

Live Cattle Evaluation for Carcass Traits and Grid Marketing Basics.

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Fed cattle are marketed primarily by three methods. Live weight, dressed (*i.e.* carcass) weight, and grid/formula (*i.e.* grade and yield) price. Live price are based on grid/formula pricing when cattle are marketed through an auction facility or packer buyers provide a bid price. Therefore understand basics behind grid/formula pricing structure can help farmers better understand how live cattle are priced.

In a grid/formula price system, the carcass value is determined by three factors: carcass weight, yield grade (YG), and quality grade (QG). First, the paper will describe how these factors are determined and second, describe how grid/formula prices are determined.

DRESSING PERCENTAGE

Dressing percentage has a large influence on carcass weight. For live cattle, buyers assess 'yield', which is not to be confused with yield grade. Dressing percentage reflects the proportion of a live animal's weight, which will result in carcass weight. Some major factors that affect dressing percentage are stage of maturity of animal, degree of muscling, hide weight (thickness and amount of mud), fill (amount of stomach content), amount of fatness, and weighing conditions (e.g., time off feed and water, scales, hours of transportation).

Dressing Percent - Calculation: $DP = (\text{hot carcass weight} \div \text{live weight}) \times 100$

Table 1. Range of dressing percentages for beef and dairy breeds of cattle for young finished cattle.

Class of Cattle	Minimum	Maximum	Average
Beef	58%	65%	62-64%
Dairy	55%	62%	58-60%

Fat thickness and muscling should also be taken into account when assessing dressing percentage. Table 2 outlines some guidelines on impacts of muscling and fat thickness on dressing percent.

Table 2. Fat and muscle effects on dressing percent in cattle.

Backfat, in.	Degree of Muscling		
	Thin	Average	Thick
0.2	58.5%	60.5%	62.5%
0.4	60%	62%	64%
0.6	61.5%	63.5%	65.5%
0.8	63%	65%	67%

USDA YIELD GRADE

Yield grade predicts the percentage of semi-boneless, closely trimmed retail cuts from the round, loin, rib and chuck from the carcass. Lean, muscular animals have a higher cutability and low numerical yield grade scores (1 or 2). Excessively fat animals have numerically high yield grade scores (4 or 5) with lower cutability.

The four factors used to calculate yield grade are:

- 12th rib fat thickness
- Ribeye area
- Kidney, pelvic, and heart fat (% KPH)
- Hot carcass weight

Fat Thickness

To determine yield grade, fat cover is measured between the 12th and 13th rib opposite the ribeye. However, in live evaluation of fat cover, evaluators will use other locations to determine overall finish. Other locations used to assess fat cover include fullness of brisket, twist (crease between round under the tail), fat over the ribs ribs, tailhead (*i.e.* pones), fat cover (muscle shape) over the loin, fullness of cod/udder, and fullness of rear flank. Remember, fat fills in seams between muscle groups and deposits in non-muscular areas. Therefore, the smoother an animal appears, the fatter the animal usually is. Patterns of fat deposition can be dependent on breed, sex, and management strategies. Fat thickness is used to determine the preliminary yield grade (PYG) which is shown in Table 3.

Table 3. Relationship of backfat to preliminary yield grade (PYG).

Degree of Finish	Estimate for Backfat, in.	Estimated PYG
Very Lean	<0.2	<2.3
Lean	0.2-0.39	2.3-3.0
Intermediate	0.4-0.59	3.0-3.5
Fat	0.6-0.79	3.5-4.0
Very Fat	>0.8	>4.0

Ribeye Area

Ribeye area (REA) expressed in square inches (sq. in.) of longissimus muscle (loin muscle). The REA is also measured between 12th and 13th rib on the carcass.

The average ribeye size is relatively dependent on weight of animal. On average 100 pounds of live weight results in approximately 1.0 - 1.2 sq. in. of REA in beef cattle and approximately 0.8 - 1.0 sq. in. REA in dairy cattle (Table 4).

Table 4. Live cattle weight and average estimated ribeye area (REA).

Live Weight	Carcass Weight	Average REA
1000	620	11.2
1050	651	11.6
1100	682	12.0
1150	713	12.4
1200	750	12.8
1250	775	13.1
1300	806	13.4
1350	837	13.8
1400	868	14.1
1450	900	14.6
1500	930	14.9
Here estimates are based on cattle, which will dress 62%.		

