Price Premiums from a Certified Feeder Calf Preconditioning Program

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Abstract

Preconditioning calf programs add value for buyers. Models estimated with data collected for calves certified under the Oklahoma Quality Beef Network (OQBN) in 2001-2003 generally found premiums paid for certified, preconditioned calves versus calves neither weaned nor vaccinated. Larger premiums were found when also marketing certified, preconditioned calves in sale lots of 10 head or more.

Introduction

Preconditioning programs for feeder calves are designed to reduce stress associated with shipping calves at weaning, strengthening calves' immune systems, and improving performance in post-weaning production phases (i.e., stocker and feedlot) (Avent, Ward, and Lalman). Health management of calves has been increasingly stressed for ranch managers in recent years by several segments of the beef industry: academic educators and researchers, industry participants, and animal health companies. Feedlot managers indicated significant performance differences favoring preconditioned calves (Avent, Ward, and Lalman). Benefits identified from preconditioning included lower death loss, smaller percentage of sick cattle, higher average daily gain, better feed efficiency, and improved carcass traits such as a higher percentage of carcasses grading Choice and smaller percentage of severely discounted carcasses.

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The Oklahoma Cattlemen's Association in cooperation with the Oklahoma Cooperative Extension Service combined to sponsor a preconditioning and process verification program for calves beginning in 2001. Certification requirements for the Oklahoma Quality Beef Network (OQBN) program specify a minimum 45-day post-weaning period prior to sale or shipment (http://okcattlemen.org). Bull calves must be castrated and healed, and horned calves dehorned and healed. All calves must receive clostridial and bacterial vaccinations with boosters and calves must be fed a concentrate supplement for a minimum of 14 days after weaning. An on-ranch, third party verification by a certified representative is required to ensure calves have been weaned, castrated, dehorned, and health records are complete. All certification steps must be completed 21 days or more prior to the sale or shipping date.

Previous research indicates buyers pay price premiums for preconditioned calves though the premiums alone do not necessarily offset the added costs for preconditioning (Avent, Ward, and Lalman). This paper reinforces previous findings of price premiums for preconditioning. However, unlike other research, it addresses the price premium risk associated with marketing preconditioned calves. It also considers the combined benefits from preconditioning and marketing calves in larger sale lots which has not been discussed in previous research. Estimated price premiums paid by buyers were from two model specifications for OQBN-certified calves sold at 20 sales in eight Oklahoma livestock market locations between 2001 and 2003. The first model is similar to those used in previous research on feeder cattle traits. The second model is unique in that it estimates premiums from interactions of several price-influencing factors associated with preconditioning along with marketing calves in larger sale lots.

Previous Research

Numerous studies have estimated price differentials for feeder cattle traits (Buccola; Faminow and Gum; Lambert, et al.; Marsh; Schroeder, et al. 1988; Smith, et al.; Troxel et al.; Turner, Dykes, and McKissick). Most are relevant to estimating price effects for preconditioned calves. Avent, Ward, and Lalman discuss several feeder calf attributes and market factors affected by preconditioning programs and a summary of expected price effects follows:

- Marketing calves after a 45-day post-weaning period typically means receiving lower prices for heavier calves compared with marketing lighter calves at weaning.
- Castration of bull calves leads to higher expected prices for marketing steer calves compared with bull calves.
- Marketing polled or dehorned and healed calves typically results in higher prices compared with horned calves.
- Improved condition or fleshiness from precondition calves may lead to discounted prices for excessive condition.
- Healthy, preconditioned calves can expect to receive a price premium compared with calves that appear sick or unhealthy and calves that are marketed immediately after weaning.
- Marketing calves in larger, uniform sale lots, either from a single owner or sorted and commingled, typically results in higher prices.

Preconditioning premiums are estimated after considering several factors affecting feeder calf prices; such as weight, lot size, frame size, muscling, condition, and others.

