2019-2020

Citrus County Fair
Beef
Skill-a-Thon
Study Guide

INTRODUCTION

This manual has been developed by the Animal Sciences Department Faculty at the University of Florida as a study guide for the Beef Skill-a-thon. The topic for this year's Skill-a-thon is **Products and Marketing**.

The Citrus County Fair recognizes that agricultural education instructors, 4-H agents, parents, and leaders provide the traditional and logical instructional link between youth, their livestock projects and current trends in the animal agriculture industry. **PLEASE NOTE:** This manual is provided as a ***study guide*** for the skill-a-thon competition and should be used as an additional aid to ongoing educational programs.

Sections are labeled **Junior, Intermediate & Senior, Intermediate & Senior, or Senior** to help exhibitors and educators identify which materials are required for each age level.

The knowledge and skills vary by age group and may include:

Juniors (age 8-10 as of September 1, 2019)
By-Products
Wholesale Cuts of Beef & Beef Primals

Intermediates (age 11-13 as of September 1, 2019)
all of the above plus…
Retail Cuts of Beef
Feeder Cattle Grading
Cookery

Seniors (age 14 and over as of September 1, 2019)
all of the above plus....
Quality & Yield Grading
Buying on the Grid
Quality Assurance
Skeletal Anatomy

GOOD LUCK!

Products and Marketing

Youth livestock projects focus on the selection, raising, showing and often selling of animals. By virtue of their participation in livestock projects, youth become part of an industry that provides food and fiber for the world. The steps involved in the movement of animals and animal products from producer to consumer are known as *processing and marketing*. Tremendous changes have occurred in recent years in the ways animal products are harvested and marketed but the fundamentals remain the same. Price is dependent on *supply and demand*. We can impact supply through increased breeding but demand is more difficult to affect. In order to maintain a stable market for animal products, consumers must have confidence in the ***wholesomeness and quality*** of what they are buying. That means the products must be safe, nutritious and tasty. Many livestock organizations have implemented promotion programs to increase market share, improve prices and increase export markets. The Beef Checkoff is an example of such a program with the slogan "Beef, its what's for dinner." Read about it at: http://www.beefboard.org/promotion/checpromotion.asp

Marketing may be as simple as receiving a set price per pound or may involve a pricing system known as 'Value Based Marketing'. ***Value based pricing systems*** account for quality and apply deductions or bonuses as products deviate from an accepted *baseline*. This should ultimately improve the quality of products offered to consumers, therefore boosting consumer confidence. Animal products may be marketed at auctions, by direct sales, contracts or electronically with the use of computers and satellite technology. Regardless of the marketing method, the seller is trying to receive the highest *price* while the buyer is trying to receive the greatest *value* (high quality and reasonable price).

Beef Cattle Products and Marketing

In 2011 the beef industry was the second largest money-generating commodity in modern agriculture (corn now ranks #1). About 45% of the cash receipts from U.S. agriculture each year are generated from **animal agriculture** and 38% of animal agriculture's share is from beef with a reported annual revenue of about $63 billion. http://www.ers.usda.gov/data-products/farm-income-and-wealth-statistics.aspx#27415

The beef cattle industry is structured differently than most other types of livestock production. The major segments of the industry are *seedstock* producers, *commercial cow-calf* producers, *yearling or stocker* operators, and *feedlot finishing* operations. The products of these segments in the order listed are: bulls and replacement females for breeding, feeder calves to be shipped to feedyards or stocker operations, stocker calves that are grown to heavier weights on forages before entering the feedlots, and finished cattle to be harvested and hung on the rail. Animals used for breeding are eventually harvested as well with their carcasses being boned out for use in processed products like hamburger and hot dogs.

Lower priced competing meats, inconsistent products and reduced consumer confidence have been cited as reasons for reduced beef consumption throughout the 1990's. The National Cattlemen's Beef Association http://www.beefusa.org/, working at many levels has turned this trend around through research, education and promotion programs. Maintaining profitability in beef production is a challenge and we see the number of cattle operations decreasing while the average size operation is increasing. Efforts to integrate the various segments of the industry show promise.

