BEEF CATTLE RESEARCH UPDATE

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Factors Affecting the Selling Prices of Beef Calves

Many cow-calf producers market their calves through local livestock auctions. A USDA survey found that about nearly two-thirds of beef-cow operations (60.7%) used an auction market as the primary method of sale for weaned steers in 2007.[1] When buyers at a livestock auction view feeder calves, they must appraise individual characteristics (muscle thickness, frame score, breed composition, etc.) as predictors of quality and animal performance and adjust their bids accordingly. Thus, cow herd owners need to understand what animal attributes affect the value of feeder calves. Two recent studies evaluated the impact of management and genetic factors on the selling price of beef calves.

Sam Houston State University researchers collected data from nine Texas livestock auctions on 1,420 lots consisting of 7,073 head.[2] All selling prices are reported as dollars per cwt of liveweight. These researchers reported that selling prices for steers ($132.34), heifers ($118.46), and bulls ($107.63) were different from each other ($P < 0.01$). Polled calves ($127.78) sold for a higher ($P < 0.01$) price than horned ($104.91) calves. British calves ($128.440) sold for the highest ($P < 0.03$) price, while calves that appeared to be predominantly American ($111.08) received the lowest price. Black ($122.51) calves sold for a higher ($P < 0.02$) price than red ($117.67) or yellow ($115.29) calves. Calves advertised as preconditioned ($131.38) and healthy calves ($121.27) sold for the highest ($P < 0.01$) price, and calves that were sick ($86.14) sold for the lowest ($P < 0.01$) price. Selling price of calves increased incrementally as lot size increased. Calves sold in groups of 20 or more ($129.07) had the highest ($P < 0.01$) selling price and calves sold as singles ($109.03) had the lowest selling price.

University of Arkansas researchers collected data from 14 Arkansas auction barns in 2010 on 38,346 lots consisting of 79,822 head. In one paper[3], the effect of management factors on selling prices was evaluated and in a second paper[4], the impact of genetic factors on selling prices was evaluated. All prices are reported as dollars per cwt of liveweight. These researchers reported that steers sold for $6.31 more ($116.16; $P < 0.001$) than bulls ($109.85) while heifers sold for $102.71. Polled calves sold for $8.03 more ($P < 0.001$) than horned calves. Cattle classified as calves sold for $5.48 sold for more than cattle classified as yearlings ($110.29 vs. 104.81; $P < 0.001$). Body condition affected selling price ($P < 0.0001$) with fat, very thin, fleshy, average, and thin calves selling for $94.40, $98.05, $102.23, $108.36 and $110.11, respectively. In addition, fill affected selling price ($P < 0.0001$) with gaunt, shrunk, average, full and tanked calves selling for $114.40, $109.65, $106.28, $99.41 and $90.33, respectively. Healthy calves sold for $108.69, which was higher ($P < 0.001$) than dead hair ($98.43), stale ($87.21), sick ($62.48), bad eye(s) ($95.38) or lame ($68.57) calves. Calves that were announced as preconditioned sold for a higher price ($113.57; $P < 0.001$) than healthy calves. The selling prices of calves increased ($P < 0.001$) as lot size increased (singles: $107.81, groups of 2 to 5 head: $1110.52, or groups of 6 or more: $112.60).

In the genetic evaluation, 20 breed or breed groupings were evaluated based on phenotypic expression (subjective identification of breed, color, and USDA frame and muscle scores). Five breed or breed types received the highest selling prices but were not different from each other (Angus x Brahman: $111.82, Angus x Herford: $111.70, Angus: $111.36, Charolais x Hereford: $110.48, and Hereford x Angus x Brahman: $110.22; $P > 0.10$). Simmental ($99.90), Brahman ($94.34), and Longhorn/Longhorn cross calves ($71.75) sold for lower prices than other breeds ($P < 0.001$). Black-white faced calves ($111.74) received the highest selling price ($P < 0.001$) followed by black ($110.23), yellow ($110.09), and yellow-white faced ($109.81) which were not different from each other ($P > 0.10$). Spotted calves received the lowest selling price ($82.16; $P < 0.001$). The

selling prices for large- ($108.81) and medium- ($108.67) framed calves were similar (P > 0.10) but were higher (P < 0.001) than small-framed calves ($86.71). Price also differed (P < 0.001) for muscle scores 1, 2, 3 and 4 ($110.82, $101.88, $78.41 and $53.64, respectively).

These studies clearly illustrate that many factors affect the selling price of calves at livestock auctions. Beef cattle producers can influence the value of their calves by changing their management strategies (calf body condition, castration, horns, fill, health, group selling, etc.) and through genetic selection or modification of their breeding objectives.

Effects of USDA Feeder Cattle Frame Grade on Cattle Performance and Profitability

As illustrated in the previously cited studies, stocker cattle producers (buyers) typically favor taller, more heavily muscled cattle over small framed cattle because it is assumed that larger framed cattle will perform better. In the previously cited Arkansas study, medium or large-framed calves sold for approximately $22/cwt more than small-famed calves. A joint project between the Noble Foundation (Ardmore, OK) and Colorado State University measured the effect of USDA feeder cattle frame and muscle grades on performance and profitability of a stocker grazing enterprise.[5] In this study, 395 steer calves (397 lb) were purchased from six sale barns in southeast Oklahoma and northeast Texas in the fall of three consecutive years (2000, 2001, and 2002). Individual purchase weight and price were recorded, and steers were assigned USDA feeder cattle grades of Large (LG), Medium (MED), or Small (SM) frame size and Number 1 or Number 2 muscle thickness by the same official USDA market graders. Following a receiving period (average of 63 days), the steers were grazed on rye pasture an average of 118 days and were then valued by commercial order buyers in frame and muscle grade groups. After the grazing phase in each year, steers were transported 854 miles to the Colorado State University research feedlot near Ft. Collins, CO. At the feedlot, the steers were assigned to 15 pens based on frame-muscle grade combinations and finished on a steam-flaked corn based diet. Steers were weighed and ultrasound measured at 28 day intervals. When a pen of steers was predicted by ultrasound to have reached 0.4 inches backfat, that pen was slaughtered at a commercial slaughter facility in Greeley, CO.

