

BEEF EMPIRE CARCASS MERIT DAYS INDEX SYSTEM

*T. H. Powell, J. A. Unruh, M. E. Dikeman,
S. D. Laudert¹, R. W. Lee¹, and G. Seibert¹*

Summary

Kansas State University, in cooperation with the Beef Empire Days committee, developed a new beef carcass index system for 1991, incorporating yield and quality traits as indicators of carcass merit. Development of the system considered current industry and consumer demands in a critical evaluation of final carcass ranking. The index starts from 100 points and applies positive and negative adjustments for hot carcass weight; ribeye area; adjusted 12th rib fat thickness; percent kidney, pelvic, and heart fat; and quality grade. The index was first used in 1991.

(Key Words: Beef, Carcass, Index, Quality, Cutability.)

Introduction

The annual Beef Empire Days carcass show provides an opportunity to educate both producers and packers. The show's former carcass ranking system had been criticized for its complexity. Kansas State researchers were asked to develop a ranking method that would accurately reflect the needs of the meat packing industry, while also being meaningful to the producers.

Description of Index System

The index starts with 100 points. Positive and negative adjustments are made based on hot carcass weight; adjusted backfat; ribeye area; internal fat (kidney, pelvic and heart fat); and quality grade. The system is easily

adapted to a computer spreadsheet. Following is a description of the adjustment procedures.

Hot Carcass Weight

We defined the optimum hot carcass weight ranges as 700 to 750 lb for steers and 650 to 700 lb for heifers. Outside of those ranges the carcass indices are adjusted downward as follows:

$$\text{Heifer Adjustment} = -146.186 + (0.433725 \times \text{HCW}) - (0.000321276 \times \text{HCW}^2)$$

or

$$\text{Steer Adjustment} = -168.673 + (0.465860 \times \text{HCW}) - (0.000321283 \times \text{HCW}^2), \text{ where HCW} = \text{hot carcass weight in lbs.}$$

These adjustments are illustrated in Figure 1.

Adjusted Twelfth Rib Fat Thickness

The optimum 12th rib fat thickness is defined as .30 in., which corresponds to a preliminary yield grade of 2.75 for both heifers and steers. Indices are adjusted according to the scale in Table 1. The adjustment is illustrated in Figure 2.

Ribeye Area

For each carcass, a ribeye requirement is calculated based on hot carcass weight. The requirement is calculated for both steers and heifers by the formula:

¹Beef Empire Days Committee, Garden City, KS.

$$\text{Ribeye req.} = 4.8 + (0.012 \times \text{HCW}).$$

Sample values are given in Table 2. Figure 3 illustrates the relationship between hot carcass weight and required ribeye area.

For every sq. in. that an entry's actual ribeye area deviates from the required value, a 5-point adjustment is made to the index. For example, the adjustment for a 600-lb carcass with a 14.0 sq. in. ribeye would be calculated as follows:

$$\begin{aligned} &14.0 \text{ sq in (actual ribeye area)} \\ &\underline{-12.0 \text{ sq in (requirement for a 600-lb carcass)}} \\ &2.0 \text{ sq in} \\ &\times \underline{5 \text{ points per sq in}} \\ &+ \mathbf{10} \text{ point adjustment to the index} \end{aligned}$$

For a 750-lb carcass with an 11.0 sq. in. ribeye, the adjustment would be:

$$\begin{aligned} &11.0 \text{ sq in (actual ribeye area)} \\ &\underline{-13.8 \text{ sq in (requirement for a 750-lb carcass)}} \\ &-2.8 \text{ sq in} \\ &\times \underline{5 \text{ points per sq in}} \\ &-\mathbf{14} \text{ point adjustment to the index} \end{aligned}$$

We established ribeye areas of 16.0 and 15.4 sq. in. for steers and heifers, respectively, as the maximum allowed for full credit. Carcasses with ribeye areas greater than those are discounted 5 points for each sq. in. the ribeye area exceeds the maximum. For example, an 800-lb heifer carcass would have a required ribeye area of 14.4 sq. in. If that carcass actually had a 16.0-sq. in. ribeye, it would be adjusted as follows:

1. Adjustment for maximum ribeye area.

$$\begin{aligned} &15.4 \text{ sq in (maximum for heifers)} \\ &\underline{-14.4 \text{ sq in (requirement for an 800-lb carcass)}} \\ &1.0 \text{ sq in} \\ &\times \underline{5 \text{ points per sq in}} \\ &+ \mathbf{5} \text{ points} \end{aligned}$$

