ESTIMATION OF BEEF VALUE BASED ON BOXED BEEF YIELDS

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Story in Brief

A database was developed from fabrication data obtained from 598 carcasses (steers = 457, heifers = 116, Holstein = 25). Carcass grade data were collected and sides were fabricated into boneless subprimals following progressive HRI guidelines. Boxed beef yields for individual major subprimals (shoulder clod, chuck roll, ribeye roll, strip loin, tenderloin, top butt, inside round, gooseneck, and knuckle), minor subprimals (loose meats), 75% lean trim, and 50% lean trim were calculated at the commodity-trimmed and closely-trimmed levels and stratified by USDA yield grade. Yield grade, quality grade, drop credit, slaughter/fabrication cost, carcass weight, and dressing percentage were entered as variables into a spreadsheet program to estimate beef value when boxed beef product was fabricated at the commodity-trimmed or closely-trimmed endpoint. This program facilitates precise estimation of beef value as yield, quality, and production/fabrication parameters vary.

(Key Words: Beef, Cutability, Software, Value-based, Meat.)

Introduction

Approximately 80% of fed beef is fabricated as boxed beef at either commodity (maximum of 1 in. external fat) or close-trim (maximum of 1/4 in external fat) fat trim specifications. Therefore, identification of beef value depends upon method of marketing (boxed beef vs carcass) and fat-trim level (commodity vs close). The 1991 National Beef Quality Audit (NBQA) estimated that excess fat production was responsible for a $219.25 loss for every steer and heifer slaughtered in 1991 (Lorenzen et al., 1993) as a result the quarter inch fat trim level was proposed as the “commodity” fat-trim specification for boxed beef primals/subprimals. Production of closely-trimmed primals/subprimals has subsequently increased during the previous 3 years and has remained steady at current production levels of approximately 43% (Dolezal, 1995); however, the 1995 NBQA estimated that economic losses

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resulting from excess fat production have decreased 4.8% in comparison to the 1991 NBQA.

For production of closely-trimmed boxed beef to increase beyond present levels, a value based method of estimating beef value must be developed. The purpose of this project was to utilize carcass grade and yield parameters in combination with slaughter/fabrication costs to precisely estimate beef value.

Materials and Methods

A database was created from carcass fabrication data collected from 598 carcasses (steers = 457, heifers = 116, Holstein = 25). Carcasses were fabricated into boneless boxed beef following progressive HRI guidelines as set forth by commercial beef packers. Products fabricated were categorized as major subprimals (shoulder clod, chuck roll, ribeye roll, strip loin, tenderloin, top butt, inside round, gooseneck, and knuckle), minor subprimals (loose meats), 75% lean trim, and 50% lean trim. Yields of these subprimals were evaluated at commodity-trimmed and closely-trimmed fat specifications.

Carcass weight, USDA quality and yield grade, slaughter and fabrication cost, drop credit, and estimated dressing percentage were included as independent variables in a computer spreadsheet. Least squares means for yield of each boxed beef product expressed as a percentage of cumulative side weight were calculated by USDA yield grade category. These yield values were then entered into the spreadsheet as fixed variables and used to calculate product weight based on the given carcass weight. Prices were applied to individual subprimals dependent on USDA quality grade, external fat trim level and product weight classification when appropriate. Estimated live weight (lb) and gross carcass, gross live, net carcass, and net live values ($/cwt) could then be calculated.

Results and Discussion

Least squares means characterizing the carcasses utilized in this project stratified by USDA yield grade are presented in Table 1. As expected, adjusted fat thickness (AFT) increased ($P<.05$) and ribeye area (REA) decreased ($P<.05$) as yield grade became less desirable. Hot carcass weight (CWT) and kidney, pelvic, and heart fat percentage (KPH) increased ($P<.05$) as numerical yield grade increased from YG 2 to YG 3 and from YG 3 to YG 4; however, CWT and KPH did not differ ($P>.05$) from YG1 to YG2. Ranges for carcass yield grade parameters (not in tabular form) are: CWT, 555 to 1008 lb.; REA, 9.3 to 18.9 $in.^2$; AFT, .08 to 1.28 in. Mean yield grades were as follows: YG1 (1.55), YG 2 (2.53), YG3 (3.45), and YG 4 (4.33). Quality grade consist was 61% U.S. Choice and 39% U.S. Select.

