

Developing Beef Bulls

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Introduction

Developing beef bulls can be both challenging and rewarding. Sale of breeding age bulls is often a significant source of revenue for seedstock producers. A comprehensive bull development program addresses selection and breeding strategies that will target the type of bull that fits production and marketing conditions. Nutrition, health and management strategies are also important components of bull development programs. It is important from a profitability standpoint to keep development costs at acceptable levels while maintaining an effective development program. The product of a successful development program is healthy, well-grown bulls that are ready to serve as effective herd sires.

Goals for a Bull Development Program

A good bull development program starts with good planning. Begin by evaluating resources (time, capital, land, labor, facilities, forages, etc.) required to develop a reasonable plan for developing young bulls. A proper bull development program involves cost management and a well-designed nutrition and herd health program. Goals for a bull development program should include:

- ✓ Design breeding programs to produce high quality bulls.
- ✓ Develop selection criteria for placing weaned bulls in a development program.

- ✓ Keep costs to a reasonable level without cutting corners.
- ✓ Develop forage and feed programs that meet nutritional needs for target weight gains.
- ✓ Plan for bulls to be well-grown without excess condition as yearlings.
- ✓ Have bulls physically fit so they will be active breeders.
- ✓ Implement a well-designed herd health program.

Goals for a bull development program may differ from one operation to the next depending on production and marketing conditions and personal preferences. Goals may also change over time. Regular program evaluation can reveal areas where goals may need to be modified to enhance program direction.

Selection of Bulls for Development

Selection of bulls for a development program begins before the calves are born. Start with careful selection of sires that complement the cow herd and are expected to produce a desired type of bull calf. Not all bulls are suitable as herd sires, and likewise, not all young bulls are worth developing into breeding bulls. Bulls being considered for a development program should be physically sound, free from genetic defects and exhibit an acceptable level of reproductive potential. The genetic potential of a bull will also impact his value as a herd sire and the price that he can command.

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Observe nursing bull calves for problems that may necessitate culling. Early identification of these culls facilitates the implementation of cost-effective management practices such as early castration and implanting with growth promoters that would not otherwise be performed on bulls developed for breeding purposes. This can help capture added value from animals not making the cut in a bull development program. Weaning is a good time to cull low performing, unthrifty, structurally unsound or genetically inferior bull calves and select those bull calves that will continue into a postweaning development program. Bulls also should be evaluated during selection and throughout the development program for their disposition (temperament). Bulls that exhibit a poor disposition should be culled.

Expected progeny differences (EPDs) are available on many seedstock animals. They provide predictions of genetic merit for specific traits and serve as a valuable selection and marketing tool. Accuracy (ACC) values give an indication of the reliability of EPDs. The closer the ACC is to “1” the more reliable the EPD becomes. Typically, ACC values increase as a bull sires more calves with reported performance records. Heavily used artificial insemination sires often have high ACC values, while young bulls often have low ACC values and are generally termed “unproven.” If EPDs are unavailable

for use in the selection process, then contemporary group performance ratios can be used and are often more dependable than actual or adjusted individual performance information.

Bull Nutrition

Postweaning development of beef bulls is important for future effectiveness as herd sires. Different management strategies are needed for bulls of different ages. Bulls should be separated and managed according to age groups (weanling bull calves, yearling bulls, highly fitted or gain tested bulls, two-year-old bulls, mature bulls). Separating younger and older bulls may be particularly important in preventing injuries. Dividing bulls into management groups also allows for the development of diets that complement the nutritional requirements of each group.

As bulls mature, their nutritional requirements change (Table 1). Younger bulls require less quantity but higher quality diets. While daily dry matter intake generally increases with increasing body weight, crude protein (CP) requirement as a percentage of dry matter intake declines. Younger bulls require higher protein percentages for the rapid lean muscle growth that is occurring during early development.

Table 1. Nutrient requirements of bull calves less than 12 months of age with an expected mature weight of 2,000 pounds.

Body weight, lbs	Average daily gain, lbs	Daily dry matter intake, lbs	Total digestible nutrients, % dry matter	Crude protein, % dry matter*
300	1.0	8.3	58	11.4
	2.0	8.6	65	16.3
	3.0	8.6	72	21.3
500	1.0	12.2	58	9.8*
	2.0	12.6	65	12.9
	3.0	12.6	72	16.3
700	1.0	15.6	58	9.1*
	2.0	16.3	65	11.4
	3.0	16.3	72	13.9
900	1.0	18.9	58	8.3*
	2.0	19.6	65	9.9*
	3.0	19.6	72	11.9*
1500	2.0	34.5	63	6.1*
2000	0.0	37.2	46	5.6*

*Balancing rations based on these crude protein levels will likely result in inadequate rumen degradable protein for optimal rumen function and diet digestibility. Minimal protein levels for mature bulls are recommended to be no less than 8 percent.



