30 Management Considerations for Bulls

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Objectives

- **Discuss the impacts of nutrition on development and fertility in young bulls.**
- **Present nutritional considerations and recommendations for bull development.**
- **Discuss how bulls should be used for breeding at different stages of their lives.**

Bull Development Nutritional Considerations

For a yearling bull to be used successfully in a breeding program, he should have reached puberty three months to four months before breeding time. The age of a bull at puberty depends on several interrelated factors. Among these factors, size or weight, age and breed contribute the most to age at puberty. The production of semen by a young bull largely depends on his overall growth as well as the development of his testicles and other reproductive organs. The size of testicles and volume of semen produced are positively correlated. Consequently, a well-managed bull development program will provide adequate nutrition to achieve puberty and allow the bulls in a contemporary group to express differences in growth and carcass characteristics.

However, young bulls can be, and frequently are, overfed to the point they become excessively fat. Research indicates overconditioning has a negative impact on fertility of young bulls. In fact, numerous experiments have documented feeding diets higher in energy concentration, compared to diets with moderate energy concentration leads to reduced epididymal sperm reserves, reduced sperm motility and increased abnormal sperm cells (Coulter, 1994). The exact mechanism by which feeding high-energy diets for long periods of time reduces fertility in young bulls is not known, although it is clear that overconditioning plays an important role. Increased fat deposition in the testes and in the neck of the scrotum have been implicated in reduced fertility. In one experiment, young bulls fed a high-energy diet had 34% greater total scrotal lipid (13.7%) than bulls fed a moderate energy diet (10.2%; Coulter, 1994). In these studies, the correlation between total scrotal lipid and epididymal sperm reserves was -0.26 and the correlation between back fat thickness and epididymal sperm reserves was -0.38. These articles suggest the insulative properties of fat deposited over the testes and in the neck of the scrotum leads to reduced thermoregulation capacity, increased scrotal temperature and ultimately, reduced bull fertility (Coulter, 1994).

Diets high in fermentable carbohydrates and lacking in effective fiber also can lead to acute and (or) subclinical acidosis as well as laminitis or subclinical laminitis (Nocek, 1996). These conditions are more commonly found in high-energy diets containing a greater proportion of concentrate feed. In general, high-energy diets that create (either sporadically or consistently) a ruminal environment with a pH of 5.5 or lower cause acute or subclinical acidosis and laminitis. Therefore, feeding management and diet formulation should be designed to minimize the occurrence of this condition. Feed formulation guidelines to achieve optimal ruminal health when higher energy diets are fed include a minimum of 20% dietary effective NDF (see chapter 17 for more information), and a minimum of 30% dietary NDF with at least 75% coming from forage. Remember that many coproduct feeds, such as distiller's grains, corn gluten feed, wheat middlings and soybean hulls are high in NDF. However, the NDF in these feeds is rapidly fermented, highly digestible and therefore contributes very little to the effective fiber (eNDF) value of the diet.

A rule of thumb to achieve optimal rate of growth and body composition is to provide adequate nutrition to reach approximately 60% to 65% of their expected mature weight by the beginning of the breeding season. Cattle with larger skeletal size or frame will generally be heavier at maturity compared to cattle with a smaller skeletal size and therefore, will need to be grown or developed to a greater extent by the time they are one year old. The frame scoring system shown in Table 30.1 is a common method used to estimate mature size and weight of bulls. Obviously, weight at a given age and hip height (frame score) will vary considerably depending on muscularity, chest width or overall thickness, depth of rib or heart girth and fatness.

All Web addresses given in this chapter are subject to change. The links to these websites will be updated regularly at the Master Cattleman website at extension.okstate.edu/programs/master-cattleman.html

Table 30.1. Cattle frame scores for males based on hip height in inches[a].