Muscle grade did not affect animal performance or profitability during the grazing period or feedlot period. The effects of frame grade on performance and profitability are shown in Table 1. SM steers were purchased at a significant discount (~$13/cwt) compared to larger framed animals. On average, the market valued SM steers approximately $50 per head less than larger framed animals. During the grazing period, daily gains increased linearly as frame size increased (2.36, 2.56, and 2.65 lb/day, respectively, for SM, MED, and LG). However, due to the lower purchase price, SM steers returned approximately $27 and $35 per steer more than MED and LG steers, respectively.

As expected, feedlot initial weight increased as frame grade increased. The number of days required to reach the target backfat thickness increased as frame grade increased (97, 117, and 129 days, respectively, for SM, MED, and LG). Final feedlot weight also increased dramatically as frame size increased. However, daily gains during the finishing period did not differ between groups. As-fed feed intake tended to be lower in SM steers than in MED and LG cattle. As a result, gain to feed ratio decreased as frame size increased. At the end of the finishing phase, final live value of the steers increased as frame size increased due to greater final weights. Finishing phase net returns were similar across groups. Cumulative net returns (grazing + finishing) for SM steers were approximately $27 and $46 per steer more than for MED and LG steers, respectively.

As expected, hot carcass weight increased as frame size increased (696, 775, and 807 lb, respectively, for SM, MED, and LG). Dressing percent also increased with frame size. Marbling score decreased linearly with increasing frame size. Due to greater carcass weights, the carcass value per steer increased as frame size increased. However, net returns on a grid basis decreased as frame size increased.

In summary, in this dataset net returns were greater for SM steers than for MED and LG steers. The SM steers were originally purchased for $50/steer less than MED and LG steers which was an unjustified discount based on their actual performance. These researchers concluded that the SM steers were most profitable because they were inappropriately discounted by the market. They also noted that this suggest that producers who manage cow herds that contain small framed cows may need to consider retaining ownership of small-framed calves to optimize their profit.

Table 1. Effect of estimated USDA frame grade on performance and net return of steers.

Item	Small	Medium	Large	Linear P-value
# steers	110	172	113	
Purchase Weight, lb	397	395	401	0.25
Purchase Price, $/lb	0.92	1.04	1.06	0.0001
Grazing Performance				
Initial Weight, lb	443	448	454	0.04
Final Weight, lb	721	750	772	0.0001
ADG, lb/day	2.36	2.56	2.65	0.0001
Bid Price, $/lb[1]	0.80	0.81	0.80	0.38
Net Return, $/steer	112.29	85.09	76.87	0.0001
Finishing Performance				
Initial Weight, lb	794	825	845	0.0001
Days on Feed	97	117	129	0.0001
Final Weight, lb	1144	1259	1301	0.0001
ADG, lb/day	3.62	3.75	3.59	0.75
As-fed Intake, lb	27.1	28.7	28.7	0.099
As-Fed G:F	0.134	0.132	0.125	0.02
Feed cost of gain, $/lb of gain	0.409	0.425	0.438	0.06
Final Value, $/steer	877.49	962.00	991.17	0.0001
Net Return, $/steer live basis[2]	82.16	81.72	77.05	0.04
Cumulative Net Return, $/steer live	194.46	167.25	148.20	0.0001
Carcass Performance				
Hot Carcass Weight, lb	696	775	807	0.0001
Dressing Percent	60.8	61.6	62.0	0.0001
Fat thickness, inches	0.50	0.48	0.43	0.0002
Marbling Score[3]	432	417	390	0.0001
Carcass price, $/lb	1.17	1.17	1.14	0.006
Carcass Value, $/steer	819.35	903.50	919.41	0.0001
Net Return, $/steer grid basis[4]	23.88	23.02	(0.52)	0.01
Cumulative Net Return, $/steer grid	136.38	108.40	77.01	0.0001

[1]Price determined by averaging bids of 3 commercial order buyers.
[2]Net return to the finishing phase if steers were sold on a live basis ($0.77/lb of final live weight; USDA–Agricultural Marketing Service average price for Sept., Oct., and Nov. in 2001, 2002, and 2003).
[3]Scores: 300 = Slight, 400 = Small.
[4]Carcass price determined by applying a calculated grid to each steer. Grid calculated by averaging 3 mo of USDA–Agricultural Marketing Service reported carcass premiums in each year.
Adapted from Reuter et al., 2011

[1] USDA-APHIS. 2010. Page 13 in Beef 2007-08, Part IV: Reference of Beef Cow-Calf Management Practices in the United States, 2007–08. USDA–APHIS–VS–CEAH, Fort Collins, CO. Available: http://www.aphis.usda.gov/animal_health/nahms/beefcowcalf/downloads/beef0708/Beef0708_dr_PartIV.pdf.
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