Group of bulls at completion of development program.

Two basic nutritional programs are available for developing young bulls. The first program is developing bulls at a moderate rate of gain, and the second program is developing bulls on a ration that is capable of supporting high rates of gain so genetic differences can be measured for selection and marketing purposes. Developing bulls at a moderate rate of gain can be achieved with good quality pasture or hay and supplemental feed. Hay generally does not contain enough nutrients to provide more than one and a half pounds per day gain for growing bulls. Cool-season, small grain pastures such as wheat, rye and annual ryegrass can support rates of gain in excess of two pounds per day. Warm-season grass pasture may support good rates of gain early in the growing season; however, in mid- to late-summer, quality will generally not be adequate to provide sufficient gains. Supplementation will be necessary when using summer forages.

Either a commercially available supplement can be purchased at a local feed supply store, or a custom supplement can be blended at a local mill or on the farm with locally available feedstuffs. Developing a supplement for fall weaned bulls being fed for moderate growth through the winter on hay should begin with an analysis of the hay for nutrient composition. The correct amount of a commercially available supplement or the composition and feeding rate of a custom blended supplement can be more accurately determined with a hay analysis. The following are examples of custom-blended supplements for calves fed good quality hay [12% CP and 58% Total Digestible Nutrients (TDN), dry matter basis] with a desired rate of gain of 2.0 pounds per day (Table 2).

These supplements are based on feed ingredients commonly available in Arkansas feed mills; however, supplement options are not limited to these ingredients, but may also include other feeds such as hominy, soybean hulls, wheat midds and rice bran.

When possible, supplements should be formulated to keep starchy grain (ex., corn, milo) intake at no more than 0.5 percent of body weight to complement forage digestion.

Table 2. Example feed supplements for a bull development program targeting two pounds of gain per day.

	Example supplements ¹ , % as-fed		
	84	87	60
Cracked corn	84	87	60
Cottonseed meal ² , 41%	16	—	—
Soybean meal, 48%	—	13	—
Corn gluten feed	—	—	40
Feeding rate, % BW	0.75	0.70	0.75
Minerals/vitamins ³	Free-choice	Free-choice	Free-choice

¹ Formulated based on hay containing 12% CP, 58% TDN, 0.45% calcium and 0.27% phosphorus, dry matter basis.

² Cottonseed meal at this level of intake should not affect bull fertility.

³ A complete mineral containing 24% calcium and 4% to 6% phosphorus should be fed free-choice. Alternatively (with the exception of the corn plus corn gluten option), the local feed blender may add limestone, trace mineralized salt and a vitamin A, D and E premix.

Periodically weighing growing bulls will help determine if the level of supplementation is providing the desired rate of gain. Remember, as bulls grow, intake increases. As the bulls get bigger, the supplement will represent a smaller amount of their intake unless the level of supplementation is adjusted. Supplemental feeding should not be based on the weight of the bulls the day they are weighed but adjusted for the expected average weight over the feeding period (Table 3).

Table 3. Calculation of supplemental feeding rate.

	Incorrect method	Correct method
Initial weight	550 lbs	550 lbs
Days in each feeding period	30 days (adjusting intake monthly)	30 days (adjusting intake monthly)
Rate of gain	2 lbs/day	2 lbs/day
Weight used to calculate feeding rate	550 lbs (initial weight at start of feeding period)	30 days ÷ 2 = 15 days (halfway point) 2 lbs/day x 15 days = 30 lbs 550 lbs ÷ 30 lbs = 580 lbs (average weight over feeding period)
Supplement intake	1% of body weight	1% of body weight
Feed amount	550 x 0.01 = 5.5 lbs/hd/day	580 lbs x 0.01 = 5.8 lbs/hd/day

Developing bulls on a high-grain diet for rapid weight gain, such as diets used for performance testing, requires a three-step approach to feeding. The first step is designed to adapt the bulls to a high level of concentrate feeding without causing metabolic mishaps during the process. The goal is to get bulls that are adapted to a forage-based diet onto a high-grain diet without inducing acidosis or founder. The middle step is the period the bulls are on full feed and growing at a high rate of gain for 112 days or more. The final step is working the bulls off a high-grain diet and back to a predominately forage-based ration. One of the biggest complaints from bull buyers is grain-fed bulls falling apart after being put onto pasture.

