

Introduction to Beef Production



Student Reference

10-4201-S

*In cooperation with the Agricultural Education Department and
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Introduction to the Beef Industry

The production of beef cattle accounts for nearly half of all livestock receipts in the United States. Beef production takes place nationwide, with many animals raised in the Midwest, Southwest, and the western plains. The United States ranks third in beef numbers, with India and the former Soviet Union ranking first and second, respectively.

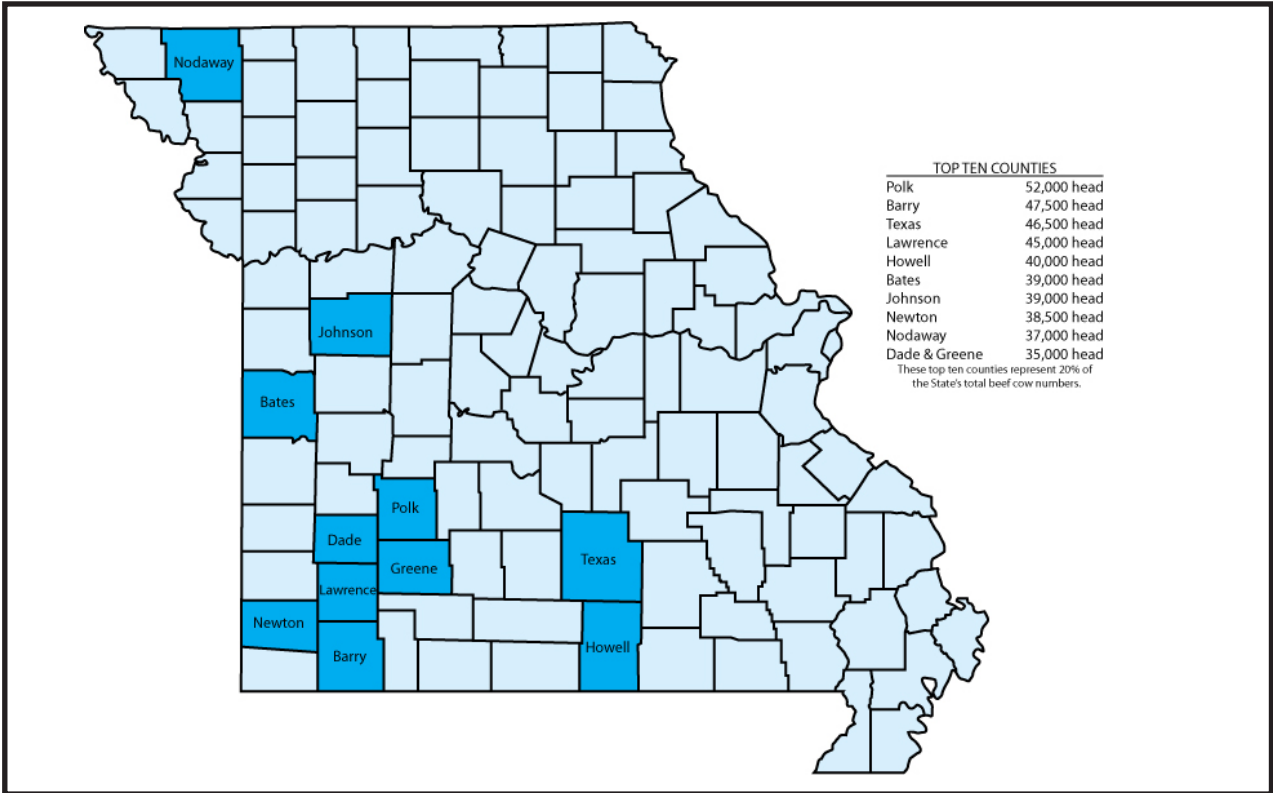
Beef cattle production is increasingly popular in the United States. The main reason for its popularity is that beef cattle can use forages as their major feed source, since they are ruminants with a four-part stomach that allows them to digest large amounts of roughage. Millions of acres nationwide cannot be used for crop production because of poor soil type, steep slope, or lack of suitable rainfall. However, the land can support grass, which in turn can be used by beef cattle. Producers market their forage crops through the sale of cattle. Also, beef cattle generally require less labor than other animals and have fewer losses due to deaths.

The production of beef cattle is not without its problems. It can be a high-risk occupation, especially when grain prices are extremely high and market prices for cattle are low. Beef cattle are also not as efficient as other animals in converting feed to meat. Average feed conversion ranges from 6:1 to 9:1, which means it takes six to nine pounds of feed for the animal to gain one pound of weight.

Beef Production in Missouri

Missouri is among the nation's leaders in beef cattle production. Missouri ranked second nationally in total number of beef cows, with more than 7 percent of U.S. cattle operations found within the state. More than 4.5 million head of cattle and calves are inventoried in Missouri each year. The state continues to rank highly in the production of purebred beef cattle; several nationally recognized herds are located in Missouri. Beef production is scattered statewide, although most beef cows are in the southwestern part of the state (see Figure 1.1). As of January 1, 2004, Polk County ranked first in beef cow numbers with 52,000 head.

Figure 1.1 - Beef Cow Numbers in Missouri By County



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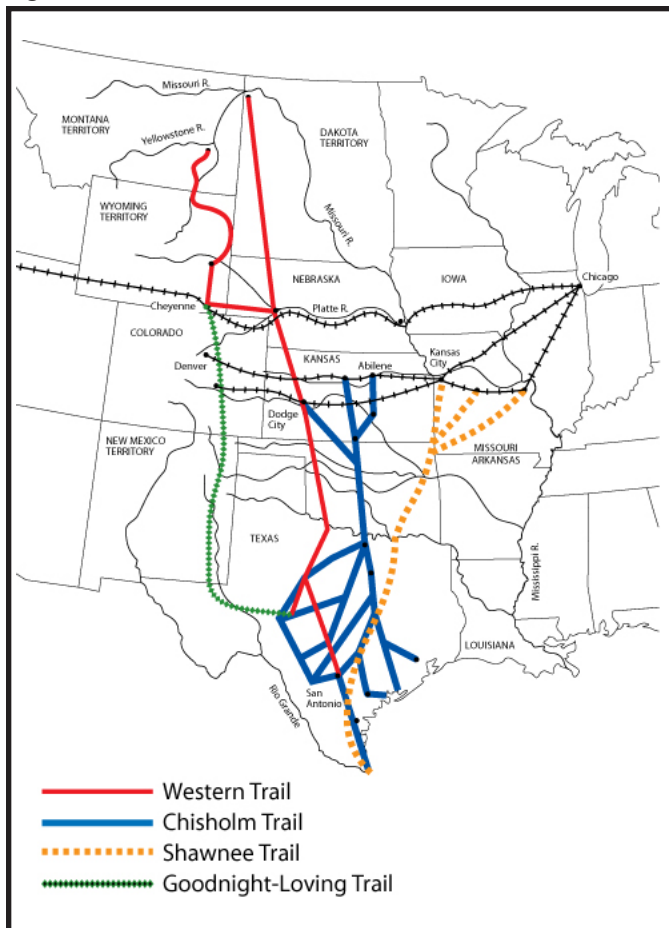
Beef Facts

Birth Weight - 60 to 100 pounds
Body temperature - 101.5°F (average)
Feed to gain ratio - 6:1 to 9:1
Weaning weight - 400 to 600 pounds
Slaughter weight - 1,000 to 1,350 pounds

The History of Beef Cattle in the United States

Beef cattle are not native to the United States. Christopher Columbus brought the first cattle to the New World on his second voyage. The Spanish introduced the Longhorn breed into Mexico in the early 1500s. Europeans who settled in what would one day become the United States brought cattle with them as well. The Jamestown settlers, for example, brought many cattle to the United States in 1611. The first known purebred breed of cattle to be imported were Shorthorns, which were brought to the United States during the 1780s. As pioneers traveled westward to settle new land, they took cattle with them.

Figure 1.2 - Cattle Drive Trails



After the Civil War, cattle drives from Texas to cow towns like Kansas City and Abilene took place on famous trails such as the Shawnee, Chisholm, and Western trails, shown in Figure 1.2. The Longhorn cattle brought north in these drives were shipped by railroad to the eastern United States, where most of the people lived.

The reduction of buffalo herds and the end of the clashes with Native Americans helped open the Great Plains for beef production. Cattle production flourished west of the Mississippi River because the vast grasslands of the Great Plains provided good grazing. The fencing of the West with barbed wire broke up the open grasslands and allowed herds to be improved for more efficient production by producers who could manage them more closely. This emphasis on improved herds and production eventually led to the importation of many modern beef breeds, such as Simmentals and Limousins, in the 1960s.

