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U.S.D.A. Quality and Yield Grades for Beef

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The market value of a beef carcass at the present time is primarily determined by two factors: (1) the quality of the meat (palatability) and (2) the quantity or amount of lean meat available.

The U.S.D.A. has established grades to represent the differences that exist in both the quality and quantity of edible meat in a beef carcass. The differences in quality of the meat are represented by the U.S.D.A. quality grades and differences that exist in quantity or amount of salable lean are represented by the U.S.D.A. yield grades. The U.S.D.A. grader may apply one or the other, neither or both of the U.S.D.A. grades depending upon the request of the packing plant. On certain types of beef the packer may choose to use his own "house grade" or "packer brand" in place of the U.S.D.A. grades.

Beef quality grades are important in determining carcass value because they serve as guides to the eating characteristics of the final product. The eating characteristics of beef are measured by the palatability of the cooked product--its tenderness, juiciness and flavor. The U.S.D.A. beef quality grades--Prime, Choice, Good, Standard, Commercial, Utility, Cutter and Canner--have been used since 1927 to identify differences in the palatability of beef.

The major factors used to determine quality grades are (1) marbling, (2) maturity and (3) conformation.

Marbling, the amount and distribution of small flecks of fat within a muscle system, is the most important single factor in determining quality grades. The evaluation of marbling is made on the cut surface of the rib eye muscle by partially separating the hind- from the forequarter between the twelfth and thirteenth rib. Marbling contributes to the overall juiciness and flavor of beef. Several degrees of marbling have been established and are used as guides in grading beef carcasses.

Maturity is also an important factor in determining beef quality grades. The primary indicators of maturity are color, size and shape of the rib bones, ossification of cartilage, particularly the "buttons" on the vertebrae, and the color and texture of the lean. Advanced maturity is often associated with decreased thickness. Five maturity groups, A through E, have been established for ease of reference with group A indicating carcasses from very young animals and group E indicating carcasses from animals with evidences of advanced maturity or old age. The approximate age ranges of these maturity groups are as follows:

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- A - 9 to 30 months
- B - 30 to 48 months
- C - 48 to 60 months
- D - Over 60 months
- E - Over 60 months

After the maturity group and degree of marbling have been evaluated, the two values are combined with the use of the chart in figure 1 into a single quality evaluation. The chart shows the minimum amount of marbling permitted for each of the quality grades and indicates that within each grade with progressive increases in maturity there is a progressive increase in the marbling requirement. For example, the minimum marbling requirement for choice varies from a small amount for the young carcasses to a modest amount for carcasses having the maximum maturity permitted in the choice grade. The chart also shows that cattle in the C, D and E maturity groups are not eligible for the prime, choice, good and standard grades. For example, a steer with a typical slight amount of marbling and a typical A maturity would fall into the average good grade. The majority of market steers and heifers that fail to make the choice grade lack the degree of marbling necessary.

The next step in determining the final quality grade is the evaluation of conformation. Conformation is thickness in relation to length. Particular attention is given to development of fullness in regions of the more valuable cuts--loin, rib and round. The final evaluation of conformation is in terms of the U.S.D.A. grades. For example, a steer may have low choice conformation.

The final quality grade is determined, in general, by the maturity and marbling level if optimum levels of conformation are met. However, if conformation level is less than optimum, compensation factors are used to determine the final grade.

The U.S.D.A. quality grades provide consumers with a guide to the eating characteristics of beef. Each grade is associated with a specific degree of quality, thus enabling consumers to utilize the meat most efficiently by preparing it in the manner for which it is best suited.

### Beef Yield Grades

Since 1965 U.S.D.A. yield grades (also referred to as cutability grades) have provided an additional marketing tool for use by all who buy or sell cattle and beef carcasses. Yield grades are a means of identifying the most important value-determining characteristic; the amount of trimmed retail cuts that can be obtained from a beef carcass. Specifically, yield grades are based on the percentage of boneless, closely trimmed retail cuts from the round, loin, rib and chuck. These four wholesale cuts account for more than 80% of the carcass value. There are five U.S.D.A. yield grades numbered 1 through 5. Carcasses with a yield grade of 1 have the highest yield of retail cuts, while carcasses with a yield grade of 5 have the lowest yield of retail cuts. Yield grades for beef carcasses are applied without regard to sex or quality grade. Table 1 shows the percent of boneless, closely trimmed retail cuts that can be cut from the round, loin, rib and chuck for each of the five yield grades.

Yield grades are determined by using the following four factors: (1) fat thickness, in.; (2) rib eye area, sq. in.; (3) percent kidney, heart and pelvic fat and (4) carcass weight, lb.