Avent, Ward, and Lalman estimated models with detailed feeder calf sale data from three consecutive-day sales in December 2000 at the Joplin Regional Livestock Market. One sale was the regular weekly public sale and two were special preconditioned calf sales for two separate, commercial preconditioning programs. In one program, producers followed a single protocol whereas the other program gave producers a choice of alternative protocols. The estimated premium for the single-protocol program was $3.36/cwt. compared with the regular weekly auction, while the multiple-protocol program generated an estimated premium of $1.96/cwt. The higher premium for the first program could be attributed to more stringent and uniform management requirements.

Dhuyvetter, Bryant, and Blasi estimated models for detailed feeder calf characteristics from two sales per year over five years (1999-2004) at a livestock market in Holton, Kansas. Half the sales were in the fall and half in the winter. Preconditioned calves on average received a $4.62/cwt. premium in the fall sales and a $3.22/cwt. premium in the winter. Fall premiums over the five years ranged from $3.90/cwt. to $5.45/cwt. while winter premiums ranged from $2.30/cwt. to $4.63/cwt. Dhuyvetter, Bryant, and Blasi also pooled the sale data into a

single model in which the estimated premium was $2.95/cwt. for fall sales and $1.41/cwt. for winter sales.

King and Seeger (2004) estimated price premiums for feeder calves sold at the Joplin Regional Livestock Market in 10 special sales during the November-March period of 2003-2004. Estimated premiums for two preconditioning programs were $5.33/cwt. and $4.84/cwt. The two preconditioning programs differed in required vaccinations and whether or not calves were put on a backgrounding nutritional program. Unexpectedly, the program receiving the largest premium required fewer vaccinations and no backgrounding.

King and Seeger (2005) estimated premiums paid by buyers for a commercial preconditioning program at Superior Livestock Auction's video sales each year from 1995-2004. Price premiums were estimated for three value-added health programs over the ten years. Premiums increased for each preconditioning program over time and differed by degree of management practices required. The highest annual average premium was associated with the most stringent management program. The premium associated with this protocol ranged from $2.47/cwt. in 1995 to a high of $7.91/cwt. in 2004, averaging $4.37/cwt. over the ten years. For the middle preconditioning program in terms of management requirements, premiums began at $1.35/cwt. in 1995 and increased to $3.47/cwt. in 2004, averaging $1.91/cwt. for the ten years. Lastly, the program with the fewest management requirements had an expectedly smaller premium, beginning at $0.70/cwt. in 1995, increasing to $1.71/cwt. in 2004, and averaging $1.07/cwt. over the ten-year period.

In summary, research to date consistently indicates buyers pay premium prices when purchasing preconditioned calves, though the premium magnitude varies. Premiums were affected by time of year when preconditioned calves were sold, sale location, and required management practices in the preconditioning program. The Avent, Ward, Lalman study involved one sale location and sales for three consecutive days. The Dhuyvetter, Bryant, Blasi study involved one location, though two sales per year over five years. King and Seeger (2004) involved a single location with pooled sales across years; while King and Seeger (2005) involved a single market with calves consigned from many states and data pooled across several sales each year.

In the study reported here, price premiums were estimated in two ways for 20 individual sales from eight market locations over a three-year period. In general, significant premiums were paid by buyers for preconditioned calves relative to calves not weaned and for which vaccinations were unknown. However, considerable variation in premiums was found among sales, raising questions regarding the risk associated with receiving preconditioning premiums. Larger premiums were paid when considering the effects from preconditioning plus marketing calves in sale lots of 10 head or more and in sales with larger numbers of preconditioned calves.

Data and Models Estimated

Table 1 summarizes OQBN sales for 2001-2003. All but one sale occurred from October to December and the lone late-winter sale (in February 2002) was omitted from the analysis since the preconditioning program primarily focuses on fall-weaned calves. In most cases, livestock market managers began their sale with publicly-consigned sale lots. At a predetermined time, buyers were told the next x lots were OQBN-certified calves. Following those lots, the sale resumed with remaining publicly-consigned lots. Data from one sale in 2003 was omitted because the market manager failed to identify the OQBN sale lots to buyers. One market which sponsored two sales each year required calves to have EID (electronic identification) tags that were scanned so calves could be sorted into more uniform, 50-lb. weight groups.