Terminology

The beef industry has a unique language all its own. Individuals involved with beef cattle should understand and use this terminology correctly. The following are some commonly used terms.

Steer - Castrated male.

Heifer - Young female that has not given birth to a calf.

Bull - Mature male.

Cow - Female that has given birth to a calf.

Polled - Genetically without horns.

Feeder calf - Term used for a male or female animal from weaning until the animal is placed in a feedlot.

Replacement cattle - Bulls and heifers that will be used to add to existing breeding stock.

Slaughter cattle - Steers and heifers between 1,000 and 1,350 pounds that will be processed into beef.

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Segments of the Beef Industry

The beef industry can generally be divided into four major segments: purebred breeders, cow/calf producers, backgrounders, and feedlot operators. Purebred producers specialize in the production of genetically superior females and herd bulls that commercial cow/calf producers will ultimately use to improve their stock. Cow/calf producers generate income by raising steers and heifers to sell. They generally breed cows to calve in the early spring or early fall and wean the calves at five to seven months of age. Cow/calf producers may then sell the calves to a backgrounder or a feedlot operator as feeder calves. Backgrounding operations allow the weaned calves to graze on forages, usually supplemented with small amounts of grain, to produce cattle that are ready to put on full feed in a feedlot. The calves are generally purchased weighing 400 to 600 pounds and backgrounded until they weigh 700 to 900 pounds. Feedlot operators purchase calves from either cow/calf producers or backgrounding operations and feed them until they weigh between 1,000 and 1,350 pounds and are ready for slaughter. Cow/calf producers and backgrounders also have the option of retaining ownership of the cattle through the feedlot and allowing the feedlot operator to custom feed the animals. Custom feeding refers to the practice of feeding the cattle for the owner and charging a certain price per pound of gain as well as other fees. When they are ready for slaughter, the animals are sold to a packer to be processed into beef.

Careers in the Beef Industry

The career possibilities relating to beef cattle production are widely varied. Becoming a beef cattle producer is only one option available to individuals interested in the beef industry. For example, ranch managers are in charge of a cattle operation and must make day-to-day decisions about the operation of the ranch. Artificial insemination technicians perform artificial insemination on beef cattle for producers. Livestock order buyers buy cattle off the farm or at auction markets for other people, who provide the funds for the purchase. Veterinarians help maintain healthy and productive animals and respond to health emergencies. Pharmaceutical sales representatives sell livestock vaccines to producers. Equipment sales and service representatives sell and service equipment used by producers for cattle production. Nutritionists help formulate feeding programs for beef cattle. Feedlot

operators manage all aspects of the process of feeding cattle for slaughter. Livestock extension specialists provide producers with support and information concerning all aspects of beef production from marketing to herd health. Biotechnology researchers work to find cures for diseases and innovative means to improve production.

Summary

Beef cattle are extremely important to agriculture in Missouri and the nation. The state ranks second nationally in beef cow numbers. In spite of their importance today, cattle are not native to the United States. The early explorers and settlers brought them to the continent. In the nineteenth century, beef production became a major industry on the western grasslands of the United States. Beef production has evolved since then into an industry consisting of four sectors: purebred breeders, cow/calf producers, backgrounders, and feedlot operators. Many career opportunities currently exist in the industry.

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Beef cattle had to be imported to the United States. Importation began in the late 1400s and continues through the present. The purpose of importing new breeds is to add to the genetic stock available to improve herds.

Beef Species

The two species of cattle are *Bos indicus* and *Bos taurus*. *Bos indicus* breeds originated from Zebu cattle from India. They have loose skin, large ears, and humps over their shoulders. *Bos indicus* cattle are resistant to heat and insects and are well suited to hot, humid climates. They are more rarely used than *Bos taurus* breeds. *Bos taurus* cattle originated in Europe. In comparison to *Bos indicus* species, they have tight hides and small ears. *Bos taurus* cattle do not have humps. They are more tolerant of cold weather. Most cattle raised in the United States are *Bos taurus* breeds. Examples include Angus, Simmental, and Limousin cattle. Breeding cattle from these two species has created several breeds of cattle, such as the Brahman and Brangus.

Beef Breeds in Missouri

Many breeds of beef cattle are found in Missouri. The major breeds of importance in the state are Angus, Red Angus, Beefmaster, Brahman, Brangus, Charolais, Chianina, Gelbvieh, Hereford, Limousin, Longhorn, Maine Anjou, Salers, Santa Gertrudis, Shorthorn, and Simmental.

Angus - Angus cattle were first imported from Scotland by George Grant of Kansas in 1873. The cattle are black and polled. The breed is known for its maternal ability and the production of high-quality carcasses with a large degree of marbling. Angus are the most numerous breed of cattle in the United States.

Red Angus - Some Black Angus cattle carry a recessive gene for red coat color. Red Angus were developed by selecting the red individuals from Angus herds. They have the same characteristics as Black Angus cattle.

Beefmaster - Tom Lasater is credited with the original development of this breed in Texas in 1931. The cattle are approximately 1/4 Hereford, 1/4 Shorthorn, and 1/2 Brahman. Color varies from red to almost white. Both

horned and polled animals are registered. Beefmasters are selected for their good growth rate, hardiness, maternal ability, and fertility.

Brahman - American Brahman cattle were developed from Zebu cattle from India. Zebu cattle were brought to the United States in the late nineteenth and early twentieth century and crossed with several European breeds to create the American Brahman. Brahman cattle range in color from gray to black. Like *Bos indicus* breeds, they have loose hides, large ears, and a hump over their shoulders. Brahman cattle are horned. The resistance of this breed to heat and insects has made it popular in the Southwest, where it was originally developed. Brahman cattle have been used to produce many new American breeds.

Brangus - Brangus cattle were developed in the early 20th century by crossing Angus and Brahman cattle. They are 5/8 Angus and 3/8 Brahman. This breed is black and polled. Brangus are maternal, have a high growth rate, and yield thick carcasses with a minimum of excess fat.

Charolais - The King Ranch in Texas introduced the Charolais breed into the United States during the 1930s. The breed was originally developed in France. It was one of the first exotic breeds of cattle to be used in the United States. Charolais cattle are white in color and can be horned or polled. They are large, heavily muscled, and fast growing, which makes them popular in crossbreeding programs.

Chianina - Chianina cattle originated in Italy and were first used in the United States in the early 1970s. They have been used to produce show steers and as a terminal breed. (With a terminal breed, producers sell all the offspring of the bull or cow as slaughter animals, with none being kept as replacements.) They can be almost any color. The cattle may be horned or polled. They are fast-growing and extremely large. Bulls may be up to six feet tall at the shoulder.

Gelbvieh - This breed originated in Germany and was imported in the early 1970s. Gelbvieh can be red to golden or black. They may be horned or polled. Gelbvieh are gentle and very maternal.

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Hereford - Henry Clay of Kentucky first imported this breed of cattle from England in 1817. Herefords are red with a white face and chest. White is also found on the neck, feet, and switch (tail). They are horned, but the Polled Hereford breed was developed from animals that were naturally polled because of a mutation. Herefords are excellent foragers and can tolerate cold weather, which makes them popular in the western United States.

Limousin - Limousin cattle originated in France and were first introduced into the United States during the late 1960s. They can be light red to dark red or black. Both horned and polled animals can be registered. The breed is noted mainly for their carcass traits. They are lean and heavily muscled.

Longhorn - Longhorn cattle were developed from cattle brought to North America from Spain. In the early 1500s, Spanish explorers brought Longhorns to Mexico and then to Texas, where they escaped and ran wild until being rounded up by cattlemen. Longhorn cattle are extremely hardy, which made them well suited to the long cattle drives of the 19th century. Longhorns were nearly extinct by 1900, but measures have been taken to save the breed. Animals can be almost any color or combination of colors. Their horns may spread to four or more feet. They are noted for their lean meat, adaptability to harsh environmental conditions, and resistance to many diseases and parasites.

Maine Anjou - Maine Anjou cattle originated in France in the 1840s from crosses between Shorthorn cattle and a French breed. The breed was introduced into the United States around 1970. The cattle can be red and white, solid red, black, or black and white. They may be horned or polled. Maine Anjou cattle are generally heavily muscled, gentle, and fast growing. This breed has been used extensively in producing show steers.

Salers - Salers originated in France and were imported to the United States in the mid-1970s. Animals can be black or dark cherry red in color. They are a horned breed. Salers are known as an easy-calving, high-growth breed.

