}^{K} \beta_i X_{ijt} + \sum_{i=1}^{L} \theta_i V_{ijt} + \mu_t + \varepsilon_{jt},$$

where: β_0 is the intercept, X_{ijt} (i = 1,…, K) are the physical and market related explanatory variables; β_i (i = 1,…, K) are the corresponding coefficients; V_{ijt} (i = 1,…, L) are the variables representing the management categories of interest, θ_i (i = 1,…, L) are the corresponding coefficients; μ_j (j = 1) is the random effect for sale identification, and $\boldsymbol{\varepsilon_{jt}}$ is the disturbance term in the equation.

Basis, the dependent variable in the model, is defined as price/cwt received minus a reference price/cwt. As previously mentioned, the reference price is the corresponding weekly average price/cwt for a 750 pound steer (Medium and Large #1) from the OKC market for the specific sale week (AMS-USDA, Report KO_LS155). Inclusion of the OKC price serves as a proxy variable for changing market levels during the time period when sale data was collected. This is similar to the use of feeder calf and corn futures prices as previous studies have done (Bulut and Lawrence, 2007; Lawrence and Yeboah, 2002).

The impact of lot size on price received is typically modeled as a quadratic relationship (Faminow and Gum, 1986; Bulut and Lawrence, 2007). Leupp et al. (2009) deviated from the traditional quadratic form using dummy variables for lot size

differences. He found little difference in lot size impact between 5 and 20 head, but did find that lot sizes ≥ 21 received higher prices than lot size of ≤ 11 head. The quadratic relationship allows researchers to gain insight into how lot size affects the price behavior, but it also allows the price advantage for lot size to decrease after the peak premium, indicating lot sizes offered for sale can be too large – that is, the returns to lot size decline and can become negative at some point. It also imposes a symmetric shape on the lot size impact, which is unlikely. The natural log, however, indicates a steep rise in price for initial increases in lot sizes with premiums increasing at a decreasing rate – that is, leveling off - in the later increases of lot size. In an attempt to better understand the price behavior related to the lot size effect, several models were explored.

First, to better understand the data, dummy variables for lot size were estimated and results were plotted to assess how price changes as lot size increases in this particular data set. Lot size impact was modeled using three different functional forms: 0-1 lot size dummy variables across the range of observed lot sizes, natural log of lot size, and quadratic. Figure II-1 illustrates the shape of the lot size effect under different functional forms as compared to results from the use of extensive lot size dummy variables and shows the distribution of lot size in the data. Upon inspection one can see that the largest part of the data (95%) contain less than thirty head per lot. J-tests were used to compare models and all models with different functional forms for lot size were rejected (Davidson and MacKinnon, 1981). This result suggests that one model could not explain another, indicating that each included unique information. Ultimately, lot size impact was modeled with the inclusion of the natural log of number of head in a lot instead of the quadratic form. This impact constrains marginal returns for lot size from being negative.

The impact of calf weight on price was modeled as a quadratic function, similar to previous studies (Faminow and Gum, 1986; Avent, Ward and Lalman, 2004). Therefore, the specific model estimated:

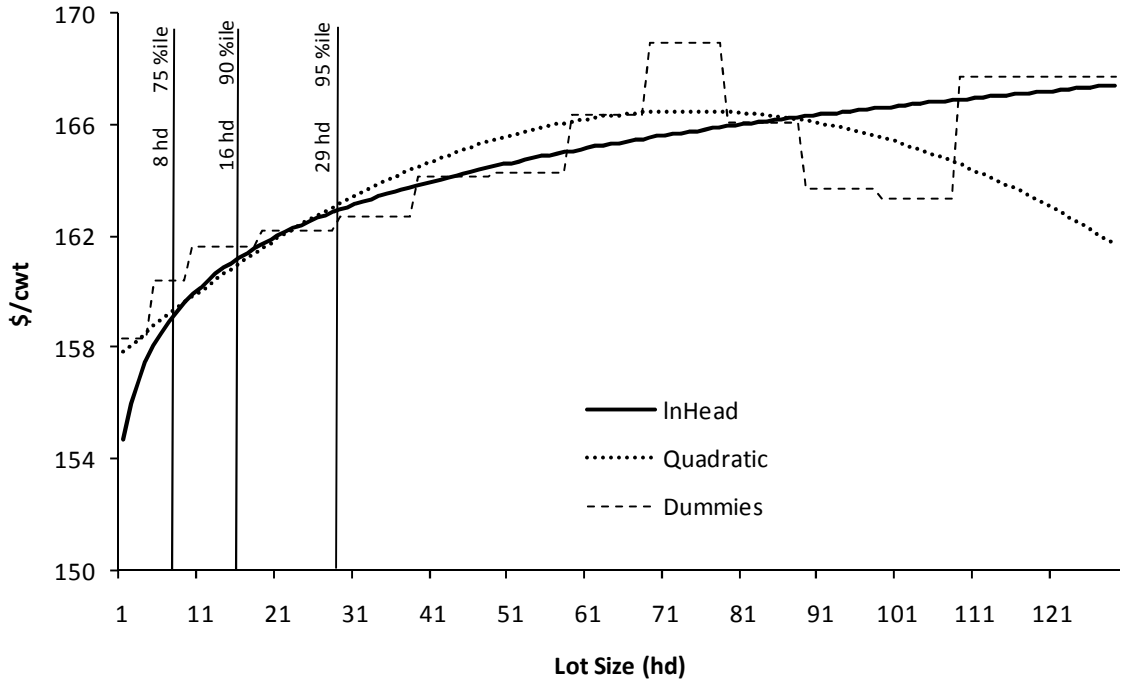

Figure II-1. Lot size distribution and illustration of lot size impact using dummy variables, natural log and quadratic models.

