Lesson 2: Beef

Beef carcasses are inspected and then quality and yield graded while in the processing plant. After grading, the carcass is split into wholesale, or primal, cuts which are sold to retail stores. At the retail level, the wholesale cuts are cut into the smaller retail cuts to be purchased by the consumer.

When officially graded, beef carcasses may consist of a quality grade only, a yield grade only, or a combination of the quality grade and the yield grade. Bull carcasses can only receive a yield grade. The United States Department of Agriculture (USDA) graders use photographs and other objective aids to correctly interpret and apply the standards.

Quality Grading

Beef carcasses are graded for quality to provide an indicator of the palatability of the lean. Palatability refers to tenderness, juiciness, and flavor of the meat. Beef carcasses are divided into two sections: 1) steers, heifers, and cows and 2) bullocks. Steer and heifer are eligible for Prime, Choice, Select, Standard, Commercial, Utility, Cutter, and Canner quality grades. Cow is eligible for the same designations except for Prime. Bullock is only available for Prime, Choice, Select, Standard, and Utility quality grades.

To determine the grade, the carcass must be split down the back into two sides and one or both sides must be partially separated into a hindquarter and a forequarter. The hindquarter and forequarter separation is made at the 12th thoracic vertebra. The separation must be done cleanly so that the grader can accurately evaluate the lean and the maturity.

The quality of the beef is determined by evaluating the quality of the lean in relation to carcass evidences of maturity. The maturity of the carcass is determined by evaluating the size, shape, and ossification of the bones and cartilages and the color and texture of the lean flesh. Lean characteristics of marbling and firmness are observed in the cut surface of the rib eye between the 12th and 13th thoracic vertebrae.

Maturity - To facilitate the application of the principles, the standards recognize five different maturity groups. The five maturity groups are identified as A, B, C, D, and E in order of increasing maturity (see Figure 2.1). The youngest and most common maturity is A, which refers to animals 30 months of age or younger. The A and B maturity groups are for young animals only. Maturity groups C through E are older animals.

In the youngest beef carcasses, the cartilages on the ends of the chine bones show no ossification. Cartilage is evident on all of the vertebrae of the spinal column, and the sacral vertebrae show distinct separation. In addition, the split vertebrae usually are soft and porous and very red in color. The rib bones have only a slight tendency toward flatness. In progressively more mature carcasses, ossification changes become evident first in the bones and cartilages of the sacral vertebrae, then in the lumbar vertebrae, and still later in the thoracic vertebrae. In beef very advanced in maturity, all the split vertebrae will be devoid of red color, be very hard and flinty, and the cartilages on the ends of all the vertebrae will be entirely ossified. Likewise, with advancing maturity, the rib bones will become progressively wider and flatter until the ribs are very wide and flat.

In the youngest beef carcasses, the lean flesh will be very fine in texture and light grayish red in color. In progressively more mature carcasses, the texture of the lean will become progressively coarser and the color of the lean will become progressively darker red. In very mature beef, the lean flesh will be very coarse in texture and very dark red in color. In determining the maturity of a carcass in which the skeletal evidences of maturity are different from those indicated by the color and texture of the lean, slightly more emphasis is placed on the characteristics of the bones and cartilages than on the characteristics of the lean. For bullock carcasses that have darker colors of lean than specified in the standards, additional consideration is given to the carcass characteristics.

Marbling and firmness - Marbling, which is intramuscular fat, is evaluated between the 12th and 13th ribs. When you look at the rib eye muscle, the marbling appears as white flecks of fat dispersed between the muscle fibers. The degrees of marbling referenced in the specifications are: slightly abundant, moderate, modest, small, slight, traces, and practically devoid. In carcass evaluation programs and other purposes, three

additional degrees are recognized: very abundant, abundant, and moderately abundant. There are color photos that graders can use to help evaluate marbling consistently. The rating for the firmness of the muscle ranges from firm to very soft and watery. The standards spell out exactly what type of firmness is required for each quality grade. The amount of firmness varies within the grade when more than one maturity level is included in the grade. For example, within the Choice Grade, the lean of an A maturity carcass can be slightly soft, but the lean of a B maturity carcass must be slightly firm.