A pricing matrix for boxed beef product is depicted in Table 2. The matrix presents prices for U.S. Choice and U.S. Select major subprimals, minor subprimals, 75% lean trim, and 50% lean trim at commodity- and closely-trimmed fat levels.

Boneless boxed beef product expressed as a percentage of cumulative side weight for commodity-trim (Table 3) and close-trim (Table 4) is presented stratified by USDA yield grade. Typically, side yield of a particular product is decreased when progressing from commodity-trim to close-trim due to removal of external fat. However, as a result of similar fabrication techniques, yields appeared to be similar for ribeye roll, sirloin flap, ball tip, tenderloin, skirt meat, cap and wedge meat, 75% lean trim, and 50% lean trim. The similarities in yields for these boxed beef products are a result of fabrication guidelines because external fat is removed from these subprimals at the commodity-trimmed and closely-trimmed fat levels.

Carcass equivalent and live animal values generated by the computer spreadsheet are categorized by quality grade and trim level (Table 5). As expected, price differentials ($/cwt) between commodity-trimmed and closely-trimmed boxed beef product (carcass equivalent and live basis) were substantial. However, the magnitude of the differential diminished as predicted cutability decreased because of the additional fat removed with closely-trimmed fabrication. The absolute value difference between commodity-trimmed and closely-trimmed boxed beef wholesale prices for a U.S. Choice yield grade 2 carcass was $ 46.72.

Net carcass value ($/cwt) was determined for Choice yield grade 3 carcasses for both the commodity and close-trim fat levels to demonstrate the impact of additional value derived from offal items and fixed costs of slaughter and fabrication (Table 6). Increases in carcass weight result in increased net carcass value at both fat trim levels. The difference in net carcass value as carcass weight increased from 600 to 900 lbs was $4.81/cwt and $4.35/cwt for close-trim and commodity trim, respectively. It is important to note, however, when carcasses reach weights of 950 lbs or more severe price discounts are incurred because these carcasses are difficult to fabricate safely and they produce retail cuts with excessive portion sizes.

Currently, most feedlots manage and market cattle on a lot basis. Therefore, uniformity is an important factor in determining an average price for a lot of cattle. To demonstrate the influence of uniformity in carcass production the live value for a lot of average slaughter cattle (n = 100) where 86 carcasses conformed to industry standards and were fabricated as boxed beef and 14 were non-conformers and were marketed as carcasses was calculated as set forth by Dolezal (1996). Table 7 lists the relative values for the 86 carcasses that conformed to weight (550 to 950 lb) and grade (U.S. Prime, U.S. Choice, U.S. Select; yield grade 3 or better) specifications for boxed beef fabrication. A

live price was determined using commodity-trimmed boxed beef predicted prices from Table 5 that corresponded with the quality and yield grade consist. The value listed for U.S. Choice, yield grade 3 was set as the base price. The adjusted live value ($/cwt) for the conformers (n=86) was $63.79.

Value adjustments for the 14 carcasses that did not conform to industry standards (weight, grade, defects) are presented in Table 8. The average discount for the 14 non-conformers is $2.60 per hundred pounds of carcass weight or $1.66 per hundred pounds of live weight ($2.60 X 63.75% dress). The average live value for this lot of slaughter cattle (n = 100) can be determined by subtracting the non-conformer discount ($1.66/cwt.) from the conformer adjusted live value ($63.79/cwt.). Therefore, the average live value for the entire lot would be $62.13 per hundred pounds of live weight.