5)

$$\begin{aligned}\text{Basis}_{jt} = {} & \alpha + \beta_1 \text{LnHead}_{jt} + \beta_2 \text{AvgWt}_{jt} + \beta_3 \text{AvgWt}_{jt}^2 + \beta_4 \text{Vac}_{jt} + \beta_5 \text{Wean}_{jt} + \beta_6 \text{Cert}_{jt} \\ & + \sum_{i=1}^{2} \beta_{7i} \text{Gender}_{ijt} + \sum_{i=1}^{8} \beta_{8i} \text{Hide Color}_{ijt} + \beta_9 \text{Brahman}_{jt} + \beta_{10} \text{Horns}_{jt} \\ & + \sum_{i=1}^{3} \beta_{11i} \text{Frame}_{ijt} + \sum_{i=1}^{4} \beta_{12i} \text{Muscle}_{ijt} + \sum_{i=1}^{2} \beta_{13i} \text{Condition}_{ijt} \\ & + \sum_{i=1}^{2} \beta_{14i} \text{Fill}_{ijt} + \beta_{15} \text{Health}_{jt} + \beta_{16} \text{Uniform}_{jt} + \beta_{15} \text{AgeSource}_{jt} \\ & + \beta_{16} \text{Reputation}_{jt} + \sum_{i=1}^{6} \beta_{17i} \text{Location}_{ijt} + \beta_{18} \text{OQBN Sale}_{jt} \\ & + \beta_{19} \text{AvgWt}_{jt} * \text{Cert}_{jt} + \beta_{20} \text{AvgWt}_{jt}^2 * \text{Cert}_{jt} + \mu_t + e_{jt}\end{aligned}$$

where j = 1,..., N denotes each sale lot, and t = 1,…,T denotes the day on which the sale took place. A description of all variables included in the model can be found in table II-2.The model is estimated using the MIXED procedure in SAS 9.2. Initial diagnostic tests using the likelihood ratio test indicated the presence of heteroskedasticity stemming from the average weight variable. The model was corrected for heteroskedasticity (Judge et al., 1988, p. 366) by specifying

6) $$E\left[e_{jt}^2\right] = \sigma_{jt}^2 = \exp\left[\alpha_1 + \alpha_2 AvgWt_{jt}\right]$$

Table II-2. Variables Included in the Model

Dependent Variable	Variable Definition
$Basis_{it}$	*i*th adjusted transaction price ($/cwt) for a lot of calves in sale *t*
Management Categories (*I*)	
Vaccination	Binary variable for vaccination status.
Weaning	Binary variable for weaning status.
Certification	Binary Variable for certification status.
Age & Source	Binary variable for Age & Source verification.
Wtint	Interaction effect of Avgwt with OQBN certification.
$Wtint^2$	Interaction effect of $Avgwt^2$ with OQBN certification.
Physical Attributes (*C*)	
Lnhead	Natural log of the total number of head in a lot
AvgWt	Average weight for a lot of cattle
$Avgwt^2$	Quadratic term for average weight
Gender	Class variable for gender of lot, base = steer, other classes: heifers, mixed.
Flesh	Class variable for fleshiness of lot, base = average, other classes: fleshy, thin.
Frame	Class variable for frame score of the lot, base = medium, other classes: large, medium/large, and small[a].
Uniform	Class variable for uniformity of the lot, base= uniform, other class: non-uniform.
Health	Class variable for health status of the lot, base = healthy, other class: not healthy.
Horns	Class variable for horn status of the lot, base = polled, other class: horned
Muscle	Class variable for the muscle score of the lot, base = medium all #2, other classes: large all #1, mixed #1 & #2, mixed #2 & #3, and light all #3.
Fill	Class variable for the fill of the lot, base = average, other classes: gaunt, and full.
Reputation	Binary variable for reputation status
Marketing (*M*)	
Barn	Class variable for Auction location, base = 7, other classes: 1 - 6.
O_sale	Binary variable for OQBN sale.

[a] No data was collected on lots deemed small framed.

Results and Discussion

Summary data are presented in table II-3 for all lots, for OQBN lots, for non-OQBN lots at an OQBN sale, and non-OQBN lots at non-OQBN sales. Characteristics of the data are similar for all subsets, with limited notable differences. At OQBN sales, approximately 25% of non-OQBN calves were vaccinated, while only 13.58% of calves at non-OQBN sales were vaccinated. This could be due to data collection times and auction barn managers scheduling cattle with similar management practices to be sold immediately following the OQBN certified sale. In contrast, more non-OQBN calves at non-OQBN sales were recorded as weaned (58.23%) than were non-OQBN cattle at certified OQBN sales (52.27%).

The summary indicates 77.14% of lots offered by the OQBN program were either black or black mixed hided cattle compared to only 67.33% at non-OQBN sales. More steers were attracted to the program as well with 58.04% of OQBN calves compared to 51.68% of non-OQBN calves at non-OQBN sales. The other major difference was for lots where seller was announced (a proxy for reputation cattle). OQBN and non-OQBN lots at OQBN sales had 36.31% and 39.65% recorded as seller announced, while only 22.52% of lots at non-OQBN sales were seller announced.

Table II-3. Summary Statistics.

	All Calves		OQBN Calves @ OQBN Sales		Non-OQBN Calves[a] @OQBN Sales		Non-OQBN Calves[a] @ Non-OQBN Sales	
Lot Characteristic	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Head	7.51	13.41	8.82	11.81	7.17	13.69	6.90	14.14
Weight	529.14	116.61	542.70	115.42	509.29	108.09	534.50	121.44
Price	113.79	16.90	118.33	15.27	110.74	17.31	112.99	17.00
Lot Characteristic	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Vaccinations								
Vaccinated	1225	41.08	827	100.00	228	25.25	170	13.58
Not vaccinated	1757	58.92	0	0.00	675	75.75	1082	86.42
Weaning								
Weaned	1822	61.10	827	100.00	472	52.27	729	58.23
Not weaned	1160	38.90	0	0.00	431	47.73	523	41.77
Certification								
Not certified	2155	72.27	0	0.00	903	100.00	1252	100.00
Certified OQBN	827	27.73	827	100.00	0	0.00	0	0.00
Color								
Black	1836	61.76	521	63.69	560	62.02	755	60.30
Red	229	7.70	53	6.48	73	8.08	103	8.23
Hereford	52	1.75	11	1.34	15	1.66	26	2.08
White/Grey	261	8.78	46	5.62	96	10.63	119	9.50
Dairy/Longhorn	39	1.31	3	0.37	6	0.66	30	2.40
Black mixed	276	9.28	110	13.45	78	8.64	88	7.03
Red mixed	66	2.22	20	2.44	10	1.11	36	2.88
Mixed	189	6.36	51	6.23	60	6.64	78	6.23
Other	25	0.84	3	0.37	5	0.55	17	1.36

Note - Frequency indicates number of lots in each category.