Animal By-Products

Animal by-products are anything of economic value other than the carcass that comes from animals during harvest and processing. They are classified as edible or inedible for humans. There may be some disagreement about what is edible but we can all agree that there are many uses for what is left after the carcass is rolled into the cooler. In developing countries by-products may become jewelry, religious implements, tools, fuel, construction material, fly swatters, or musical instruments. In developed countries, advances in technology have created many products from non-animal sources (synthetics) which compete with animal by-products, thus reducing their value. Still, by-products represent multibillion dollar industries in the United States and other developed countries. An added benefit of changing inedible parts of carcasses into useful products is that the decaying materials don't pile up and cause environmental problems. ***Rendering*** is the term for reducing or melting down animal tissues by heat and the rendering industry refers to itself as the "original recyclers". The creativity of meat processors in finding uses for by-products has led to the saying "the packer uses everything but the moo".

Edible by-products

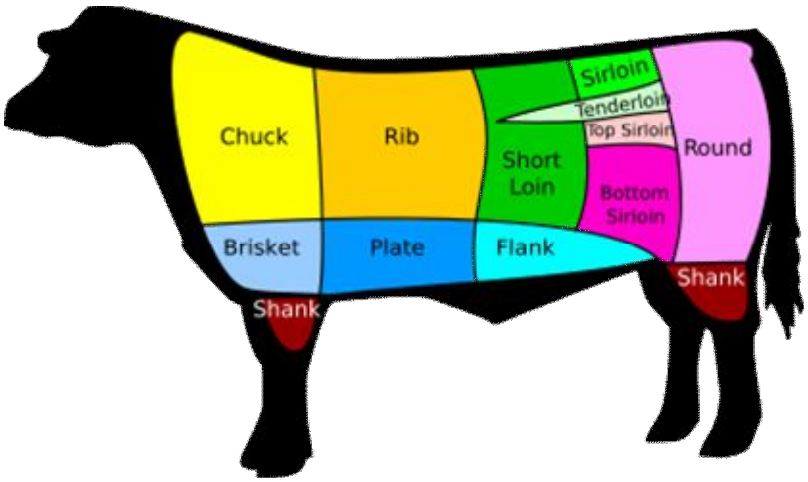
Raw Material	Principal Use
Brains, Kidneys, Heart, Liver, Testicles Spleen, Sweetbreads, Tongue	Variety Meats
Oxtails	Soup stock
Cheek and head trimmings	Sausage ingredient
Beef extract	Soups and bouillon
Blood	Sausage component
Fats	Shortening (candies, chewing gum)
Intestines	Sausage casings
Esophagus	Sausage ingredient
Bones	Gelatin for confectioneries (marshmallows), ice cream and jellied food products

Inedible by-products

Raw Material	Processed by-product	Principal Use
Hides	Leather	various leather goods
	Glue	paper boxes, sandpaper, plywood, sizing
	Hair	Felts, plaster binder, upholstery, brushes, insulation
Fats	Inedible tallow	Industrial oils, lubricants, soap, glycerin
		Insecticides, weed killers, rubber, cosmetics, antifreeze, nitroglycerine, plastics, cellophane, floor wax, waterproofing agents, cement, crayons, chalk, matches, putty, linoleum
	Tankage	Livestock and poultry feeds
Bones	Dry bone	Glue, hardening steel, refining sugar, buttons, bone china
	Bone meal	Animal feed, fertilizer, porcelain enamel, water filters
Feet	Neatsfoot stock	Fine lubricants
	Neatsfoot oil	Leather preparations
Glands	Pharmaceuticals	Medicines
Lungs		Pet foods
Blood	Blood meal	Livestock and fish feeds
	Blood albumen	Leather preparations, textile sizing
Viscera and meat scraps	Meat meal	Livestock, pet and poultry feeds

Wholesale Cuts of Beef

Fabrication of carcasses is the cutting of the carcass into wholesale and retail cuts for distribution to various markets. The size of the carcass and the preferences of the customer will determine how it is fabricated. For beef carcasses, wholesale cuts come from standard cutting methods developed to: *a) Separate fat from lean portions b) Separate tough from tender sections c) Separate thick from thin sections d) Separate valuable from less valuable cuts e) Separate retail cuts by cutting across the grain.*