Closely-trimmed boxed beef prices were applied to the same conformer lot consist (Table 9) utilized in the commodity based price example to demonstrate the impact of close-trimming on live value. Considering the discount for non-conformers ($1.66/cwt), the lot price for these 100 cattle would calculate to $65.31 on a live weight basis.

Implications

The boxed beef calculation spreadsheet may be used to determine value of slaughter animals on a live and carcass equivalent basis. Consideration of quality grade, yield grade, carcass weight, drop credit, slaughter/fabrication cost, and dressing percentage provides the flexibility to calculate values as animal characteristics and market conditions vary. This program can be utilized by producers and packers to estimate the potential value of individual animals or carcasses.

Literature Cited

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Table 1. Carcass trait means stratified by USDA yield grade.

	USDA Yield Grade			
	1	2	3	4
Carcass trait				
No. of carcasses	62	201	252	83
Hot carcass weight, lb	749.2[a]	751.3[a]	769.7[b]	787.9[c]
Adjusted fat thickness, in	.30[a]	.44[b]	.59[c]	.81[d]
Ribeye area, in^2	15.5[a]	13.6[b]	12.3[c]	11.6[d]
Kidney, pelvic, & heart fat, %	2.1[a]	2.2[a]	2.4[b]	2.7[c]
USDA yield grade	1.55[a]	2.53[b]	3.45[c]	4.33[d]

[a,b,c,d]Means in the same row with a common superscript letter are not different (P>.05).

Table 2. Pricing matrix for boxed beef subprimals.[a]

IMPS	Boxed Beef Subprimal	Price/cwt			
		Commodity		*Close*	
		Choice	Select	Choice	Select
112A	Ribeye < 11 lb	$370.00	$325.00	$370.00	$325.00
112A	Ribeye > 11 lb	$352.00	$320.00	$352.00	$320.00
114	Shoulder Clod	$100.00	$98.00	$123.00	$121.00
116A	Chuck Roll	$116.00	$116.00	$137.00	$137.00
120	Brisket	$92.00	$92.00	$115.00	$115.00
167	Knuckle	$129.00	$129.00	$148.00	$148.00
168	Inside Round	$125.00	$126.00	$140.00	$141.00
170	Gooseneck	$116.00	$118.00	$140.00	$140.00
180	Strip Loin < 12 lb	$280.00	$218.00	$386.00	$301.00
180	Strip Loin 12 to 13.9 lb	$280.00	$218.00	$386.00	$301.00
180	Strip Loin 14 lb or >	$280.00	$218.00	$386.00	$301.00
184	Top Butt < 12 lb	$190.00	$155.00	$228.00	$186.00
184	Top Butt 12 lb or >	$190.00	$155.00	$228.00	$186.00
185A	Bottom Sirloin Flap	$208.00	$208.00	$208.00	$208.00
185B	Bottom Sirloin Ball Tip < 2 lb	$130.00	$130.00	$130.00	$130.00
185B	Bottom Sirloin Ball Tip 2 lb or >	$138.00	$138.00	$138.00	$138.00
185C	Bottom Sirloin Tri-Tip	$163.00	$163.00	$183.00	$183.00
189A	Tenderloin < 5 lb	$585.00	$565.00	$585.00	$565.00
189A	Tenderloin 5 lb or >	$615.00	$570.00	$615.00	$570.00
193	Flank Steak	$245.00	$245.00	$245.00	$245.00
	Skirt Meat	$170.00	$170.00	$170.00	$170.00
	Cap & Wedge meat	$135.00	$135.00	$135.00	$135.00
	Back Ribs	$46.00	$46.00	$46.00	$46.00
	75% Lean Trim	$69.00	$69.00	$69.00	$69.00
	50% Lean Trim	$40.00	$40.00	$40.00	$40.00

[a] Prices reflect the commodity-trimmed and closely-trimmed boxed beef subprimal market on February 16, 1996.

Table 3. Commodity-trimmed-boneless boxed beef subprimals expressed as a percentage of cumulative side weight (lb).