2. Discount for amount over the maximum ribeye area.

$$\begin{aligned} &16.0 \text{ sq in (actual ribeye area)} \\ &\underline{-15.4 \text{ sq in (maximum for heifers)}} \\ &0.6 \text{ sq in} \\ &\times \underline{5 \text{ points per sq in}} \\ &-\mathbf{3} \text{ points} \end{aligned}$$

5 - 3 = 2 points final adjustment for ribeye area

Kidney, Pelvic, and Heart Fat Adjustments

Internal fat adjustments are given in Table 1 and illustrated in Figure 4. The "base" percent kidney, pelvic, heart fat is 2.5% of the HCW, with small positive adjustments for smaller values and large penalties for larger values.

Quality Grade

To be competitive in the carcass show, a carcass must grade at least LOW CHOICE. In the index system, severe penalties are assessed to carcasses that grade below low Choice; small bonuses are given to carcasses that grade above low Choice (Table 1 and Figure 5).

The numerical (positive or negative) sum of all adjustments is added to 100 to obtain the final index for a carcass. Then carcasses are ranked (highest to lowest) according to their indexes. Three examples of all adjustments are found in Table 3.

Table 2. Ribeye Area Requirements for Specific Hot Carcass Weights

Hot Carcass Weight (lbs)	Requirement (sq in.)
500	10.8
550	11.4
600	12.0
650	12.6
700	13.2
750	13.8
800	14.4
850	15.0
900	15.6
950	16.2
1000	16.8

Table 1. Index Adjustments for Fat Depth, % KPH Fat, and Quality Grade

12th Rib Fat (in.)	Adj.	% KPH Fat	Adj.	Quality Grade	Adj.
0.00 - 0.03	-27	0.5	3.0	Standard	-72
0.04 - 0.07	-22	1.0	2.5	Low Select	-36
0.08 - 0.11	-17	1.5	2.0	High Select	-21
0.12 - 0.15	-12	2.0	1.0	Low Choice	0
0.16 - 0.19	-8	2.5	0.0	Ave. Choice	4
0.20 - 0.23	-4	3.0	-2.0	High Choice	6
0.24 - 0.27	-2	3.5	-4.0	Prime	8
0.28 - 0.31	0	4.0	-6.0		
0.32 - 0.35	-1	4.5	-8.0		
0.36 - 0.39	-2	> 4.5	-10.0		
0.40 - 0.43	-5				
0.44 - 0.47	-9				
0.48 - 0.51	-14				
0.52 - 0.55	-19				
0.56 - 0.59	-24				
0.60 - 0.63	-29				
0.64 - 0.67	-35				
0.68 - 0.71	-41				
0.72 - 0.75	-47				
0.76 - 0.79	-53				
> 0.79	-60				

Table 3. Index Adjustments for Three Steer Carcasses

Hot Carcass Weight (lb)	12th Rib Fat (in.)	Ribeye Area (sq in.)	KPH (%)	Quality Grade	Final Index Value
655	.27	13.8	3.0	Ch-	100.3
855	.30	16.0	2.0	Ch+	106.5
750	.45	11.0	3.5	Se+	52.0