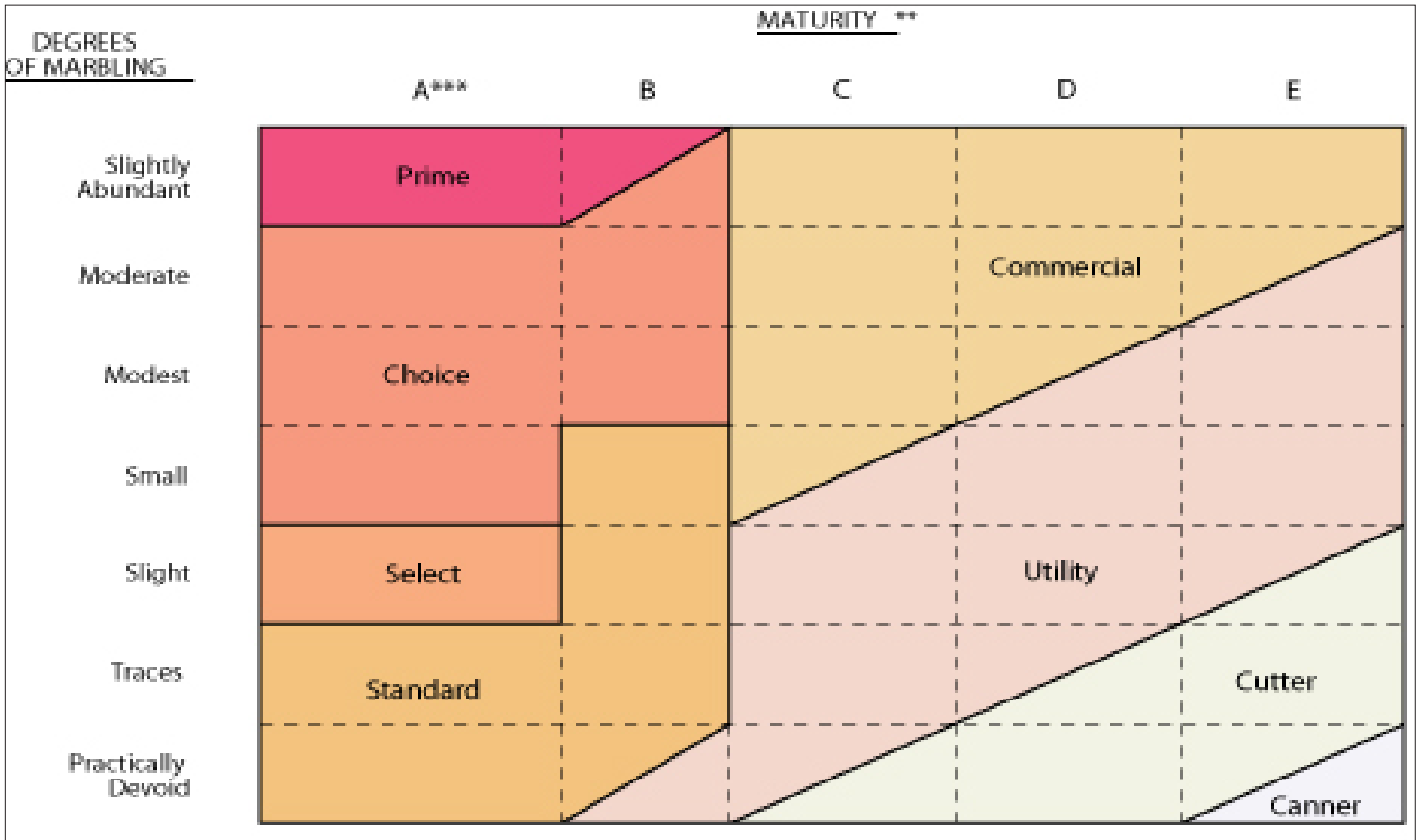
The relationship between marbling, maturity, and quality grade is shown in Figure 2.1. This figure assumes that the firmness of lean is comparably developed with the degree of marbling and that the carcass is not a "dark cutter," which is the result of reduced sugar content of the lean at the time slaughter. The limits of these five maturity groups are specified in the grade descriptions for steer, heifer, and cow carcasses.

After the maturity and marbling are estimated, the grader locates the estimates in the chart in Figure 2.1 and the quality grade is determined. For example, if the carcass has a maturity of A and a small degree of marbling, the carcass has a quality grade of Choice.

