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Relationships among beef carcass quality and cutability indicators

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Abstract

We evaluated beef carcass data (12th rib fat thickness, hot carcass weight, ribeye area, percentage of kidney-pelvic-heart fat, USDA yield grade, and USDA quality grade) from 60,625 A-maturity steer and heifer carcasses. Data were analyzed to evaluate changes in quality grade with increasing fat thickness, changes in cutability indicators across quality grades, and the association of hot carcass weight with ribeye area. Percentage of USDA Standard and Select carcasses decreased, while Low Choice and Premium Choice increased as fat thickness increased. Percentage of Low Choice remained steady for fat thickness of 0.56 - 0.60 in. and higher. Percentage of yield grade 4.0 or greater carcasses increased dramatically as fat thickness increased beyond 0.60 in. Fat thickness, hot carcass weight, percentage of kidney-pelvic-heart fat, and USDA yield grade increased, while ribeye area decreased as quality grades improved. The association between hot carcass weight and ribeye area differs from USDA requirements. Our recently collected data indicate that as hot carcass weight increases, ribeye area increases at a slower rate than indicated by USDA guidelines. Feeding cattle to a backfat thickness of 0.51-0.55 in. will maximize quality grade while minimizing discounts for yield grade 4.0 or higher.

Keywords

Cattlemen's Day, 2001; Kansas Agricultural Experiment Station contribution; no. 01-318-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 873; Beef; Carcass; Cutability indicators; Quality grade; Yield grade

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RELATIONSHIPS AMONG BEEF CARCASS QUALITY AND CUTABILITY INDICATORS[1]

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Summary

We evaluated beef carcass data (12th rib fat thickness, hot carcass weight, ribeye area, percentage of kidney-pelvic-heart fat, USDA yield grade, and USDA quality grade) from 60,625 A-maturity steer and heifer carcasses. Data were analyzed to evaluate changes in quality grade with increasing fat thickness, changes in cutability indicators across quality grades, and the association of hot carcass weight with ribeye area. Percentage of USDA Standard and Select carcasses decreased, while Low Choice and Premium Choice increased as fat thickness increased. Percentage of Low Choice remained steady for fat thickness of 0.56 - 0.60 in. and higher. Percentage of yield grade 4.0 or greater carcasses increased dramatically as fat thickness increased beyond 0.60 in. Fat thickness, hot carcass weight, percentage of kidney-pelvic-heart fat, and USDA yield grade increased, while ribeye area decreased as quality grades improved. The association between hot carcass weight and ribeye area differs from USDA requirements. Our recently collected data indicate that as hot carcass weight increases, ribeye area increases at a slower rate than indicated by USDA guidelines. Feeding cattle to a backfat thickness of 0.51-0.55 in. will maximize quality grade while minimizing discounts for yield grade 4.0 or higher.

(Key Words: Carcass, Cutability Indicators, Quality Grade, Yield Grade.)

Introduction

USDA Quality and Yield grades are inversely related. To maximize carcass value, producers must adopt management practices that allow fed steers and heifers to be marketed promptly when they have reached their quality grade potential, while minimizing waste fat. The USDA yield grade formula was developed and adopted in the 1960's when the majority of cattle were small-framed, British-breed type. Changes in cattle type during the last 40 years indicate that the USDA yield grade formula may need re-evaluation to reflect the current beef cattle population. Our objectives were to evaluate relationships among quality grade and yield grade traits; and to make recommendations for optimizing quality grade and yield grade.

