UNDERSTANDING BEEF CARCASS EVALUATIONS

BY

Wayne Jensen, Farm Advisor
Santa Barbara County

To understand beef carcass evaluations it is necessary to know what the various carcass measurements mean. The following is an explanation of the terminology and how it relates to the carcass, its final quality grade and its yield grade.

The market value of a beef carcass at the present time is primarily determined by two factors: the quality or palatibility of the meat and the quantity or amount of lean meat available. With this in mind, carcass evaluation is the technique by which the components of quality and quantity are measured.

The purposes of the beef carcass evaluation as done with the 4-H and FFA steers from the Santa Barbara County Fair are:

1. To identify variations in characteristics that affect differences in carcass value to all segments of the beef industry.

2. To help identify breeding animals which are producing progency with desirable carcasses.

3. To help relate live animal characteristics to carcass merit.

USDA QUALITY GRADE DETERMINATIONS

Quality grades are important in determining carcass value because they serve as guides to eating characteristics of the final product. The USDA quality grades: Prime, Choice, Good, Standard, Commercial, Utility, Cutter, and Canner have been in use since 1927 to identify differences in the palatibility of beef.

The major factors used to determine these grades are maturity, marbling, and conformation.

Maturity

The primary indicators of maturity are color, size, and shape of rib bones, ossification of cartiliage, and color and texture of the lean.

Advanced maturity is often associated with a decrease in tenderness. Five maturity groups, A through E, have been established with group A indicating carcasses from very young animals and group E indicating carcasses from animals of advanced maturity. While there tends to be a difference in the chronological age of animal when compared to its physiological age, the approximate age ranges of the maturity groups are as follows:

A - 9 to 30 months
B - 30 to 48 months
C - 48 to 60 months
D and E-over 60 months (degree of cartilage ossification determines the grouping)

The maturity groups are divided into thirds and are expressed in the following sequence: A-; A; A+; B-; B+; ——→ Older

Most carcasses today are found in the A maturity group.

Marbling

This refers to the amount and distribution of small flecks of fat within a muscle system. It is a subjective measurement evaluated in the rib eye muscle between the 12th and 13th rib.

The degrees of marbling are as follows:

Abundant - A	Small - Sm
Moderately Abundant - Md A	Slight - Sl
Slightly Abundant - Sl A	Traces - T
Moderate - Md	Practically Devoid - PD
Modest - Mt	

The degrees of marbling like the maturity groups are divided into thirds and are expressed similarly. A carcass with a marbling score of small minus (Sm-) would have less marbling than a carcass with a marbling score of small (Sm) or small plus (Sm+).

After the maturity group and the degrees of marbling have been evaluated, the two are combined into a single quality evaluation. For example, the minimum marbling requirement for a quality grade of choice varies from a small amount for the young carcasses to a modest amount for those carcasses having the maximum maturity permitted in the choice grade.

Conformation

The confirmation grade is evaluated at four areas of the carcass; chuck, rib, loin, and round and is assigned a grade of prime, choice, good or standard. Each of these grades can be divided into thirds and expressed as choice minus, choice, choice plus, etc.

USDA QUALITY GRADE

The final quality grade is determined in general by maturity and marbling, if optimum levels of conformation are met.

Another factor involved in determining final grade, if it occurs, is the condition of Dark Cutter. This is a condition in which the rib eye when exposed shows a much darker color than the maturity group of the carcass would indicate. This color is accompanied by a soft, gummy, sticky feel to the touch. This does not affect its palatability, but it does lower its acceptance at the retail level due to its decrease in eye appeal. Depending on the degree, this condition can lower the final grade up to one full grade. This condition is thought to be associated with stress prior to slaughtering, but it is not known why this reaction in the pigment occurs.

While not involved in the determination of the final grade, the color of fat is easily seen on the carcasses. The color of fat is associated with type of feed the animal is fed. White or cream color is associated with young grain-fed cattle, while yellow fat is found in more mature cattle, or those fed forage high in carotene.

USDA YIELD GRADES

Yield grades identify carcasses for differences in cutability or yield of boneless, closely trimmed retail cuts from the round, loin, rib, and chuck.

There are five yield grades, number 1 through 5. Carcasses in Yield Grade 1 have the highest cutability, while carcasses in Yield Grade 5 have the lowest cutability. These grades are applied without regard to sex or the quality grade. The yield grade of beef carcasses is determined by four characteristics:

1. Amount of external fat.

2. Amount of kidney, pelvic, and heart fat.

3. Area of rib eye muscle.

4. Warm carcass weight.

Thickness of fat is measured at the 12th rib. The point of measurement is at three-fourths of the length of the rib eye muscle from the chine bone end and perpendicular to the outside surface of the fat. The amount of fat over the outside of the carcass is the most important factor in determining yield grade because it indicates the amount of fat that is trimmed from retail cuts. Four-tenths of an inch variation in fat thickness results in a full yield grade change.

