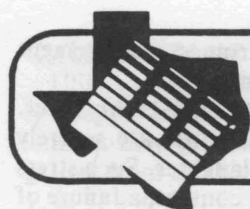


8-24-88  
Rev. 10X



## Texas Agricultural Extension Service

# USDA Beef Carcass Grades: Purpose and Application

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Acceptability and value of beef carcasses are determined primarily by two characteristics—quality of lean and cutability or yield of retailable beef. USDA grades for beef carcasses identify certain well-defined indicators of quality and quantity and furnish a system for sorting assorted supplies of beef into smaller, similar segments (grades). Grades facilitate uniform market reporting, provide a tool for expressing and comparing prices, and enhance marketing and merchandising of beef. Grades also have been promoted as a “buying guide” for consumers and as a means for reflecting consumer preference back through the marketing system to producers.

USDA grade standards were officially set in 1926 and the voluntary fee-for-service, grading and stamping service was initiated in 1927. Grade standards have been revised several times, with revisions in the last two decades based on sound research findings and/or concepts intended to improve uniformity and accuracy of application. The last grade change occurred when USDA was petitioned by a consumer interest group to change the name of the Quality Grade USDA Good to USDA Select. This petition was approved and the name change took place in 1987.

### Current Grading System

The USDA beef carcass grading system includes two separate grades—quality and yield. Quality grades reflect the expected palatability of cooked beef cuts (i.e., tenderness, juiciness and flavor), while yield grades identify carcasses for differences in cutability—the percentage yield of boneless, closely trimmed retail cuts from the round, loin, rib and chuck.

Grading is a voluntary service and should not be confused with meat inspection—a compulsory service that determines the wholesomeness of meat for human consumption and includes responsibilities for sanitation, product labeling, etc. Packers pay a fee for grading and may designate whether they want a carcass graded or not.

### Quality Grading

There are eight USDA quality grades—*Prime, Choice, Select, Standard, Commercial, Utility, Cutter and Canner*. Each USDA quality grade relates to a distinct combination of quality-indicating characteristics (marbling, firmness and maturity). Essentially all Prime and Choice beef is officially graded; only some of the Select and very little beef of the other grades is graded. Prime beef is intended primarily for use by “white tablecloth” restaurants. Choice and Select grade beef is commonly used as “block beef” in retail markets, and carcasses qualifying for the remaining grades generally are merchandised as manufactured beef products (frankfurters, ground beef, etc.). However, certain cuts from Standard and Commercial grade carcasses—particularly the loin and rib—may be used by “specialty” restaurants.

Qualification for a particular quality grade is determined by evaluation of the carcass class, maturity, degree of marbling in the ribeye (12th-13th rib) and firmness of the lean, with maturity and marbling being the most important.

Beef carcasses are classified as steers, heifers, cows, bullocks or bulls. The distinction between a bullock and bull is based solely on skeletal maturity. Bullock carcasses have evident, secondary male sex characteristics, but skeletal maturity indications are typical of cattle slaughtered at chronological ages of less than 30 months. Bull carcasses have similar sex-related characteristics, but are from more mature animals. Bullock beef of a given grade is not necessarily comparable in quality to beef of a similarly designated grade from steers and heifers.

Maturity groups A, B, C, D and E, from youngest to oldest, are determined by evaluating skeletal maturity and lean maturity. Skeletal maturity involves evaluating size, shape, color and ossification of the cartilage and bone visible in the sacral as well as the size, shape and color of the rib bones. Descriptions at various stages of skeletal maturity of ossification and chronological ages for beef carcasses of specified maturities are shown in Table 1. Lean color tends to darken (from light red to dark red) and lean texture tends to become coarser in appearance with advancing cattle maturity. Overall maturity is established by balancing skeletal and lean maturity, with skeletal

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maturity receiving the most emphasis. The four highest grades (Prime, Choice, Select and Standard) are for carcasses in the A and B maturity groups only. Commercial is restricted to carcasses in the C, D and E maturity groups and the other three grades (Utility, Cutter and Canner) may include carcasses from any of the five maturity groups.