The step-up period for adapting bulls to a high-grain diet should occur over a 3- to 4-week period, depending if the bulls were already adapted to grain supplementation, such as creep feeding, prior to weaning. An easy method of stepping bulls up to a high-grain diet is to limit feed the high-grain ration and provide free-choice access to good quality, long-stemmed hay. Initial grain feeding should start at about 1% of a bull's body weight, if the bull is not adapted to grain and the final ration being limit fed contains some roughage such as chopped hay or

cottonseed hulls. The feeding rate of the grain ration can be increased 15 percentage units each week until on full feed starting week 5, or increased 0.5 lbs per head daily until bulls reach full feed. Starting bulls too quickly on a high-grain diet will result in a fluctuating eating pattern and poor overall performance.

Rations for growing bulls fed to achieve a high rate of gain are often fed as a complete ration (includes both grains and some roughage). Complete rations should contain 15% to 20% roughage (examples include coarsely chopped hay or cottonseed hulls) to keep bulls ruminating to moderate rumen pH, prevent acidosis from occurring and keep the rumen healthy. If the roughage is not mixed with the grain portion of the diet, care must be taken to limit the grain intake so the bulls will consume at least 0.5% body weight as roughage. Feeding in this manner will also require the grain portion of the ration to be fed in at least two meals per day (morning and evening) to reduce the chances of metabolic problems. In addition to including roughage in a complete ration, liquid molasses may be added at 5% of the ration to help stimulate intake and reduce the dustiness of the ration.

Table 4. Example feed rations containing co-product feeds.

Feed ingredients	High corn ration % as-fed	High co-product ration % as-fed
Cottonseed hulls ¹	18.0	15.0
Corn	55.8	20.0
Soybean meal, 48%	17.5	—
Cottonseed meal, 41%	—	5.0
Corn gluten feed	—	30.0
Soybean hulls	—	26.5
Molasses	5.0	—
Limestone	1.6	2.0
Dicalcium phosphate	0.6	—
Trace mineralized salt	1.0	1.0
Vitamin premix	0.5	0.5
Nutrients	% Dry matter	% Dry matter
CP	16	15
TDN	78	74
Calcium	0.90	0.95
Phosphorus	0.45	0.47

¹Replacing cottonseed hulls with coarsely chopped hay may increase the CP and TDN of the ration.

Usage of co-product feeds such as soybean hulls and corn gluten feed can help reduce the cost of the ration. Using a high percentage of these feeds in the diet will limit energy intake and, therefore, bulls will likely gain at a reduced rate as compared to a high-starch diet. Feed cost of gain must be considered in evaluating the economics of developing bulls. Table 4 illustrates two examples of feed rations for bulls. The options are not limited to these examples, and feed ingredients from local feed dealers will determine the final ration. In addition, most commercial feed manufacturers also have feed rations for growing bulls.

If bulls are not performing as expected and the temperature has not been at either extreme, feed bunk and water trough management should be evaluated because water and feed intake may be the culprit. Feed bunks must be kept clean of stale or moldy feed. Feed intake is correlated with water intake, and feed intake could be reduced if the water trough is not kept clean.

The final step in developing bulls on a high-grain diet is stepping the bulls down prior to market or turning out to pasture. The last thing a buyer wants is to see a bull lose condition rapidly after being turned out to pasture. A step-down approach could be taken in an opposite manner as the step-up approach; decrease ration intake by 15% to 20% each week over several weeks until the bulls are consuming forage alone or forage plus a supplement. Moving the bulls to a larger lot and increasing the distance between feed and water resources will increase activity and help recondition the bulls for pasture.

Observation of bulls during the breeding season is an essential part of proper bull management. Besides identifying bulls that do not display adequate libido or bulls that become injured during the breeding season, close observation is important for recognizing when bulls become too thin. During the breeding season, hand feeding may be necessary to ensure that bulls maintain adequate condition for active breeding.

Development Considerations for Yearling Bulls

Many seedstock producers opt to market bulls as yearlings instead of holding them to two years of age and incurring additional development costs and risks. Using bulls first as yearlings rather than as older sires also has the advantage of lowering the generation interval. This is important from a genetic improvement standpoint as it speeds progress for genetic improvement in economically relevant traits.



Young bull in ideal body condition for the start of the breeding season.

Yearling bulls still have a lot of growth and development ahead of them and should be managed differently than older bulls. The extra activity of bulls during the breeding season may result in some body condition loss. It may be difficult to supplement bulls separately from the remainder of the herd, so bulls should be fed to go into the breeding season in at least good body condition (body condition score = 6) but not be excessively fat.