Table II-3. Summary Statistics (Continued)

	All Calves		OQBN Calves @ OQBN Sales		Non-OQBN Calves[a] @ OQBN Sales		Non-OQBN Calves[a] @ Non-OQBN Sales	
Lot Characteristic	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Brahman								
Non-Brahman	2766	93.04	747	91.32	833	92.25	1186	94.73
Brahman Influence	207	6.96	71	8.68	70	7.75	66	5.27
Gender								
Steer	1545	51.81	480	58.04	418	46.29	647	51.68
Heifer	1304	43.73	347	41.96	412	45.63	545	43.53
Bull/Mixed	133	4.46	0	0.00	73	8.08	60	4.79
Flesh								
Thin	67	2.25	7	0.86	9	1.00	51	4.07
Average	2036	68.48	513	62.71	565	62.57	958	76.52
Fleshy	870	29.26	298	36.43	329	36.43	243	19.41
Muscling								
Thick, all #1	389	13.08	78	9.54	148	16.39	163	13.02
Mixed, #1 & #2	778	26.17	295	36.06	212	23.48	271	21.65
Medium, all #2	1755	59.03	443	54.16	532	58.91	780	62.30
Mixed, #2 & #3	12	0.40	1	0.12	7	0.78	4	0.32
Light, all #3	39	1.31	1	0.12	4	0.44	34	2.72
Uniformity								
Uniform	2959	99.53	818	100.00	897	99.34	1244	99.36
Not uniform	14	0.47	0	0.00	6	0.66	8	0.64
Condition								
Gaunt	22	0.74	2	0.24	9	1.00	11	0.88
Average	2455	82.58	669	81.78	695	76.97	1091	87.14
Full	496	16.68	147	17.97	199	22.04	150	11.98

Note - Frequency indicates number of lots in each category.

Table II-3. Summary Statistics (Continued)

	All Calves		OQBN Calves @ OQBN Sales		Non-OQBN Calves[a] @OQBN Sales		Non-OQBN Calves[a] @ Non-OQBN Sales	
Lot Characteristic	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Frame								
Large	415	13.96	76	6.29	131	14.51	208	16.61
Medium/Large	774	26.03	292	35.70	207	22.92	275	21.96
Medium	1784	60.01	450	55.01	565	62.57	769	61.42
Horns								
Horns	187	6.29	0	0.00	77	8.53	110	8.79
No horns	2786	93.71	818	100.00	826	91.47	1142	91.21
Health								
Healthy	2950	99.23	813	99.39	893	98.89	1244	99.36
Not healthy	23	0.77	5[b]	0.61	10	1.11	8	0.64
Age & Source								
Verified	152	5.11	103	12.59	1	0.11	48	3.83
Not verified	2821	94.89	715	87.41	902	99.89	1204	96.17
Reputation								
Not announced	2036	68.48	521	63.69	545	60.35	970	77.48
Seller announced	937	31.52	297	36.31	358	39.65	282	22.52

Note - Frequency indicates number of lots in each category.

[a] Non-OQBN calves refer to non-vaccinated and non-weaned calves.

[b] Any unhealthy cattle were pulled from lot and sold individually

Coefficients from the mixed model estimation can be found in table II-4. Most variables were significant at the 5% level, except the interactions between certification and weight which were significant at the 10% level. Some subjective traits were not significant. Results for most lot characteristics are in agreement with previous studies. As expected, black hided lots receive a higher price/cwt than all other hide colors. The biggest discount from the base of black hided cattle, $27.71/cwt ($p < .0001$), was given for lots deemed Dairy/Longhorn. Hide colors which received prices most similar to the black hided base were black mixed and white/grey lots, which received discounts of $1.21/cwt ($p = 0.0288$) and $1.81/cwt ($p = 0.0146$) respectively. Lots recorded as Brahman-influence received a discount of $3.48/cwt ($p < .0001$). This discount is in addition to value for hide color. Heifers received a significant discount, as expected, at $11.78/cwt ($p < 0.0001$) while lots containing bull calves were discounted $5.78/cwt ($p < 0.0001$). Other characteristics resulted in findings similar to those of previous studies. One thing to note is the lack of significance for many subjective lot characteristics such as: lots deemed fleshy, frame scores, muscle scores, and the fill of each lot. Though previous literature has found significance in these characteristics, our result is not surprising as the subjectivity likely contributes to higher variability of assessment values across data collectors and across buyers. Some subjective traits were statistically significant. Lots deemed thin in body condition received a discount of $9.26/cwt ($p < .0001$). The other distinguishable discount was for lighter muscled lots. Lots of mixed #2 and #3 muscle score cattle were discounted $10.11/cwt ($p = 0.0018$) and lots of all #3 cattle were heavily discounted at $20.07/cwt ($p < .0001$). This implies a large discount

for less than average muscled cattle but no significant premium for heavier muscled cattle. Again the subjectivity of muscle score may contribute to this result.

Table II-4. Parameter Estimates for Mixed Hedonic Pricing Model.

Variable	Coefficient	Standard Error	t-value	P-value
Intercept	59.107	4.074	14.51	<0.0001
lnhead	3.039	0.208	14.64	<0.0001
AvgWt	-15.771	1.421	-11.10	<0.0001
$AvgWt^2$	0.869	0.123	7.05	<0.0001
Management				
Vaccinated	1.438	0.605	2.38	0.0175
Weaned	2.051	0.507	4.04	<0.0001
Certification	15.544	7.954	1.95	0.0508
Premium Interaction				
Wtint	-4.995	2.772	-1.80	0.0717
$Wtint^2$	0.388	0.237	1.64	0.1015
Hide Color				
Red	-3.479	0.637	-5.46	<0.0001
Hereford	-7.465	1.247	-5.99	<0.0001
White/Grey	-1.807	0.739	-2.44	0.0146
Dairy/Longhorn	-27.709	2.187	-12.67	<0.0001
Other	-13.755	1.772	-7.76	<0.0001
Black mixed	-1.209	0.553	-2.19	0.0288
Red mixed	-2.912	1.018	-2.86	0.0043
Mixed	-4.392	0.674	-6.51	<0.0001
Brahman				
Influenced	-3.478	0.631	-5.51	<0.0001
Gender				
Heifer	-11.777	0.329	-35.95	<0.0001
Bull	-5.771	0.734	-7.86	<0.0001
Flesh				
Thin	-9.263	1.352	-6.85	<0.0001
Fleshy	0.626	0.399	1.57	0.1170
Frame				
Large	0.071	0.596	0.12	0.9051
Medium/Large	-0.118	0.463	-0.26	0.7985
Uniformity				
Not uniform	-15.307	2.416	-6.34	<0.0001

Table II-4. Parameter Estimates for Mixed Hedonic Pricing Model (Continued).

