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CHARACTERIZATION OF BOXED BEEF VALUE IN ANGUS FIELD DATA

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Authors:

B.R. Schutte, S.L. Dolezal, H.G. Dolezal and D.S. Buchanan

Story in Brief

The OSU Boxed Beef Calculator was used to generate closely trimmed boxed beef value on 33,350 progeny produced by 1,087 sires. Wholesale prices reflected a three year average (1995, 1996, 1997) for 19 boxed beef items and five quality grade categories. Nonconforming carcasses (i.e., YG 4.0 or >) were priced separately. Quarterly differences were significant indicating that boxed beef prices reflect a significant Choice/Select spread seasonal pattern. The current study indicated that sire rankings based on carcass price ($/cwt) are not expected to change between the low and average pricing periods or the average and high pricing periods. Sires in the top 10% had a higher carcass price ($/cwt) because progeny from those sires had more desirable quality by yield grade combinations than the bottom 10%. Moreover, sires in the top 10% had higher carcass values expressed in $/hd for all three quality grade spreads because of heavier carcass weights and higher carcass prices ($/cwt). The percentage of sires meeting carcass price ($/cwt) and carcass value ($/hd) benchmarks were acceptable; however, percentages could be improved with the elimination of progeny that do not conform to boxed beef fabrication specifications (U.S. Standard, yield grade 4s and 5s, and carcass weights less than 550 lb or greater than 949 lb). Absolute differences in boxed beef value represent a more industry applicable picture of profit potential for sire groups and reinforce the importance of a multiple-trait systems approach.

Key Words: Beef Cattle, Carcass, Value

Introduction

Increased interest in breed strengths and application of expected progeny differences (EPD) require a fast-paced seedstock industry. Seedstock producers are planning aggressive breeding programs to meet future bull buyer needs. The American Angus Association National Sire Evaluation Report (1998) includes EPDs for percent retail product. The use of a cutability equation to predict percentage retail product allows for simultaneous consideration of relative fatness and muscling instead of independent assessment of the latter two traits. These EPDs are valuable for comparing the expected difference in average cutability of future progeny from bulls.

One of the more difficult areas to make genetic improvements is in the area of enhancing taste and tenderness. Genetic tools for enhancing product

quality and palatability are limited. Identification of genetic combinations to produce offspring in the upper 2/3 U.S. Choice or better categories (i.e., Certified Angus Beef™) are hindered by limited bull selection tools for quality and tenderness. Marbling EPDs are based on progeny data available in the particular breed association and are used to predict differences in average marbling score of future offspring. A challenge to seedstock and commercial cow-calf operators is to balance quality and red meat yield. Results from the American Angus Association database show a genetic correlation of nearly zero, indicating that selection for marbling does not hinder improvement in percent retail product. However, the ability to identify sires whose progeny excel in both quality grade and red meat yield remains challenging. Too often, sizeable improvements in progeny marbling deposition are accompanied with excess external and seam fat, small ribeyes, or both.

The purpose of the study was to examine the impact of average, low, and high Choice/Select quality grade price spreads on Angus sire progeny mean boxed beef values as well as examine contemporary group and sire effects on boxed beef value. Another objective was to determine sire close trim boxed beef value rankings based on progeny data and evaluate whether or not sire rankings differ significantly due to seasonal Choice/Select quality grade price spreads. In addition, progeny carcass performance was compared with benchmark values.

Materials and Methods

The potential exists to generate a genetic value by combining quality grade and red meat yield attributes into one selection tool. The Oklahoma State University Boxed Beef Calculator (Gardner et al., 1996) may be used to generate closely trimmed boxed beef values for every individual carcass record on progeny of bulls. The Calculator is designed to utilize individual carcass weight, quality grade (five levels: Prime, Premium Choice, Choice, Select, or No Roll), yield grade (nearest 0.1 yield grade; 1.0 to 5.0), and dressing percentage (individual or lot) to generate closely-trimmed boxed beef values in dollars per hundred pounds of carcass weight. Through the use of a 1995-97 price database (average of the top three packers) for wholesale subprimals (19 boxed beef items), premiums and discounts are derived relative to a base value or industry par for carcass merit. Seasonality of prices exists; however, the extensive price database allows average quality grade and yield grade (YG) spreads to be generated. In the future, more detailed prices can be provided if cattle marketing endpoints and seasonal time frames are known.