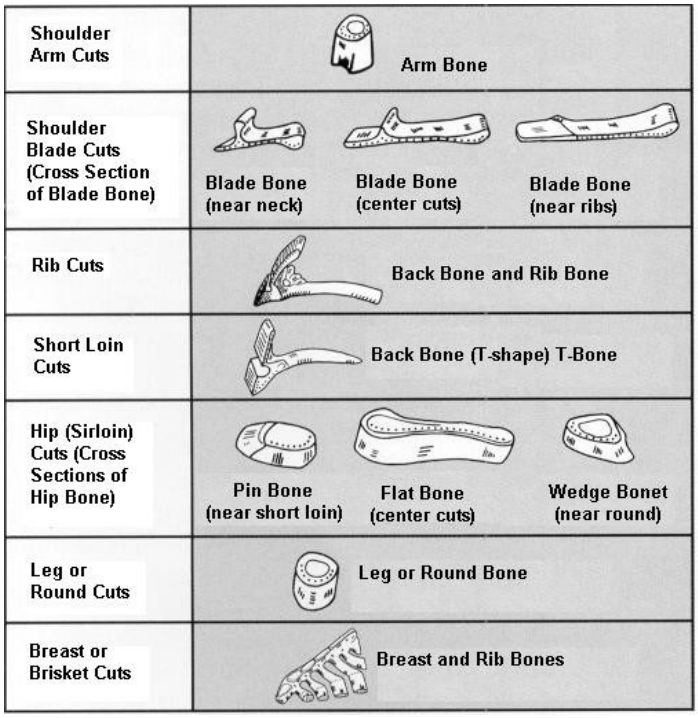


Source: Wikimedia commons

Primal Cuts

Of the wholesale cuts, those that are *lean, tender, thick, and valuable and that contain a large proportion of their muscles running in the same direction* are called *primal* cuts. The ***primal beef cuts are round, loin, rib and chuck***.

(Copied with permission from NCBA, "The Guide to Identifying Meat Cuts")



Retail Cuts of Beef

At the retail markets, boxed cuts are used to generate retail cuts for the meat case. Different stores have their own styles for each cut in an attempt to meet customers' needs. Retail specifications include size or thickness of cut, external fat trim, boneless or bone-in, and number of cuts per package. Items generated other than steaks and roasts may include stir fry, kabob, cubing material, and grinding material for processed or value-added products. Labels on meat must be specific for species, wholesale cut and retail cut names (example: Beef Rib Steak). A printable chart for retail cuts can be found at: http://www.beefretail.org/beefcutcharts.aspx

Visit the grocery store and practice visually identifying retail cuts of beef or go to:

http://aggiemeat.tamu.edu/meat-identification-pictures/

Feeder Cattle Grading

Florida is a cow/calf state and is a major supplier of feeder calves (between six months and one year of age sold to feeders; light, med, heavy, mixed, all sex classes) to western states for backgrounding operations and feedlots. Feeder cattle are yearling steers and heifers between one and two years of age (light, medium, heavy and mixed) and are graded based on frame, muscling and thriftiness. The feeder cattle standards recognize three frame size grades and four muscle thickness grades.

Frame size refers to the animal's skeletal size– its height and body length– in relation to its age. It relates to the weight at which, under normal feeding and management conditions, an animal will produce a carcass that will grade Choice. Large frame animals require a longer time in the feedlot to reach a given grade and will weigh more than a small-framed animal would weigh at the same grade.

Muscle thickness in feeder cattle refers to the development of the muscle system in relation to skeletal size. Thicker muscled animals will have a carcass with more lean meat and a better Yield Grade. Muscles scores range from 1 (Moderately Thick) to 4 (less thickness than No. 3).

In addition to the twelve combinations of feeder cattle grades for thrifty animals, an ***Inferior*** grade exists for unthrifty animals. Thriftiness refers to the apparent health of an animal and to its ability to grow and fatten normally. Unthrifty feeder cattle may have any combination of thickness and frame size. "Double-muscled" animals are included in the Inferior grade because they are unable to produce carcasses with enough marbling to grade Choice.