Kidney, Pelvic, Heart Fat (KPH)

This is very difficult to estimate in live cattle; however, it is related to subcutaneous fat thickness. Therefore you can estimate using the following guidelines in Table 5.

Table 5. Relationship of kidney pelvic, heart, fat (KPH) and yield grade adjustment.

Estimate of Fat Thickness	Approximate % KPH	Adjustment to YG
<0.2	1.0-1.5%	0.5
0.2-0.39	1.5-2.0	0.4-0.3
0.40-0.59	2.0-2.5	0.3-0.2
0.6-0.79	2.5-3.0	0.2-1.0
>0.8	3.0% or more	0

To calculate yield grade:

1. Estimated backfat and convert to preliminary yield grade (PYG). Use the following equation. $PYG = (\text{Backfat (in.)}/0.4) + 2.0$
2. Estimate REA and calculate required REA based on estimated carcass weight.
 - Start at 600 lb. carcass requires an 11.0 sq. in.
 - For every 25 lbs add 3 sq. inches to requirement
 - For every 8.33# add one 1 sq. inch
3. Calculate adjustment for REA by the following equations: $Adj. = (\text{Req. REA} - \text{Est. REA}) / 3$
4. Estimate adjustment for Kidney, Pelvic, and Heart Fat (KPH) -See Table 5.1
5. Final Yield Grade = PYG + REA Adj. – KPH Adj.

USDA QUALITY GRADE

To determine USDA Quality grade for beef the following two characteristics of the carcass are used: 1) maturity and 2) marbling. Maturity is the overall physiological maturity of the carcass and marbling is the intramuscular fat within ribeye. Although carcass maturity is based on visual evidence of physiological age, Table 6 outlines the approximate relationships to chronological age are provided to assist in determining maturity in live slaughter cattle.

Table 6. USDA maturity classification and estimated chronological age of cattle.

Maturity Classification	Approximate Age
A	9-30 months
B	30-42 months
C	42-72 months
D	72-96 months
E	>96 months

Since most market cattle evaluated are young (A maturity, which is approximately less than 30 months of age), their quality grade is based almost entirely on marbling, which is visually evaluated in the ribeye. Figure 1 defines the relationship between marbling and maturity for beef quality grades.

After the marbling and maturity are determined they are then combined to give the final quality grade. There are eight beef quality grades, which are USDA Prime, Choice, Select, Standard, Commercial, Utility, Cutter, and Canner. Where Prime, Choice, Select and Standard are designated for the young (A&B) cattle only with the exception that B carcasses cannot be graded Select. Then the old carcasses can only be graded Commercial, Utility, Cutter, and Canner (i.e. hardbone).

Marbling content is difficult to estimate in the live animal but is related to overall fat thickness. Often the only indication of the previously listed factors is fat cover as visually determined. Fatter animals tend to grade higher (Prime or Choice) than do leaner animals. However, unpredictable exceptions occur quite frequently. It is not uncommon to have cattle with more than 0.8 inch fat grade Select or those with 0.15 inch grade Choice. Of all the beef graded in the U.S. in 2011, 4% were graded Prime, 65% Choice and 31% Select.

Genetics play a strong role in determining genetic potential of marbling, but the outcome is influenced by management, health, and nutrition. Table 7 outlines some guidelines based on breed averages and the amount of fat cover which can be used to predict quality grade. *These are only guidelines and cattle within breeds can perform outside these guidelines.*

Figure 1. RELATIONSHIP BETWEEN MARBLING, MATURITY, AND CARCASS QUALITY GRADE¹

DEGREES OF MARBLING	MATURITY ²				
	A - 0-30 mo	B - 30-42 mo	C - 42-72 mo	D - 72-96 mo	E - > 96 mo
Abundant	PRIME				
Moderately Abundant					
Slightly Abundant				COMMERCIAL	
Moderate					
Modest	CHOICE				
Small				UTILITY	
Slight	SELECT				
Traces					
Practically Devoid	STANDARD			CUTTER	

¹Assumes that firmness of lean is completely developed with the degree of marbling and that the carcass is not a "dark cutter."

²Maturity increases from the left to right (A through E).