Wholesale prices reflected a three year average (1995 to 1997) for the 19 boxed beef items. Nonconforming carcasses were priced separately (carcasses with YG 4.0 were discounted $15/cwt from the base; YG 5.0 $20.00; <550 and >999 lb carcasses $25.00; 950 to 999 lb carcasses

$10.00). The average closely trimmed premiums/discounts ($/cwt) relative to the base price for quality grades and additional yield grades were: Prime = +$5.00, Premium Choice = +$2.00, Select = -$7.79, No-Roll = -$15.58, YG 1 = +$16.27 and YG 2 = +$7.24/cwt.

Progeny data (n=37,848), adjusted for age at harvest (480 d), were received from the American Angus Association, St. Joseph, MO, and in cooperation with Iowa State University, Ames, IA. Data included herd code, harvest date, sire registration number, steer or heifer tag number, fat thickness (in, 12th/13th rib interface), ribeye area (in^2), carcass weight (lb), percentage kidney, pelvic and heart fat, percentage retail product and marbling score for progeny harvested between spring 1975 and fall 1997. Edited data for the current study (n=33,350) represented 1,087 sires with 10 or more offspring per sire. A similar approach in evaluating beef sires is reported by Dolezal and Dolezal (1998). Also, the database included 328 herds and 218 harvest dates (defined as month/year).

Progeny records were processed through the Boxed Beef Calculator using Low, Average, and High Choice/Select quality grade spreads (Low=$4.03, Average=$7.79, and High=$12.54). Thus, every progeny record was priced in each of three pricing scenarios so that three databases (Low spread, Average spread, and High spread) were available for further analyses.

Carcass traits were analyzed using a mathematical model accounting for harvest date, gender, sire and residual error term. Correlations among carcass traits were computed after accounting for these known sources of variation. Sire progeny means were computed under each Choice/Select spread scenario and sire rank correlations were examined.

Results and Discussion

Table 1 presents the characteristics of the adjusted data as well as the boxed beef data calculated using the OSU Boxed Beef Calculator. Steers comprised 93.5% of the progeny records (n=31,181), while 6.5% were heifers (n=2,169). Of the 33,350 records, 28,210 (84.6%) progeny were considered to conform to boxed beef fabrication specifications (U.S. Prime through U.S. Select, U.S. yield grades 1.00 to 3.99, and carcass weights within the range of 550 to 950 lb).

Correlations for all progeny (Table 2) indicated that percentage boxed beef yield, boxed beef yield without lean trim, boxed major cuts yield, and percentage retail product had a strong relationship with yield grade (r_p=-.94, -.99, -.99, and -.99, respectively). Correlations between retail product and other traits of interest were: carcass weight (-.26), marbling score (-.18), ribeye area (.54) and fat thickness (-.80).

Sire differences, after accounting for harvest date and gender variation, were

highly significant ($P<.01$). Considering all progeny data, Figure 1 illustrates the percentage of progeny above and below the benchmark price for a low Choice, yield grade 3.99 weighing 750 lb (low Ch/Se=$102.39/cwt, average Ch/Se=$102.67/cwt, and high Ch/Se=$105.18/cwt). This benchmark was determined for a 3.99 because the BBC allows for further segmentation of whole numerical yield grades (i.e., 3.99 vs 3). The low Choice/Select spread resulted in the highest percentage of progeny (78.8%) to exceed the carcass price benchmark. The percentage above the benchmark declined to 72.1 and 68.6% during the average and high Choice/Select spreads because yield grade premiums were less important, while quality grade requirements had a greater impact on carcass price as the quality grade spread increased.

If the benchmark had been tightened to a 3.0 rather than 3.99, then the benchmarks would have been $107.56, 107.85, and 110.50/cwt, for low, average, and high spreads, respectively. Corresponding percentage of progeny above these benchmarks would be 42.8, 42.3, and 40.0%. Even in a breed that demonstrates excellent carcass merit, it is important to set future, progressive benchmarks as this 3.0 yield grade target demonstrates.