Two models were estimated for each sale. The objective of the first model was to determine the market price premium for OQBN-certified, preconditioned calves compared with other calves sold in the same sale.[1] The objective of the second model was to estimate the interaction effects for several variables associated with preconditioning and with marketing calves in 10-head lots or larger. Model specification for both objectives was similar to hedonic models cited earlier to determine price differentials for feeder cattle characteristics. Models were of the form (1)

$$(1) \quad P_{ij} = \sum_{K} V_{ijk} T_{ijk}$$

where price (P) for sale lot i at sale j was assumed to be dependent on k sale lot characteristics and feeder calf traits (T). The model estimates the value (V) of each sale lot characteristic

and feeder cattle trait. Variables included in Model 1 were lot size, average weight, breed group, fleshiness, muscling, frame size, sex, horns status, sale lot uniformity, healthiness, and health management practices.

The focus of the first model was on price differences for several health management practices. Buyers had varying degrees of information regarding the health management of the calves sold and this information comprised the management variable. In some cases, buyers knew little about how calves had been managed (vaccinations unknown, not weaned). For other sale lots, the auctioneer announced calves had been vaccinated, (vaccinated, not weaned), weaned (weaned, vaccinations unknown), or vaccinated and weaned (vaccinated, weaned, not certified). Buyers were told when calves had been managed according to the OQBN protocol (OQBN-certified) or preconditioned following a commercial program (other certified).

Model 1 treated each variable or group of dummy variables independently of others. However, there are known interdependencies of feeder calf variables associated with preconditioning as noted in the literature. To be OQBN certified, bull calves must be castrated and horned calves must be dehorned. Preconditioned calves typically have a healthy appearance and may be sorted and sold in larger, more uniform lots.[2] Therefore, the second model considered these interdependencies by creating a variable capturing the interaction of OQBN-certified calves sold in lots of 10 head or more. Other variables were as defined for Model 1. The interaction dummy variable consisted of sale lots of 10 head or more and characteristics associated with OQBN-certification (including polled or dehorned calves, healthy calves, uniform sale lots, and the OQBN nutrition and health management program).

Sale lots of 10 head or more were chosen for two reasons. First, nearly all previous feeder cattle research reports a price advantage for larger sale lots, even 10 head, compared with smaller or single-head lots. Even many smaller-to-medium size cow-calf producers can potentially market in uniform lots of 10 head. Second, 10-head sale lots were chosen because insufficient numbers of larger sale lots were available to create a variable with more calves (i.e., a higher minimum-size lot) and still have enough observations to estimate the second model consistently for each sale.

It was hypothesized the variable for OQBN-certified calves in the first model would be positive and significant, similar to previous research. Further, it was hypothesized that the interaction variable in the second model would be positive and significant but larger since it also included larger sale lots. No comparison with previous research is possible for the second model since no comparable models have been reported in the literature.

Model Results

Harvey's procedure was used to correct for heteroskedasticity common to sale data and models were estimated by feasible generalized least squares (FGLS) in SAS (Greene; SAS Institute). One variable from each set of dummy variables (sex, breed, flesh, muscling, frame, horns, health, uniformity, and management in Model 1; and sex, breed, flesh, muscling, frame, and OQBN-certified lots in Model 2) was omitted to correctly estimate the models. Number of sale lots varied from sale to sale over the three years. Number of sale lots ranged from 128 to 260 for the six sales in 2001; from 64 to 221 for the seven sales in 2002; and from 33 to 199 for the seven sales in 2003.

Similarly, explanatory power of the models varied, as measured by the adjusted R^2s. For Model 1, adjusted R^2s ranged from 0.644 to 0.895 in 2001; from 0.406 to 0.895 in 2002; and from 0.736 to 0.952 in 2003. For Model 2, adjusted R^2s ranged from 0.611to 0.819 in 2001; from 0.388 to 0.750 in 2002; and from 0.703 to 0.960 in 2003.

