The Value of Preconditioning Programs in Beef Production Systems

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Abstract

Net returns to feeding were calculated for preconditioning. The added value to cattle feeders, without accounting for death loss, from purchasing preconditioned calves over calves of unknown origin is $46.83/head and $49.54/head for the CPH and GT calves, respectively. As a result, a feedlot operator could pay $8.50/cwt and $9.00/cwt more per 550 pound CPH and GT feeder calves, respectively, and still maintain the same level of profit.

Introduction

In recent years, the beef industry has focused on improving the quality and consistency of beef products offered to consumers. Emphasis has been placed on improving the quality characteristics of steer and heifer carcasses (Smith et al., 2001). As a result, a higher percentage of fed cattle are currently being sold through some type of a value-based pricing system, in which carcass prices are based primarily upon carcass quality and yield grades, rather than only live or carcass weight. With the increase in value-based marketing, feedlot operators have become increasingly interested in management practices that enhance the value of beef carcasses, while at the same time maintaining feed efficiency and reducing cost of gain.

The move to a value-based, fed cattle pricing system has increased the need for "information sharing" across segments of the beef industry. In order to reduce the transaction costs associated with the traditional multi-segmented beef production system, vertical cooperation systems, such as alliances, have formed within the industry. The integrated systems have increased the amount of information that is shared between industry segments, with

seedstock, cow-calf and feedlot segments trying to work together to improve the quality and yield characteristics of carcasses. Many of the existing beef alliances require verification of some type of prior health or preconditioning program for feeder calves before they begin the finishing phase of production. With the demand for higher quality products, the increase in value-based marketing, and the increase in vertical coordination systems, both cow-calf producers and feedlot operators have become more in-tune to health management practices that have the potential to increase overall profitability.

The health status of calves upon arrival to the feedyard has been shown to impact the efficiency of cattle in the feedyard, and also to affect the quality attributes of the cattle at harvest. Several studies have documented that sickness, or morbidity of cattle, is a major determinant of the variability of production costs of feeding cattle. Gardner et al. (1996) reported that the costs associated with morbidity are the most important determinant of profitability in feedlot cattle. Griffen et al. (1995) found that morbidity rates account for approximately eight percent of all production costs without consideration of losses due to reduced performance. As such, Speer et al. (2001) documented that sickness, especially with bovine respiratory disease, illustrates the importance of preweaning health management to cattle buyers because of the economic risk associated with these diseases. Additionally, "Ranch-to-Rail" studies across the country have documented the potential income for calves managed under several preconditioning programs. Thus, if feedlot producers were able to predict feedlot performance and subsequently to purchase calves that are more likely to remain healthy during the feeding period, they would likely increase their profits through reduced costs and higher revenues. Previous studies have indicated that calves that have been preconditioned prior to being placed in the feedlot may perform better;

however, no known studies have documented the economic value of preconditioning programs to either the feedlot operator or the cow-calf producer.

Objectives

The primary objective of this paper is to estimate the variation in economic returns from feeding calves that were purchased from producers who participated in a certified "preconditioned for health" program versus calves that were purchased from an unknown source. The value of preconditioned cattle to feedyard operators and the potential premium that cow-calf producers could ask feedyard operators to pay for preconditioned calves will be estimated. Additionally, the factors influencing feedlot net returns will be determined.

Data

Feedlot, carcass and palatability data was collected from 273 feeder steer calves (originating from three different sources), which were enrolled in the Rocky Mountain Ranch-to-Rail program[2]. In total, three groups of calves of similar genetic backgrounds were compared; two groups representing two different preconditioning programs from known cow-calf producers, and one group from an unknown source. The two groups of preconditioned calves originated from value-added calf (VAC) programs which were sponsored by the Kentucky Cattlemen's Association: 1) the Certified Preconditioned for Health program (CPH), and 2) the Kentucky Gold Tag program (GT). The requirements of each of the preconditioning programs are outlined in Table 1. The third group consisted of calves that were purchased through Kentucky auction markets; the herd health and processing history of all calves purchased through

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[2] The data utilized in this paper is taken from the Roeber et al. (2001) study. The Rocky Mountain Ranch-to-Rail Program was an educational, retained ownership program designed to provide feedlot and carcass performance information to commercial and seedstock cattle producers. The program was conducted through Colorado State University; all cattle were fed and processed in Eastern Colorado.

the auction markets (AM) was unknown. Efforts were made by cattle buyers to assemble groups of calves of similar genetic background and weights. In January, cattle were transported from Kentucky to a commercial, Colorado feedyard, where they were weighed, vaccinated, implanted and placed on identical finishing rations.