Figure 2 carcass value benchmarks of $767.93, $770.03, and $788.85/hd were used for the low, average, and high pricing periods to determine the percentage of progeny that exceeded or fell short in carcass value ($/hd). Because carcass value ($/hd) was influenced by carcass weight (750 base), the percentages above and below the low, average, and high Choice/Select benchmarks were lower than percentages for carcass price ($/cwt). Nevertheless, Figure 2 indicates over half of all progeny were above all three carcass value benchmarks.

There is concern that when sires are ranked on carcass price using the average Choice/Select spread, rankings may change during the low and high quality grade spread seasons of the year. However, Spearman Rank correlations showed that the relationships between sire rankings for the average and low Choice/Select spreads, as well as the average and the high Choice/Select spreads were both strong (.99; $P<.0001$). This indicates that when sires are ranked by the average Choice/Select spread, significant rank order change is not expected if progeny are harvested during the low or high quality grade seasonal spreads. The correlation between the low Choice/Select spread and the high spread drops to .95 ($P<.0001$), which suggests that some re-ranking of sires can be expected. Therefore, the average Choice/Select spread should be used to evaluate sire value based on boxed beef prices.

Of the 1,087 sires, the top and bottom 10% based on carcass value ($/cwt) were evaluated and are presented for the average quality grade spread in Table 3. The top 10% showed an improvement of $16.04/cwt in carcass price in comparison with the bottom 10% during the average Choice/Select

spreads. Similar patterns occurred in the low and high Choice/Select spreads. This improvement in carcass price ($/cwt) resulted in a carcass value advantage for all three pricing periods of greater than $200.00/hd. Progeny from the top 10% sires had significantly (P<.001) higher quality carcasses with less fat, larger ribeye areas, heavier carcass weights, and more desirable yield grades when compared with the bottom 10%. The improved value of the top 10% over the bottom 10% was also a direct effect of the minimal occurrence of progeny not conforming to boxed beef fabrication specifications for one or more of the qualifying characteristics.

Implications

It is important to recognize that, as with other carcass traits, the values are assuming performance at various production stages has been optimized. As with percentage retail product, extreme differences in carcass weight, for example, would influence the overall profitability difference between sire progeny groups. Breeds with interest in carcass merit should consider the development of genetic values to assess profitability using a progressive carcass value determination system.

Literature Cited

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Table 1. Carcass trait means for complete progeny data, progeny data conforming to boxed beef fabrication specifications, and progeny data not conforming to boxed beef fabrication specifications.

Traits	Complete	SD	Conform	Non-Conform
Number of progeny	*33,350*		*28,210*	*5,140*

Marbling score[a]	5.77	1.02	5.81	5.56
Quality grade [b]	2.85	.85	2.81	3.10
Prime, %	3.1	-	3.0	3.4
Prem Choice, %	32.8	-	33.0	32.2
Choice, %	42.8	-	44.5	33.1
Select, %	18.6	-	19.5	13.8
Standard, %	2.7	-	-	17.6
Fat thickness, in	.54	.16	.51	.68
Ribeye area, in^2	12.37	1.37	12.52	11.50
Carcass weight, lb	743.4	88.2	743.8	741.5
< 550 lb	2.3	-	-	14.6
550 to 950 lb	97.1	-	100.0	81.2
950 to 1000 lb	.6	-	-	3.7
1000 lb >	.1	-	-	.4
KPH, %[b]	2.33	.62	2.28	2.62
Yield grade	3.18	.67	3.06	3.87
1.0 to 1.99	3.4	-	3.4	3.3
2.0 to 2.99	35.8	-	39.3	16.9
3.0 to 3.99	50.1	-	57.3	10.8
4.0 to 4.99	9.9	-	-	64.3
5.0 to 5.99	.7	-	-	4.7
Box yield, %	67.22	2.19	67.43	66.08
w/o lean trim, %	52.09	1.98	52.38	50.47
major cuts, %	40.29	1.64	40.53	38.95
Retail product, %	62.66	2.67	63.18	59.82
Low spread, $/cwt	104.83	7.80	107.73	88.91
Average spread $/cwt	104.59	8.30	107.49	88.73
High spread $/cwt	106.23	9.06	109.05	90.75
Low spread $hd	781.84	112.07	803.34	663.73
Average spread $/hd	780.24	114.72	801.68	662.60
High spread $/hd	792.56	119.72	813.49	677.72

[a]5.00 to 5.99 = Small; 4.00 to 4.99 = Select.