Yield Grades

The yield grade refers to the amount of saleable meat obtained from the carcass as boneless, trimmed retail cuts from the round, sirloin, short loin, rib, and square-cut chuck. Yield grades are a numerical value from 1 through 5 with 1 being leaner and more muscular than 5. A yield grade of 1 indicates the highest percentage of saleable meat and 5 indicates the lowest percentage of saleable meat. The factors that influence yield grades are external fat thickness, the amount of fat from the kidney, pelvic, and heart areas, the area of the rib eye muscle, and the carcass weight.

Figure 2.1 - Quality Grading*



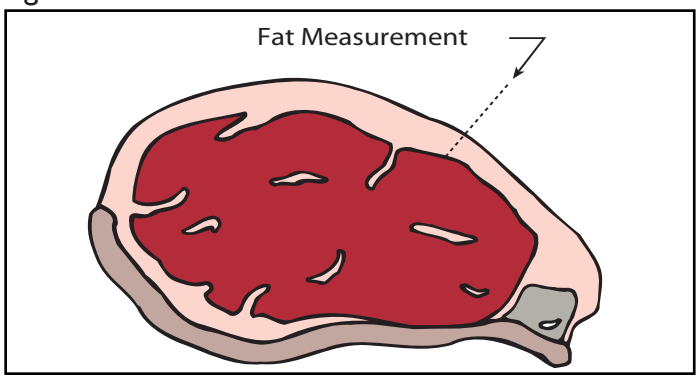
* Assumes that firmness of lean is comparably developed with the degree of marbling and that the carcass is not a "dark cutter."
** Maturity increases from left to right (A through E).
*** The A maturity portion of the Figure is the only portion applicable to bullock carcasses.

The yield grade is determined using the following equation: Yield grade = 2.50 + (2.50 x adjusted fat thickness, inches) + (0.20 x percent kidney, pelvic, and heart fat) + (0.0038 x hot carcass weight, pounds)-(0.32 x area rib eye, square inches). The grade is expressed as a whole number. If the calculations result in a whole number and a fraction of a number, the fraction is dropped. It is important to note that the number is NOT rounded. If the calculations result in 3.7, the final grade would be 3, not rounded to 4.

External fat thickness - The amount of fat covering the rib eye gives a good approximation of the total carcass fat. However, the measurement may be adjusted if unusual amounts of fat are found on other parts of the carcass, especially in the brisket, plate, flank, cod or udder, inside round, rump, and hips. The amount is measured in tenths of an inch. The external fat is measured ¾ of the length of the rib eye from the chine bone (see Figure 2.2).

Kidney, pelvic, and heart fat - This includes the kidney and surrounding area fat, the lumbar and pelvic fat

Figure 2.2 Location of External Fat Measurement



in the loin and round, and the heart fat in the chuck and brisket areas. The fat in the kidney, pelvic, and heart areas is evaluated subjectively and expressed as a percent of the carcass weight. The higher the percentage of fat, the less retail cuts are available.

Rib eye area - The actual rib eye area is measured at the 12th rib using a grid or other device approved by the Agricultural Marketing Service of the USDA. The grid measures the muscle area in square inches. An increase in the area of rib eye increases the percent of retail cuts. A change of 1 square inch in area of rib eye changes the yield grade by approximately 30 percent of a yield grade.

Hot carcass weight - The hot carcass weight is the weight of the carcass before it is chilled. If only the chilled carcass weight is known, that amount can be multiplied by 102 to give an estimate of the hot carcass weight. Hot carcass weight is used instead of chilled carcass weight because as the carcass cools, water is lost to dehydration, reducing the weight of the carcass. As carcass weight increases, the percent of retail cuts decreases. A change of 100 pounds in hot carcass weight changes the yield grade by approximately 30 percent of a yield grade. For example: A beef carcass has the following measurements: adjusted fat thickness = .7 inches; kidney, pelvic, and heart fat = 4.5%; hot carcass weight = 625 pounds; rib eye area = 10.6 square inches.