Santa Gertrudis - This breed was developed on the King Ranch in Texas in the early 10th century. Santa Gertrudis cattle are 5/8 Shorthorn and 3/8 Brahman. They are dark

red in color and can be horned or polled. The breed is known for easy calving and good foraging ability.

Shorthorn - Shorthorn cattle originated in England. The breed was first imported during the late 1700s and was one of the first breeds to be crossed with Longhorns. Shorthorns can be red, white, red and white, or roan in color. They may be horned or polled. Shorthorns are generally regarded as highly maternal, gentle cattle that produce high-quality carcasses.

Simmental - Simmental cattle are originally from Switzerland. They were first imported in 1969. Simmentals can be solid red, red and white, yellow, black, or black and white in color. Both horned and polled Simmentals are registered. Simmental cattle are large and fast-growing. They are known for being maternal and for high milk production.

Selecting a Breed

Of the breeds discussed, all have strong and weak points; no one breed is superior to another. Each producer must look at his or her needs, what breeds were used in the past, available feed and labor resources, the goals of the operation, market trends for a particular breed, and the traits of the breeds. The producer must select the breed or breeds that would be best for him or her. Producers need to evaluate how to improve the profitability of their operations by increasing the value of the cattle that they sell. They need to follow current and future market trends and select breeds that best fit the markets. For example, breeds such as the Simmental and Gelbvieh may not be a wise choice for a producer with a limited amount of feed available because these larger, more maternal breeds have higher maintenance requirements and call for more feed resources.

Summary

Numerous breeds are used in beef cattle production in Missouri. Many breeds look similar physically but have different characteristics. Producers need to select breeds of cattle that fit the requirements of their operations and current and future market trends.

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Principles of Beef Cattle Selection

Proper selection of animals is extremely important in the beef cattle industry. Beef producers must decide which animals to select for different purposes, such as breeding and slaughter. High-quality animals are more productive and more valuable.

Parts of a Beef Animal

The use of correct terminology for the parts of an animal is critical to avoid confusion when describing it. Figure 3.1 shows the proper names for the parts of a beef animal.

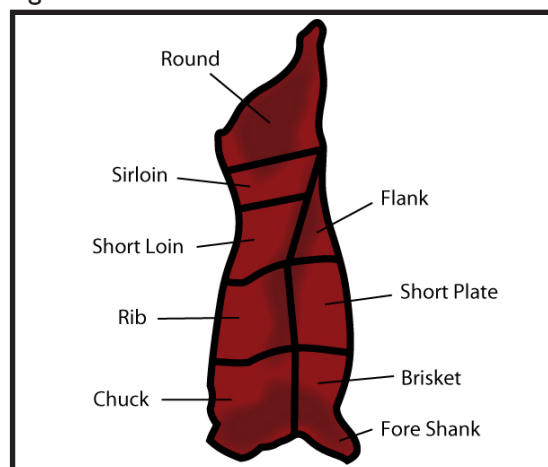
Wholesale Cuts of a Beef Animal

Wholesale cuts are large cuts of meat that retail stores, such as grocery stores, purchase and cut into smaller retail cuts. The consumer then buys the retail cuts. The wholesale cuts are the round, sirloin, short loin, rib, chuck, flank, short plate, brisket, and fore shank. Figure 3.2 illustrates the wholesale cuts.

Selection of Slaughter and Feeder Cattle

The selection of slaughter cattle is based on the future carcass quality and cutability, the percentage of salable meat from a carcass, of the animal. At slaughter, they are assigned different yield grades based on the quality of the carcass. The goal of producers is to choose slaughter cattle that will meet the standards for the choice quality grade. Choice grade beef is the most common grade

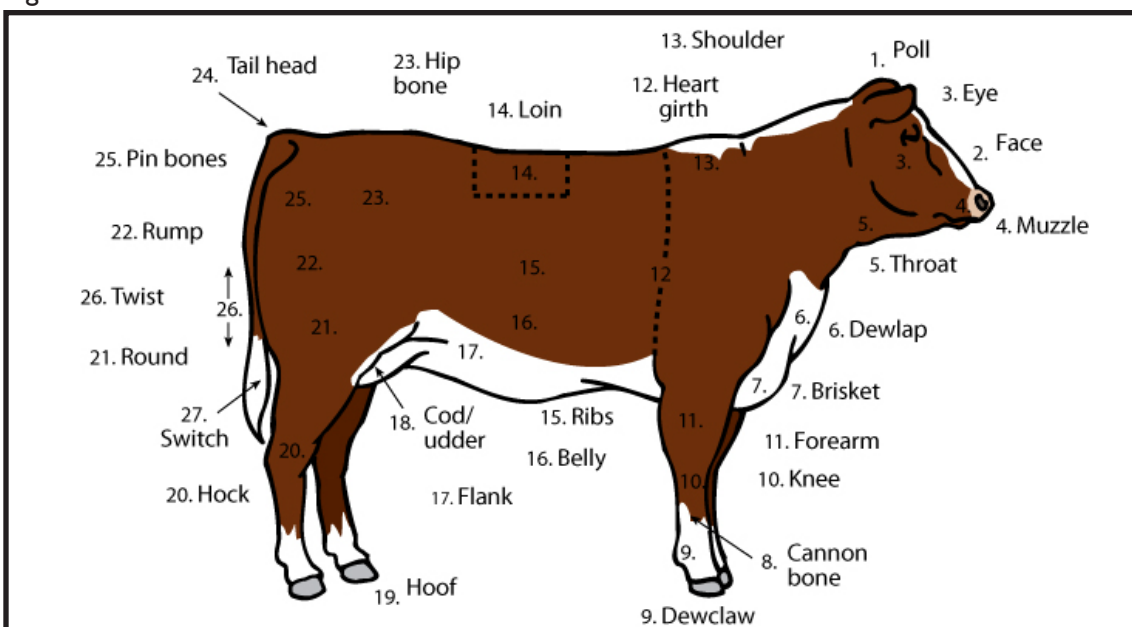
Figure 3.2 - Wholesale Cuts of Beef



purchased by the consumer. Slaughter steers and heifers should be evaluated for muscling, size, and amount of external fat.

Muscling - Muscling translates into how much thickness the animal has. Thicker cattle have more muscle thickness and width along their top line and through their rump and stifle. Heavily muscled animals are wide when viewed from the rear. Muscular cattle produce carcasses with more salable meat, which is profitable for both the producer and packer. Areas to observe when evaluating muscling are the size of the forearm, thickness along the top of the animal, and thickness and depth of the quarter, as shown in Figure 3.3.

Figure 3.1 - Parts of a Beef Animal



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Size - The size, or weight, of the animal is another important factor in the selection of slaughter cattle. Size suggests the potential carcass weight of the animal. Packers prefer beef carcasses to weigh between 600 and 850 pounds. Larger or smaller carcasses are harder to process into suitably sized wholesale cuts. Beef cattle generally have dressing percents (dressing percent = carcass weight ÷ live weight) between 60 and 65 percent, with 62 percent being average. Live weights should be between 1,000 and 1,250 pounds.

External fat - External fat thickness is the final major component in selecting slaughter cattle. Slaughter cattle must have approximately 1/2 inch or less of external fat on the 12th and 13th ribs to have the potential to reach choice-quality grade. Steers and heifers with 1/2 inch of external fat will have a smooth appearance along their ribs and ponies of fat (fat deposits) opposite their pin bones. The calves will also have evidence of fat on the cod or udder region and through the brisket.

Feeder cattle selection is very similar to the selection of slaughter cattle. As with slaughter cattle, the producer wants to select animals that will yield a choice-quality grade carcass. Evaluation is based upon factors that will influence future carcass value. Feeder cattle are evaluated for frame size and degree of muscling, which indicate potential slaughter weights.