Considerable parameter instability was evident over the 20 sales as is often the case for smaller, local markets at any point in time. A brief summary follows for variables in Model 1 which were not the focus of this study but which are relevant to pricing feeder calves:

- A quadratic variable for lot size was significant in 15 sales. Buyers paid higher prices for larger sale lots but the premiums got smaller as lot size increased.
- A quadratic variable for average weight of the sale lot was significant in 17 sales. Prices paid by buyers declined as calf weight increased but at a small, declining rate.
- Significant price differences for breed groups were found in

eight sales. Buyers typically paid a premium price for English, Angus, and Angus crossbred calves relative to other breed groups. The average premium across all years compared with the other three breed groups ranged from $3.31/cwt. to $7.74/cwt.

- Buyers paid lower prices for heifers ($8.60/cwt. on average) in all 20 sales. Sale lots of bull calves or mixed gender calves were discounted an average of $4.76/cwt. in seven sales.
- Buyers paid a small price premium (averaging $1.36/cwt.) for thin calves (in four sales) and discounted fleshy or fat calves (in eight sales) by an average of $1.78/cwt.
- Buyers paid a small premium ($0.52/cwt. on average) for heavy muscled calves (in five sales) but discounted thin muscled calves more severely ($6.20/cwt. on average) in seven sales.
- Buyers discounted large frame calves (in four sales) an average of $1.68/cwt. but discounted small frame calves more heavily, by $4.55/cwt. on average in four sales.
- Uneven (non-uniform) sale lots were discounted $1.91/cwt. on average in nine sales.
- Unhealthy calves were heavily discounted in six sales, by an average of $8.58/cwt.
- Calves with horns were discounted in three sales by $1.56/cwt. on average.

The focus of both Models 1 and 2 was on estimated premiums paid by buyers for specified health management programs. Table 2 presents coefficients for the health management variable from Model 1 while Table 3 presents coefficients for the OQBN-lot size interaction variable from Model 2. Care was taken to preserve the confidentiality of livestock market locations.

Buyers paid a significant premium for OQBN-certified calves compared with at least one other health management group in four sales in 2001, four sales in 2002, and six sales in 2003 (14 of 20 sales for the 3 years). However, somewhat unexpectedly, another management category received a price premium relative to OQBN-certified calves for two sales in 2001, one sale in 2002, and two sales in 2003 (5 of 20 sales for the 3 years). No consistent pattern was evident in these latter cases; thus reasons for the unexpected findings are not clear. Significant premiums for OQBN-certified calves ranged from $1.87/cwt. to $13.73/cwt. over the three years, a considerably wide range. Note there was no significant price difference between health management groups for one sale in 2001 and three sales in 2002. The weighted average of premiums for OQBN-certified calves for the three years (net of any discounts and when the management coefficients were statistically significant) was $1.04/cwt. in 2001, $4.85/cwt. in 2002, and $4.38/cwt. in 2003. Averages for 2002 and 2003 compared favorably with previous research.

Figure 1 shows the average OQBN-certified premium paid by buyers each year compared with calves for which buyers had the least health-management information (vaccinations unknown, not weaned). Buyers paid an increasing premium over the three years for preconditioned calves relative to this commonly-sold group of calves. The average premium increase from 2001 to 2002 and 2003 may be related to increased buyer confidence in the integrity of the OQBN certification program or learning by buyers of the value to them from preconditioning. Reputation likely played a role as well (Turner, McKissick, and Dykes). Feeder calf buyers pay premiums based on their expectation of production performance, given their confidence in the integrity of the program, which in the case of preconditioning is whether or not producers managed calves according to the specified protocol (Yeboha and Lawrence). Thus, the certification feature of OQBN and some other preconditioning programs is an effort to associate integrity with the program and build its reputation with buyers.