Variable	Coefficient	Standard Error	t-value	P-value
Health				
Unhealthy	-32.792	1.856	-17.66	<0.0001
Horned Status				
Horns	-3.153	0.656	-4.81	<0.0001
Muscling				
Thick, all #1	0.436	0.566	0.77	0.4419
Mixed, #1 & #2	-0.152	0.452	-0.34	0.7366
Mixed, #2 &# 3	-10.112	3.229	-3.13	0.0018
Light, all #3	-20.066	2.356	-8.52	<0.0001
Condition				
Gaunt	-0.415	1.842	-0.23	0.8218
Full	-0.607	0.477	-1.27	0.2032
Age & Source				
Verified A&S	0.947	0.765	1.24	0.2159
Reputation				
Seller Announced	0.215	0.419	0.51	0.6083
Sale Value				
OQBN Sale	-0.564	0.513	-1.10	0.2718
Location Effect				
Barn 1	-2.362	0.902	-2.62	0.0089
Barn 2	-8.212	1.127	-7.29	<0.0001
Barn 3	-8.748	0.938	-9.33	<0.0001
Barn 4	1.538	0.824	1.87	0.0621
Barn 5	-2.669	0.775	-3.44	0.0006
Barn 6	-0.083	0.792	-0.11	0.9162

[a] Number of observations: 2976 feeder calf lots.

[b] Bases: non-vaccinated, non-weaned, non- certified preconditioned, black, non-Brahman influenced, steers, average flesh, uniform, healthy, no horns, medium (#2) muscled, average body condition, non-age and source verified, non-reputation, at a non-OQBN sale, and at barn 7.

The number of head marketed per lot significantly affects the price/cwt received ($p < .0001$). Using single head lots as the base, lot size effect was modeled as a function of the natural log of the number of head in a lot. This indicates premiums increase rapidly

with lot size and then level out. For example, sale lots containing five and ten head receive a premium of $4.89/cwt and $7.00/cwt above the base lots size of one head, respectively, while 20 and 30 head lots receive premiums of $9.11/cwt and $10.34/cwt, respectively. Increasing lot size from 5 to 10 head yields a $2.11/cwt advantage while increasing the lot size from 20 to 30 head only provides a $1.23/cwt marginal benefit.

With respect to average calf weight of the lot, the price/cwt received decreased at a decreasing rate, as expected. In layman's terms, this is known as the price slide. Figure II-2 reveals how marketing a heavier average weight lot results in receiving a lower price/cwt, all else equal, but in all cases the pounds marketed provide a higher absolute value. Figure II-3 shows how relative price decreases as average weight of a lot increases and confirms that lighter average calf weights bring higher relative prices. Lots with an average calf weight of 350 pounds received advantages of $8.82/cwt over 450 pound calves. The price slide from 450 – 550 pounds was $7.08/cwt, from 550 - 650 pounds $5.35/cwt and from 650 -750 pounds $3.61/cwt.

The main focus of this paper was to determine the price premium received for preconditioned cattle that are OQBN certified versus cattle which are neither preconditioned nor certified. The estimate statement in the MIXED procedure was used to test hypotheses and construct premiums for different weights of OQBN cattle. The null hypothesis is tested for the midpoint of each 100 pound weight range:

7) $$H_0: \beta_0 + \beta_4 \text{Vaccinated} + \beta_5 \text{Weaned} + \beta_6 \text{Certification} + \beta_{18} \text{OQBN Sale} + \beta_{19} \text{AvgWt} * \text{Cert} + \beta_{20} \text{AvgWt}^2 * \text{Cert} = 0$$

8) $$H_a: \beta_0 + \beta_4 Vaccinated + \beta_5 Weaned + \beta_6 Certification + \beta_{18} OQBN\ Sale + \beta_{19} AvgWt * Cert + \beta_{20} AvgWt^2 * Cert \neq 0$$

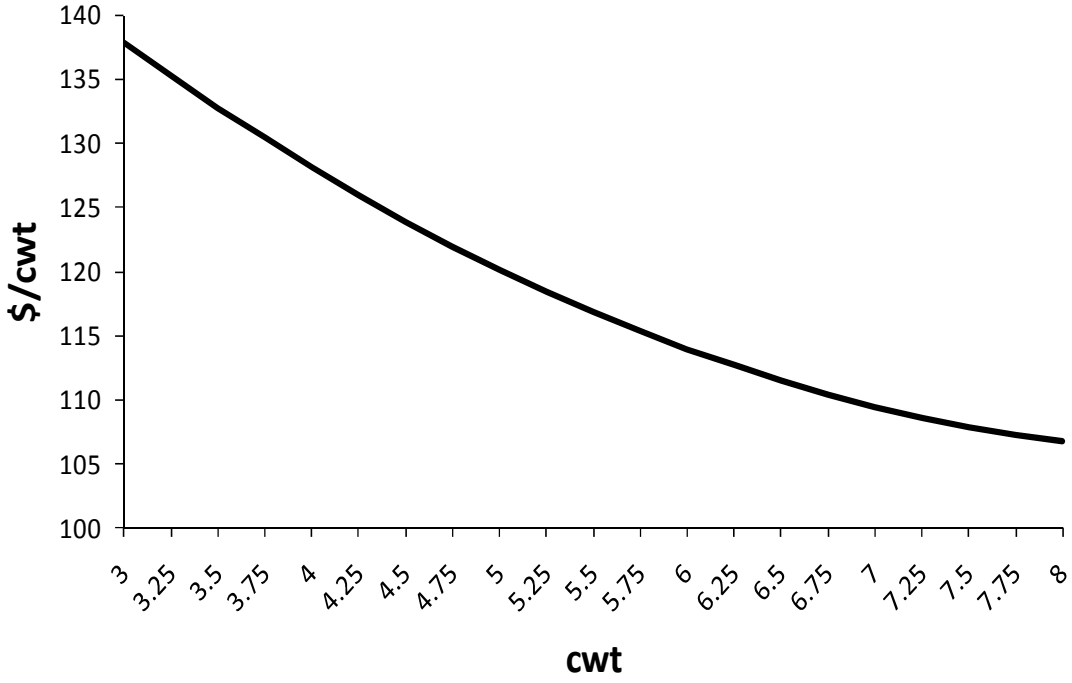

Figure II-2. Effect of average weight on price per cwt.