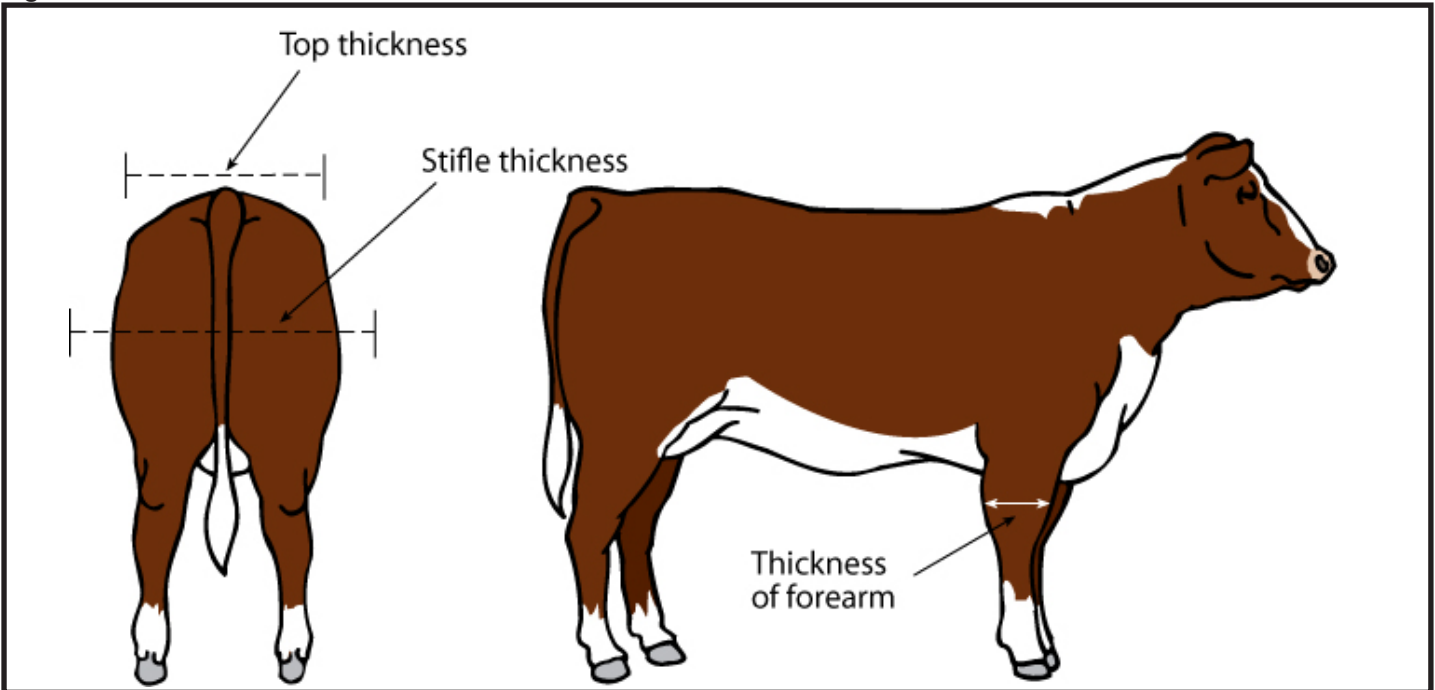
Priorities in Slaughter Cattle
Muscling - Heavily muscled foreman, top, and stifle
Live weight - 1,000 to 1,230 pounds
External fat - 1/2 inch or less at the 12th and 13th ribs

Frame size - Frame size is determined by looking at height in relation to age. Feeder steers and heifers can have a large, medium, or small frame (see Figure 3.4). The frame size of feeder animals is determined by predicting what the live weight of the calf will be when it has 1/2 inch of external fat in the 12th and 13th rib area.

Muscling - Muscling is the other factor in feeder calf selection. Feeder steers and heifers can have muscle scores of 1, 2, or 3, with the lower number assigned to the more muscular animal. Animals are given a muscle score depending on their thickness (see Figure 3.5).

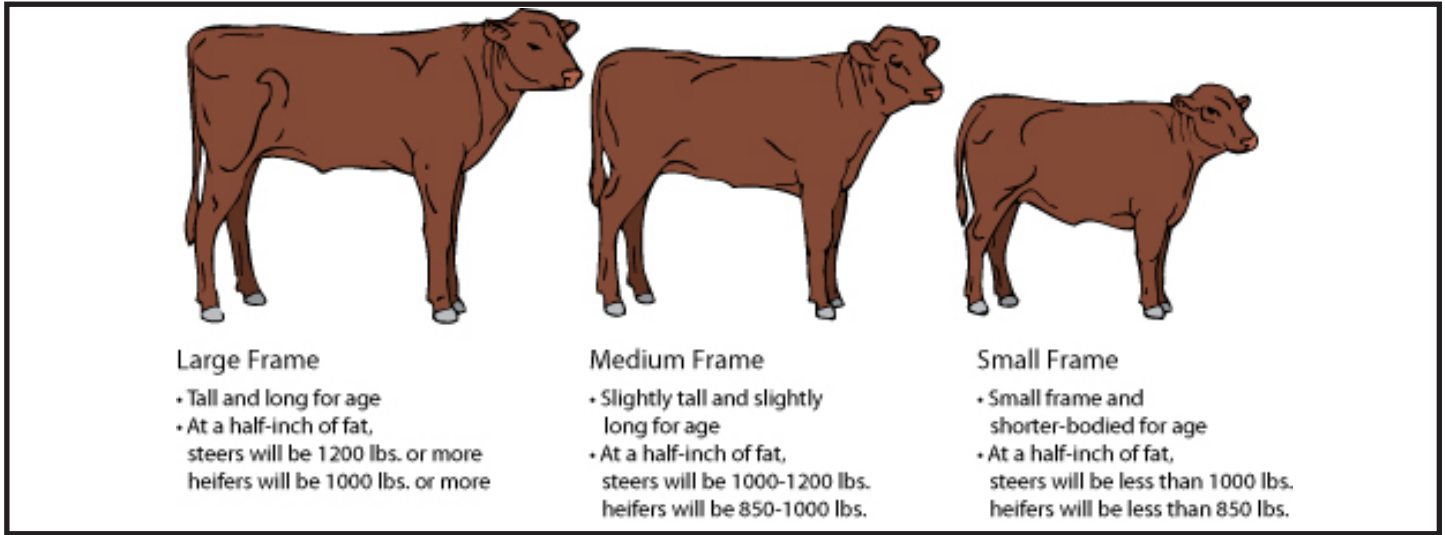
Feeder cattle grades set a standard for comparing animals. The grade of a feeder steer is the frame size combined with the muscle score. A sample grade is "Medium Frame, No. 1," which refers to a medium-framed calf that is heavily muscled. This designation refers to a steer weighing between 1,000 and 1,200 pounds with 1/2 inch of external fat and an ample amount of muscle thickness.

Figure 3.3 - Thickness



Principles of Beef Cattle Selection

Figure 3.4 - Frame Size



Breeding Cattle

The selection of breeding cattle is partly based on visual characteristics like soundness, volume/capacity, muscling, and balance. Along with visual selection, producers often use performance values, frame score, and expected progeny differences (EPDs) to evaluate and select breeding animals. The selection of breeding cattle can have a lasting effect on a producer's cow herd. If the producer keeps the female offspring from a bull or cow, they will pass on its genetic material to other animals in the herd.

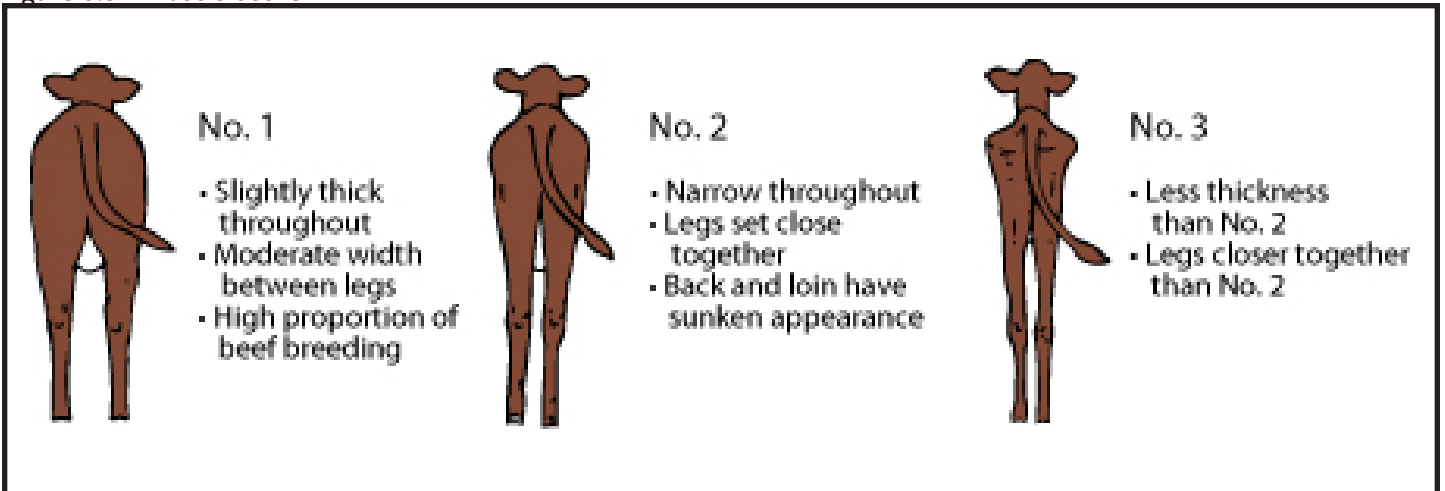
Soundness - Both skeletal and reproductive soundness are important in the selection of breeding cattle. Skeletal soundness refers to the animal's ease of movement. Beef cattle should take long strides off both ends of their skeleton and fill their track (the rear foot landing in the track left by the front foot) when moving. The animal should set its feet down square and wide. Reproductive

soundness is extremely important in both males and females. Bulls need to have at least 32 centimeters of scrotal development at one year of age. Females need to show signs of development of the vulva and udder by breeding age.