Age (months)	Frame score[3] 3.0	4.0	5.0	6.0	7.0	8.0
5	37.5	39.5	41.6	43.6	45.6	47.7
6	38.8	40.8	42.9	44.9	46.9	48.9
7	40.0	42.1	44.1	46.1	48.1	50.1
8	41.2	43.2	45.2	47.2	49.3	51.3
9	42.3	44.3	46.3	48.3	50.3	52.3
10	43.3	45.3	47.3	49.3	51.3	53.3
11	44.2	46.2	48.2	50.2	52.2	54.2
12	45.0	47.0	49.0	51.0	53.0	55.0
13	45.8	47.8	49.8	51.8	53.8	55.8
14	46.5	48.5	50.4	52.4	54.4	56.4
15	47.1	49.1	51.1	53.0	55.0	57.0
16	47.6	49.6	51.6	53.6	55.6	57.5
17	48.1	50.1	52.0	54.0	56.0	58.0
18	48.5	50.5	52.4	54.4	56.4	58.4
19	48.8	50.8	52.7	54.7	56.7	58.7
20	49.1	51.0	53.0	55.0	56.9	58.9
21	49.2	51.2	53.2	55.1	57.1	59.1
Mature	52.3	54.1	55.9	58.0	60.0	62.0

Frame score (5 to 21 months) = 0.4878 (ht)[b]
- 0.0289 (days of age) + .00001947 (days of age)[c]
+ 0.0000334 (ht) (days of age) - 11.548

Steer slaughter weight[d]	1,000	1,100	1,200	1,300	1,400	1,500
Mature bull weight[e]	1,570	1,730	1,890	2,050	2,200	2,360

a Approved by the Beef Improvement Federation.
b USDA Medium Frame Size is a Frame Score of approximately 4.0 to 5.5.
c Steers continue growth longer than bulls, being about 1/2 inch to 1 inch taller at 18 to 21 months.
d At 0.5 inch fat cover.
e At 12 months, bulls weigh 50% to 60% of this mature weight, under most development programs.
Source: Ag Life Extension, E-192

Another good barometer for appropriate growth, development and body condition of young bulls is to simply use the body condition scoring system described in chapter 20. The system uses 1 for emaciated animals and 9 for very obese animals. A good target for body condition score in young bulls is 6 at the beginning of their first breeding season. Perhaps the best way to verbally describe the ideal condition is bloomy but not fat.

BIF Guidelines for On-Farm and Central Bull Test Stations

Most bulls undergo some form of performance testing after weaning, either on the farm or at a central bull test station. The Beef Improvement Federation (BIF) provides guidelines for uniform beef improvement programs emphasizing the use and interpretation of performance data and quality management programs in improving the efficiency, profitability and sustainability of beef production (Cassady, 2010). Most breed associations participate in the BIF organization and encourage use of their guidelines for bull development. Guidelines are provided for on-farm testing as well as for central bull test stations. The guidelines are useful in designing an optimal nutrition program to ensure bulls are adequately grown and developed, while not becoming overconditioned prior to being put into service.

Weaning Weight and Yearling Weight

Guidelines for yearling and weaning data include recommended average age at weaning of around 205 days within a contemporary group. Recommended average contemporary group ages for yearling weight data collection are based on the development program chosen and determined primarily by the energy content of the test period diet. For example, recommended average contemporary group age is 365 days for bulls receiving a high-energy diet, 452 days for bulls receiving moderate-energy diets and 550 days for bulls receiving low-energy diets. Specific criteria for high-, moderate- or low-energy concentrations are not provided, although the assumption is that moderate-energy programs will be based on high-quality forage and possibly some concentrate supplementation, while low-energy diets will be based on year-round grazing and/or harvested forage with little concentrate feeding and will include some moderate- to low-quality forage.

For on-farm testing programs, BIF recommends a minimum of 70 days from weaning to data collection for yearling weight. However, for central bull test stations feeding concentrate-based diets (high energy as described above), the BIF guidelines include a minimum of 21 days for an adaptation period and a minimum of a 112-day test period using diets containing 60% to 70% TDN on a DM basis. This is equivalent to approximately 1 to 1.15 mega calories of metabolizable energy per pound of feed and similar to the recommended energy concentration suggested for feed intake and feed efficiency data collection.

Feed Intake and Feed Efficiency

Specialized equipment is necessary to evaluate post-weaning feed intake and feed efficiency as animals must be housed in contemporary groups, although feed intake data must be collected on an individual animal basis. These specialized feeding facilities are gradually becoming more abundant around the country and include commercial facilities designed by American Calan®, GrowSafe Systems Ltd.® and Insentec BV®. Recommended guidelines for feed intake and efficiency traits include a minimum of a 21-day adaptation period, a minimum of 70 days on test and a minimum energy concentration in the diet of 1.1 mega calories of metabolizable energy per pound of feed. For perspective, good-quality corn silage contains about 1.2 mega calories per pound, fresh Bermudagrass forage and high-quality alfalfa hay contains about 1.0 mega calories per pound, while cracked or dry rolled corn and corn dried distiller's grains contains about 1.5 mega calories of metabolizable energy per pound.