Calves in each of the three treatment groups were fed to an estimated fat thickness endpoint of 1.1 cm; thus, calves were harvested on different dates ranging from June to August. After harvesting, cattle were priced on an individual carcass basis. Additionally, 120 carcasses were randomly selected to obtain strip loins, which were analyzed for tenderness and palatability. Feedlot performance and carcass data for each group is summarized in Table 2. Performance data included: feedlot entry weight, finished live weight, average daily gain, pounds of feed to pound of gain, morbidity rate (the number of hospital visits), and mortality rate (death loss). Carcass data included: carcass quality and yield grades, dressing percentage and hot carcass weight.

Methods

In order to compare the economic returns from each of the three preconditioning programs, net returns to feeding per head were calculated and averaged for each group of cattle: CPH, GT and AM. Net Returns to Feeding (NRTF) is defined as total revenue minus total costs of feeding, processing, medical and veterinary, transportation and marketing costs. Total revenue was calculated by multiplying the average carcass price for carcasses in each program by the average hot carcass weight for a program. Carcasses were priced on an individual carcass basis using ten-year average USDA prices. Grid prices ($/cwt) for each quality and yield grade subclass are shown in Table 3. The NRTF does not take into account the purchase price of the feeder calf, therefore, differences in NRTF among calves originating from a known

preconditioning program can be compared to NRTF from auction market calves in order to determine the potential differences in the value of feeder calves.

In order to examine the ability to use cattle attributes to predict the potential economic profitability from feeding a calf and marketing it through a value-based pricing system, the following equation was estimated using the OLS regression:

NRTF = f(INWT, HOSPITAL, PROGRAM, ANGUS, QG, YG, DOF, DP).

Where NRTF is the net returns to feeding explained previously; INWT is the weight of the calf when placed in the feedlot (pounds); HOSPITAL is a discrete variable equal to the number of times an animal was pulled from the pen and treated due to illness; PROGRAM is equal to zero if the calf originated from the auction market, is equal to one if the calf originated from the CPH program, and is equal to two if the calf originated from the GT program; ANGUS is equal to one if the calf was Angus and was equal to zero otherwise; QG is the quality grade of the carcass (1-5); YG is the yield grade of the carcass (1-5); DOF is the number of days the animal was in the feedlot; and DP is the carcass dressing percent.

Results

Effects of Preconditioning Program on Feedlot Performance, Carcass Traits and Palatability

Cattle that originated from a known preconditioning program (CPH and GT cattle) performed significantly better in the feedlot (Table 2). CPH and GT cattle had significantly higher ADG, were more efficient, and had lower morbidity and mortality rates. While the preconditioned, CPH and GT cattle exhibited increased feedlot performance over the AM calves, no significant differences in hot carcass weight or quality grades were found among the three groups of cattle. The GT cattle, however, had a slightly less desirable quality grade and a higher yield grade than the CPH and AM cattle. After accounting for differences in quality grade, no

significant differences in either shear-force values or palatability rankings were found between meat evaluated from each of the three groups of cattle.

As mentioned earlier, previous studies have shown a significant negative impact of morbidity on feedlot performance and carcass characteristics. The results from this study are similar to previous research. Hospital visits among all cattle, regardless of origin, were divided into three discrete categories for analysis. Cattle visiting the hospital two or more times had a 12% lower average daily gain. The number of hospital visits also had a significant effect on hot carcass weights, dressing percentage, and yield grades (Table 4). Cattle requiring two or more hospital visits had lower hot carcass weights and dressing percentages than untreated cattle. However, cattle receiving two or more hospital visits had more desirable (lower) yield grades (Table 5).

Effects of Preconditioning Programs and Hospital Visits on Total Revenue and NRTF

Net returns to feeding were calculated according to the methods described previously. Per head total revenue, total costs of feeding and NRTF for each program are shown in Table 6. The added value to cattle feeders, without accounting for differences in death loss, from purchasing preconditioned calves over calves of unknown origin (AM calves) is $46.83/head and $49.54/head for the CPH and GT calves respectively. As a result of this added value for preconditioned calves, a feedlot operator could pay approximately $8.50/cwt and $9.00/cwt more per 550 pound CPH and GT feeder calves, respectively, and still maintain the same level of profit.