Volume/capacity - Both males and females should be evaluated for body capacity. An animal should be deep sided (possessing vertical depth) and wide ribbed and have spring or curvature to the outside of its rib cage. Capacity determines how much forage and grains an animal can consume. The more it eats, the higher its production should be.

Muscling - Breeding animals should be heavily muscled to produce feeder and slaughter animals that are heavily muscled.

Figure 3.5 - Muscle Score



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Balance - Balance refers to the skeletal and muscular formation of the animal. These factors contribute to the beauty of its phenotype, or physical appearance. Beef cattle should be long bodied, level topped, uniform in depth, stout boned, and clean fronted (free of excess skin). Attractiveness is more important to purebred producers who show cattle for promotional purposes.

Visual Selection Guide to Breeding Cattle

1. Skeletally and reproductively sound
2. Adequate body capacity
3. Heavily muscled
4. Attractive

In addition to looking at these characteristics, producers may look at other measures to evaluate an animal for breeding. For example, performance data consists of information about how a particular animal has performed in the past. It includes actual weights, such as birth weight, weaning weight, and yearling weight. Feed to gain ratios are another important measure used in selection.

Frame score is a measure of height in relation to the age of the animal. The frame score can be used to estimate the size of the animal at maturity. Frame scores range from one to ten, with five to seven considered ideal. Bulls are generally larger than females at the same frame score.

The current trend in breeding animal selection is to use genetic estimates, or EPDs, as an aid for selection. EPDs make a prediction about the performance of the future offspring of a parent. They look at the difference in production between the offspring of a particular animal and those of an average animal. All EPDs assume that the parent has been mated to animals of equal genetic value. Negative numbers indicate lighter calves, while positive values identify heavier calves.

The basic EPDs a producer should be aware of are birth weight EPDs, weaning weight EPDs, yearling weight EPDs, and milk EPDs. Birth weight (BW) EPDs are a prediction in pounds of the difference in birth weights. Weaning weight (WW) EPDs are a prediction of the difference in pounds in weaning weight. Yearling weight (YW) EPDs are the difference in pounds at one year of age. A milk (M) EPD shows the difference in pounds in the weaning

weights of the calves produced by the parent's female offspring due to the milk production of the cow.

Look at the sample EPDs in the box below. Evaluating the EPDs of the two bulls shows that if Bull #1 and Bull #2 are mated to genetically equal cows, calves from Bull #1 should be three pounds heavier at birth ($2 - (-1) = 3$), fifteen pounds heavier at weaning ($20 - 5 = 15$), and twenty pounds heavier at one year of age ($30 - 10 = 20$). The calves from cows from Bull #1 should be five pounds heavier at weaning than those from Bull #2 because of the cows' milk.

BW EPD WW EPD YW EPD M EPD

Bull #1	+2	+20	+30	+5
Bull #2	-1	+5	+10	0

Crossbred and Purebred Breeding Systems

Crossbreeding is mating animals of different breeds. Commercial beef producers use crossbreeding to take advantage of the characteristics of different breeds. For example, a producer may want to cross an Angus, with its high carcass value, and a Charolais, since this breed has good growth and muscling. The offspring produced by crossbreeding display heterosis, or hybrid vigor. Heterosis results in improved performance, growth, and/or carcass traits. It is evident when the animal displays superior qualities in comparison to the average of its parents' traits. Producers using crossbreeding need to select bulls to use in their herds as well as replacement females. Most commercial producers buy purebred bulls and sell feeder calves or retain ownership through the feedlot. Daughters of bulls are usually kept as replacements.

Purebred breeders must select registered bulls and females of the same breed to purchase and use as replacements. They produce bulls and females used by other purebred breeders and commercial producers.

Summary

Knowing the names of the parts of the beef animal and the wholesale cuts of beef is necessary in the production of beef cattle. It is part of making informed choices in selecting animals. Slaughter and feeder cattle selection is based upon potential carcass traits. Breeding animal selection encompasses visual traits as well as performance indicators and genetic estimates.

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Beef cattle operations have different requirements depending on the type of production that takes place. However, for any operation to be profitable, producers require good handling facilities, proper forage management, and knowledge of production costs and marketing options.

Facilities

Well-planned, usable facilities are essential, whether an individual is a purebred breeder, cow/calf producer, backgrounder, or feedlot operator. Facilities should be well planned and adapted to the needs of the individual producer. The basic handling facility for all operations (see Figure 4.1), includes a holding pen with a narrow chute or alley that funnels cattle into a headgate (see Figure 4.2), which is used to restrain cattle. These facilities are important for herd health care, since they are used when giving vaccinations and medications. Most producers also include loading and unloading areas, which are usually incorporated into the handling facility. The goals behind the design of handling facilities include safety for the producer and the cattle, moving cattle through the facility with minimal labor, and convenience and accessibility.

Modifications or additions can be made to facilities based on factors like the number of cattle owned, amount of capital, and current facilities. Larger cattle operations require more elaborate facilities to accommodate the number of animals present. For example, large farms and ranches may have handling facilities, buildings for feed storage, feed mills (for processing and preparing feed rations), and a maternity barn where pregnant cows are housed when they are close to giving birth. Handling equipment and facilities can be expensive, which affects whether a producer can add new facilities to his or her operation.

Figure 4.1 - Simple Handling Facility

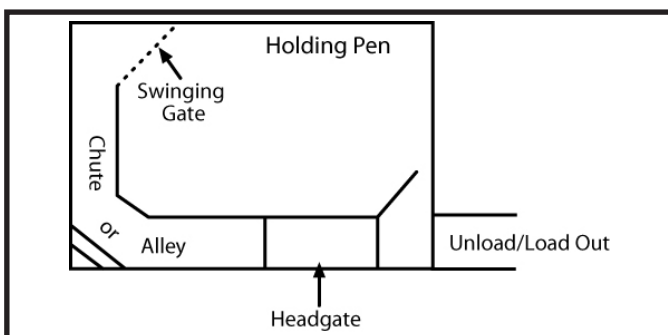


Figure 4.2 - Headgate



Cow/calf producers and purebred breeders require the same basic facilities. These include handling facilities, loading and unloading areas, and feed and hay storage. Larger operations, particularly those owned by purebred breeders, can have a show/sale barn, a maternity barn, more elaborate handling or working facilities, and an office.

Backgrounders have the fewest facility requirements. They usually raise their calves on grass pasture. However, backgrounders still require handling facilities and a loading and unloading area.

Feedlots require handling facilities, a loading and unloading area, feed storage, and a feed mill. Cattle are grouped together in feeding lots and fed until they reach market weight. Large feedlots have tremendous amounts of money invested in facilities, which must be in place before the cattle can be fed.

Forages

A major advantage of producing beef cattle is that they can use forages for food. Beef cattle can eat forages because they are ruminants. Ruminants have a four-part stomach that allows them to digest plant material efficiently. Forages in some form or another are used in all types of beef cattle production.

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Cow/calf producers and purebred producers use forages to feed the herd year-round. Depending on the weather conditions and location, cattle may graze on grass pastures from May through November. Producers can use grass resources more efficiently by setting up a rotational grazing system. Rotational grazing involves dividing pastures into small units; the cattle alternate between them when grazing. This type of grazing allows the producer to increase the number of animals per acre because they consume most of the available forage. During the summer, the producer harvests excess forages as hay or haylage, which will be used during the winter. In an ideal situation, the cattle require little or no supplemental grain. Cow/calf producers may also feed their cattle on cornstalks or wheat pasture during the winter.

Backgrounders use forages as an inexpensive way to achieve gain in purchased feeder steers. They put steers and heifers on grass pastures or feed hay until they are large enough to go to the feedlot. Backgrounders, like cow/calf producers, may feed cattle on cornstalks or wheat pasture throughout the winter.