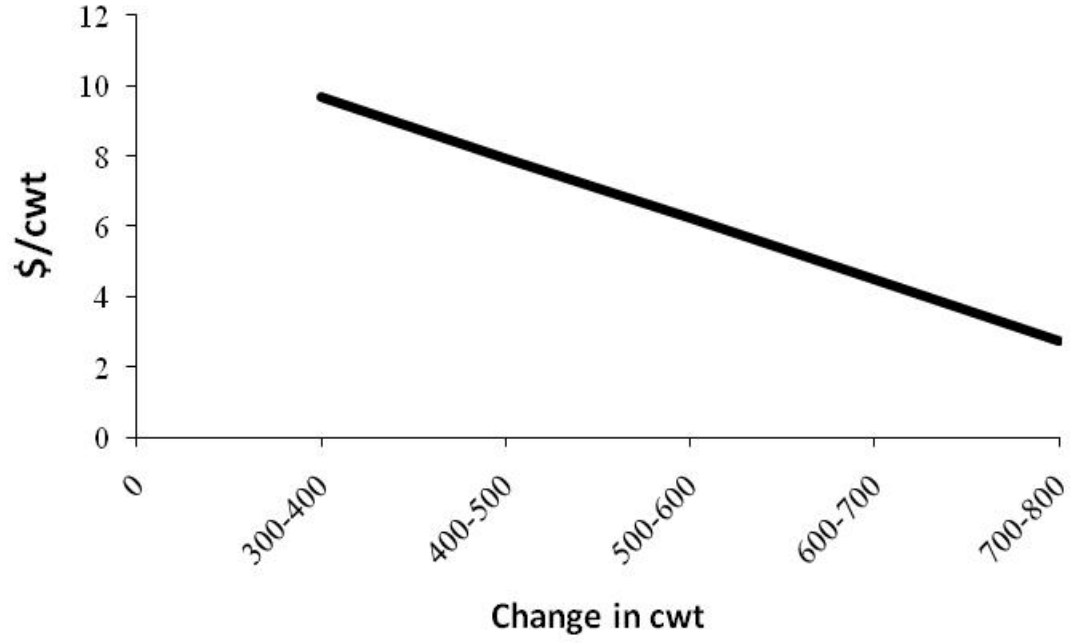

Figure II-3. Relative price change as average weight increases

Table II-5. Management Practice Premiums Per Hundredweight by Weight

	Units	Vaccinated Only	Weaned Only	OQBN[a] Value	Certification Premium[b]
350 lbs	$/cwt	1.44 (0.0175)	2.05 (<0.0001)	13.10 (0.0011)	11.36 (0.0047)
450 lbs	$/cwt	1.44 (0.0175)	2.05 (<0.0001)	11.21 (0.0091)	9.47 (0.0272)
550 lbs	$/cwt	1.44 (0.0175)	2.05 (<0.0001)	10.10 (0.0242)	8.35 (0.0613)
650 lbs	$/cwt	1.44 (0.0175)	2.05 (<0.0001)	9.76 (0.0285)	8.02 (0.0708)
750 lbs	$/cwt	1.44 (0.0175)	2.05 (<0.0001)	10.20 (0.0164)	8.46 (0.0458)

Note – OQBN and Certification premiums were calculated by the ESTIMATE statement in SAS using the MIXED procedure.
Note - P-values are in parentheses beneath the respective coefficients.
[a] The value of the OQBN premium is the sum of vaccinations, weaning and certification at an OQBN sale versus a base animal at a non-OQBN sale.
[b] Certification premium is the value of certifying preconditioning of cattle.

Table II-5 shows premiums for different levels of management practices and/or certification, as compared to non-vaccinated, non-weaned, and non-certified calves across 5 weight categories ranging from 350 pounds to 750 pounds. In all categories, calves with vaccinations alone received a premium of $1.44/cwt ($p = 0.0175$), while weaning alone increased sale price received by $2.05/cwt ($p < 0.0001$). These premiums were modeled as constants across weight, while the value of OQBN certification was allowed to change as average weight changed.

The weight specific premium indicates that a 350 pound OQBN certified lot will receive a premium of $13.10/cwt ($p = 0.0011$) over non-vaccinated, non-weaned, non-certified lots. The value of certification above all other management variables is $11.36/cwt for a 350 pound lot. Other certification premiums were $9.47/cwt, $8.35/cwt, $8.02/cwt, and $8.46/cwt for 450, 550, 650 and 750 pound lots respectively. Data reveals

that buyers place higher premiums on lighter weight calves being certified preconditioned than heavier weight cattle which have been certified preconditioned. Certification serves as a tool for cattle buyers to maximize profits. Lighter weight cattle are more likely to get sick and die when moved to the next phase of production, and heavier weight cattle that are likely further from weaning have lower chances of illness. The health benefits of preconditioning suggested by research aids in cattle buyers' management decisions to maximize profit.

Age and Source cattle received no statistically significant premium in our model, but this may be due to the fact that only 5.1% of the cattle were age and source verified and this percentage was spread out over the collection period. Age and Source cattle are intended for export markets and having too few to offer likely offsets the premiums which these cattle are expected to bring since buyers are unable to put together truck load lots. Additionally, the quality of age and source cattle offered for sale in the data was inconsistent.

The reputation variable included in the model was insignificant, but as noted by Turner, McKissick and Dykes (1993), reputation can be a double edged sword. A good reputation can lead to premiums while a bad reputation can lead to discounts. Additionally, it is difficult to capture the full ramification of reputation with the proxy of "seller announced", as some livestock markets are in the practice of announcing most sellers, whether long time customers or one time sellers. *OQBN Sale*, the variable measuring the impact of selling at an OQBN sale versus a non-OQBN sale, was also not significant. This result suggests the overall price level at an OQBN certified sale was not higher than sales which did not include OQBN certified cattle. This indicates that other

cattle which were not certified OQBN cattle received no premium over other sale days during the time period studied. It was thought the overall price level might be higher due to the possible attraction of more buyers to OQBN certified auctions. This result may be driven by tight supplies in the feedlot sector of the beef industry and rising prices overall during the data collection period (Peel, 2011).