Coefficients for the OQBN-lot size interaction variable in Model 2 were expected to be larger than premiums found from Model 1. Premiums in Model 2 also were more consistent than those in Model 1 (Table 3). Coefficients from the second model reflected the interaction of larger sale lots in conjunction with preconditioning. Some industry reporting of preconditioned calf sales fail to separate the premium associated with preconditioning and the premium associated with marketing calves in larger sale lots. The OQBN variable in Model 2 and premiums shown in Table 3 were for 10 head or more of OQBN-certified, dehorned, uniform, healthy calves. Buyers paid a premium for these sale lots in five of six sales in 2001, all seven sales in 2002, and all seven sales in 2003 (19 of 20 sales in total). When premiums were found (all but one sale), the premium ranged from $2.43/cwt. to $13.04/cwt. The

weighted average premium was $5.70/cwt. in 2001, $5.38/cwt. in 2002, and $6.46/cwt. in 2003. Increasing premiums from 2001 to 2003 may be related in part to the reputation of the OQBN program or better understanding of the value of preconditioning by buyers.

Economic Implications

Results from the two models contribute to the question of whether or not added revenue from preconditioning offsets added costs. Avent, Ward, and Lalman developed a partial budget to compare marginal cost and marginal revenue, along with sensitivity to selected production risks, i.e., varying post-weaning gains, death loss, and animal health costs. The models estimated in this study and discussed above, unlike previous research, indicate considerable variability in price premiums for preconditioning among sale locations and dates. Thus, while production risks affect the marginal cost-marginal revenue relationship, so too does price premium risk.

Using more current feeder calf prices ($130/cwt. rather than $95/cwt. in the Avent, Ward, Lalman budget) and incorporating the discount for fleshiness from Model 1 ($1.75/cwt. rather than $0.60/cwt.), increased the net return from preconditioning to $10.77/hd. (from -$6.93/hd.). The premium used in the Avent, Ward, Lalman partial budget ($3.30/cwt.) was replaced with the means from Models 1 and 2 for 2001-2003 plus and minus one standard deviation. The mean premium from Model 1 was $3.75/cwt. with a standard deviation of $5.15/cwt. Including these premiums into the partial budget changed net returns considerably, as shown below:

	Premium	Net return
Mean premium less 1 std. deviation	$0.00/cwt.[3]	-$7.49/hd.
Mean premium	3.75	13.26
Mean premium plus 1 std. deviation	8.90	41.76

Similarly, using the mean premium from the second model ($6.25/cwt.) plus and minus one standard deviation ($2.97/cwt.) changed budgeted net returns as shown:

	Premium	Net return
Mean premium less 1 std. deviation	$3.28/cwt.	$10.66/hd.
Mean premium	6.25	27.10
Mean premium plus 1 std. deviation	9.21	43.48

Thus, while economic studies report average price premiums for preconditioning in most cases, ranch managers must recognize that considerable variability exists across sales that can greatly affect the net return to preconditioning calves for individual producers. Depending on the estimated premium and standard deviation, net returns varied widely in the examples above, from a loss of $7.49/head to a positive $43.48/head. Given the partial budget used here, the breakeven premium is $1.36/cwt., well below the average premium reported in most studies but certainly not guaranteed as evidenced from results presented here. Relatively little attention has been given to this risk in the literature on preconditioning.

Many factors can influence the price premium paid by buyers at any given sale. One not mentioned and perhaps the hardest to predict is competition. Buyers will pay a premium only sufficiently large enough to purchase preconditioned calves over rival bidders and just below their expected performance differential for preconditioned calves verses calves not preconditioned. Estimating buyer rivalry and other factors affecting across-sale variability in price premiums is difficult.

Another important factor in the size of the price premium appears to be the volume of preconditioned calves at each sale. On average, the markets in Oklahoma which had more preconditioned lots were those in which the price premium was largest for preconditioned lots sold in 10-head lots or more.