Depending on their location, feedlot operators may or may not use forages as the basis of cattle diets. Most feedlots feed cattle grass hay for a few days after they are received. Some feedlots feed a base diet of haylage, but most use a diet of corn silage and grain with protein supplements.

Production Costs

Beef cattle production should be viewed as a business; the goal of any business is to make a profit. One major factor to consider when running any business is return on investment. Costs for beef production vary widely depending on the size of the operation, facilities, labor requirements, loans, and other factors. Fixed costs will be similar for all producers despite the type of production system used. Fixed costs include depreciation, interest on loans, repairs, taxes, and insurance. The types of variable costs a producer has may differ depending on the production system. The major variable cost in livestock production is the cost of feed. Other variable costs include medications, veterinary expenses, equipment, facilities, and the cost of the stock.

Producers have to consider several factors when calculating the costs of production and returns on investment. Suppose a producer wants to buy a few feeder steers. The producer has pasture available but is also going to feed the steers five pounds of grain per head per day. The grain mix is \$12 per 100 pounds. The producer can buy 400-pound steers at \$62.00 per 100 pounds (or \$.62 per pound). Market trends predict 500-pound steers will be worth \$64.00 per 100 pounds (or \$.64 per pound) in 90 days. Can the producer profit from buying the steers?

The initial cost of one steer is \$248 (400 pounds × \$.62). The feed costs are \$54 for that animal (5 pounds × \$.12 × 90 days), which gives a total cost of \$302 (\$248 × \$54). The producer will sell the steer for \$320 (500 pounds × \$.64/pound). Each steer will yield a profit of \$18, excluding any death losses or veterinary expenses.

The producer should also calculate the breakeven price, which is the price required to cover costs. The formula for breakeven price is given below.

$$\text{Breakeven price} = \frac{\text{Total costs}}{\text{Total pounds of calves sold}} \times 100 \text{ lbs.}$$

The producer in the above example must receive \$60.40 per cwt (100 pounds), or \$.604 per pound, to cover costs.

Choosing a Production System

Many factors must be considered when choosing a production system. The major differences between the systems involve the amount of labor, capital, and time committed, required management skills. Not all producers have the resources or ability to operate a 100,000 head feedlot.

Inexperienced producers with limited resources would be better suited to backgrounding feeder calves or possibly starting a small cow/calf operation. These businesses do not require as large an investment as the others. Labor requirements are also much lower than the other production systems.

Producers with more experience may choose to run large cow/calf or small purebred operations. These types of production require more money, time, and labor.

Skilled producers with solid financial backing may choose to own a feedlot operation or a purebred herd. These operations require the most resources in terms of money, labor, and time. Producers interested in raising purebred livestock must realize that promotion and marketing skills are extremely important to be successful.

Marketing Options

Beef producers have a variety of marketing options available to them. Among them are auctions (including video auctions, in which buyers view a video recording of the cattle being sold that is transmitted via satellite), sales to livestock order buyers, private treaty sales, consignment sales, production sales, direct sales to the packer, and trading in cattle futures. Different marketing options may be used depending on the type of production system.

Cow/calf producers can use several marketing techniques. They generally sell feeder calves to the highest bidder through a local or video auction, but some producers retain ownership of the calves through the feedlot. They make payments to the feedlot operator that cover the feed costs and a daily cost per head to feed and care for the cattle. When the cattle are sold to a packer, the producer receives the revenue. Cow/calf producers sometimes sell their cattle off the farm directly to livestock order buyers who buy cattle for feedlot operators and packing plants. Recently, many producers have formed alliances or marketing groups to market like sets of calves that are the same in size or breed as a branded or labeled product (e.g., Certified Angus Beef).

Cow/calf producers also have the option of using the cattle futures market. In this market, futures contracts are bought and sold. Futures contracts call for the delivery of cattle at some future date. They can help manage the financial risk of beef cattle production if a producer uses them to hedge on cattle prices. Hedging involves buying or selling a futures contract to prevent losses from rising or falling prices.

Purebred breeders, backgrounders, and feedlot operators can also use the cattle futures market, as well as several other marketing options. Purebred breeders may sell their cattle at auctions or private treaty sales, which are sales in which a producer and customer privately negotiate the terms of the sale. They may also sell animals

at a consignment sale, a special type of auction in which producers entrust a group of animals to another party, such as a breed association, to be sold for a commission. A fourth marketing option used by purebred breeders is a production sale. This type of sale is an auction by one producer or a small group of producers that takes place on a farm. Backgrounders have fewer options for marketing their animals. They often sell cattle at live or video auctions. Feedlots that own cattle may either auction them off or sell them directly to the packer, with the amount of money received determined by the live weight or carcass grade of the cattle.

Summary

Producers of beef cattle need to consider many factors when evaluating a production system. Well-planned facilities are essential for successful beef cattle production, and all production systems require basic handling facilities. Feeding cattle appropriately on forages is also very important, since forages are often a primary source of nutrients. Production costs vary greatly according to the production system used, and producers can market their beef cattle in many different ways. Producers must evaluate their talents and resources when selecting a production system.

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Preserving herd health is essential to success in beef cattle production. A knowledge of health problems that affect beef cattle is vital. Developing a herd health program and knowing the proper routes of administration for giving vaccinations and medicines are an important part of maintaining herd health. A producer should work closely with a veterinarian to help keep his or her cattle healthy.

Herd Health Problems of Beef Cattle

Many diseases can affect beef cattle. A few of the major disorders are listed below. Producers should be familiar with their symptoms to be able to identify herd health problems.

Anaplasmosis - This disease is caused by parasites spread by biting insects. It results in the destruction of oxygen-carrying red blood cells. Symptoms include weight loss and labored breathing. Affected animals may die of a lack of oxygen. Controlling insects and giving vaccinations can help to prevent anaplasmosis. It is treated with tetracycline, a treated mineral, or daily doses of other antibiotics.

Blackleg - Blackleg is one disease caused by the clostridial microorganism. This disease usually results in the death of fast-growing calves. Symptoms include swollen and inflamed muscles and lameness. Gas from swollen muscles builds up under the skin and makes a crackling noise when pressed. Vaccines are inexpensive and very effective.

Bovine respiratory syncytial virus (BRSV) - This virus weakens the respiratory system, making the animal more vulnerable to infection. Symptoms include discharge from the mouth and nose, fever, and a hacking cough. Calves are more likely to become ill, especially ones that are under stress. Producers can vaccinate animals against this disease.

Bovine virus diarrhea (BVD) - BVD can cause severe diarrhea in cattle. Other symptoms that may be present include fever, coughing, and nasal discharge. It can be prevented through vaccinations.

Brucellosis - Brucellosis is an incurable reproductive disease causing abortions. Cows and bulls may also become sterile. Because the disease has no cure, infected animals must be slaughtered to keep it from spreading. Producers should vaccinate replacement heifers as calves.

The microorganism that causes the disease can also infect human beings.

Fescue foot - Fescue foot is a nutritional health problem that occurs in cattle pastured on tall fescue due to a toxin in the fescue. In severe cases, the animal may lose one or both of the rear hooves, as well as the tips of the ears and tail. Other symptoms include an arched back, rough coat, and stiffness or lameness. One way to prevent fescue foot is mixing legumes with the fescue.

Grass tetany - This nutritional disorder is found in cattle grazed on grass pastures that have insufficient levels of magnesium. It usually occurs in lactating cows but may develop in other cattle. Some symptoms are trembling and staggering. If untreated, it may cause death. Prevention involves feeding cattle magnesium supplements. The disorder is treated with intravenous administration of a solution containing magnesium and calcium.

Infectious bovine rhinotracheitis (IBR, red nose) - IBR is caused by a virus and takes several forms. One form is a respiratory disease characterized by fever, nasal discharge, and a reddened muzzle. In females, another form attacks the reproductive system and causes abortions and inflammation of the vagina and vulva. A third type is similar to pinkeye. Cattle should be vaccinated for IBR.

Leptospirosis - Leptospirosis is spread through the urine of infected animals. Symptoms of this disease include fever, rapid respiration, poor appetite, and jaundice. It causes abortions, weak calves, and stillbirths. Five different strains of leptospirosis exist, so producers should consult their veterinarian to learn which vaccine is appropriate. Humans can get this disease from cattle.

Pinkeye - This disease causes the eye to develop a pinkish color or, in the more serious form of the disease, to water and develop a white, cloudy film. Blindness may occur. Vaccinations can be used to help control pinkeye. Proper fly control also seems to help limit outbreaks of this disease.