Consequently, bull development diets can be formulated to contain around 1.1 mega calories of metabolizable energy

and easily meet the minimum effective fiber criteria mentioned above. Diets fed free choice at or close to this energy level are recommended. These formulation criteria would be considered a moderate energy level and should achieve optimal growth and development of young bulls to ensure early, as well as long term reproductive health and soundness. Note that this criteria is not designed to maximize post-weaning growth rate.

Cow-to-Bull Ratios for Commercial Herds

The three major goals of any breeding season should be to:

1. Get cows settled as early in the breeding season as possible.
2. Cows need to be bred to the bulls with the highest possible genetic worth.
3. Achieve both as economically as possible by getting the cows bred with the fewest possible bulls.

Defining the optimum female-to-bull ratio is important to a successful breeding season. However, no one ratio is optimal for all ranches or small herd operations. The number of bulls required to adequately cover the breeding females is related to many factors influencing the female-to-bull ratio including:

- distribution of the breeding females,
- terrain,
- water availability,
- carrying capacity and feed intensity,
- pasture adaptation and
- pasture size.

Bull variation is caused by:

- age,
- condition,
- mating ability,
- libido,
- fertility,
- sperm reserve,
- social behavior and
- injury.

Management decisions include:

- length of breeding season,
- reproductive diseases,
- breeding intensity and
- amount of observation.

Most of these factors must be considered in defining the optimum female to bull ratio. Figure 30.1 illustrates how difficult it is for producers to know the optimum cow-bull ratio. This study, conducted in Colorado, shows the percentage of synchronized females that bulls impregnated when given the opportunity to breed three to 51 synchronized females. Notice that some bulls had a poor percentage

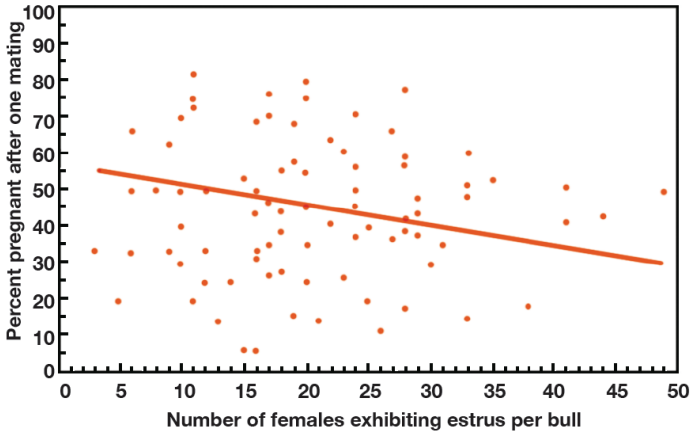

Figure 30.1. Effect of number of females exhibiting estrus on the percentage pregnant by each bull in single-sire mating of estrous synchronized females. Source: Pexton et al.

pregnancy rate, even when exposed to small numbers of females and some bulls had a high rate, even though they were running with 30 or more synchronized females. The vertical axis depicts the percentage pregnant after one opportunity to mate with the group of synchronized females.

Proper management during the breeding season should result in each female being bred by a single fertile bull each time she is in estrus. Bull overlap (more than one bull breeding a cow in heat) is not desirable, primarily because it does not enhance pregnancy rates. Disadvantages of bull overlap are increased risk of bull injury through competition for estrous females, additional pressure from social dominance and the extra costs incurred by purchasing and maintaining more bulls.

Research at an Eastern Colorado research station, where the average carrying capacity is 25 acres per animal-unit-year, showed similar conception rates for bull-to-female ratios of 1:25 and 1:50 (Healy, et al.). This research was conducted with multi-sire breeding pastures. All of the bulls were experienced bulls and had previously passed a breeding soundness examination.