The second major quality grade-determining factor is marbling or intramuscular fat (flecks of fat within the muscle). The nine degrees of marbling are: *Abundant, Moderately Abundant, Slightly Abundant, Moderate, Modest, Small, Slight, Traces, and Practically Devoid*. Figure 1 shows how marbling and maturity are combined to determine the carcass quality grades. To qualify for a particular grade, carcasses also

must meet a minimum lean firmness requirement which differs depending upon maturity.

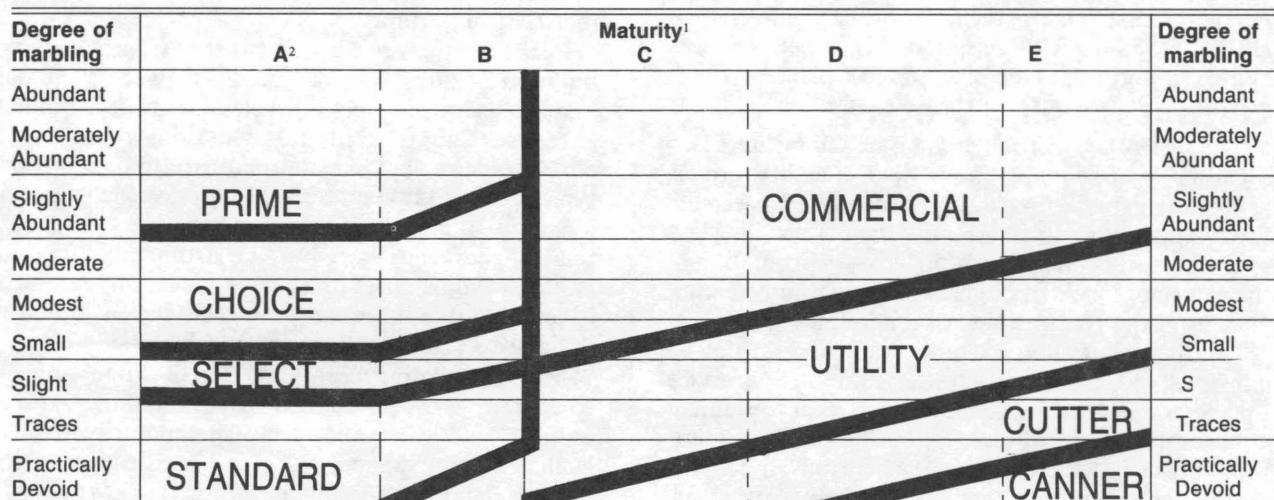
Special consideration is given to *dark-cutting* beef. *Dark-cutters* sometimes result if cattle are severely stressed 12 to 24 hours prior to slaughter. Such stress results in a reduced muscle sugar content, a failure of the muscle color to brighten (bloom) upon exposure to air and a *sticky* condition of the lean. Varying degrees of *dark-cutting* beef from slightly *shady* to *black-cutters* can be identified. Dependent on the degree to which this characteristic is developed, carcasses otherwise eligible for Prime, Choice or Select grades can be discounted one full grade; carcasses otherwise eligible for Standard and Commercial grades can be discounted up to one-half grade. This condition is not considered in other grades.

**Table 1. Guidelines for determining skeletal maturity.**

USDA maturity group	Sacral vertebrae	Lumbar vertebrae	Thoracic <sup>1</sup> vertebrae	Ribs	Age <sup>2</sup>
A-	Distinct separation	No ossification		Slight tendency toward flatness	9 mos.
A + /B-	Completely fused	Nearly completely ossified	Cartilages show some evidence of ossification (10% ossified)	Slightly wide and slightly flat	30 mos.
B + /C-	Completely fused	Completely ossified	Cartilages are partially ossified (35% ossified)	---	42 mos.
C + /D-	Completely fused	Completely ossified	Outlines of cartilages are plainly visible (70% ossified)	Moderately wide and flat	72 mos.
D + /E-	Completely fused	Completely ossified	Outlines of cartilages are barely visible (90% ossified)	Wide and flat	96 mos.