Summary and Conclusions

Preconditioning calves has become more prevalent in recent years. Preconditioning typically results in healthier calves at marketing so adds value to feeder calf buyers compared with purchasing non-preconditioned calves. One key question is how much more are buyers willing to pay for the added value to them from preconditioning.

Two models were estimated with feeder calf data collected from 20 sales in Oklahoma where Oklahoma Quality Beef Network (OQBN) calves were sold during the fall months of 2001-2003. Models were specified to estimate premium prices paid by buyers for preconditioned, certified calves. The first hedonic-type model was similar to previously estimated models for price differences among feeder cattle traits. Explanatory variables were assumed independent with no recognition of interaction or

interdependencies associated with a preconditioning protocol. Significant price premiums for OQBN-certified calves varied widely, from no significant differences for health management groups to a range of $1.87/cwt. to $13.74/cwt. when significant differences were found. In a few sales and unexpectedly, OQBN-certified calves were discounted relative to other health management groups.

The second model recognized the interdependent nature of several characteristics for preconditioned calves. A unique variable was created to measure the price premium for several combined characteristics related to preconditioning. Estimated premiums from the second model were higher and more consistent across sales but still varied widely, ranging from $2.43/cwt. to $13.04/cwt. when a significant premium was found. No significant premium was found for one sale. Premiums estimated from Model 2 included a premium for larger sale lots (10 head or more) in addition to preconditioning.

Evidence suggests buyers frequently pay a premium for OQBN-certified, preconditioned calves, as has been found for other preconditioning programs in previous research. However, many factors affect the size of the premium at any given sale and in some sales there may be no significant premium. Thus, ranch managers must recognize the price premium risk associated with preconditioning and its effect on budgeted marginal costs and marginal revenues for preconditioning.

Two factors that appear to influence the price premium are the reputation and integrity of the preconditioning program, and the volume of preconditioned calves offered for sale at the market where preconditioned calves are sold. Ranch managers cannot directly control either of these factors but need to be aware of them when choosing a preconditioning program and a market.

Endnotes

[1] At one livestock market, publicly-consigned calves were not sold the same day as OQBN-certified calves. Thus, the comparison for that location was between the special OQBN sale and the market's regular weekly sale the same week.

[2] Note sorting calves to increase uniformity and sale lot size are not part of the preconditioning protocol. However, average lot sizes of OQBN-certified calves were consistently larger than non-preconditioned sale lots across sales and over the three years (Table 1).

[3] For this example, it was assumed the mean less 1 standard deviation would result in no premium but also no discount for preconditioned calves.

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Figure 1. Estimated annual average OQBN-certified premiums compared with the health management group conveying the least information to buyers, 2001-2003

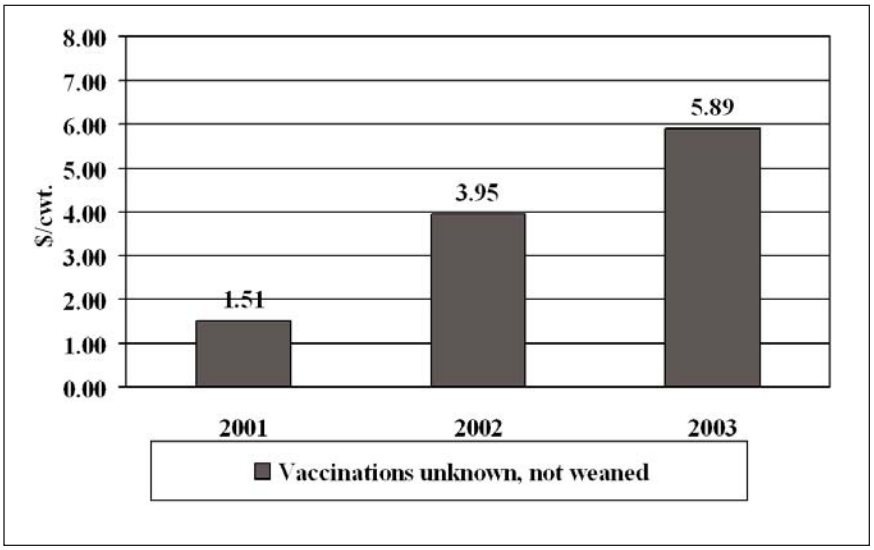

Table 1. Selected summary statistics for Oklahoma Quality Beef Network (OQBN) sales, 2001-2003