Experimental Procedures

Carcass data (n=60,625) were collected from multiple plants throughout the nation during 1995-1997 by the NCBA Cattlemen's Carcass Data Service (CCDS). Carcasses were sorted into five quality grades: Standard, Select, Low Choice, Premium Choice, and Prime, and analysis of variance was used to determine differences in cutability indicators by quality grade. Percentage of each quality grade was calculated by 0.05 in. fat thickness increments to illustrate changes in quality grade with increased fat thickness. The data were also sorted by USDA hot carcass weight groupings that correspond to ribeye area requirements for calculating yield

[1]Appreciation is expressed to the NCBA Cattlemen's Carcass Data Service, West Texas A&M University for providing the data.
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grade. The USDA yield grade formula assumes a relationship between hot carcass weight (HCW) and ribeye area (REA) as follows: REA = 0.012 * HCW + 3.8. Adjustments to the yield grade of a carcass are applied when the actual ribeye area is above or below this assumption. Ribeye area means and standard deviations were calculated at each USDA carcass weight increment from 484 to 1034 lbs. to illustrate the relationship between USDA ribeye area requirements and actual data from current cattle types.

Results and Discussion

Cutability trait averages changed linearly ($P<0.05$) as USDA quality grade increased (Table 1). Fat thickness, hot carcass weight, percentage of kidney-pelvic-heart fat, and USDA yield grade all increased as quality grade increased, but ribeye area decreased. Lower cutability carcasses, with smaller ribeyes, had higher quality grades than more heavily muscled, high cutability carcasses.

Percentage of Standard and Select decreased steadily as fat thickness increased, while percentage of Premium Choice steadily increased (Figure 1). Percentage of Low Choice increased up to a fat thickness of 0.56-0.60 in., then leveled off. Percentage of Prime slowly increased to a high of 3.4% at a fat thickness of 0.96-1.0 in. If cattle feeders target for an endpoint fat thickness of 0.40 in., our data indicate that they could expect 2.5% Standard, 51.1% Select, 38.9% Low Choice, 7.2% Premium Choice, and 0.3% Prime while incurring only 0.1% yield grade 4.0 or higher. If cattle feeders target for at least 50% Choice cattle, our data indicate they should feed to a fat thickness of 0.41-0.45 in. Feeding cattle to a fat thickness of 0.51-0.55 in. maximized quality grade while minimizing heavily discounted yield grade 4.0 or higher carcasses. Percentage of yield grade 4.0 or higher carcasses increased dramatically as fat thickness increased beyond 0.56-0.60 in.

Ribeye area increased at a slower rate (slope of 0.0082 vs. 0.012 $in.^2$/lb) in relation to hot carcass weight than USDA standards suggest (Figure 2). From 784 to 808 lbs. USDA standards and our data agree. However, carcasses weighing less than 784 lbs. tend to have larger ribeyes than USDA guidelines require, which mathematically lowers their yield grades below what our data suggest. Likewise, carcasses weighing more than 808 lbs. tend to have smaller ribeyes than required by USDA guidelines, which mathematically raises their yield grades above what our data suggest. USDA ribeye area ($in.^2$) requirements versus our mean ribeye area ($in.^2$) of selected hot carcass weights are shown in Table 2. These data suggest that the USDA yield grading standards should be revised to reflect ribeye area × hot carcass weight relationships of current cattle types.

Table 1. Least Squares Means for Cutability Indicators of USDA Quality Grades

Variable	Standard	Select	Low Choice	Premium Choice	Prime
n	1792	25,868	25,120	7377	468
Fat thickness (in.)	0.27[a]	0.42[b]	0.50[c]	0.57[d]	0.60[e]
Hot carcass weight (lbs.)	719.0[a]	755.5[b]	763.5[c]	771.4[d]	772.3[d]
Ribeye area ($in.^2$)	13.45[e]	13.21[d]	12.81[c]	12.67[b]	12.44[a]
Kidney-pelvic-heart fat %	1.92[a]	2.10[b]	2.13[c]	2.21[d]	2.30[e]
USDA yield grade	2.00[a]	2.60[b]	2.98[c]	3.25[d]	3.41[e]

[a,b,c,d,e]Within a row, means lacking a common superscript letter differ ($P<0.05$).