IMPS	Boxed Beef Subprimal	USDA Yield Grade 1	2	3	4
112A	Ribeye Roll	3.74[a]	3.50[b]	3.31[c]	3.21[d]
114	Shoulder Clod	5.85[a]	5.78[ab]	5.72[bc]	5.68[c]
116A	Chuck Roll	8.63[a]	8.53[a]	8.40[b]	8.13[c]
120	Brisket	3.26[a]	3.19[ab]	3.11[b]	3.14[ab]
167	Knuckle	3.16[a]	3.02[b]	2.87[c]	2.83[c]
168	Inside Round	6.61[a]	6.52[a]	5.88[b]	5.66[b]
170	Gooseneck	8.33[a]	7.80[b]	7.44[c]	7.19[d]
180	Strip Loin	3.92[a]	3.79[b]	3.76[b]	3.81[ab]
184	Top Butt	3.55	3.47	3.47	3.50
185A	Bottom Sirloin Flap	.96[a]	.96[a]	.94[ab]	.92[b]
185B	Bottom Sirloin Ball Tip	.67[a]	.64[ab]	.61[bc]	.56[c]
185C	Bottom Sirloin Tri Tip	.82	.83	.83	.80
189A	Tenderloin	1.78[a]	1.65[b]	1.54[c]	1.46[d]
193	Flank Steak	.54[a]	.51[b]	.49[c]	.47[d]
	Skirt Meat	1.24[a]	1.20[a]	1.13[b]	1.13[b]
	Cap & Wedge Meat	4.12[a]	4.03[a]	3.76[b]	3.43[c]
	Back Ribs	1.97[a]	1.84[b]	1.785[c]	1.793[bc]
	75% Lean Trim	8.94[a]	8.92[a]	8.92[a]	8.49[b]
	50% Lean Trim	6.54[a]	5.94[b]	5.90[b]	6.45[a]
	Fat trim to 1 in	11.02[a]	13.71[b]	16.23[c]	17.79[d]
	Bone	14.36[c]	14.16[c]	13.89[b]	13.55[a]

[a,b,c,d] Means in the same row with a common superscript letter are not different (P>.05).

Table 4. Closely-trimmed-boneless boxed beef subprimals expressed as a percentage of cumulative side weight (lb).

IMPS	Boxed Beef Subprimal	USDA Yield Grade 1	2	3	4
112A	Ribeye Roll	3.75[a]	3.52[b]	3.32[c]	3.23[d]
114	Shoulder Clod	5.57[a]	5.42[b]	5.20[c]	5.02[d]
116A	Chuck Roll	8.10[a]	7.98[a]	7.66[b]	7.13[c]
120	Brisket	2.78[a]	2.67[a]	2.57[b]	2.55[b]
167	Knuckle	3.06[a]	2.89[b]	2.72[c]	2.68[c]
168	Inside Round	6.28[a]	5.84[b]	5.39[c]	5.09[d]
170	Gooseneck	8.17[a]	7.54[b]	7.09[c]	6.82[d]
180	Strip Loin	3.66[a]	3.39[b]	3.17[c]	3.01[d]
184	Top Butt	3.32[a]	3.17[b]	3.05[c]	2.96[d]
185A	Bottom Sirloin Flap	.9662[ab]	.9665[a]	.9455[bc]	.9251[c]
185B	Bottom Sirloin Ball Tip	.67[a]	.65[ab]	.61[bc]	.57[c]
185C	Bottom Sirloin Tri-Tip	.78[a]	.74[b]	.71[c]	.66[d]
189A	Tenderloin	1.79[a]	1.66[b]	1.54[c]	1.48[d]
193	Flank Steak	.54[a]	.51[b]	.49[c]	.47[d]
	Skirt Meat	1.24[a]	1.21[a]	1.14[b]	1.14[b]
	Cap & Wedge Meat	4.13[a]	4.05[a]	3.78[b]	3.46[c]
	Back Ribs	1.97[a]	1.86[b]	1.79[c]	1.81[bc]
	75% Lean Trim	8.95[a]	8.97[a]	8.96[a]	8.56[b]
	50% Lean Trim	6.55[a]	5.98[b]	5.93[b]	6.50[a]
	Fat Trim to 1/4 in	13.32[a]	16.76[b]	19.97[c]	22.25[d]
	Bone	14.39[b]	14.25[b]	13.96[a]	13.66[a]

[a,b,c,d] Means in the same row with a common superscript letter are not different (P>.05).