	2001	2002	2003
Number of sales (October to December)	7	7	8
Number of lots	1,224	1,121	855
Number of head	13,824	11,215	11,258
OQBN-certified calves			
Number of lots	400	326	221
Number of head	6,999	5,214	4,169
Average lot size (head)	17.5	16.0	18.9
Other calves			
Number of lots	824	795	634
Number of head	6,825	6,001	7,089
Average lot size (head)	8.3	7.5	11.2

Table 2. Estimated price premium ($/cwt.) for Oklahoma Quality Beef Network (OQBN)-certified calves compared with other management groups, by market location and year, 2001-2003

	Market Location							
	A	B	C	D	E	F	G	Average Premium
2001								
Management Group								
Vaccinations unknown, not weaned	NA	NA	NA	2.08	-3.42	5.88		1.51
Vaccinated, not weaned	0.00	3.56	NA	0.00	NA	NA		3.56
Weaned, vaccinations unknown	0.00	NA	2.66	0.00	NA	NA		2.66
Vaccinated, weaned, not certified	0.00	NA	0.00	-4.54	NA	0.00		-4.54
Other certified	NA	NA	0.00	NA	NA	NA		0.00
Weighted average								1.04
2002								
Management Group								
Vaccinations unknown, not weaned	1.87	0.00	0.00	0.00	3.63	4.44	10.59	3.95
Vaccinated, not weaned	-4.48	NA	0.00	NA	0.00	0.00	NA	-4.48
Weaned, vaccinations unknown	0.00	NA	0.00	NA	0.00	0.00	5.85	5.85
Vaccinated, weaned, not certified	3.15	NA	0.00	NA	0.00	0.00	13.73	8.44
Other certified	NA	NA	0.00	NA	0.00	NA	NA	0.00
Weighted average								4.85
2003								
Management Group								
Vaccinations unknown, not weaned	4.54	9.57	7.50	0.00	7.46	2.76	3.49	5.89
Vaccinated, not weaned	3.31	NA	NA	NA	NA	NA	NA	3.31
Weaned, vaccinations unknown	0.00	5.81	8.90	0.00	0.00	0.00	0.00	7.35
Vaccinated, weaned, not certified	0.00	NA	10.07	0.00	-3.34	0.00	NA	3.36
Other certified	0.00	NA	0.00	-7.57	NA	NA	NA	-7.57
Weighted average								4.38

Notes: Positive numbers represent the estimated premium paid for OQBN-certified calves. Negative numbers mean OQBN-certified calves received a discount to calves sold in that respective management group. NA means there were no observations in that respective management group at that respective sale. 0.00 means no significant difference.

Table 3. Estimated price premium ($/cwt.) for specifically defined Oklahoma Quality Beef Network (OQBN)-certified lots compared with other sale lots, by sale and year, 2001-2003

	Market Location							
2001	A	B	C	D	E	F	G	Average Premium
Management Group								
OBQN certified, 10 hd or more, healthy, uniform, no horns	0.00	5.27	3.48	8.42	3.60	7.70		5.70
Other management groups	Base	Base	Base	Base	Base	Base		Base
2002								
Management Group								
OBQN certified, 10 hd or more, healthy, uniform, no horns	6.66	5.57	2.32	5.33	10.22	7.56	7.45	5.38
Other management groups	Base	Base	Base	Base	Base	Base	Base	Base
2003								
Management Group								
OBQN certified, 10 hd or more, healthy, uniform, no horns	13.04	2.99	9.11	2.85	5.00	9.46	2.77	6.46
Other management groups	Base	Base	Base	Base	Base	Base	Base	Base

Note: 0.00 means no significant difference.