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Abstract

Objectives were to determine: 1) value of Holstein feeder steer lots compared with steer lots of other breed descriptions, 2) value of beef-dairy cross weaned steer calves compared with Holstein weaned calves or weaned calves of other breed descriptions, and 3) value of beef-dairy cross weaned calves compared with weaned calves of other beef breed descriptions sold through video auctions. Data on 14,075 feeder steer lots sold in 211 auctions from 2010 through 2018; 763 weaned steer calf lots, and 1,125 weaned steer and heifer calf lots sold via seven auctions in 2020 and 2021 were used. Separate multiple regression models using backwards selection to quantify effects of various factors on sale price were developed for feeder cattle, weaned steer, and weaned steer and heifer calf lots. Breed group categories used to assess potential differences in sale price included: English-English crossed, English-Continental crossed, Brahman-influenced, Holstein, and beef-dairy crossed (weaned calves). Breed description of feeder steer, weaned steer calf, and weaned steer and heifer calf lots affected sale price ($P < 0.0001$). Among feeder steer lots, Holsteins sold for the lowest ($P < 0.05$) sale price ($110.56/cwt) compared with all other breed groups. Among weaned steer calves, beef-dairy crossed lots sold for the second lowest ($P < 0.05$) price ($147.62/cwt), though greater than Holsteins. Among weaned steer and heifer calves, beef-dairy crosses sold for less than ($P < 0.05$; $136.39/cwt) all other breed groups. Beef-dairy crosses have improved value prospect compared to Holstein steers in the beef supply chain, potentially contributing to increased use of beef semen in dairy females.

Introduction

Improvements in and greater availability of sex-sorted semen technologies in the beef and dairy industries have been instrumental to the growth in number of beef-dairy cross calves in the beef supply chain today. Some dairy producers use beef semen to mate a portion of their breeding females, creating beef-dairy crosses, in attempt to add value to calves entering the beef supply chain (Scanavez and Mendonça, 2018; Penhorwood, 2019; Berry, 2020).

Bovine semen companies, breed associations, and allied industry stakeholders have and are continuing to work to identify ideal beef bull genetics, management protocols,

and marketing strategies to improve efficiency and profitability of beef-dairy cross calf production. As beef-dairy calf production increases, opportunities to measure beef-dairy cross calf value exists. Data available on feeder and weaned calves sold through video auctions enabled evaluation of three distinct but related research questions on dairy feeder steer and beef-dairy cross calf values relative to other breed categories. Questions addressed include: 1) What is the relative value of Holstein feeder steers compared with steers of other breed descriptions? 2) What is the relative value of beef-dairy cross weaned steer calves compared with Holstein weaned calves or weaned calves of other breed descriptions? and 3) What is the value of beef-dairy cross weaned calves compared with weaned calves of other beef breed descriptions?

Experimental Procedures

Information describing factors about lots of feeder steers and weaned steer and heifer calf lots sold through a livestock video auction service (Superior Livestock Auction, Fort Worth, TX) was obtained from the auction service in an electronic format. Data were collected for lots of feeder steers sold from 2010 through 2018 and for lots of weaned steer and heifer calves in 2020 and 2021. Units of study were a lot of feeder steers, lot of weaned steer calves, and lot of weaned steer and heifer calves.

Data available on the lots varied with each analysis, but included some combination of the following variables:

- Auction year
- Auction date
- Gender of the lot
- Lot size (linear and quadratic)
- Base weight (linear and quadratic)
- Mixed gender lot
- Breed description
- Health protocol administration
- Region of United States lot originated from
- Number of days between auction and forecasted delivery dates
- Slide and weight stop combination
- Weight variation
- Presence of horns
- Implant status
- Freight adjustment status
- Frame score
- Flesh score
- Sale price of lot ($/cwt)
- Whether the lot qualified for one or more of these programs: Bovine Viral Diarrhea Persistently Infected free, Source and Age verified, Beef Quality Assurance, Superior Progressive Genetics, GainSmart, Verified Grassfed, IGS Feeder Profit Calculator, Non-GMO, Black Angus Verified Beef, BeefCare, Top Dollar Angus,