Using estimates from results of this study, the 2010 OQBN program made a significant impact on the Oklahoma cow/calf industry. Table II-6 exhibits total estimated dollar impact of the 2010 OQBN program, as well as the revenue gained by preconditioning alone and preconditioning with certification. Approximately 81 percent of cattle enrolled in the program were sold through OQBN certified sales, while the other 19 percent were assumed to be direct marketed. Since specific sale data is unavailable on these cattle, we assumed an average weight of 550 pounds and calculated their increased value using the OQBN premium for a five weight lot. Preconditioning calves (vaccinated and weaned) increases the value of OQBN calves by a total of $174,109.12. The additional revenue garnered by OQBN certified calves sold at OQBN sales is estimated at $417,840. OQBN certified calves sold outside of OQBN sales are estimated to have increased returns of $95,823.75 over non-preconditioned calves. The estimated overall impact of OQBN totals $513,663.75.

Table II-6. Total Estimated Dollar Impact of 2010 OQBN Program

Wt Range (lbs)	# of head	total cwt	Vac + Wean Premium	Precondition $ Value	OQBN Premium	OQBN $ Value
300-399	487	1,648.50	3.49	5,753.27	13.10	21,595.35
400-499	1,813	7,888.50	3.49	27,530.87	11.21	88,430.09
500-599	2,669	14,190.00	3.49	49,523.10	10.10	143,319.00
600-699	2,016	12,668.50	3.49	44,213.07	9.76	123,644.56
700-799	552	4,005.00	3.49	13,977.45	10.20	40,851.00
Total sold at OQBN sales	7,537	40,400.50	3.49	140,997.75		417,840.00
Total direct marketed[a]	1,725	9,487.50	3.49	33,111.38	10.10	95,823.75
Total value	9,262	49,888.00	3.49	174,109.12		513,663.75

[a] 9262 total head were enrolled in the program. It is assumed the cattle not sold through OQBN hosted sales were direct marketed at a 550 lb average weight with a $10.10/cwt premium.

Summary and Conclusions

In this paper, data on 2,976 lots representing 25,839 head of feeder cattle from seven area livestock markets was used to estimate the values of a certified preconditioning program in the state of Oklahoma. All physical attributes of lots, except the more subjective attributes, significantly affected price as expected. Black and black mixed hide color lots received the highest prices while dairy/Longhorn lots received the largest discount. Heifers were discounted $11.48/cwt while lots with horns were discounted $3.15/cwt. Surprisingly, Age and Source verified lots and lots for which seller was announced (reputation) received no significant premium. Results indicated that cattle buyers are willing to pay premiums for certain management practices, as well as for certification of those management practices. Vaccinations and weaning were valued at $1.44/cwt and $2.05/cwt, respectively. Certification premiums ranged from $11.36/cwt for 350 pound calves to $8.02/cwt for 650 pound calves.

Lalman and Smith (2001) report costs for preconditioning programs range from $35 - $60. Donnell (2007) collected cost data from producers participating in the preconditioning program certified by the Samuel Roberts Noble Foundation. In 2004 and 2005 the average cost for Noble cooperators to precondition calves was $49.25. This included nutrition costs (feed, mineral, and hay), interest cost and labor. If we calculate the returns to preconditioning based on an average weight of 550 pounds, using cost estimates from Donnell, we find the benefit is $5.75 per head. This benefit does not take into account the additional pounds gained from the 45 day preconditioning program.[5] This estimate is assuming a base animal from the model. However, one must be careful as these cost estimates are outdated and the sample size was only forty producers. Extensive data pertaining to producer costs for participating in the program is needed to determine the overall economic value for the program. Decision tools that assess benefits and costs are available to producers considering participation in a preconditioning program (e.g. McGrann, 2004; Devuyst, Raper and Stein, 2010).

Future studies should examine the relationship between weight and its effects on premiums for vaccinations and weaning. Also, while this study assumed the same certification premium existed for steers and heifers, the markets in fact may not offer this scenario. Not all heifer lots are bought with the intention of feedlot placement, but rather are purchased as replacement females. Heifer performance in the feedlot is typically inferior to that of steers, as reflected in the large discount measured here for heifers. That performance difference may also be reflected in premiums offered, warranting exploration into how gender affects premium behavior.

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[5] The feed value in the estimated costs will result in additional weight gain not accounted for in our estimate.

Cow/calf producers looking for value added opportunities have several facets which deserve investigation into the impact on the bottom line. Results of this study indicate that premiums exist for cattle participating in the OQBN certified preconditioning program. In 2010 OQBN's estimated impact on producer revenue was valued at $513,663.75. Extension personnel can use this study to educate producers about the success of this value added opportunity as well as about how management decisions can affect viability of their operation.

THESIS CONCLUSIONS

This thesis explored the prices received for calves participating in a certified preconditioning program and sold in special sales at participating livestock markets. Oklahoma Quality Beef Network (OQBN) is a brand-neutral third-party health management certification program (VAC-45) for calves. Producers are required to follow specific health and management protocols to be eligible for program certification. Data from 2973 lots representing 25,839 head of cattle was collected at sixteen sales during a period spanning from October 27, 2010 to December 13, 2010. Approximately one-third of the data represents OQBN certified cattle. The data contain information on each lot pertaining to physical, management and market characteristics of each lot.

The first objective of this study was to develop a tool for rapid individual sale data analysis and information dissemination. A Microsoft Excel spreadsheet tool was created to produce price and lot characteristic summaries for individual sales. This price summary template was produced to mimic the USDA AMS market reports with which most producers are familiar. The summaries report weighted average prices across management categories of different weights of cattle for steers and heifers, respectively. These weighted average price summaries are generated by simply inserting the sale identification code into the template. This allows Extension educators to provide rapid feedback to producers who sold in each specific sale as well as to managers of participating livestock auction barns and other interested industry parties.