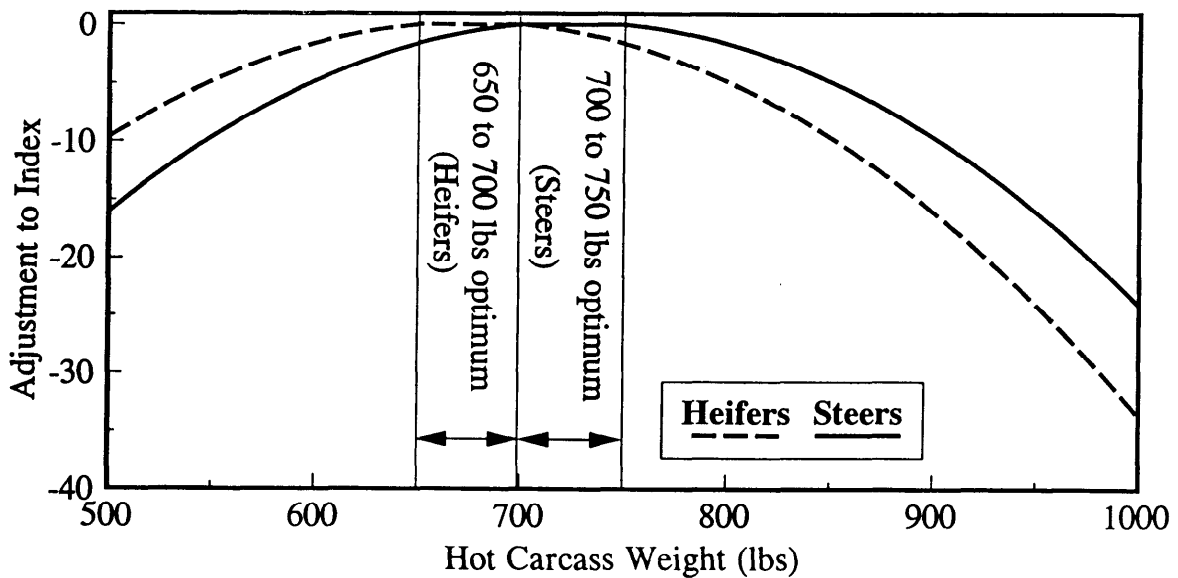


Figure 1. Adjustment for Hot Carcass Weight.

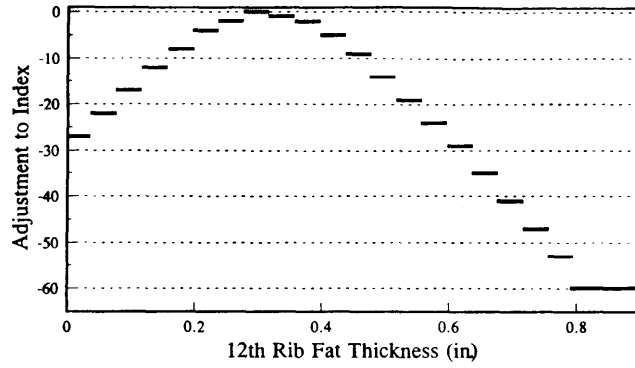


Figure 2. Adjustments for Fat Thickness.

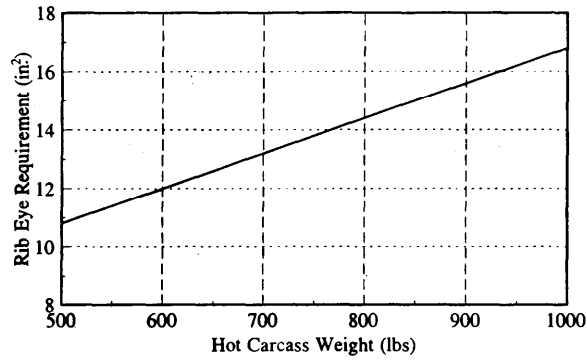


Figure 3. Ribeye Area Requirements.

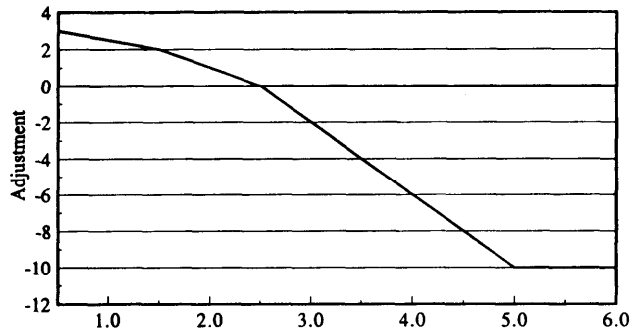


Figure 4. Adjustments for Kidney, Pelvic and Heart Fat.

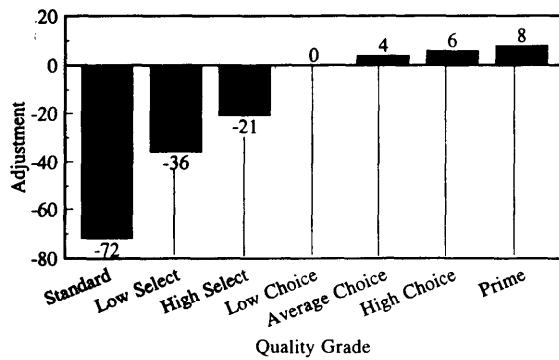


Figure 5. Adjustments for Quality Grade.