The twelve possible grades of feeder cattle that have been determined to be thrifty are as follows:
Large Frame No. 1, Large Frame No. 2, Large Frame No.3, Large Frame No.4,
Medium Frame No. 1, Medium Frame No. 2, Medium Frame No. 3, Medium Frame No. 4,
Small Frame No. 1, Small Frame No. 2, Small Frame No. 3, and Small Frame No. 4.
Source: http://www.vdacs.virginia.gov/marketnews/grading/feedercattlegrades.pdf

FRAME

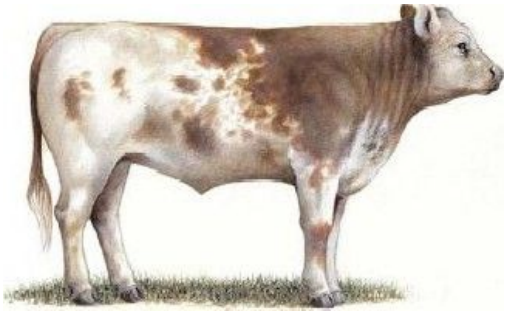
	FRAME	Expected Weight to Grade Choice STEERS	HEIFERS
	Large +		
L	Large	⬆	⬆
	Large -	1250#	1150#
	Medium +		
M	Medium	⬆	⬆
	Medium -	1100#	1000#
	Small +	1100#	1000#
S	Small	⬇	⬇
	Small -		

MUSCLE SCORE

MINIMUM THICKNESS	DEGREE OF THICKNESS
1	Moderately thick -
2	Tends to be Slightly Thick -
3	Thin -
4	

Visit the following web site for a Power Point presentation of feeder cattle grading:
http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELDEV3068679