The other primary objective of this study was to assess the existence and magnitude of premiums for cattle enrolled in OQBN, along with estimating the values of management and physical characteristics. The overall price levels of OQBN sales were also compared to price levels of non-OQBN sales. Results suggest that cattle enrolled and sold through OQBN value added sales during Fall 2010 received higher prices as compared to non-preconditioned cattle where data was collected. Vaccinations and weaning were valued at $1.44/cwt and $2.05/cwt, respectively. Certification premiums ranged from $11.36/cwt for 350 pound calves to $8.02/cwt for 650 pound calves. The implications of this research suggest that buyers are willing to pay more for certified preconditioned cattle and that producers who are preconditioning their cattle are receiving higher prices than producers who do not. More importantly, the results indicate that producers who precondition and participate in the OQBN certification program will receive a premium for the certification.

Using estimates from this study, the OQBN program added $513,663.75 in revenue to Oklahoma cow/calf producers who sold cattle at 2010 OQBN hosted sales. This includes the value of all cattle sold through OQBN certified sales as well as the value of cattle certified as preconditioned through OQBN but direct marketed through channels where data was not collected.

Future research should explore relationships between weight and price premiums for vaccinations and weaning. Also warranting exploration is the certification premium for gender. This research assumed a constant premium across genders, which may not be reality. Steers and heifer may in fact receive different certification premiums. Also needed is a cost/benefit analysis of the OQBN program. Collecting cost data directly

from program participants would facilitate a cost/benefit analysis that could determine the overall returns generated by the program.

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APPENDICES

APPENDIX A-Creating a Price

Summary for Individual

OQBN Sales

This document describes the process of generating a price summary for extension personnel after each individual OQBN sale for distribution to interested parties, such as livestock market owners and OQBN producers. The creation of a price summary for individual OQBN sales involves:

(1) the master data file (a Microsoft Excel named "2010 OQBN Data With Summaries Final Version" for the 2010 data) ,

(2) the (Microsoft Excel) raw data input file for the individual sale as collected on laptops at the sale,

(3) and one of four Microsoft Publisher summary template files, depending on the audience of the summary (described below).

Instructions:

Open the master data file ("2010 OQBN Data With Summaries Final Version") and open the tab named "sale data". Simultaneously open the raw data input file for the individual sale. Copy the raw sale data and paste it into the master data file's appropriate columns, appending it to the data that may already exist in the master file. Initially the operator will need to create a sale ID number column in the master data file and indicate a specific and unique number for each individual sale. Since individual livestock markets sometimes host multiple sales, it is important that individual OQBN sales are given a unique ID number. The data collection template (DeVuyst) (the raw data file) does not contain the sale ID column.

In the master file, switch from the "sale data" tab to the "price breakdown report" tab and input the assigned sale ID number for the desired sale into the black cell (cell

C1). This generates the desired price summary report in cells B4 through T23. It is important to understand the created summaries do not report all collected data. Unhealthy lots are left out, as well as any lots less than 300 pounds and any lots deemed mixed gender. If cell H1 is highlighted in pink and says “true”, this means all of the data collected at desired sale is accounted for by the summary. If the cell does not say “true”, then there is a problem somewhere either within the data or the commands. This cell (H1) contains a conditional equation which determines if all data is accounted for, once again, because not all of the data collected is reported.

The information to the right of the price summary is used to determine if all data is accounted for. It gives us information of the distribution of data. i.e. how many lots and cattle are in each category. Cells AC27 and AL27 indicate how many lots and the total number of cattle included in the report, respectively. The “sale totals” tables starting in Cell V30 and continuing horizontally account for data not included in the price summary. The above reference to Cell H1 containing “true” uses this data to reconcile whether all data is accounted for. The code in Cell H1 indicates X34=AC27 or that the number of lots in the summary is equal to the total number of lots from the sale minus those lots not reported. The lots not reported are the lots in the “sale totals” tables starting in Cell V30 and continuing horizontally.

Once all the data is accounted for, next open the desired Publisher template. There exist four templates:

A&S.Summary.Template.Pub

This summary shows OQBN data ONLY. It shows All OQBN vs OQBN which are Age and Source verified. It also includes the corresponding sale location, date and participation statistics.

Internal.Summary.Template.Pub

This summary shows OQBN data and non-OQBN data for a sale. It includes two pages. The first page is the price summary by gender and weight category, while the second page is a characteristics summary. Both pages report the corresponding sale location, date and participation statistics for the sale. It is intended for the characteristics summary to stay within the Extension Faculty or Beef Value Enhancement Committee.

External.Summary.Template.Pub

This summary shows OQBN data and non-OQBN data for a sale. It is one page in length. It only includes the price summary by gender and weight category and the corresponding sale location, date and participation statistics from the sale. This price summary is intended for distribution to livestock market owners and other interested parties via extension personnel.

Noble.Summary.Template.Pub

This summary is very similar to the External Summary Template, except it includes Noble cattle to the far right of the summary.

Upon opening the appropriate Publisher template, Publisher will prompt you for an update on the link. This link is referring to the price summary in Excel. Double check Cell C1 to make sure you have the desired sale you want before updating the Summary Template. After you indicate "Yes" for updating the link, save the template as a PDF file with a name that reflects the individual sale and the summary type (Age and Source, Internal, External, or Noble). This PDF file can then be disseminated to the appropriate user. This process is the same for each of the four summaries. The Excel spreadsheet used to create the price summary also contains the other information used by the Publisher Template. This information is the sale date, sale location, producer participation, number of OQBN lots at the sale and the total number of OQBN cattle at the sale. This information from the Excel Spreadsheet is explained in AppendiX B titled "Explanation of Microsoft Excel Spreadsheet Sale Summary Component Used for OQBN 2010".

APPENDIX B-Explanation of Microsoft

Excel Spreadsheet Sale Summary

Component Used for OQBN 2010

The following is an explanation of the Microsoft Excel spreadsheet created to allow for rapid data analysis and price summary reports to be created and dispensed accordingly following individual OQBN sales.

Tab 1 "SaleData"

This tab is where all sale data is compiled as information from each individual sale data file is added. Raw data files were collected at each sale using Dr. Devuyst's data entry template.

Tab 2 "AgeSourceData"

This tab was created by copying and pasting the sales where Age and Source (A&S) cattle were sold. This data was only used for summary statistics and corresponds with the table titled "Age and Source Comparison of OQBN Cattle at Sales Containing Age & Source Cattle". This table can be found in the Age & Source $ tab. This was created for the Beef Value Enhancement Team for comparison of A&S cattle to other cattle.