<sup>1</sup>Descriptions refer to the uppermost three thoracic vertebrae in the forequarter (in the region of the 10th, 11th, and 12th ribs).

<sup>2</sup>Approximate chronological age equivalent.



**Figure 1. Relationship between marbling, maturity and carcass quality grade.<sup>3</sup>**

<sup>1</sup>Maturity increases from left to right (A through E).

<sup>2</sup>The A maturity portion of the Figure is the only portion applicable to bullock carcasses.

<sup>3</sup>Assumes that firmness of lean is comparably developed with the degree of marbling and that the carcass is not a "dark cutter."

## Cutability or Yield Grading

USDA yield grades for beef carcasses were officially adopted in June 1965, but their use in conjunction with quality grades was optional until 1975. Yield grades from the highest to the lowest are designated 1, 2, 3, 4 and 5. Expected average percentage yields, by yield grade, for both boneless, closely trimmed, retail cuts from the round, loin, rib and chuck and semi-boneless yields or retail cuts from the entire carcass are presented in Table 2. Yield grades are determined by (1) the thickness of external fat over the ribeye at the 12th rib—adjusted for other than typical distribution of fat elsewhere on the carcass (Table 3); (2) the percentage of kidney, pelvic and heart fat; (3) the surface area in square inches of the ribeye muscle; and (4) the hot carcass weight (Figure 2). These grade-determining factors can be used in the following two equations to estimate yield grade and percentage cutability:

$$\begin{aligned} \text{Yield Grade} = & 2.5 + 2.5 (\text{adjusted fat thickness, inches}) \\ & + 0.2 (\text{kidney, pelvic and heart fat, percent}) \\ & + .0038 (\text{hot carcass weight, pounds}) \\ & - .32 (\text{ribeye area, square inches}) \end{aligned}$$

$$\begin{aligned} \text{Percentage BCTRC} = & 51.34 - 5.78 (\text{adjusted fat thickness, inches}) \\ & - 0.462 (\text{kidney, pelvic and heart fat, percent}) \\ & - 0.0093 (\text{hot carcass weight, pounds}) \\ & + 0.74 (\text{ribeye area, square inches}) \end{aligned}$$

The following example illustrates the use of these equations:

Assume: adjusted fat thickness = 0.4 inches  
 kidney, pelvic and heart fat = 3.0 percent  
 hot carcass weight = 625 pounds  
 ribeye area = 12.8 square inches

**Table 2. Relationship between yield grade and (1) average percentage boneless, closely trimmed, retail cuts and (2) total yield of semi-boneless, closely trimmed, retail cuts.**

Yield Grade	Percent BCTRC <sup>1</sup>	Percent TRC <sup>2</sup>
1	53.5	82.0
2	51.2	77.4
3	48.9	72.8
4	46.6	68.2
5	44.3	63.6

<sup>1</sup>BCTRC = Percentage of carcass weight in boneless, closely trimmed, retail cuts from round, loin, rib and chuck

<sup>2</sup>TRC = Percentage of carcass weight in semi-boneless, closely trimmed, retail cuts from the entire (total) carcass

A yield grade of 2.4 and a percentage cutability of 51.3 percent are obtained using the appropriate prediction equation.

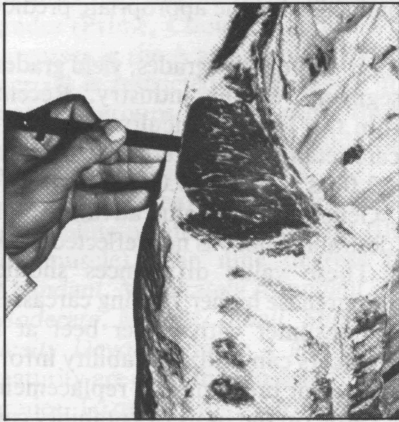
Used in conjunction with quality grades, yield grades can benefit all segments of the industry. Recent research results from the Texas Agricultural Experiment Station indicate retail-value differences between yield grades (2.0 vs 3.0) as high as \$15.00 per hundred-weight of carcass. Generally, the value advantage of yield grades more desirable than 3 is not reflected back to the producer. These value differences should motivate retailers to purchase higher yielding carcasses and to supply the consumer with leaner beef at a savings in cost. Producers can utilize cutability information to identify superior breeding and replacement stock. Selection of cattle on the basis of cutability can increase efficiencies in production and marketing in all segments of the beef production industry. It appears likely that variations in cutability will become increasingly more important as a value-determining characteristic.