The amount of fat over the outside of a carcass is an important factor in determining yield grade because it is a good indication of the amount of fat that is trimmed in making retail cuts. The measurement is made between the twelfth and thirteenth rib over the length of the rib eye from its chine bone end. This measurement may be adjusted to reflect unusual amounts of fat on other parts of the carcass.

The rib eye muscle is the largest muscle in the carcass lying on each side of the backbone running the full length of the back. When the carcass is separated into a fore- and hindquarter between the twelfth and thirteenth ribs, a cross section of the rib eye muscle is exposed. The area of the rib eye muscle is used in determining the yield grade because it is an indicator of the total amount of muscle in a carcass. Among carcasses of the same fatness and weight, an increase in the rib eye area indicates an increase in the yield of the retail cuts.

The amount of kidney, heart and pelvic fat around the kidneys and in the pelvic and heart areas also affects carcass yields.

Table 2 shows the expected pounds fat trim, bone and trimmed retail cuts per hundredweight of carcass for each of the five yield grades. The values indicate that as percent fat increases from yield grades 1 to 5 the percent trimmed retail cuts decreases. Currently bone is worth about 1 cent per pound. Tallow or fat is worth about 5 cents per pound. Trimmed retail cuts average about \$1.25 per pound. A 650 pound yield grade 1 carcass would provide 533 pounds of trimmed retail cuts and 49.4 pounds of waste fat as compared to the same weight yield grade 5 carcass which would provide 413 pounds of trimmed retail cuts (120 pounds less) and 182 pounds waste fat (133 pounds more). Trimmed retail cuts decrease 4.6 pounds in each grade for an average loss of about \$5.75 per hundredweight or about \$37.00 for a 650 pound carcass. Value differences of \$5 to \$6 per hundredweight between adjacent yield grades (2 and 3, 3 and 4, etc.) are quite common. With the advent of yield grades, retailers can order beef of a specific yield grade and carcass weight, knowing approximately how many pounds of edible lean will be available for sale.

#### Estimating Yield Grades in Live Cattle

Evaluating live cattle in terms of their potential yield grade is very useful in appraising their value. Cattle with a desirable yield grade (high yield of retail cuts--yield grade 1 or 2) will be thickly muscled and have little outside fat cover. Cattle that are fat, wasty and poorly muscled will have a less desirable yield of retail cuts (yield grades 4 and 5). Differences in both fat thickness and muscling affect the appearance of the live animal and, because fatness and muscling have opposite effects on yields of retail cuts, evaluating live animals for yield grade requires an ability to make separate and accurate evaluations of these two factors.

Cattle can vary a great deal in external fat thickness at slaughter time. Therefore, the ability to estimate fat thickness correctly is very important in determining yield grade. Differences in fat thickness can be best estimated by observing areas where fat is deposited most rapidly--the brisket, flanks, twist and over the back and around the tailhead. As cattle increase in fatness, these areas become progressively fuller, thicker and deeper in appearance.

The muscular development of an animal can best be evaluated by observing those body parts that are the least affected by fatness--the round and forearm area. The thickness and fullness of the round and forearm is largely due to thickness of muscling.

It is necessary to know how to accurately estimate quality and yield grades to do a good job of marketing cattle. In order to become more skillful in estimating yield grades in live cattle, it is helpful to evaluate a group of cattle individually and then observe their carcasses in the cooler. In the cooler it is important to compare the visual estimates with the final quality and yield grades as well as the actual degree of marbling, fat thickness, rib eye area, etc.

Yield grades provide an indirect means for reflecting consumer preferences for beef with a high ratio of lean to fat. Thus, they can be effective in bringing about changes which will eliminate much of the waste now present in the production and marketing of beef. When used in conjunction with quality grades, yield grades will provide a means of identifying strains of cattle and production methods which will produce high quality beef with a minimum of waste fat which should lead to better values for consumers and greater returns for producers.

Degrees of marbling	Maturity Groups				
	A	B	C	D	E
Abundant					
Moderately abundant	Prime				
Slightly abundant				Commercial	
Moderate	Choice				
Modest					
Small	Good				
Slight				Utility	
Traces	Standard				
Practically devoid				Cutter	

Figure 1. Relationship between marbling and maturity.

Table 1. Percent of Boneless Retail Cuts from Round, Loin, Rib and Chuck

Yield Grades				
1	2	3	4	5
52.4 and above	52.3 to 50.1	50.0 to 47.8	47.7 to 45.5	45.4 and below

Table 2. Pounds Fat Trim, Bone and Trimmed Retail Cuts Per Hundredweight of Carcass for Each of the Five Yield Grades

	Yield Grades				
	1	2	3	4	5
Fat trim	7.6	12.7	17.8	22.9	28.0
Bone and shrink	10.4	9.9	9.4	8.9	8.4
Trimmed retail cuts	82.0	77.4	72.8	68.2	63.6