In addition to the calculated differences in total revenue, total costs, NRTF and added value from preconditioning calves, the NRTF equation described above was estimated through OLS regression. Several different versions of the equation were estimated in order to determine

the variables that had the largest impact on NRTF. The model that was most predictive of NRTF as well as the estimated coefficients for each of the independent variables are shown in Table 7 ($R^2 = 0.77$). The signs and magnitudes of all significant variables affecting NRTF make economic sense. Increases in the following variables increase NRTF: initial weight of the calf going into the feedlot, average daily gain, and dressing percentage. Additionally, NRTF was increased if calves had gone through a preconditioning program, CPH or GT. The variables decreasing the NRTF were QG and YG. Carcasses with lower amounts of marbling (increase in QG variable) and higher yield grades also decreased NRTF. Surprisingly, HOSPITAL was not a significant variable, as morbidity increased (number of visits to the hospital increased) we would expect NRTF to decrease, however, the coefficient does have the expected negative sign.

Implications

The results of this study indicated that calves which have gone through a preconditioning program prior to entering the feedlot had lower production costs due to decreased morbidity, mortality, and increased average daily gain. However, only GT calves had significantly improved carcass traits over the AM calves. Thus, the added value in the CPH and GT calves is likely attributable to lower costs rather than increased carcass value from preconditioning. Since cattle in this study were fed to a constant fat thickness, it is unknown what the impact on carcass value might be if cattle were simply fed to a certain number of days in the feedyard. Additional economic research should be completed with a broader base of cattle of known and unknown treatment histories to verify the economic impact of preconditioning management practices to the cow-calf producer and the feedlot operator.

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Table 1. Pre-conditioning Program Requirements[a].

Trait	CPH Program	Gold Tag Program
Owned by seller	60 d	27 d
Weaned	30 d	
Bunk broke	Yes	
Water trough broke	Yes	
Dehorned	Yes	Yes
Castrated	Yes	Yes
Treated for grubs/lice	Yes	
Dewormed	Max. 50 d before sale	
Clostridial (7-way) vaccine	Yes	21 to 60 d before sale
Pasteurella vaccine & booster	Optional	21 to 60 d before sale
IBR vaccine[b]	14 to 90 d before sale	21 to 60 d before sale
PI3 vaccine[c]	14 to 90 d before sale	21 to 60 d before sale
BVD vaccine[d]	14 to 90 d before sale	
BRSV vaccine[e]	14 to 90 d before sale	21 to 60 d before sale
H. somnus vaccine[f]	14 to 90 d before sale	21 to 60 d before sale
Processing records	Yes	Yes
Ear tag	Yes	Yes
Guarantee heifers open	Yes	
Guarantee steers castrated	Yes	

[a] Further information on the pre-conditioning programs CPH: Certified Preconditioned for Health and Gold Tag can be obtained from the Kentucky Cattlemen's Association, Lexington.
[b] IBR: Infectious Bovine Rhinotracheitis, includes booster at least 14 d before sale.
[c] PI3: Parainfluenza virus, includes booster at least 14 d before sale.
[d] BVD: Bovine viral diarrhea, includes booster at least 14 d before sale.
[e] BRSV: Bovine respiratory synctial virus, includes booster at least 14 d before sale.
[f] H. somnus: Haemophilus somnus, includes booster at least 14 d before sale.

Table 2. Least squares means for individual feedlot performance and hot carcass weight stratified by preconditioning program.

Trait	Certified: Preconditioned for Health (n=95)	Kentucky Gold Tag Program (n=90)	Auction Mkt. (n=88)
Feedlot entry weight (lb)	558 [a]	564 [a]	551 [a]
Final live weight (lb)	1222	1231	1215
Average daily gain feedlot entry to reimplant (lb/day)	4.0[a]	3.6[b]	3.7[b]
Average daily gain feedlot entry to harvest (lb/day)	3.6[a]	3.6[a]	3.7[b]
Feed to Gain (lbs)	5.42 [a]	4.98 [b]	5.54 [c]
Percent Morbidity	34.7 (n=32)	36.7 (n=33)	77.3 (n=68)
Percent Mortality	1.1 (n=1)	1.1 (n=1)	11.4 (n=10)
Hospital visits per animal	0.55[a]	0.70[a]	2.00[b]
Quality Grade[d]	2.49 [a]	2.71 [b]	2.49 [a]
Yield Grade[e]	2.19 [a]	1.91 [b]	2.12 [a]
Dressing Percent (%)	64.12 [a]	63.27 [b]	63.16 [b]
Hot carcass weight (lb)	784	779	768

[a, b, c] Means in the same row with a common superscript do not differ ($P < 0.05$).
[d] USDA Quality Grades: 1 = Prime, 2 = Choice, 3 = Select, 4 = Standard, 5 = Commercial.
[e] USDA Yield Grades 1-5.