FRAME SIZE



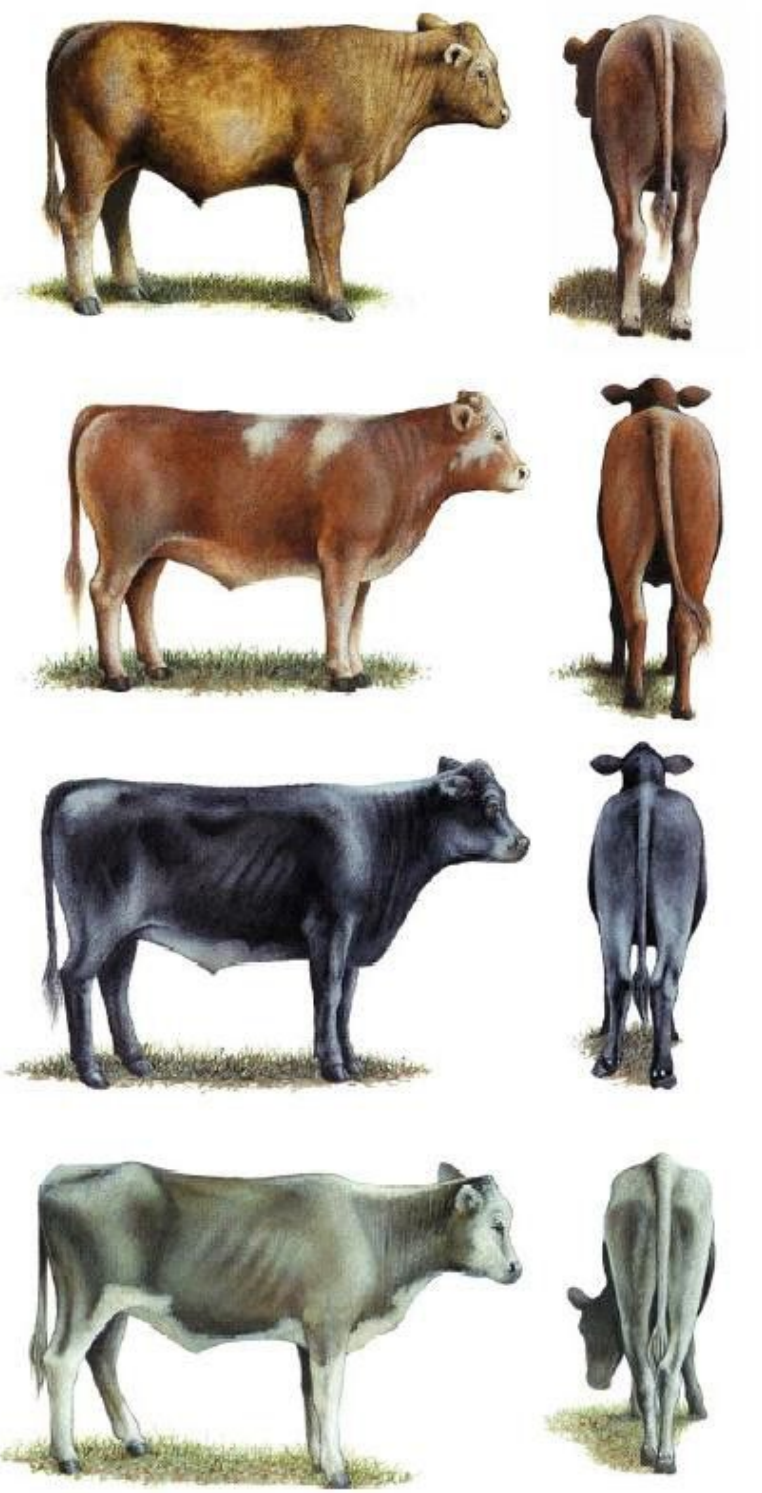
Large

Medium

Small

Large and medium frame pictures depict minimum grade requirements. The small frame picture represents an animal typical of the grade.

MUSCLE THICKNESS



No. 1

No. 2

No. 3

No. 4

No. 1, No. 2, and No. 3 thickness pictures depict minimum grade requirements. The No. 4 picture represents an animal typical of the grade.

Meat Cookery

Methods of cooking meat include dry heat or moist heat. Dry heat cookery methods improve flavor of meat through crust formation and caramelization but increase chewiness and decrease tenderness because of protein hardening. Moist heat cookery methods increase the tenderness of meat cuts that are comprised of muscles containing large amounts of connective tissue. Cookery under moist conditions for long periods at relatively low temperatures generates steam that then converts the collagen in connective tissue into gelatin. Methods should be selected based on initial tenderness of the cut, desired quality characteristics of the resulting product, available cooking facilities/equipment, and the amount of time available for preparation.

Dry Heat

Dry Heat methods of cooking are suitable for tender cuts of meat or less tender cuts which have been marinated. Use cuts low in collagen and elastin.

Roasting - This method of cooking is recommended for larger cuts of meat. Meat is seasoned and placed in an open roasting pan with a cooking thermometer placed in the center to determine degree of doneness.

Broiling - This method is most suitable for tender, usually thin cuts of meat. Less tender cuts may also be broiled when marinated. Meat is directly exposed to the source of heat from above or from both sides at the same time. It involves high heat and produces a distinct caramelized flavor.

Grilling - This method is actually a method of broiling. Meat can be grilled on a grid or rack over coals, heated ceramic briquettes or an open fire.

Pan-Broiling - This method is faster and more convenient than oven broiling for cooking thinner steaks or chops. It involves conduction of heat by direct contact of the meat with hot metal. Fat drippings are poured off as they accumulate.

Pan-Frying - This method differs from pan-broiling in that a small amount of fat is added first, or allowed to accumulate during cooking. Pan-frying is for ground meat, small or thin cuts of meat.

Stir-Frying - This method is similar to pan-frying except that the food is stirred almost continuously. Cooking is done with high heat, using small or thin pieces of meat.

Deep-Fat Frying - This method is cooking meat immersed in fat. This method is only used with very tender meat.

Microwave Cookery - High frequency electrical energy causes molecules inside the product to vibrate creating friction and heat without heating the surrounding air. The rapid speed of microwave cooking makes it ideal for frozen cuts in institutions and restaurants. Consumers complain that microwaved meat is inferior in flavor.

Moist Heat

Moist Heat methods of cooking are suitable for less tender cuts of meat. Moist heat cooking helps to reduce surface drying in those cuts requiring prolonged cooking times. With moist heat cookery, meat may lose some water-soluble nutrients into the cooking liquid. However, if the cooking liquids are consumed, as in stews or soups, nutrients are transferred and not totally lost. Meat should never be boiled because high temperatures toughen protein.

Braising - In some regions of the country the term "fricassee" is used interchangeably with braising. The surface of the meat is seasoned, covered with flour and browned. Afterward the meat is placed in a covered pan with a small amount of liquid and cooked at low temperatures to soften the connective tissue and yield a more tender product.