Bull overlap can be decreased by eliminating bull congregation within breeding pastures. This can be achieved by dividing the breeding herd into separate pastures or by using pastures with natural barriers to reduce mixing of breeding groups. In addition, riders can be used to keep bulls well distributed among breeding groups.

Large cow-to-bull ratios can reduce bull costs on very large ranches with minimal risk. On a small 50- to 100-cow operation, using just one bull that happens to undergo an injury or disease could spell disaster for an entire calf crop.

Recommendations for smaller herds that will utilize only one bull per pasture may need to be more conservative. A time-honored rule of thumb is to place about the same number of cows or heifers with a young bull as his age is in months. For instance, a bull that is 14 months old going into his first breeding season should be expected to breed 14 cows or 15 cows, while a 2-year-old bull may be placed with 20 cows to 25 cows. Mature bulls that have passed a

veterinarian's breeding soundness exam normally give good results when placed with 25 cows to 35 cows.

Bull Pastures

Maintaining a 60- to 75-day breeding and calving season can be one of the most important management tools for cow-calf producers. A uniform, heavier and more valuable calf crop is one key reason for keeping the breeding season short. Plus, more efficient cow supplementation and cow herd health programs are a product of a short breeding season.

Many small producers lose all of these money-making advantages because they do not have a pen or trap that will hold the bull away from cows and heifers for nine months to 10 months of the year. It is a good idea to have a bull pasture that is somewhat isolated. Bulls kept away from cows will remain quieter and will fight less. A pasture with adequate area also will encourage exercise and reduce confrontations between bulls.

Several sources of information about cattle fencing on the internet include Dr. John Spitzer, a Clemson University beef cattle specialist, who uses a minimum of two acres per bull for the bull pasture. Well-fertilized introduced pastures, such as Bermudagrass in eastern Oklahoma (with adequate rainfall) can stand this stocking density. However, native grass situations will require more acreage per bull unless the producer wants to feed a great deal of hay and supplement during much of the year.

Clemson uses a five-strand, high-tensile fence with the strands spaced 10 inches apart. High-tensile wire is a heavy gauge, smooth wire that can be made as a permanent system with in-line wire stretchers. The first strand is 10 inches above the ground. The end result is a fence 50 inches tall.

The fence, of course, must be electrically charged. A good high-voltage, low-amperage fence energizer or charger provides the energy source. The Clemson design uses the second, third and fifth wire as charged wires, with the first and the fourth wire attached to grounds. The grounds will be most effective if they are set deep into the soil. This will allow for good grounding even when summer droughts cause top soil to become quite dry. Different designs may fit different situations. For example, some designs electrify the first wire (from the bottom) and make the second wire a ground (Figure 30.2). Talking to a commercial representative from a reputable fencing supply company can be very helpful. Being able to keep the bull away from the cows for nine months to 10 months of the year is a critical step to a more efficiently managed, profitable cow-calf enterprise.

Bull Management After the Breeding Season

After the breeding season, bulls become a necessary evil or an unwelcome visitor. Many producers might like to forget about them for the balance of the year and some almost do. While it is true that bulls during the post-breeding season do not require much management, adequate planning and care

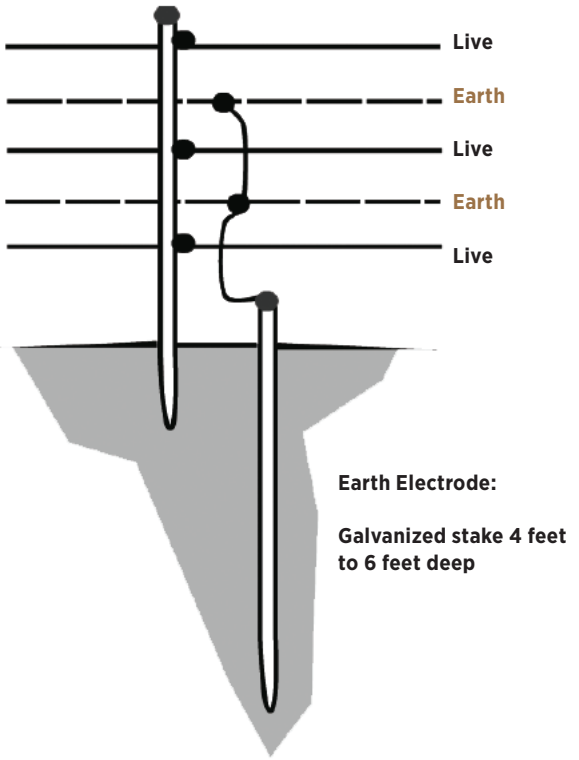

Figure 30.2. Example of fence design. Source: Adapted from Spitzer.