The amount of kidney, pelvic, and heart fat is evaluated subjectively and is expressed as a percent of the carcass weight. This affects carcass yield because all of this fat is removed in trimming; increases in these fats decreases the yields of retail cuts. The average amount of kidney, pelvic, and heart fat is 3.5 percent.

The area of rib eye is determined where this muscle is exposed by ribbing at the twelfth rib. The rib eye is one of the largest muscles of the carcass, lying on each side of the backbone and running the full length of the back. The area of rib eye is used in determining the yield grade because it is an indicator of the total amount of muscle in the carcass, since all muscles are proportional to one another within a carcass. Among carcasses of the same degree of finish and weight, an increase in the rib eye area indicates an increase in yield of retail cuts.

The warm carcass weight is the weight of the carcass taken immediately after slaughter.

The yield grade can be determined by following the steps described below:

1. Determine a "preliminary yield grade" by tenths (2.1, 3.3, 3.5, etc.) using the following schedule:

Thickness of Fat Over Rib Eye	Preliminary Yield Grades
.2 inch	2.5
.4 "	3.0
.6 "	3.5
.8 "	4.0
1.0 "	4.5
1.2 "	5.0

2. Determine the final yield grade (1 to 5) by adjusting the preliminary yield grade for variations in kidney fat from 3.5% and for variations in area of rib eye.

Table I. Required Rib Eye Area for Specific Carcass Weights.

Warm Carcass Weight (lbs.)	Area of Rib Eye (Sq. Inch)
450	9.2
475	9.5
500	9.8
525	10.1
550	10.4
575	10.7
600	11.0
625	11.3
650	11.6
675	11.9
700	12.2
725	12.5
750	12.8
775	13.1
800	13.4
825	13.7

Rate of adjustment for area of rib eye in relation to weight:

1. For each square inch more than the area indicated subtract .3 of a grade from the preliminary grade.

2. For each square inch less than the area indicated add .3 of a grade to the preliminary grade.

Rate of adjustment for percent of kidney, pelvic, and heart fat:

1. For each percent of kidney, pelvic and heart fat less than 3.5% subtract .2 of a grade from the preliminary yield grade.

2. For each percent of kidney, pelvic, and heart fat more than 3.5% add .2 of a grade to the preliminary yield grade.

Example of determining yield grade with the following data:

.6 inch fat thickness at the 12th rib, 12.5 sq. in. of rib eye, 625 lbs. warm carcass weight, and 2.0% kidney, heart, and pelvic fat -

1. A .6 inch fat thickness results in preliminary yield grade of 3.5.

2. A carcass that weighs 625 lbs. requires an 11.3 sq. inch rib eye - 12.5 - 11.3 = 1.2 sq. inches more than required.
   1.2 x .3 = .36 so be subtracted from preliminary yield grade.

3. 2.0% is 1.5% less the average of 3.5% kidney, heart, and pelvic fat -

   1.5 x .2 = .3 to be subtracted from preliminary yield grade.

4. The final yield grade is determined in this instance by subtracting the adjustments from the preliminary yield grade:

Preliminary yield grade	= 3.50
less adjusted rib eye	- .36
	3.14
less adjusted kidney fat	- .30
	2.84

In the official USDA grading program all fractional parts of the yield grade are dropped. In this case the final yield grade would be 2.

Carcass Index

The carcass index is used to combine both the quality and yield factors to determine the overall merit of the carcass.

Procedure for determining carcass index:

1. By determining the yield grade to the nearest one-tenth of a grade and converting this to a yield of boneless retail cuts of the round, loin, rib, and chuck.

2. Determine the Quality Grade in terms of thirds of USDA Grades.

3. Subtract .8 percent from the estimated yield of retail cuts for each one-third quality grade from prime plus (P+).

The following table represents the percent of carcass weight in boneless retail cuts from round, loin, rib, and chuck for corresponding yield grades:

Yield Grade	Yield of Cuts
1.0	54.6
1.5	53.5
2.0	52.3
2.5	51.2
3.0	50.0
3.5	48.9
4.0	47.7
4.5	46.6
5.0	45.4

Example of determining the carcass index of a carcass that has a USDA Quality Grade of Choice minus and a Yield Grade of 3.0:

Estimated Yield of Cuts	3.0 Yield Grade	= 50.0
Choice minus* quality	.8 x 5	= 4.0
	Index	= 46.0

*Choice minus is one and two-thirds below high prime.

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