Stewing – Small pieces of lean meat can be browned on the surface then covered with liquid and gently simmered in a covered pan until tender. Care should be taken not to let the temperature of the liquid exceed 195^{O}F, because boiling toughens meat protein.

Simmering - Involves cooking in water at low temperatures (180^{O}F) like stewing except more water is used and the meat is usually not browned first.

Pressure Cooking – Cooking under pressure produces steam which aids in softening connective tissue. Pieces of meat may be browned then cooked with a small amount of water in a special vented pressure cooker.

Poaching - Cook in a liquid that is not actually bubbling at 165 to 180 degrees. It is usually used to cook delicate foods such as fish and eggs. It takes one third less time than roasting. Poaching helps to keep shrinkage of the meat to a minimum.

Meat Facts

100g Roasted	Calories (g)	Fat (g)	Sat'd Fatty Acids (g)	Protein (g)	Iron (mg)
Beef	216	9.9	3.79	29.58	2.9
Chicken	190	7.41	2.04	28.93	1.21
Goat	108	2.58	.79	29	3.3
Lamb	206	9.52	3.4	28.22	2.05
Pork	212	9.66	3.41	29.27	1.1
Rabbit (stewed)	206	8.41	2.51	30.38	2.37

Slaughter Cattle Evaluation

Slaughter cattle are classified by weight, age and sex. Grading of live cattle is rarely practiced in modern marketing channels. Feeder cattle are placed in the feedlot in groups that are expected to gain in a similar fashion. They remain on feed for a specified amount of time and are sent to slaughter. Payment is made based on the quality and yield characteristics of the carcass upon harvest rather than on the live animal.

Though live evaluation is not used in modern beef production, steer shows require that the judge make a "*best guess estimate*" of how the animal's carcass will look hanging on the rail. By visual appraisal and possibly with ultrasound information, judges evaluate cattle for quality and yield. Quality grades are estimated based on the amount and distribution of finish on the animal. The firmness and fullness of muscling and maturity of the animal are other factors involved in quality grading. The quality grades of steers and heifers are: *Prime, Choice, Select, Standard* and *Utility*. There are 5 possible yield grades; 1 indicates the animal with the highest yield of lean meat and 5 the lowest yield. Yield grades in live cattle are based on visual estimate of degree of fatness and the amount of muscling relative to body weight. To view a power point presentation of slaughter cattle evaluation, visit the web site:

http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELDEV3069258

Carcass Evaluation

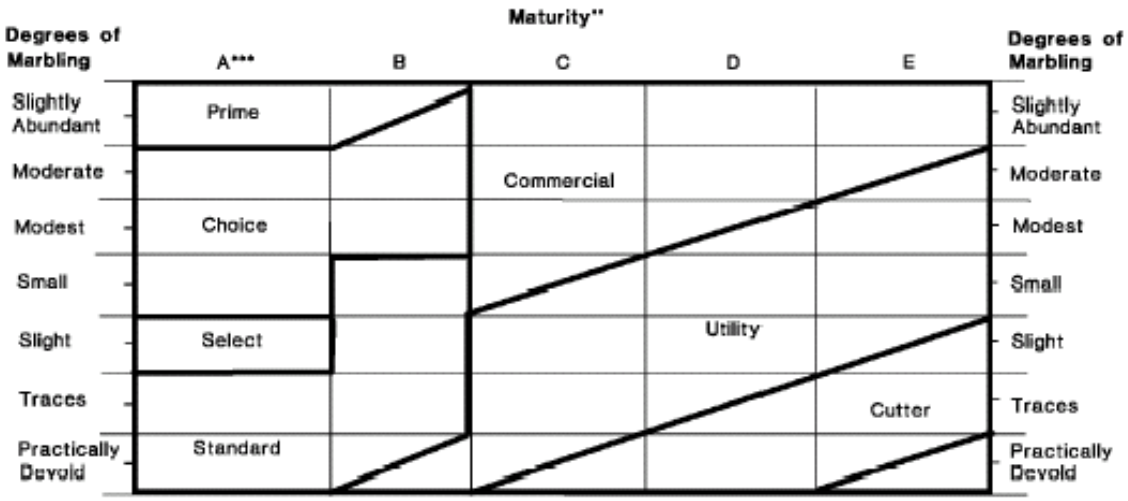
The young beef animal is usually ready to be harvested when it is 12 to 24 months old, weighing between 1,100 to 1,400 pounds and yielding about a 700 - 900 pound carcass. Carcasses may be graded for **quality and yield** as previously discussed with live cattle grading.