Yearling bulls can lose significant amounts of weight during their first breeding season. They must gain this weight back and continue to grow before the next breeding season. It is important to observe growing bulls closely for changes in body condition. Adjustments to the feeding programs can then be made in a timely manner. A good target is for a two-year-old bull to weigh approximately 75% of his expected mature weight.

Bull Health

When considering the proper vaccination protocol for breeding bulls, it is good to know which diseases can lead to reproductive problems. High reproductive efficiency is the most economically important factor for success in a cow-calf enterprise. Diseases that can result in abortion, infertility and reproductive performance in the cow herd include leptospirosis, IBR, BVD, vibriosis and trichomoniasis. Consider vaccinating breeding bulls for these diseases.

✓ **Leptospirosis** is a bacterial disease that can cause late-term abortions in pregnant cows. Once the urinary and reproductive tracts become infected, the bacteria can be shed in urine, uterine discharge, semen and aborted fetuses/placentas. This shedding allows herd mates to become infected, resulting in decreased production and reproductive performance in the herd.

✓ **IBR** (Infectious Bovine Rhinotracheitis) can lead to several forms of clinical disease. Syndromes caused by the IBR virus can be grouped as respiratory tract infections, eye infections, abortions, genital infections, neurological infections and a generalized infection of newborn calves.

✓ **BVD** (Bovine Viral Diarrhea) virus can have several possible disease outcomes in infected cattle. Bovine Viral Diarrhea causes a wide variety of clinical syndromes in cattle including infertility, congenital abnormalities (eye defects, brain defects), abortion and stillbirths in calves. If a calf is infected in the uterus during a particular period of gestation, it can develop what is known as a persistent infection or PI. These calves are immunotolerant of the disease carrying the disease without noticeable clinical signs, and they become persistently infected shedders of BVD virus for the rest of their lives. A PI calf can also develop a syndrome known as mucosal disease, which can produce high mortality in calves and yearling cattle. Severe signs are noted with mucosal disease such as high fever, poor appetite, dehydration, diarrhea and erosive lesions in the gut (mouth to anus). Bovine Viral Diarrhea infections have also been linked to respiratory disease (pneumonia), as well as a hemorrhagic syndrome (failure of blood to clot normally) in cattle. The description of the clinical syndromes noted above is over simplified from what is known to occur in nature. However, it does point out the exceptionally complicated nature of this disease.

✓ **Vibriosis** (Campylobacteriosis) typically causes most of the performance loss during the breeding season leading to infertility and loss of early pregnancies. Characteristic clinical signs of this disease would include a high percentage of cows in the herd returning to heat during the breeding season. They may also show prolonged or irregular estrus periods. As a result, many cows will calve later due to repeated breeding caused by infection. Infrequently, cows may abort between four and eight months of a *Campylobacter* infection.

✓ **Trichomoniasis** is a venereal disease of cattle caused by a protozoan parasite, *Tritrichomonas foetus*. Like most venereal diseases of domestic animals, trichomoniasis has few adverse effects in the bull. The cows and heifers tend to suffer the consequences of the infection. The disease causes virtually no outward signs of illness. Therefore, it can often be present in a herd for a considerable

time before it is suspected and diagnosed.

Trichomoniasis can lead to infertility and early embryonic death causing the cow to return to heat and subsequently extending the breeding season. This causes devastating production losses due to poor calf crops and prolonged calving seasons. In bulls, the organism lives on the tissue lining of the penis and prepuce (sheath). Bulls less than four years of age tend to clear themselves of the infection, while those four years and older are often infected for life.

A local veterinarian can make specific recommendations for developing a proper vaccination protocol for the herd. He or she has the most complete information on disease problems in the area and knows the circumstances on a particular farm or ranch. An individualized approach to disease risk and management is the most effective.

Performing a breeding soundness evaluation (BSE) prior to marketing or the breeding season is one tool that helps ensure that only bulls with a high likelihood of successful breeding will be sold or used. Breeding soundness is very important in herds of all sizes, regardless of the number of bulls used. Very few bulls are completely sterile, but most have a fertility level that ranges from very high to very low. A BSE simply tries to determine which bulls will not perform satisfactorily for potential culling from the herd. Approximately one in five bulls will not pass a BSE. A breeding soundness evaluation performed by a veterinarian one or two months prior to the breeding season is an important management procedure. This involves a complete physical examination, a scrotal circumference measurement and a semen evaluation of the bull. Scrotal size is directly correlated with actual volume of sperm production. In addition to a BSE, observing the bull during service is necessary for monitoring cow cycling activity and ensuring that cows are being serviced timely and properly.