[b]2.0 to 2.99 = premium Choice; 3.00 to 3.99 = Choice.

[c]Kidney, pelvic, and heart fat.

Table 2. Residual correlations[a] among carcass traits for all progeny dat (n=33,350).

Traits	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. Quality grade[b]	-.88	-.26	-.39	-.47	-.07	.02[ns]	-.17	-.13	-.17	.19	.19	.19	.17
2. Marbling score[c]		.20	.30	.36	.07	-.02[ns]	.17	.13	.18	-.19	-.19	-.19	-.18
3. Low $/cwt			.98	.91	-.16	.46	-.52	-.03	-.66	.51	.60	.60	.66
4. Average $/cwt				.98	-.14	.44	-.47	-.01[ns]	-.60	.46	.54	.54	.60
5. High $/cwt					-.12	.40	-.41	.01[ns]	-.52	.40	.47	.47	.52
6. KPH, %[d]						-.01[ns]	.15	.04	.26	-.26	-.26	-.26	-.35
7. Ribeye area, in^2							-.09	.40	-.55	.47	.50	.49	.54
8. Fat thickness, in								.25	.80	-.74	-.79	-.79	-.80
9. Carcass weight, lb									.30	-.37	-.36	-.38	-.26
10. Yield grade										-.94	-.99	-.99	-.99
11. Box yield (BY), %											.98	.98	.94
12. BY w/o lean trim, %												1.0	.98
13. BY major cuts, %													.98
14. Retail product, %													

[a]All other correlations (P<.0001); [ns](P>.05).

[b] 1.00 to 1.99=Prime; 5.00 to 5.99=Standard.

[c]10.00 to 10.99=Abundant; 9.00 to 9.99=Moderately abundant; 8.00 to 8.99=Slightly abundant; 7.00 to 7.99=Moderate; 6.00 to 6.99=Modest; 5.00 to 5.99=Small; 4.00 to 4.99=Slight; 3.00 to 3.99=Traces; 2.00 to 2.99=Practically devoid.

[d]Kidney, pelvic and heart fat.

Table 3. Progeny carcass trait means for sires in the top and bottom

10% for the average Choice/Select spread.					
	Average Choice/Select spread				
	Top 10%		Bottom 10%		
Traits	Mean	SD	Mean	SD	Diff**
Carcass value, ($/cwt)	110.19	1.04	94.15	2.72	16.04**
Carcass value, ($/hd)	822.27	90.94	616.36	130.97	205.91**
Number of sires	109	--	110	--	
Number of progeny	2728	--	1751	--	
Marbling score[a]	6.29	1.06	5.05	1.04	1.24**
Quality grade[b]	2.44	.73	3.53	.96	-1.09**
Prime, %	7.7	--	.7	--	
Prem. Choice, %	47.4	--	14.7	--	
Choice, %	38.5	--	32.7	--	
Select, %	6.1	--	35.0	--	
Standard, %	.2	--	16.9	--	
Fat thickness, in	.48	.13	.55	.21	-.07**
Ribeye area, in^2	12.92	1.33	11.30	1.27	1.62**
Carcass weight, lb	747.0	75.4	644.4	106.6	102.7**
< 550 lb, %	.3	--	20.2	--	
550 to 950 lb, %	99.4	--	79.4	--	
950 to 1000 lb, %	.3	--	.5	--	
1000 lb >, %	.0	--	0	--	
KPH, %[c]	2.22	.57	2.96	.57	-.74**
Yield grade	2.84	.57	3.29	.79	-.45**
1.0 to 1.99, %	6.2	--	3.9	--	
2.0 to 2.99, %	53.8	--	34.3	--	
3.0 to 3.99, %	38.5	--	41.3	--	
4.0 to 4.99, %	1.4	--	18.2	--	
5.0 to 5.99, %	0.0	--	2.3	--	
Box yield (BY), %	68.03	1.86	68.26	3.26	-.23**