Quality grades infer *palatability* of the carcass or how good the carcass will taste. When determining quality grade of beef you must determine the class or sex of the carcass, maturity or age of the carcass, color and texture of the meat, and marbling. Marbling, at certain levels, is necessary for palatability, juiciness, and flavor. There are nine levels of marbling:
(Ab) Abundant, (MA) Moderately Abundant, (SA) Slightly Abundant, (Md) Moderate, (Mt) Modest, (Sm) Small, (Sl) Slight, (Tr) Traces, and (PD) practically devoid.

Yield grades represent the amount of edible meat that a carcass contains. Economically this is very important. Do not confuse dressing percent, often called yield with yield grade. The lower the yield grade number, the higher percent of carcass in total retail cuts. Yield grades are based on 4 carcass traits:

1. Amount of external fat measured between the 12th and 13th ribs known as FOE (inches)
2. Amount of kidney, pelvic, and heart fat otherwise known as KPH fat (percent)
3. Rib eye muscle (area) or REA (square inches)
4. Hot carcass weight or HCW (pounds)

Relationship Between Marbling, Maturity, and Carcass Quality Grade*



* 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.

Calculating Yield Grades

1. Determine the Preliminary Yield Grade. Adjusted fat over the ribeye (FOE) of .40 equals a preliminary grade of 3.0. Each change of ±.10 inch from .40 inches changes the PYG by ±.25.

2. Carcass Weight Determines how large the rib eye area must be. A 600 pound carcass requires an 11.0 inch^2 ribeye for no adjustment to PYG. Each additional 25 pounds carcass weight requires an additional .3 inch^2 REA and each 25 pounds less than 600 allows .3 inch^2 less REA for no adjustment to PYG.

3. Adjust for Ribeye Area Deviations from required size. Rib eye area in excess by 1 inch^2 changes PYG by -.3. For each 1 inch^2 deficiency in REA the PYG will increase by .3

4. Adjust for Percent KPH Deviations from 3.5 Percent. A change of ±1 percent changes the PYG by ±.20 YG.

Work the following example and have your instructor check your work.
FOE = 0.5
Carcass Weight = 650 pounds
Rib Eye Are = 12.6 inch^2
KPH = 2.5%

http://meat.tamu.edu/beefgrading/

Buying on the Grid

In today's beef marketing systems packers do not buy live cattle. Rather they buy and sell cattle "on the rail" by "formula pricing" or with a "negotiated grid". The term "grid" is used because prices are determined by using a spreadsheet-type grid where values are arranged in columns and rows by USDA Quality and Yield Grades. Grids are constructed from ***base prices***. For most, the base price is for a **Choice YG 3**, and carcasses are assigned ***premiums or discounts*** to that price. Some grids are splitting YG 2 and YG 3 into "A" and "B" divisions. The "A's" are 2.0 to 2.4 or 3.0 to 3.4 while the "B's" are 2.5 to 2.9 or 3.5 to 3.9. Cattle not fitting the grid, often called "out-cattle", consist of B maturity carcasses, Slight or less marbling score (no-roll), carcass weight falls outside stipulated range (≥900 or ≤550) or dark cutters. Below is an example of the premiums and discounts that can be applied to the based price for a carcass value program. Premiums and discounts are additive.

Table 1. Grid arrangement of premiums and discounts for carcasses falling in various quality and yield grade categories (the top figure within each cell defines the quality grade adjustment, the bottom figure defines the yield grade adjustment).

