

Performance Testing Bulls on the Farm

Bryan Kutz
Instructor/Youth
Extension Specialist -
Animal Science

Importance of Performance Testing

Proper bull selection is the most rapid way to make genetic improvements to the cattle herd. Performance testing provides valuable information that can be used in selection of superior breeding animals. Evaluation of performance traits is part of a complete bull evaluation that will help match the needs of the cow herd with the right herd sires. Structural soundness and health should be evaluated along with performance data and Expected Progeny Differences. This information can also be useful in marketing bulls. Data from an on-farm test, combined with breed association record programs, provide prospective buyers with good indications of underlying genetic merit for traits measured.

On-farm tests evaluate the postweaning performance of beef bulls under uniform conditions. A contemporary group is a group of animals of similar age, sex and breed composition raised under the same management conditions. When used in conjunction with breed association record programs, on-farm test reports can be completed with little additional work beyond completion of breed association records.

Which Bulls Should Be Tested?

Bulls being considered for sale as breeding animals or being incorporated into a breeding program are potential candidates for performance testing.

Bulls should be evaluated at weaning for structural soundness and conformation. Bulls with poor feet, legs or eyes may not perform well in a pasture breeding scenario and may need to be culled at weaning. Bulls to be tested should have a weight per day of age of greater than two pounds per day. At least five bulls should be tested to allow each bull's performance to be compared to the average performance for the group.

Preweaning Records Required

The success of an on-farm bull test is largely dependent on proper record-keeping. Calves should be properly identified (unique ear tag, tattoo, brand or combination) at birth. Calf identification number, calf birth dates, dam identification number, dam birth date, sire identification number and calf birth weights should be recorded. Weaning date and actual weaning weight should also be recorded at weaning. Adjusted 205-day weaning weights can then be calculated using the following formula:

$$\text{Adjusted 205-day weaning weight} = [(\text{weaning weight} - \text{birth weight}) \div \text{weaning age in days}] \times 205 + \text{birth weight} + \text{age-of-dam weaning weight adjustment}$$

Beef Improvement Federation age-of-dam weaning weight adjustment factors are shown in Table 1; however, breed association age-of-dam adjustment factors should be used whenever possible.

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Table 1. Classification of age-of-dam and associated male weaning weight adjustment factors

Age-of-dam range (days)	Age-of-dam (years)	Male weaning weight adjustment factor (pounds)
Less than 1,004	2	+60
1,004 to 1,338	3	+40
1,339 to 1,703	4	+20
1,704 to 3,561	5 to 9	0
3,562 to 3,926	10	0
3,927 to 4,292	11	+20
4,293 to 4,657	12	+20
More than 4,657	13	+20

Example 1: A bull calf weighing 80 pounds at birth was born on February 1. The calf was weaned on September 10 when he was 221 days old and his dam was 1,640 days old. The actual weaning weight of the calf was 550 pounds. From Table 1, the age-of-dam is 4 years, and the applicable age-of-dam weaning weight adjustment is +20 pounds.

$$\text{Adjusted 205-day weaning weight} = [(550 - 80) \div 221] \times 205 + 80 + 20 = \mathbf{536 \text{ pounds}}$$

Types of Tests

There are two types of on-farm performance tests for bulls: a **feed-based test** and a **forage-based test**. The feed-based test simulates a feedlot or finishing program, while the forage-based test relies more on pasture and hay. Choose the test that best fits your resources and marketing plan.

Feed-Based Test

Feed-based tests should be considered when:

- Bulls are marketed as yearlings.
- Feed mixing and feeding facilities are available.
- A dependable feed supply is available at a reasonable cost.

Forage-Based Test

Forage-based tests should be considered when:

- Bulls are marketed at 18 months of age or older.
- A year-round supply of high-quality forages is available.
- Pastures have adequate fencing and water sources.

Guidelines for On-Farm Tests

When Should Bulls Be Placed on Test?

Calves within a contemporary group should have a **maximum age range of 90 days**. Feed-based tests provide animals with high levels of energy intake and take a minimum of 112 days to complete. The recommended age range for bulls starting a feed-based test is **208 to 298 days**. This puts the average age of the bulls at approximately 365 days at the conclusion of the test. **Forage-based tests** provide animals with moderate levels of energy intake and take **168 days** to complete. The recommended **minimum age** for bulls starting a forage-based test is **232 days**. This test records an adjusted 452-day long yearling weight at the conclusion of the test.