Deworm and delouse bulls before the development period and before they are turned into the pasture for the breeding season. Internal parasites can negatively affect growth and performance. Approximately 40 products can be used to treat cattle for parasites. Choices are usually made dependent on price and formulation. Cost is primarily a function of active ingredients (generally, the higher the price, the better the worm kill). Producers should try to treat bulls at least twice a year for internal parasites – once in the spring and once in the fall. If cattle are infected with liver flukes, choose a dewormer that is labeled for flukes and deworm those

animals in the fall of the year. Always remember to use all products as specified on the label. If the dose is cut or the product is given in a manner not indicated on the label, the presence of the active ingredient at the site of the parasites will be diminished. In other words, the product may not work as well if improperly handled and administered.

Coccidiosis is another internal parasite that can negatively affect the performance of bulls. This parasite is transmitted orally through water troughs, feed bunks or hay/grain that is contaminated with infected feces. This pathogenic organism likes to live and propagate in moist areas; therefore, muddy areas around feed bunks or in shady areas of the pasture may bring about this disease. This parasite typically affects young animals; thus, young bulls being reared together in a drylot situation may be exposed to this disease. The disease causes a decrease in appetite, weight loss, diarrhea with or without blood, dehydration, straining to defecate and death. Coccidiosis is treatable with sulfa-antibiotics and amprolium. If coccidiosis is a problem in a herd, prevention can be achieved through addition of amprolium, deconquinate or ionophores to the water/feed source. Producers may also work to control the amount of muddy/moist areas in the pasture.

Producers should also consider the capacity of their bull during a limited breeding season. Age of the bull will play a major role in the number of cows that he is expected to cover successfully during this time. Table 5 shows the typical number of cows that a bull can be expected to serve based on his level of maturity.

Table 5. Bull capacity in pasture and pen breeding systems.

Age of bull	Number of cows to be served	
	Pasture breeding	Pen breeding
15 months	15-20	20-25
24 months	20-25	25-35
Mature	25-35	35-50

Marketing Bulls

At the conclusion of a bull development program, bulls are ready for use or sale as herd sires. There are several options for marketing bulls including private treaty sales and production sales. Certain factors

should be considered no matter what marketing approach is used. Successful marketing programs rely upon breeder reputation, advertising effectiveness, amount and credibility of information presented to prospective buyers, product value, degree to which the product fits the customer's needs and level of customer service offered. According to the Beef Improvement Federation, seedstock breeders should provide the following information to prospective buyers:

- ✓ Adjusted birth weight, ratio and EPD/ACC
- ✓ Adjusted 205-day weight, ratio and EPD/ACC
- ✓ Adjusted yearling weight, ratio and EPD/ACC
- ✓ Number of contemporaries at weaning and yearling
- ✓ Sire
- ✓ Maternal grandsire
- ✓ Breed or breed composition

Additional pedigree information, performance results, carcass ultrasound scan results and EPDs for other economically relevant traits should be provided if available. Results of recent breeding soundness evaluations along with background information on nutritional and herd health programs are frequently of interest to potential buyers as well.

Seedstock producers should assist potential buyers with selection decisions by (1) considering the production goals of the customer, (2) matching bulls to the customer's current cow herd, (3) recommending specific animals for purchase and (4) justifying the recommendations in terms of genetic improvement. The seller may need to ask specific questions about the customer's herd and goals to make informed purchasing recommendations. In some instances, it may be worthwhile to visit the customer's operation.

Maintaining a high level of customer service after the sale can be an effective customer satisfaction tool for increasing in the number of repeat buyers. Customer service can involve delivering bulls to customers, answering bull management questions, providing breeding guarantees and offering calf buy-back programs. Breeders who are successful in establishing and maintaining a good reputation for producing quality seedstock and meeting the needs of

their customers will have a significant advantage over breeders who do not.

Summary

Bull development programs involve carefully planned animal selection, nutritional management, and herd health programs. Properly managing bulls during the development phase will make the transition to the breeding pasture much smoother. Maintaining an acceptable balance between program

quality and cost-effectiveness is important. Marketing programs should be designed to reap the rewards of a successful bull development program and develop a strong customer base. For more information on development programs for beef bulls, contact your county Extension office.

References

Beef Improvement Federation. 2002. Guidelines for Uniform Beef Improvement Programs. 8th ed.

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