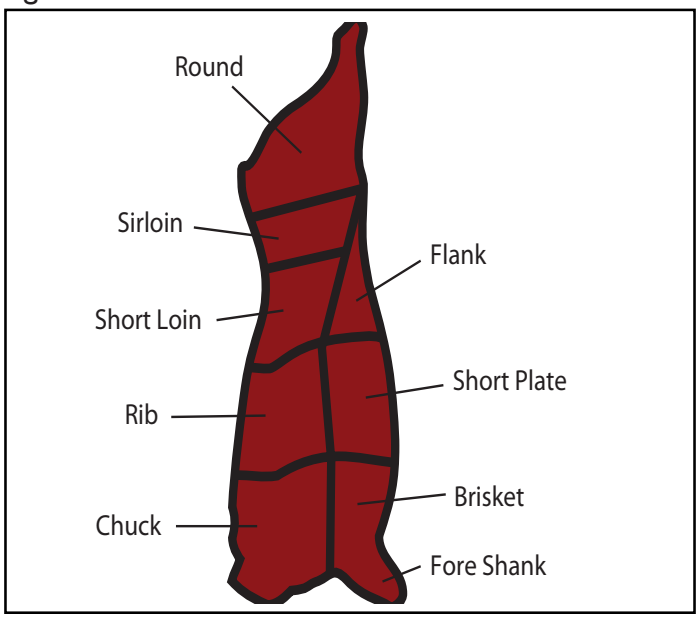
Formula: Yield grade = 2.50 + (2.50 x adjusted fat thickness, inches) + (0.20 x percent kidney, pelvic, and heart fat) + (0.0038 x hot carcass weight, pounds) - (0.32 x area rib eye, square inches)

Yield grade = 2.50 + (2.50 x .7) + (0.20 x 4.5) + (0.0038 x 625) - (0.32 x 10.6)
Yield grade = 2.50 + 1.75 + .9 + 2.375 - 3.392
Yield grade = 4.133 = Final yield grade of 4

Wholesale Cuts

The wholesale cuts of beef are the chuck, rib, short loin, sirloin, round, flank, short plate, brisket, and fore shank (see Figure 2.3).

Figure 2.3 - Wholesale Cuts of Beef



Retail Cuts

Wholesale cuts are cut into various retail cuts. Some retail cuts, such as ground beef and stew meat, are made from several different wholesale cuts. Steaks and roasts are the primary types of retail cuts. Steaks are generally under 1 inch thick, and roasts are usually over 1 ½ inches thick. The following is a list of the most common retail cuts from each wholesale cut.

Chuck
- Arm pot roast
- Blade pot roast
- Boneless shoulder pot roast
- Boneless top blade steak
- Chuck eye roast
- Cross rib pot roast
- Flanken-style ribs
- Mock tender
- Short ribs
- Seven bone roast
- Under blade pot roast

Rib
- Rib roast large end
- Rib roast small end
- Rib steak
- Rib eye steak
- Rib eye roast
- Back ribs

Short loin
- Boneless top loin steak
- Porterhouse steak
- T-bone steak
- Tenderloin steak and roast

Sirloin
- Sirloin steak, round bone
- Sirloin steak, flat bone
- Top sirloin steak

Round
- Bottom round roast
- Boneless rump roast
- Eye round roast
- Round steak
- Tip roast, cap off
- Tip steak
- Top round steak and roast

Flank and Short Plate
- Flank steak
- Flank steak rolls
- Skirt steak

Fore Shank and Brisket
- Brisket whole
- Brisket flat half
- Corned brisket, point half
- Shank cross cuts

Other cuts - These cuts come from more than one wholesale cut.
- Beef for stew
- Cubes for kabobs
- Cubed steak
- Ground beef

Variety meats - These retail cuts are not from any wholesale cut, but they are other edible parts of beef cattle.
- Heart
- Tongue
- Liver
- Kidney
- Tripe
- Brains
- Sweetbreads

Summary

Beef carcasses are graded for both yield and quality. Quality grades refer to how the meat will taste, while yield grades refer to how much saleable meat is available from a carcass. Wholesale cuts are divided into retail cuts, which are purchased by consumers.

Credits

Boggs, Donald L., and Robert A. Merkel. *Live Animal Carcass Evaluation and Selection Manual.* 4th ed. Dubuque: Kindall/Hunt Publishing Company, 1993.

Meat Evaluation Handbook. Chicago: National Livestock and Meat Board, 1988.

United States Department of Agriculture, Agricultural Marketing Service, Livestock and Seed Division. *United States Standard for Grades of Carcass Beef.* United States Department of Agriculture (Effective January 31, 1997).