Getting Bulls Ready to Test

Bulls enrolled in an on-farm bull test are not only being compared with one another for growth performance and other economically important traits, but they are also being developed into young breeding animals. At the conclusion of the test, bulls should be uninjured, thrifty and in good condition. An injured, sick or dead bull will chip away at profits. There is a financial investment in producing bulls to the postweaning stage. These bulls may either be used in future breeding programs or sold as market animals, in the case of bulls that are injured or are inferior potential breeders. Bulls will generally return more on the initial investment if they are used in the farm's breeding program or sold as breeding animals rather than as market animals. Thus, it is important to ensure the health of the bulls on test.

Proper calfhood and postweaning vaccination programs are vital to an effective herd health program. Recommended preweaning vaccinations include 7-way blackleg, IBR-BVD-PI3-BRSV and 5-way leptospirosis. *Pasteurella* and *Haemophilus somnus* may also be included in a vaccination program. Vaccinations and boosters should be administered according to product label recommendations and Beef Quality Assurance guidelines. Calves should also be dewormed at or near weaning. Calves on forage-based tests should be dewormed at least one additional time during the growing period. Visit with a local veterinarian about a health program for growing bulls. Bulls need to be healthy when entering the on-farm performance testing program. If performance differences result from sickness, an accurate comparison of the genetic potential for postweaning performance of a sick bull versus a healthy bull may not be made.

The paddock or pasture in which the on-farm test will be conducted should be free of hazards such as stray barbed wire or nails. It is also useful to

precondition bulls prior to the test by giving them time to complete a “bawling out” period and training them to eat from a bunk and drink from a waterer, if they will be using bunks or waterers during the test.

Preventing digestive upset in bulls on-test is a concern that should be addressed before the testing period even begins. For the **feed-based test**, a **minimum three-week warm-up period** for bulls to adjust to the test ration is vital to maintaining the digestive integrity of the animals. Bulls should be slowly adapted to the test ration by starting them off with a small amount (5 to 10 pounds per head per day). Increase the amount of the test ration by approximately 1 pound per head per day until the bulls eventually start leaving feed in the trough. At the same time, slowly decrease the amount of roughage (hay) offered to shift from a roughage-based diet to a concentrate-based diet. For the **forage-based test**, a **two- to three-week warm-up period** should be utilized during which bulls are gradually shifted from their pretest nutritional program to the test nutritional program. This allows time for bulls to adjust to the forage and supplementation program before initial test weights are taken. For both types of tests, make sure the bulls have access to clean water and shade at all times.

Nutrition

Nutritional programs should provide adequate levels of protein and energy to allow for expression of genetic differences in growth among bulls. Your county Extension agent or an Extension specialist can work with you to formulate a proper bull test ration. Mineral and vitamin requirements need to be considered in ration formulation. Mineral supplementation is critical to the forage test, as many forage programs in Arkansas will not meet the mineral requirements of growing bulls without supplementation. Forage samples should be tested for nutritional quality so a ration can be formulated to most accurately meet the nutrient needs of the bulls for the desired level of growth performance. For the feed-based test, test rations with 60 to 70 percent total digestible nutrients on an as-fed basis should be fed free-choice. If a test ration with 60 to 70 percent total digestible nutrients on an as-fed basis is provided as part of the forage-based test, it should be limit-fed at a rate of 1 to 1.5 percent of body weight. Negative associative effects of high starch supplements (corn) on forage fiber digestion must be considered when selecting a supplement for forage-based tests.

A backup feed supply should be available in case supply declines to inadequate levels. Limit grazing time and start feeding the backup feed before forage available for grazing runs out. When forage supply is inadequate and bulls are constantly hungry,

they may spend more time fighting with each other. Risk of injury to bulls increases when they fight or ride one another. This can be a problem during forage tests because of the advancing age of bulls. Fighting may be minimized by providing a backup forage supply or offering supplemental feed during periods when forage supply limits intake. Change from grazing to feed gradually over a period of two to three weeks to maintain digestive health.