Tab 3 "PriceBreakdownReport"

This tab is where the data analysis for price summaries all happens. The only cell which requires any input is Cell C1. This is where the user indicates the Sale ID of the desired sale report. Refer to "How to make a price summary" for instructions on how to create a price summary. Note: THE ENTIRE SPREADSHEET IS USING THE NUMBER INDICATED IN CELL C1. Cell C1 is linked to many tabs throughout the spreadsheet, as well as to all the database codes. All of the numbers in the price summary are created

using database commands. The database code can be found in Tab 4 “PriceBreakdown Code”.

Tab 4 “Price Breakdown Code”

This tab contains the majority of the code used in the spreadsheet. It contains the database code for the Price Summary as well as for other analyses.

Tab 5 “Lot Characteristics Report”

This tab is where the characteristics summaries are created. This is used in the Internal Summary Template only. This gives the team a measure of the lot characteristics of each sale.

Tab 6 “Lot Characteristics Code”

This tab contains the code for the Lot characteristics Report.

Tab 7 “Sale Information Data”

This is another tab where we must input data. The data needing entered is actually sale information. i.e. sale ID number, sale location, sale date, whether it was an OQBN sale or not, and how many producers participated in the sale, This information is what is used for the price summary created in Microsoft Publisher. This tab holds specific information for each sale. Obviously for years following, this information will be different. Columns H, I, and J were used as a reference to indicate which sale summaries had been created.

Tab 8 "Sale Information"

This tab contains the sale information which is linked to the publisher file. Every template uses this information.

Tab 9 "Sale Information Code"

This tab contains the code used to create the "Sale Information".

Tab 10 "Age and Source $"

This tab is used by the A&S Publisher Template. It contains the price summary for OQBN vs OQBN A&S. The other tables in this tab were used for analyses asked for in special requests for the Beef Value Enhancement Extension Assistant. The code for this report is located in the "Price Breakdown Code" tab.

Tab 11 "OQBN Lot Characteristics Report"

This tab is identical to the "Lot Characteristics Report" except it is for OQBN lots only. This characteristics report is used in conjunction with the A&S table to compare all OQBN lots. In other words it is used in the A&S Publisher Template.

Tab 12 "OQBN Lot Characteristics Code"

This code is used to create the "OQBN Lot Characteristics Report".

Tab 13 “Noble Price Summary”

This tab is where the Noble price summary is created. This summary is used by the Noble Publisher Template. All of the code is in the “Price Breakdown Code” Tab.

Tab 14 “Doug”

This tab was created for specific analyses asked for by Doug McKinney as needed. The first table starting in C5 is a summary for the sale id indicated in Cell C1 in the “PriceBreakdownReport” tab. The Second table starting in C14 is a summary for all OQBN data. The last table is similar but for A&S cattle.

Tab 15 “Doug2"

This tab contains the breakdown of OQBN data by gender. It was used in determining the weights to include in the Regression Model for Paper 2.

APPENDIX C-Microsoft Publisher

Price Summary Example

Oklahoma Quality Beef Network

Price Breakdowns by Weight (Steers)

Head	Wt Range (lbs)	Avg Weight (lbs)	OQBN Price Range	OQBN Avg Price	Vac-45 Non-Cert Price Range	Vac-45 Non-Cert Avg Price	Long-Weaned Price Range	Long Weaned Avg Price	Other Price Range	Other Avg Price
85	300-399	355	135.00 - 135.00	135.00	124.00 - 147.00	136.46	123.00 - 136.00	127.16	81.00 - 81.00	81.00
242	400-499	456	85.00 - 132.00	125.67	112.00 - 137.00	122.84	117.00 - 141.00	128.04	81.00 - 132.00	115.19
543	500-599	554	85.00 - 121.00	117.71	94.00 - 131.50	120.34	87.00 - 133.00	113.61	105.50 - 118.00	116.07
773	600-699	644	105.00 - 115.00	110.94	100.00 - 118.00	109.08	105.50 - 113.00	108.52	92.00 - 108.00	104.70
104	700-799	745	102.00 - 108.00	107.36	107.00 - 108.00	107.37	105.00 - 105.00	105.00	-	
29	800-899	828	-		115.50 - 115.50	115.50	-		-	
0	>900	-	-		-		-		-	

Price Breakdowns by Weight (Heifers)

Head	Wt Range (lbs)	Avg Weight (lbs)	OQBN Price Range	OQBN Avg Price	Vac-45 Non-Cert Price Range	Vac-45 Non-Cert Avg Price	Long-Weaned Price Range	Long Weaned Avg Price	Other Price Range	Other Avg Price
68	300-399	360	115.00 - 115.00	115.00	93.00 - 115.00	105.83	93.00 - 117.00	100.81	110.00 - 124.00	128.50
587	400-499	450	75.00 - 117.50	115.47	100.00 - 120.00	112.18	84.00 - 116.00	106.36	105.00 - 114.00	109.90
798	500-599	554	100.00 - 107.50	105.03	103.00 - 115.00	107.28	77.00 - 112.00	103.03	97.00 - 100.00	99.44
322	600-699	658	100.00 - 104.50	104.00	100.00 - 107.50	105.21	90.00 - 100.00	95.04	-	
1	700-799	795	90.00 - 90.00	90.00	-		-		-	
0	800-899	-	-		-		-		-	
0	>900	-	-		-		-		-	

Sale Location	OQBN Producer Participation	Number of OQBN Lots Sold
El Reno	19	34
Sale Date	**Number of OQBN Calves Sold**	**Sale**
Nov. 3, 2010	659	OQBN

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Scope and Method of Study: The purpose of this study was to: 1) develop a spreadsheet tool to allow for rapid creation of price summaries from each OQBN sale where data was collected; 2) to determine the existence and magnitude of premiums received by cattle enrolled and participating in Fall 2010 OQBN hosted sales. A random effect hedonic model was utilized to determine the existence and magnitude of the premiums using SAS 9.2.

Findings and Conclusions: Cattle enrolled and participating in the 2010 OQBN program received price premiums over cattle which had not been preconditioned, as well as price premiums for being certified preconditioned through the OQBN program. The price premiums ranged from $11.36/cwt for a 350 pound average weight to $8.02/cwt for a 650 pound average lot weight.