AngusLink, Charolais Advantage, Balancer Edge, VitaFerm Raised, Non-Hormone Treated Cattle program, Global Animal Partnership GAP 1 or 4 program, or Certified Natural program

Separate multiple-regression models for each analysis to address each of the three posed research questions were developed using a backwards selection procedure to quantify effects of independent factors on the sale price of beef calves. Where appropriate, models were adjusted for the random effect of auction date nested within auction year. The multiple regression models included 16, 22, and 21 variables potentially affecting sale price, respectively, in analysis of relative value of Holstein feeder steers, beef-dairy cross, and Holstein weaned steer calf value, and beef-dairy cross weaned calf (steers and heifers) value research questions. The variable of interest in addressing these research questions was breed description of the lot.

Only lots of feeder steers were included in analyses comparing value of Holsteins to feeder steers of other breed descriptions. By nature of structure of the dairy industry, few, if any Holstein feeder heifer lots are sold via this video auction platform. Additionally, it has only been in recent years that weaned calves marketed via this video auction have been described as "beef-dairy cross" within the lot descriptions for sale, and beef-dairy cross calves of both genders were available for sale. Therefore, those comparisons were made in data available from 2020 and 2021 sales that weren't available in earlier years.

Results and Discussion

In addressing the question, "What is the relative value of beef-dairy cross weaned steer calves compared with either Holstein weaned calves or weaned calves of other breed descriptions?", data were analyzed from 763 lots of weaned steer calves sold via seven video auctions through Superior Livestock Auction in 2020 and 2021. Mean weight and number of steer calves in the lots analyzed were 614.9 ± 130.3 lb body weight (BW) and 124.7 ± 75.4 head, respectively. Of the 22 fixed effects, nine were considered significant and included in the final model for lots of weaned steer calves. Breed description of the lot affected ($P < 0.05$) calf sale price, with English-English cross weaned steer calves having sold for the greatest sale price at $165.18/cwt, while Holstein weaned steer calves sold for the lowest sale price at $113.04/cwt (Table 1). Beef-dairy cross weaned steer calf lots sold for $34.58/cwt more ($P < 0.05$) than Holstein weaned steer calves.

In addressing the question, "What is the value of beef-dairy cross weaned calves compared with weaned calves of other beef breed descriptions?" data were analyzed from 1,125 lots of weaned steer and heifer calves sold via seven video auctions through Superior Livestock Auction 2020 and 2021. Mean weight and number of steer and heifer calves in lots analyzed were 618.4 ± 98.8 lb BW and 123.4 ± 75.4 head, respectively. Of the 21 fixed effects, 11 were considered significant and included in the final model for lots of weaned steer and heifer calves. Again, breed description of the lot affected ($P < 0.05$) weaned steer and calf sale price, with Brahman-influenced, English-Continental cross, and English-English cross lots selling for more ($P < 0.05$) than beef-dairy cross weaned steer and heifer calves (Table 2).