## USDA Carcass Evaluation Program

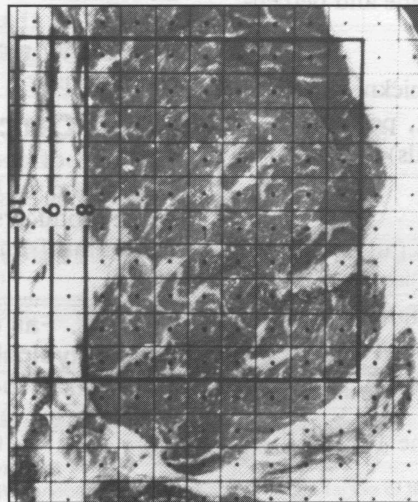
USDA offers two systems—the Carcass Evaluation Service and the Beef Carcass Data Service—that provide cattle producers and feeders with valuable carcass information from their slaughter animals.

**Table 3. Fat distribution descriptions for carcasses typical of certain yield grade junctions.**

Yield grade	Description of fat distribution
Junction of 1 and 2	Muscle visible through fat in many areas THIN covering of fat over the rib, loin, rump and clod VERY THIN covering of fat over the outside round, top of chuck and neck SLIGHT DEPOSIT of flank and cod fat
Junction of 2 and 3	Nearly completely covered with fat SLIGHTLY THIN covering of fat over the loin, rib and inside round SLIGHTLY THICK covering of fat over the rump, hip and clod Lean plainly visible through the fat on outside round, top of chuck and neck SMALL DEPOSIT of flank and cod fat
Junction of 3 and 4	Completely covered with fat SLIGHTLY THICK covering of fat over the loin, rib and inside round MODERATELY THICK covering of fat over the rump, hip and clod Lean visible through the fat on neck and lower outside round SLIGHTLY LARGE DEPOSIT of flank and cod fat
Junction of 4 and 5	Completely covered with fat MODERATELY THICK covering of fat over the loin, rib and inside round THICK covering of fat over the rump, hip and clod Muscle visible on the shank, flank and plate MODERATELY LARGE DEPOSIT of flank and cod fat



*Thickness of fat cover over the ribeye is measured at a point three-fourths of the length of the ribeye from the chine-bone end.*



*Ribeye area is measured by gridding.*



*Kidney and pelvic fat in the hindquarter (indicated by arrows) is estimated. Heart fat, located in the forequarter, is not shown.*

**Figure 2. Illustrations of determinants of yield grades.**

Different kinds of information are provided and different arrangements are necessary to obtain each report. To use the Beef Carcass Evaluation Service, a producer or feeder must: (1) know when and where his cattle will be slaughtered, (2) identify each animal (tag or tattoo) and (3) provide his area USDA meat grading supervisor with that information before slaughter. For the Beef Carcass Data Service, the producer or feeder must purchase eartags from the Texas Agricultural Extension Service and attach one in each animal's ear. These services are offered on a fee basis. Additional information can be obtained by contacting your state Extension meat specialist.

**References**

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 USDA Marketing Bulletin No. 45. *USDA Yield Grades for Beef*, 1978

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Issued in furtherance of Cooperative Extension Work in Agriculture and Home Economics. Acts of Congress of May 8, 1914, as amended, and June 30, 1914, in cooperation with the United States Department of Agriculture. Zerle L. Carpenter, Director, Texas Agricultural Extension Service, The Texas A&M University System.