ensures bull costs will be reasonable and ready to go again when needed. In most spring-calving herds, the breeding season begins in the spring or early summer and extends for two months to three months. With a 60-day prebreeding conditioning period, the post-breeding season is about seven months, usually in the fall and winter. Goals for this period are basically as follows:

- keep feed costs at a practical minimum,
- keep the bulls in moderate condition,
- minimize chance of injuries and
- allow growth of young bulls.

Post-Breeding Appraisal

As bulls come out of the breeding pasture, one of the first steps should be to appraise the bull battery and sort them three ways. The largest group should be the mature bulls in good condition that will not require any special care. Perhaps the most important group is the young bulls that are still growing and need higher-quality feed (Figure 30.3). Bulls that are extremely thin or need special care for other reasons can be placed in this group as well. The last group is for old or crippled bulls that have completed their productive life and are to be marketed.

All bulls should have access at all times to a high-quality vitamin and mineral mix. Vitamin and mineral requirements for breeding bulls do not differ substantially from the cow herd and therefore, a well-designed mineral program that complements the ranch's base forage resources should work well for the bulls (see chapter 19 for more information).

Mature bulls in good condition can exist very well on an essentially all-roughage diet. While the amount will vary

Figure 30.3. Young bull in performance testing program.

some with the size of the cattle, a good rule to remember is about 2% of their body weight in dry feed per day is required. Protein needs will parallel closely those of a dry pregnant mature cow in the middle third of gestation. Bulls weigh 1.5 times as much as cows, so the protein supplement should be fed accordingly. Bulls may only actually be working 60 days to 90 days out of the year. If they cannot gain body condition while they are not working and consume average to high-quality forage or hay, their female progeny may not be able to either.

Yearlings

Yearlings should be left with the cow herd for 60 days or less. Beyond that time, their body condition may decline to such a degree that it may have long-range effects on their growth. After removal from the cow herd, yearlings should be kept separate from the older bulls at least through their second winter.

After the breeding season, yearling bulls should have access to higher-quality pasture, hay or silage. Protein supplementation may be required if forage contains 8% protein (DM basis) or less. These cattle are still growing rapidly, and may need to replace some condition lost during the breeding season. Feeding low-quality hay or grazing extremely low-quality pasture without supplementation is not advisable for these young bulls that are still growing.

Salvage Bulls

Often, bulls that have completed their productive life because of age or injury can be marketed to advantage after a brief period on a high-energy feed program. Bulls will vary greatly in condition at the end of the breeding season depending upon the number of cows per bull, the length of the breeding season and the quality of the feed available.

However, most bulls will gain very rapidly and efficiently after the breeding season if they are provided with the necessary nutrition. These bulls should be placed on excellent pasture or free-choice hay of high quality, then fed a concentrate feed that provides the most economical energy source, usually a cereal grain. Concentrates can be fed at the rate of 20 pounds to 25 pounds per head per day, although when fed at this level, it should be split into two equal feedings. Grain supplements should be started slowly and gradually increased to avoid digestive disturbances. At this nutritional level, bulls can be expected to gain between 3 pounds to 5 pounds per day for at least 60 days. Mature cattle also make excellent use of silage, if available.

Conclusion

A careful balance in terms of development nutrition level is necessary to achieve optimal reproductive capacity and longevity in young bulls without overfeeding or overconditioning. Moderate levels of dietary energy and moderate body condition are recommended for bull development. Once bulls have matured, access to abundant, clean water, a high-quality mineral mix and a good-quality roughage source should provide adequate nutrition to accomplish moderate body composition for optimal fertility. Overconditioning is never a good practice for bulls, no matter the age or stage of development. Also consider that bulls not capable of maintaining moderate body condition, while consuming moderate- to high-quality forage, may have high maintenance requirements (and therefore would produce cows with high maintenance requirements) or a medical problem that needs to be addressed.

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