Scours - Scours is a complex condition that can have many causes, including BVD. It causes severe diarrhea in calves and can cause death. Producers can vaccinate cattle before calving as an aid in prevention, although good sanitation is also important in controlling this disease.

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Shipping fever (parainfluenza-3 virus or PI-3, pasteurella, hemophilus pneumonia) - Shipping fever is a term commonly used to refer to several respiratory diseases. High fever, coughing, difficulty in breathing, and discharge from the eyes and nose are symptoms. This disease often appears in cattle that are under stress. It can be prevented with vaccinations.

Vibriosis - Vibriosis is a disease spread among females by the bull during breeding. It results in abortions with no outward signs of disease. It also causes poor conception rates. Vaccines are available to prevent the disease.

Herd Health Programs

Developing a herd health plan is very important for all beef cattle producers. The herd health program used by a producer affects the wholesomeness and profitability of the final beef product. Producers should always keep in mind that they are producing beef, not just cattle.

Herd health programs should focus on disease and parasite prevention rather than treatment, since prevention is far more economical and successful than treatment programs. Cow/calf producers and purebred breeders should vaccinate feeder calves against IBR, PI-3, BVD, BRSV, pasteurella, and clostridial diseases like blackleg before weaning. Producers should consult their local veterinarian and/or animal health supplier for the exact timing of all vaccinations. Many vaccines require a booster shot, which is a second round of injections given shortly after the original vaccination. Vaccines can often be purchased in combination with one another. The producer should also apply products that kill external and internal parasites. Injections, pour-on insecticides, and oral medications can control parasites.

Cow/calf producers and purebred breeders should vaccinate replacement bulls and heifers against BVD, IBR, PI-3, leptospirosis, vibriosis, hemophilus pneumonia, pasteurella, and clostridial diseases. Replacement heifers also need to be vaccinated against brucellosis at four to nine months of age by giving them the OCV vaccine. Vaccinations are usually done thirty days before breeding to build immunity before breeding occurs. These vaccines may require that a booster shot be given. If parasites have not already been treated, the producer should apply products that kill external and internal parasites when giving the booster shots. At the same time, mature cows

and bulls should also be given boosters for leptospirosis, vibriosis, BVD, IBR, and clostridial diseases, along with external and internal parasite treatments.

Backgrounders and feedlot operators will usually revaccinate cattle because the history of the calves is unknown. They vaccinate their cattle against IBR, PI-3, BVD, BRSV, pasteurella, and clostridial diseases and treat animals for external and internal parasites. Work is currently being done on providing vaccination information on a certificate or special tag along with the cattle to save on the cost of boosters.

Routes of Administration

Producers can administer animal health products in a variety of ways. The label should always be consulted before giving any vaccines, dewormers, or other medicines to check on the proper routes of administration, expiration date, and use of the product. Common routes of administration are intramuscular, subcutaneous, oral, intranasal, and intravenous (see Figure 5.1).

Intramuscular (IM) - Intramuscular injections are made into the muscle. They should be given in the neck, never along the back or hip of the animal. Intramuscular injections are used for antibiotics and some vaccines.

Subcutaneous (Sub-Q) - Subcutaneous injections are given between the skin and muscle. They should be given in the loose skin on the side of the neck. This route is recommended because of the potential for carcass damage when injections are given into muscle tissue.

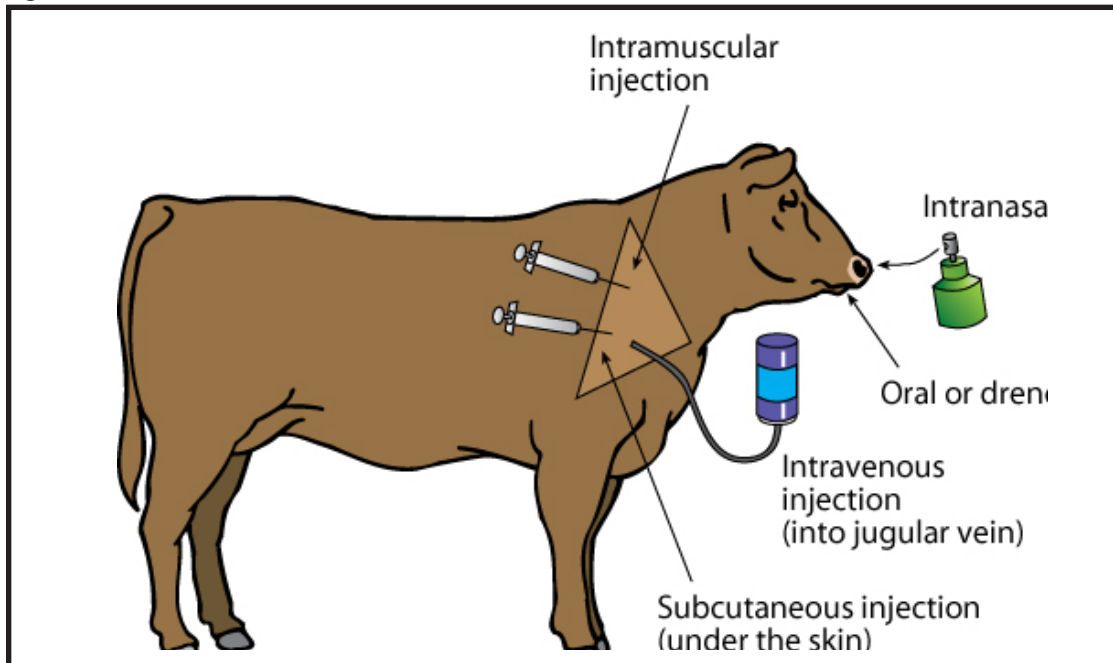
Oral - An oral, or drench, is administered through the animal's mouth. Dewormers and some vaccines are given orally.

Intranasal (IN) - Like nasal sprays used by humans, intranasal vaccines are sprayed into the nasal cavity.

Intravenous (IV) - Intravenous treatments are given directly into the jugular vein of the animal. Either injections or actual drip IVs can be administered in this way.

Subcutaneous injections should be used whenever possible, but the directions must be read and followed exactly. The producer should also be aware of withdrawal dates, which indicate the number of days after the

Figure 5.1 - Routes of Administration



injection is given that he or she must wait before selling the animal for slaughter.

Summary

Every cattle operation should develop a thorough herd health program. The veterinarian and producer both need to be involved in herd health management. Most cattle diseases can be prevented with proper management. Vaccinations should be given on schedule to help ensure herd health. Producers should follow the directions on the label exactly when vaccinating cattle. If an injectable vaccine is used, subcutaneous injections should be given if possible.

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Good herd management practices are vital for profitable beef production. Supplying an appropriate diet and applying reproductive management practices lead to maximum production and reproductive efficiency. Another important aspect of herd management is using a method to identify livestock for record keeping purposes.

Nutrition

Proper nutrition is essential for maximum growth and performance in any animal. It is also a key to herd health. Beef cattle require balanced diets containing the appropriate levels of energy (supplied by fats and carbohydrates), protein, vitamins, minerals, and water. With proper levels of these nutrients, the animals can carry out the bodily processes necessary for maintenance and production.

Maintenance involves replacing cells, repairing damaged cells, and fighting off diseases. Animals fed balanced diets receive essential vitamins and minerals, which aid the body in fighting diseases. Without proper nutrition, the ability to ward off disease is reduced, which usually results in illness.

The nutritional needs of animals change as they pass through different stages of production. For example, their nutritional requirements increase as they experience growth and development. Gestation (pregnancy) and lactation (milk production) also increase their nutrient needs.

Reproductive Management

A second part of herd management is correctly managing breeding and reproduction. Whether producers choose spring calving (February to May) or fall calving (September to November), the length of the calving season needs to be limited to 60 days to ensure the uniformity of calves at weaning. Producers must plan the turn out and lock up dates for bulls to control the length of calving. Bulls should be turned out with the cows between 60 and 90 days after the first calf is born and locked up 90 days later to maintain the current calving cycle. Bulls should not be turned out before 60 days have passed because many cows are not ready to conceive again until 60 to 90 days after calving.

Producers should evaluate all bulls for breeding soundness before they are turned out with the cows. Qualified veterinarians examine semen under a microscope to check for abnormalities, sperm count, and motility (ability to move). Producers should replace bulls that fail the breeding soundness exams to help ensure that the cows will be bred. Generally, young bulls can breed between 15 and 20 cows annually, while mature bulls can handle up to 50 cows.