To address the question, "What is the relative value of Holstein feeder steers compared with steers of other breed descriptions?", data were analyzed from 14,075 lots of feeder steers sold via 211 video auctions through Superior Livestock Auction from 2010 through 2018. Mean weight and number of steers in lots analyzed were 800.7 ± 111.6 lb BW and 121.1 ± 110.3 head, respectively. Of the 16 fixed effects, 15 were significant and included in the final model for lots of feeder steers sold from 2010 through 2018, as only the presence of horns did not affect sale price ($P = 0.43$). To determine potential change in relative value of Holstein feeder steer lots from 2010 through 2018, data were analyzed in three-year increments. A separate analysis was performed for each three-year increment (Table 3). In all three-year increments, Holstein feeder lots sold for the lowest ($P < 0.05$) sale price compared to the other breed descriptions of beef feeder steer lots. The mean discount of Holstein feeder steer lots relative to other breed descriptions was $33.19/cwt in 2010 through 2012, $42.96/cwt in 2013 through 2015, and was the greatest in 2016 through 2018 at a mean discount of $46.24/cwt. The greater relative percentage discount in sale price of Holstein feeder steers as compared with beef breed categories from 2016 to 2018 (33.2% discount) compared with earlier years (26.9% and 24.3% discount in 2010 to 2012 and 2013 to 2015, respectively) was likely partially in response to key events in the beef value chain. In December 2016, a major packer announced a decision to no longer harvest Holstein steers. It has been well documented that Holstein feeder cattle are less feed efficient and have a lower dressing percentage than beef feeder cattle. Perhaps, though, in this time of growth of beef-on-dairy production there is also opportunity for segments of the beef value chain to capitalize on what some may deem as a more consistent and predictable Holstein feeder steer while knowledge gaps about growth performance and carcass quality and consistency of beef-dairy cross cattle are being filled.

Implications

Holstein and beef-dairy cross calves are discounted relative to other beef breed descriptions, though industry stakeholders are continuing to gain insight about performance characteristics of beef-dairy cross animals through all segments of modern beef production. This study, however, also found that lots of beef-dairy cross feeder steers not only had greater value than lots of Holstein steers, but were much closer in value to the traditional beef breed descriptions, likely further driving use of beef semen in dairy females.

References

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Table 1. Effect of breed description on the sale price of weaned steer calf lots sold through seven Superior Livestock Auction video sales in 2020 and 2021

Breed description	Number of lots	Least squares mean of sale price, $/cwt	Regression coefficient
English-English cross	270	165.18[a]	52.14
English-Continental cross	197	160.38[b]	47.34
Brahman influenced	111	155.54[c]	42.50
Beef-dairy cross	94	147.62[d]	34.58
Holstein	91	113.04[e]	0.00

[a-e]Means within a factor without a common superscript differ ($P < 0.05$).

Table 2. Effect of breed description on the sale price of weaned steer and heifer calf lots sold through seven Superior Livestock Auction video sales in 2020 and 2021

Breed description	Number of lots	Least squares mean of sale price, $/cwt	Regression coefficient
English-English cross	441	155.15[a]	18.79
English-Continental cross	321	151.09[b]	14.70
Brahman influenced	181	146.20[c]	9.81
Beef-dairy cross	182	139.39[d]	0.00

[a-d]Means within a factor without a common superscript differ ($P < 0.05$).

Table 3. Sale price of Holstein feeder steer lots relative to other breed descriptions sold through 211 Superior Livestock Auction video sales from 2010 through 2018

Breed description	Number of lots	Least squares mean of sale price, $/cwt	Regression coefficient
2010 to 2018			
English-English cross	3,829	152.39[a]	41.83
English-Continental cross	4,310	150.61[b]	40.05
Brahman influenced	4,945	148.75[c]	38.19
Holstein	991	110.56[d]	0.00
2010 to 2012			
English-English cross	1,252	128.10[a]	34.47
English-Continental cross	1,562	126.81[b]	33.18
Brahman influenced	2,185	125.56[c]	31.93
Holstein	282	93.63[d]	0.00
2013 to 2015			
English-English cross	1,171	182.43[a]	44.82
English-Continental cross	1,485	180.46[b]	42.85
Brahman influenced	1,630	178.83[c]	41.22
Holstein	373	137.61[d]	0.00
2016 to 2018			
English-English cross	1,465	145.62[a]	47.84
English-Continental cross	1,359	144.47[b]	46.69
Brahman influenced	1,283	141.97[c]	44.19
Holstein	360	97.78[d]	0.00

Breed description affected sale price ($P < 0.0001$).

[a-d]Prices without a common superscript differ ($P < 0.05$) within years.

Within each analysis (2010 to 2018, 2010 to 2012, 2013 to 2015, and 2016 to 2018), each multiple regression model was adjusted for the random effect of auction date nested within auction year.