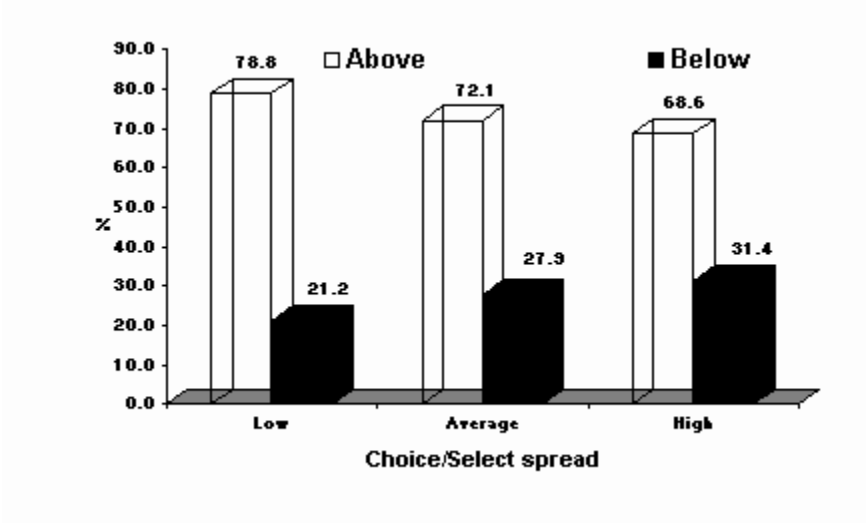
BY w/o lean trim, %	52.97	1.69	52.38	2.58	.59**
BY major cuts, %	41.01	1.37	40.58	2.17	.43**
Retail product, %	64.03	2.23	61.78	3.11	2.25**

[a]5.0 to 5.99=Small; 4.0 to 4.99=Slight.

[b]2.00 to 2.99 = premium Choice; 3.00 to 3.99 = Choice.

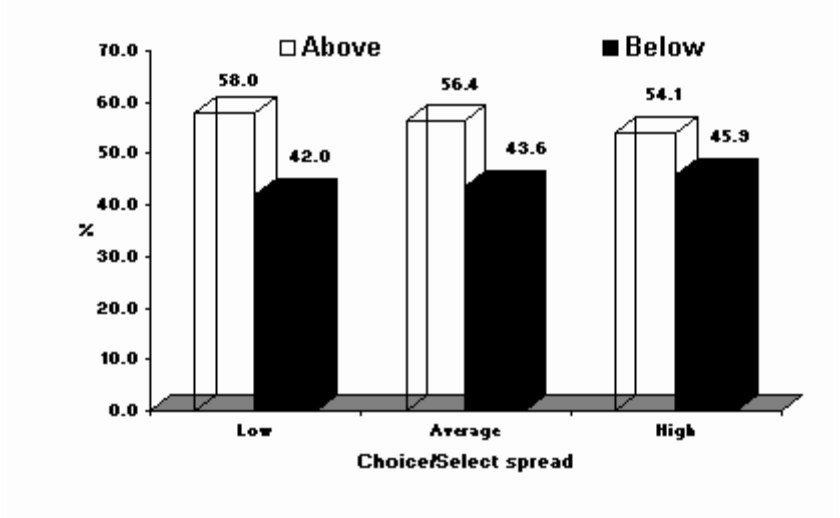
[c]Kidney, pelvic and heart fat.

** (P<.01).



aU.S. Choice, yield grade 3.99, 750 lb carcass weight: Low spread=$102.39/cwt; Average spread=$102.67/cwt; High spread=$105.18/cwt.

Figure 1. Percent of all progeny (n=33,350) above and below the average benchmark carcass price ($/cwt) for the low, average, and high quality grade spreads[a].



[a]Low, average, and high quality grade spread benchmark prices x 750 lb carcass weight:
Low spread=$767.93/hd; Average spread =$770.03/hd; High spread=$788.85/hd.

Figure 2. Percent of all progeny (n=33,350) above and below the average carcass value benchmark ($/hd) for the low, average, and high quality grade spreads[a].

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