Table 3. Grid prices/cwt for the quality and yield grade subclasses based on the 10 yr. average USDA Choice price and a minimum $3 Choice/Select spread

Quality/Yield Grade	Price/cwt
Prime 3	116.84
Choice 1	114.84
Choice 2	112.34
Choice 3	110.84
Choice 4	90.84
Select 1	111.84
Select 2	109.34
Select 3	107.84
Select 4	87.84
Standard 1	111.84
Standard 2	99.34

Table 4. Percentage of cattle within each preconditioning treatment not visiting the hospital, visiting the hospital once, and visiting the hospital twice or more during the finishing phase of production.

Number of Hospital Visits	Certified Preconditioned for Health	Kentucky Gold Tag Program	Auction Market.
0	63.9%	61.7%	29.2%
1	27.9%	20.0%	33.3%
2 or more	8.2%	18.3%	37.5%

Table 5. Percentage of carcasses by quality grade and yield grade subclass stratified by number of hospital visits

| Quality/Yield Grade | Hospital Visits | | |
	0	1	2
Prime 3	1.14	0.00	0.00
Choice 1	1.14	1.92	5.88
Choice 2	22.72	21.15	14.71
Choice 3	17.05	5.78	5.88
Choice 4	1.14	0.00	0.00
Select 1	17.05	25.00	29.41
Select 2	22.72	25.00	26.47
Select 3	14.77	11.54	14.71
Select 4	2.27	1.92	0.00
Standard 1	0.00	7.69	0.00
Standard 2	0.00	0.00	2.94

Table 6. Total revenue, total cost and Net Returns to Feeding (NRTF) for each preconditioning treatment ($/head).

Function	Certified Preconditioned for Health (CPH)	Kentucky Gold Tag Program (KT)	Auction Market (AM)
Total Revenue	$859.44	$856.61	$854.75
Total Cost[a]	$335.75	$330.21	$377.89
NRTF[a]	$523.69	$526.40	$476.86
Added Value[b]	$46.83	$49.54	--

[a] NRTF= Total Revenue minus Total Cost; does not include the purchase price or value of the feeder calf.
[b] Added value of NRTF for CPH and GT calves over AM calves.

Table 7. NRTF Regression Results.

	Coefficient.	Std. Error	t-ratio	P-value
Constant	491.67	81.72	6.02	0.00
INWT	0.46	0.04	10.72	0.00
ADG	10.17	2.93	3.47	0.00
HOSPITAL	-0.16	2.52	-0.06	0.95
PROGRAM	22.94	2.54	9.04	0.00
ANGUS	13.19	10.00	1.32	0.19
QG	-58.55	3.58	-16.37	0.00
YG	-24.94	2.64	-9.43	0.00
DOF	0.50	0.14	3.61	0.00
DP	187.58	118.76	9.16	0.00

$R^2 = 0.77$

Number of observations = 244, some observations were lost due to missing data, furthermore, realizers and dead animals were excluded from the analysis.

Table 8. Average price for a carcass in each of the hospital visits subclasses	Hospital Visits		
	0	1	2
Avg. HCW	**780**	**788**	**760**
Prime 3	$10.38941	$0	$0
Choice 1	$10.21157	$17.37483	$51.3197
Choice 2	$199.0845	$187.2281	$125.5916
Choice 3	$147.4061	$50.48363	$49.53218
Choice 4	$8.077493	$0	$0
Select 1	$148.736	$220.3248	$249.9803
Select 2	$193.768	$215.3998	$219.9615
Select 3	$124.2382	$98.06452	$120.5608
Select 4	$15.55295	$13.28984	$0
Standard 1	$0	$67.77191	$0
Standard 2	$0	$0	$22.19653
Total Value	**$857.4641**	**$869.9374**	**$839.1426**