	Yield				
Quality	1	2	3	4	5
Prime	+ 8.00 + 3.00	+ 8.00 + 1.50	+ 8.00	+ 8.00 - 20.00	+ 8.00 -25.00
Choice	+ 3.00	+ 1.50	Base	-20.00	-25.00
Select	- 7.40 + 3.00	- 7.40 + 1.50	- 7.40	- 7.40 -20.00	-7.40 -25.00
Standard	- 35.00	- 35.00	- 35.00	- 35.00	-35.00
Out cattle:	Weight < 650	Weight > 950	No roll	Dark cutter	Age
Discount:	20.00	20.00	20.00	20.00	20.00

It is important to note that premiums and discounts vary over time based on market conditions. Premiums are more stable over time while discounts often vary weekly with wholesale boxed beef price spreads.

Example
U.S. Choice YG 3 Beef Carcass that weighs 970 pounds (Base price = $165)

Base price =	$165.00
YG 4 discount =	-20.00
Weight discount =	- 20.00
Carcass price/cwt=	$125.00

Total carcass value - $125/cwt x 970 pounds = $1212.50

You can read more about this at: http://beefmagazine.com/mag/beef_grid_pricing_primer

Beef Quality Assurance

Beef quality assurance (BQA) programs are in place within every segment of the cattle industry in order to provide safe and wholesome beef. Success of these programs is measured by consumer confidence which translates into increased consumer demand for beef. State programs are voluntary and administered through state beef councils, Land Grant Universities and state cattle associations. Cattlemen recognize that self-regulation is far superior to government regulation and that BQA programs are simply good business practices.

Every five years the beef checkoff program funds a national beef quality audit to evaluate progress the industry has made on a variety of production issues. The 2011 NBQA was designed to provide direction on the characteristics of beef like palatability and consistency but also things like food safety, sustainability, animal well-being and the disconnect between agriculture producers and consumers. The executive summary can be found at: www.bqa.org

Beef Safety - Harvest and processing occur under strict government inspection. USDA Food Safety Inspection Service (FSIS) is responsible for protecting the meat supply under the Federal meat Inspection Act. http://www.fsis.usda.gov/wps/portal/fsis/home. Pathogen Reduction/Hazard Analysis and Critical Control Points (PR/HACCP) system is used to identify and prevent food safety risks.

Beef Quality – improved quality and yield grades, uniformity, consistency, increased tenderness and palatability with a reduction in excess fat trim.

Beef Checkoff has an online promotion of "Beef in an Optimal Lean Diet" (BOLD) in which bloggers are challenged to eat beef at least once per day and report on diet/health.
www.mybeefcheckoff.com
Consumer Safety – Visit the following web sites for information and video clips on safe handling and preparation of beef products: http://www.beefitswhatsfordinner.com/foodsafety.aspx

- Use a separate cutting board when prepping raw beef. Wash the board thoroughly in hot, soapy water before using the same board for any other ingredients.
- Never put cooked beef back on the same plate you used for raw meat, and make sure to use clean utensils as well.
- Don't leave cooked food sitting out at room temperature for more than two hours.
- Use an ovenproof or instant-read thermometer to prevent over- or undercooking. Refer to safe cooking temperatures below.
- Roast meats at oven temperatures of 325°F or above.
- Keep cold foods cold and hot foods hot. If you're serving a buffet, you can keep cold foods on ice to maintain a temperature below 40°F, and keep hot foods on a hot plate or sterno flame to ensure internal temperatures stay above 140°F.
- As soon as your meal is over or within two hours (whichever comes first), place leftover food in the refrigerator. Allow hot or warm leftovers to cool in the fridge, not at room temperature.
- Divide large amounts of leftovers into small portions. The smaller size will not only be convenient for leftovers, but shallow containers will allow for quick chilling.
- Any leftovers should be covered, refrigerate and eaten within 3 to 4 days – or frozen up to 3 months. Reheat to 165°F throughout. Stir foods during reheating to be sure that all the food reaches the appropriate temperature.
- When in doubt, throw it out. Never taste leftover food that looks or smells strange.

Safe Cooking Temperatures -

Product	Minimum internal Temperature (° F) for safety and quality
Fresh Beef	
Ground beef	160°
Whole cuts (roasts and steaks)	145°
Leftovers, casseroles	165°

Beef Skeletal Anatomy

When fabricating the carcass into wholesale and retail cuts, skeletal anatomy provides the framework and landmarks for each of the cuts. Identification of bone-in retail cuts is much simpler when you have a good grasp of the bones associated with each region of the carcass.