Table 5. Value determinations from commodity- and closely- trimmed boxed beef stratified by quality and yield grades.[a]

Yield Grade	Commodity-Trimmed Choice	Commodity-Trimmed Select	Closely-Trimmed Choice	Closely-Trimmed Select
Carcass equivalent:				
1	$107.51	$101.96	$115.68	$109.12
2	$103.59	$98.27	$109.82	$103.69
3	$99.81	$94.61	$104.28	$98.50
4	$97.53	$92.35	$100.23	$94.68
Live basis:				
1	$68.54	$65.00	$73.74	$69.56
2	$66.04	$62.65	$70.01	$66.10
3	$63.63	$60.31	$66.48	$62.79
4	$62.18	$58.87	$63.90	$60.36

[a] Prices reflect the commodity- and closely-trimmed boxed beef subprimal markets on February 16, 1996.

Table 6. Net value for U. S. Choice yield grade 3 carcasses ($/cwt) stratified by carcass weight and fat trim level.[a]

	Carcass Weight (lb)			
	600	700	800	900
Fat Trim Level				
Commodity-Trimmed	$97.23	$99.04	$100.47	$101.58
Closely-Trimmed	$101.43	$103.44	$105.01	$106.24

[a] Prices reflect the commodity-trimmed boxed beef subprimal markets on February 16, 1996.

Table 7. Live value determinations from commodity-trimmed boxed beef on a lot basis[a].

Grade Consist	Relative Value	Lot Adjustment
U.S. Prime (1%; YG 3)	$ 13.88	$ .14
U.S. Choice (51%)		
4% YG 1	$ 4.91	$ .20
13% YG 2	$ 2.41	$ .31
34% YG 3	Base	$ 63.63
U.S. Select (34%)		
7% YG 1	$ 1.37	$ .10
13% YG 2	$ (.98)	$ (.13)
14% YG 3	$ (3.32)	$ (.46)
Adjusted Live Value/cwt.		$ 63.79

[a] Prices reflect the commodity-trimmed boxed beef subprimal markets on February 16, 1996.

Table 8. Value adjustments for non-conforming carcasses.[a]

Grade Consist	Relative Value	Lot Adjustment
5% Yield Grade 4 or 5	($ 15.00)	($ 0.75)
4% Extremes in weight	($ 20.00)	($ .80)
2% Dark Cutters	($ 30.00)	($ .60)
3% U.S. Standard	($ 15.00)	($ .45)
Carcass Discount/cwt.		($ 2.60)
Adjustment to Lot Live Value/cwt (assuming 63.75% dress)		($ 1.66)

[a] Prices reflect carcass prices on February 16, 1996.

Table 9. Live value determinations from closely-trimmed boxed beef on a lot basis[a].

Grade Consist	Relative Value	Lot Adjustment
U.S. Prime (1%; YG 3)	$ 9.12	$ .09
U.S. Choice (51%)		
4% YG 1	$ 7.26	$ .29
13% YG 2	$ 3.53	$ .46
34% YG 3	Base	$ 66.48
U.S. Select (34%)		
7% YG 1	$ 3.08	$ .22
13% YG 2	$ (.38)	$ (.05)
14% YG 3	$ (3.69)	$ (.52)
Adjusted Live Value/cwt		$ 66.97

[a] Prices reflect the commodity-trimmed boxed beef subprimal markets on February 16, 1996.