³The A maturity portion of the figure is the only portion applicable to bullock carcasses.



Table 7. Guidelines for breed of cattle and amount of backfat needed to obtain a certain quality grade.

Breed	Select	Choice	Prime
English	0.3-0.4 in.	0.4-0.75 in.	>0.80 in.
Continental Breeds	<0.30 in	0.5-0.8 in.	>0.80 in. to low probability
Dairy breeds	0.2-0.35 in.	0.35-0.45 in.	>0.45 in.
Brahman	0.4 -0.5 in.	> 0.6 in.	Low probability

Other rules of thumb regarding quality grade include:

- Heavier muscled cattle grade lower than light weight cattle
- Thickness due to muscle = lower quality grade; Thickness due to fat = higher quality grade
- Poor disposition = lower quality grade
- Frame size is related to fatness and weight when determining quality grade. For example a large frame steer at 1100 pounds will have lesser chance of grading choice than a small frame steer at 1100 pounds.
- Implants will have a negative impact on quality grade (reducing between 5-30%). The more aggressive the implant the program, the greater the impact. Similar results can be expected with beta-agonist
- Prior health history of cattle can influence quality. Sick cattle will result in lower quality grade.

PRICING METHODS OF CATTLE

Cattle feeders can contemplate the decision to market fed cattle in one of three pricing systems; namely, live weight, dressed weight or grid pricing (price adjustments to dressed weight). Table 8 outlines some of the differences in marketing cattle in these different systems. Traditional pricing systems (live or dressed) do not take into consideration the value of individual cattle in the pen. However, because packers have to assume the risk of discovering the value of cattle once they are slaughtered (after the purchase), base prices reflect averages with minimal QG or YG price adjustments.

In contrast, the burden of risk for cattle performance on the rail is transferred to the cattle feeder when selling on the grid; therefore, QG and YG premiums and discounts are significant and force price variability in this system. Live animal bids, and to a great extent, dressed weight bids are influenced by the price of Choice carcasses to which QG and YG price adjustments are made for the pen being considered. In the case of live weight, the price is adjusted for projected dressing percentage. This live price is credited with byproduct and hide values and adjusted for slaughter costs, transportation costs, and the packer's profit margin, to establish the estimated live bid price (Feuz et al., 1998). Dressed weight bids are derived similarly, except that a projection to live weight is not necessary, as price is established on the actual hot carcass weight.

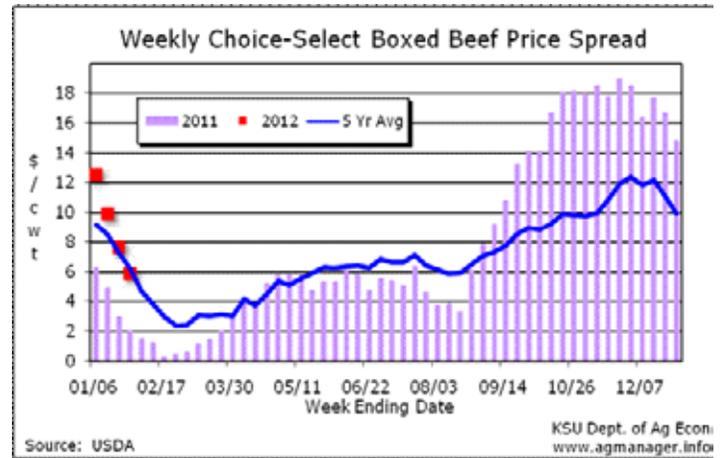
Table 8. Fed cattle pricing systems and attributes (adapted from Feuz et al., 1998; Ward et al., 1999).