Heat detection is critical for producers who use artificial insemination (AI) in their herds. One of the most obvious signs of heat is that females will allow others to ride or mount them. When a female is in heat, the producer can artificially inseminate the female and return her to the herd. Some producers will try to manipulate the estrus cycle by giving hormone injections to cows in a process called estrous synchronization; many cows can then be made to cycle simultaneously. This practice allows the producer to utilize the labor required for artificial insemination better.

Pregnancy checking is another important management practice that can increase reproductive efficiency. In this process, the female's reproductive tract is palpated to check for evidence of fetal growth and development. Producers should check all breeding females exposed to the bull 60 days after the bull is locked up; before 60 days have passed, pregnancy is more difficult to detect. All females that are checked and are open (not bred) should be sold. The other females will have an average gestation length of 281 days. A table showing the expected birth date for various service dates is provided in Table 6.1.

Identification

Methods of identifying cattle for record keeping purposes include ear tags, tattoos, and brands. Plastic tags that hang in the animal's ear are the most common method of identification. Clamps hold them in the ear, much like an earring worn by humans. Cattle tags come in a range of sizes and colors with a cost of \$.50 to \$1.00 each. The tags can be purchased blank or preprinted with numbers. Some type of tag applicator must also be purchased to apply the tags. Ear tags should be readable. They are not permanent and can be removed if necessary.

A second way to identify cattle is by tattooing. Producers of purebred cattle generally tattoo numbers and a herd

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Table 6.1 - Gestation Table

DATE OF SERVICE	DUE DATE	DATE OF SERVICE	DUE DATE
January 1	October 10	July 1	April 9
January 15	October 24	July 15	April 23
February 1	November 10	August 1	May 9
February 15	November 24	August 15	May 24
March 1	December 8	September 1	June 10
March 15	December 22	September 15	June 24
April 1	January 8	October 1	July 10
April 15	January 22	October 15	July 24
May 1	February 7	November 1	August 10
May 15	February 21	November 15	August 24
June 1	March 8	December 1	September 9
June 15	March 24	December 15	September 23

* Adapted from the Missouri Agricultural Record Book for Secondary Students

prefix (a letter code for an individual farm) inside the ear of the calf. Then they rub ink over the tattoo. To read the number, the calf must be restrained in a head gate. Tattooing is a permanent form of identification.

Another permanent form of identification is branding. Producers can use either fire branding or freeze branding. Fire branding involves placing a metal branding iron in a fire until it is red hot and then branding the animal. The brand burns away the hair in the shape of a number or symbol. Fire brands lower the value of the animal's hide. Freeze branding, in contrast, does not affect hide value. It involves placing the branding iron in a solution of liquid nitrogen or dry ice and alcohol. The hair is then shaved from the area where the brand is to be placed, and the animal is branded. The cold brand removes the pigment from the skin, and white hair grows back in that area. Freeze brands work especially well with black calves. They are more humane than fire brands. All farm insignia brands should be registered with the Missouri Department of Agriculture.

Summary

Managing a beef herd involves monitoring several factors. For example, Cattle diets must consist of the proper levels of nutrients to ensure health and production. Producers must also manage reproduction closely to help ensure that females will be bred. Finally, they should properly identify cattle with either an ear tag, tattoo, or brand to aid in identification and record keeping.

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Consumers of beef products and beef producers share an interest in the future of cattle production. Consumers are often concerned about how cattle are raised and how cattle production methods will affect the beef they consume. Producers are working to correct misconceptions about the beef industry by educating the public.

Consumer Concerns

Over the last several years, American consumers have become increasingly concerned with food safety, environmental awareness, the ethics of beef cattle production, and animal rights.

Lack of food safety is one of the American consumer's greatest fears. Most concerns revolve around bacterial and chemical contamination of the food supply. Highly publicized incidences of food safety and food preparation shortcomings have caused anxiety about the safety of beef. For example, cases in which people have become ill and even died because of E. coli bacteria in undercooked hamburger have increased fears among consumers. Consumers are also uneasy about the possible contamination of meat by residues from antibiotics and growth hormones given to beef cattle.

A growing concern of the American public is the impact of beef cattle production on the environment. Over the last 30 years, preservation of the environment has become an increasingly important issue in the United States. Consumers are especially concerned with waste management and the potential for contamination of water from the runoff of cattle waste into rivers, lakes, and streams. Many people are also concerned about the overgrazing of public lands in the western United States.

The ethics of livestock producers are also coming under attack by consumers. Unethical practices, especially those involving showing activities, have been brought to the attention of the American public. One problem is the ownership of animals by adults who allow young people to show them. Many people view this practice as unfair to junior producers who have to purchase or raise their animals themselves. The illegal use of steroids to enhance performance is a second issue of concern to consumers.

Another area of interest to the American public is the ongoing debate over animal rights. Some groups, such as People for the Ethical Treatment of Animals (PETA),

believe that all animals have the same rights as human beings. They feel that humans do not have the right to use animals as resources. These groups oppose agricultural practices that they believe limit an animal's right to live freely. Activists have carried out many protests, mailings, and demonstrations against animal agriculture. Large livestock shows and fairs are favorite sites of demonstrations by animal rights activists.

Animal Rights and Animal Welfare

As described in the preceding paragraph, animal rights activists believe that animals, like human beings, have rights, and they should not be used for food or research. Activists view castration, dehorning, and vaccination as inhumane. These practices are objectionable because they alter the animal from its original state and because many are done without anesthetics.

Because of the controversy over animal rights, the term animal welfare causes many producers to become uneasy and upset. However, a clear distinction between animal rights and animal welfare should be made. Animal welfare involves a concern for the well-being of animals used by humans. People with an interest in animal welfare believe that animals should have all their needs met in a comfortable environment. The producer is responsible for providing the necessary food and shelter.

Most, if not all, producers are in fact concerned with animal welfare. The welfare of animals affects their growth and production, which ultimately affects the profits received by the producers. The key to addressing this issue is to continue educating both consumers and producers so no grounds exist for making allegations of abuse and mistreatment of animals in agriculture.

Addressing Consumer Concerns

The beef producer might ask, "Why should I be concerned with what the American public thinks?" The obvious answer is that the public consists of the customers for agricultural products. The old saying that the customer is always right still applies.

In response to public concerns, local, state, and national cattlemen's associations have developed voluntary programs that focus on correcting practices that might trouble consumers. One such program, sponsored by

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the Missouri Cattlemen's Association, is the Beef Quality Assurance Program. The goal of the program is to make producers aware of issues that affect the safety and wholesomeness of beef. The Beef Quality Assurance Program aims at educating producers about proper management practices, proper record keeping for drug usage, and details about various growth hormones and vaccines used in beef cattle production. Producers are also informed about the correct usage, dosage, and withdrawal times for hormones and vaccines.

In addition, the USDA has an inspection program aimed at reducing bacterial contamination to address concerns about food safety. Rather than using a visual inspection, inspectors will look at bacteria counts by taking swabs of the surface of the carcass and growing bacterial cultures.

Industry associations also seek to emphasize to consumers the safety of beef production for the environment and encourage environmental awareness among producers. The National Cattlemen's Beef Association presents several Environmental Stewardship Awards annually to producers who use innovative methods to protect natural resources. In addition, the Association's publications for consumers emphasize that beef production is environmentally friendly. For example, they point out that production primarily takes place outside in unconfined settings. This practice spreads the cattle waste over the ground where it is recycled as fertilizer.

A major focus of many 4-H and FFA leaders has been to educate young people and their parents on the damaging impact of unethical showing practices. The emphasis has been on zero tolerance. The Missouri State Fair has adopted the National Code of Show Ring Ethics formulated by the International Association of Fairs and Expositions. Exhibitors must sign a form that guarantees that they will not violate the code, which includes provisions about ownership and drug use in animals. If they do, they forfeit any prizes won and may be barred from exhibiting their animals.

Industry associations have emphasized the importance of animal welfare to both producers and consumers. The Beef Quality Assurance Program gives guidelines on how to handle and care for animals. The Missouri Beef Quality Assurance Program manual includes a Code of Ethics that stresses the humane treatment of cattle. Producers have relied on these industry associations to get the

word out to consumers that beef producers care for the welfare of their animals. Many consumers are unaware of the radical ideas of many animal rights supporters. They often withdraw support from such groups once they understand them.

Summary

Consumers are increasingly concerned with food safety, environmental safety, producer ethics, and animal welfare. Recent concerns are being addressed by educating producers and consumers. Producers are actively working to provide a positive image of beef and beef production.

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