Table 2. Comparison of the USDA Ribeye Area Requirement (in^2) and Our Mean Ribeye Area (in^2)

	Hot Carcass Weight							
	400	500	600	700	800	900	1000	1100
USDA ribeye area	8.6	9.8	11.0	12.2	13.4	14.6	15.8	17.0
Our mean ribeye area	10.1	10.9	11.7	12.5	13.4	14.2	15.0	15.8

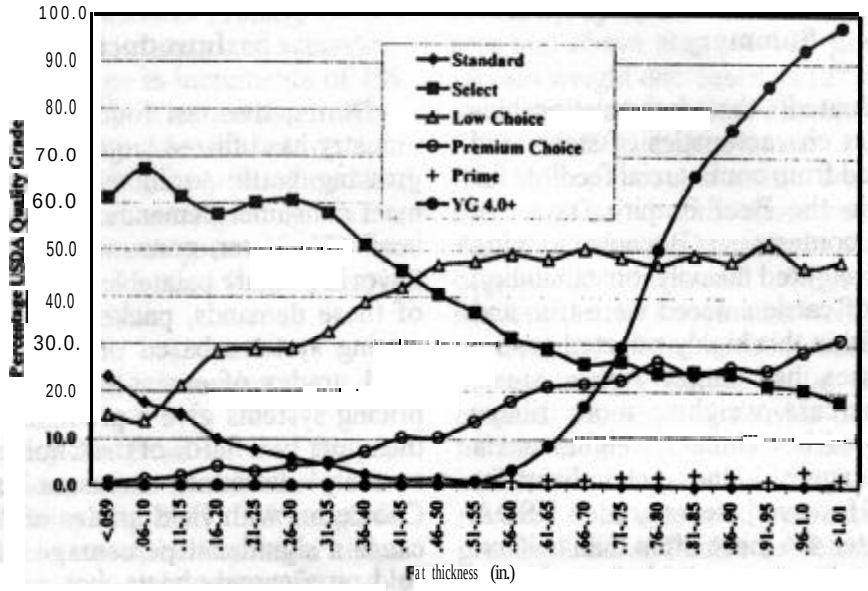

Figure 1. Relationship between USDA Quality Grade and Increasing 12th Rib Fat Thickness.

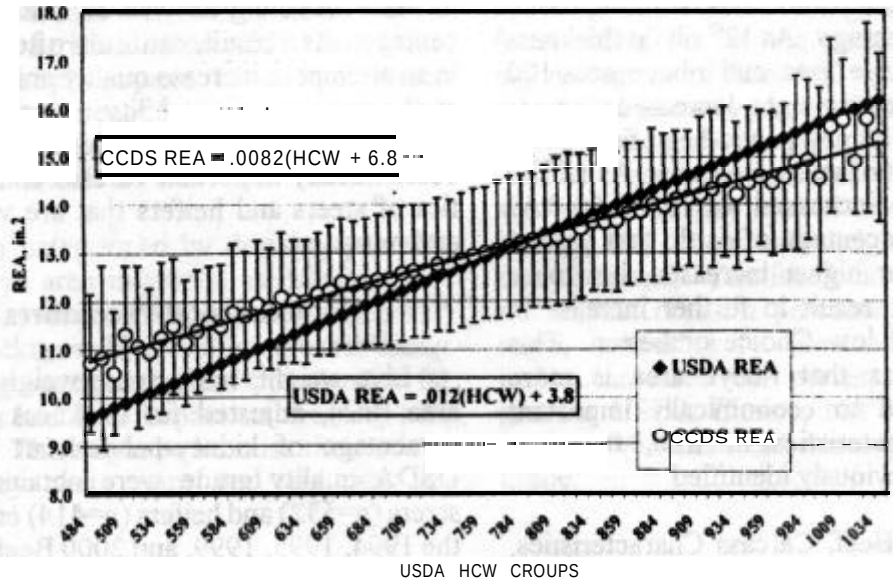

Figure 2. Comparison of USDA Ribeye Area x Hot Carcass Weight Requirements to Actual Data.