Pricing attribute	Live	Dressed	Grid
Value based	No	No	Yes
Pricing unit	Pen/Lot/Animal	Pen	Individual carcass
Price variability among animals	None	None	High
Price variability among packers	Little	Moderate	High
Pricing location	Feedlot/Auction	Plant	Plant
Prices reflect meat yield	Estimated	Dressed	Yield Grade
Price reflects quality grade	Estimated	Estimated	Actual
Base price determination	Live	Dressed	Varies
Carcass performance risk burden	Buyer	Buyer	Seller
Need to know carcass quality	No	No	Yes

Pricing cattle on a grade and yield or grid basis is essentially the same as pricing on a dressed-weight basis, except that in addition to dressing percentage, the seller assumes the risk of the quality and yield grade of each animal in the pen. Grid pricing is based on a pre-determined price (base) that reflects industry or plant averages and specified premiums and discounts for carcasses above and below the base or standard quality specifications. Base prices are established by packers or alliances based on average prices of cattle purchased by the plant where the cattle are scheduled to be slaughtered for the week prior to or the week of slaughter, specific market reports, such as the highest reported price for a specific geographic market for the week prior to or the week of slaughter, boxed beef cutout value, reported price for the live cattle futures market price, futures market price, and/or a negotiated price (Schroeder et al., 1997). Most packer grids list a base price for a Choice, yield grade 3, 550- to 900-pound steer carcass.

The USDA reports a weekly survey summarizing selected beef packer grid premium and discount schedules. This report is on the internet at http://www.ams.usda.gov/mnreports/lm_ct155.txt (National Weekly Direct Slaughter Cattle – Premiums and Discounts). The LM CT155 report is useful for understanding average grid price premiums and discounts being offered by packers, and for raising awareness of the range of discounts and premiums and an example is provided in Table 9.

Figure 2. Weekly Choice-Select Boxed Beef Price Spread.



Cattle feeders that are considering grids for marketing fed cattle must understand that premiums and discounts vary over time due to wholesale beef market conditions (Ward et al., 1999). Most QG and YG premiums tend to be quite stable over time, while discounts, especially those reflecting Choice-Select Cattle feeders that are considering grids for marketing fed cattle must understand that premiums and discounts vary over time due to wholesale beef market conditions (Ward et al., 1999). Most QG and YG premiums tend to be quite stable over time, while discounts, especially those reflecting Choice-Select grade differences tend to change more.

Typically plants will have defect discounts for dairy type, bullock/stag, hardbone, dark cutter, and over 30 months of age. The dairy type discount is likely to vary the most between plants. This is usually based on providing a large enough ribeye in order to have marketable middle wholesale cuts. Therefore, most grids will not discount dairy types if ribeye area is over 11 sq. inches. Bullock/stag carcasses will have typically have a thicker neck, be extremely lean, and darker lean color to receive the discount. Dark cutter refers to carcasses which have an unacceptable dark color lean. Dark cutters are typically the result of stress prior to slaughter. Cattle which are determined to be over 30 months of age due dentition are given discount and hardbone discount is assigned to carcasses with greater than C maturity. Plants will also assigned discounts to major and minor bruises. This is dependent on how much and where the product loss has occurred. For example if the bruise in the loin, then this would receive a greater discount than if the bruise was in the flank.

Differences in methodology used to determine base prices between and within plants and alliances should motivate cattle feeders to understand the details of the process used at arriving at base prices for the plants or alliances they wish to market their cattle through. This is especially true if plant averages are used to estimate base prices because even within the same packer, plant averages vary among plants. Information that cattle feeders need to monitor to estimate

base prices for various plants or alliances should at least include:

- Regional live or dressed weight price
- Dressing percentage
- Regional average for incidence of Choice grade carcasses
- Choice-Select spread
- Boxed beef value
- Drop credit
- Slaughter and processing costs
- Some idea of how cattle currently on feed at their lot will perform on the rail

Table 9. Example packer grid.

Category	Price/cwt
CH YG 3 600-900 lbs	Base Price
Quality Grade Premium/Discounts	
Prime	14.04
CAB*	2.81
Choice (par)	0.00
Select	-8.45
Standard (No Roll)	-20.67
Yield Grade Premium/Discounts	
YG 1	3.38
YG 2	1.31
YG 3	0.00
YG 4	--11.08
YG 5	-17.15
Carcass Weight Premium/Discounts	
<600 lbs	-7.21 to -28.93
600-900 lbs	0.00
>900 lbs	-1.07 to -21.54
Defect Discounts	
Dairy Type	-4.95 to -52.00
Bullock-Stag	-28.67
Hardbone	-27.25
Dark Cutter	-34.53
Over 30 mo.	-18.09
*CAB - Certified Angus Beef	
**Accessed USDA AMS reports on 1-30-2012 at http://www.ams.usda.gov/mnreports/lm_ct155.txt	

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