Data Collected

Data to be collected on each bull during the test includes:

- Number of animals in contemporary group
- On-test weight (initial test weight after warm-up period concludes)
- Bull weights every 28 days after initial weight
- Final test weight
- Yearling hip height
- Yearling scrotal circumference
- Ultrasound scan for carcass traits (optional)
- Daily feed intake (optional, used to calculate feed efficiency)

Weight

Weights and all other measurements should be taken on all calves on the same day. For example, instead of taking yearling weights as each calf reaches 365 days of age, weigh each calf when the average age of the contemporary group is 365 days. Initial and final test weights may be either shrunk or full weights. A single shrunk weight may be taken after a 12-hour removal from water and feed. If full weights are used, then initial and final weights should be taken on two consecutive days and averaged to minimize fill effects. Yearling weights should be adjusted to 365 days of age for the feed-based test and 452 days of age for the forage-based test. The formula for adjusted yearling weight is as follows:

$$\text{Adjusted 365- or 452-day yearling weight} = \frac{[(\text{final weight} - \text{on-test weight}) \div \text{number of days on test}] \times \{160 \text{ or } 247\} + \text{adjusted 205-day weaning weight}}$$

Average daily gain (**ADG**) can be calculated as:

$$\text{ADG} = (\text{final weight} - \text{initial weight}) \div \text{days on test}$$

Weight per day of age can be calculated anytime bulls are weighed using the following equation:

$$\text{Weight per day of age} = \text{weight} \div \text{age in days}$$

Ratios can be used to rank bulls within their contemporary groups for certain performance measures such as ADG, weight per day of age and adjusted yearling weight. For example, ADG ratio can be calculated as:

$$\text{ADG ratio} = (\text{ADG of bull} \div \text{average ADG of entire contemporary group}) \times 100$$

A ratio of 100 is equal to the average of the group. If a bull has an ADG ratio of 105, then his ADG is 5 percent higher than the average of his contemporaries.

Example 2: The bull from Example 1 was placed on a feed-based performance test. The bull weighed 575 pounds on October 1 at the start of the test. The test concluded after 112 days on January 21 when the bull was 354 days old. The bull weighed 1,000 pounds at the conclusion of the test. The average ADG for the contemporary group was 3.55 pounds per day.

$$\text{Adjusted 365-day yearling weight} = [(1,000 - 575) \div 112] \times \{160\} + 536 = \mathbf{1,143 \text{ pounds}}$$

$$\text{ADG} = (1,000 - 575) \div 112 = \mathbf{3.79 \text{ pounds per day}}$$

$$\text{Weight per day of age (at the conclusion of the test)} = 1,000 \div 354 = \mathbf{2.82 \text{ pounds per day of age}}$$

$$\text{ADG ratio} = (3.79 \div 3.55) \times 100 = 106.76$$

Hip Height

Frame score is used to describe the skeletal size of cattle. No single frame size is best for all nutritional resources, breeding programs and markets. Frame size is often one factor that buyers consider when selecting a bull. Hip height measurements can be converted to frame scores and are a useful tool for evaluating the lean-to-fat

ratio of an animal (Table 2). Although actual hip height may increase as an animal matures, most animals should maintain the same frame score throughout their life using appropriate growth/height curves. This allows one frame score to be used for an animal, regardless of when that animal's hip height is evaluated.

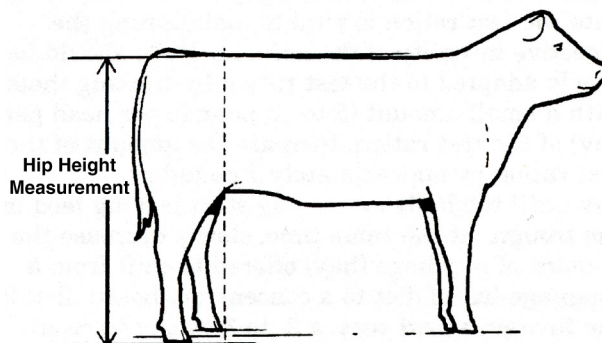


Figure 1. Recommended hip height measurement site.

The recommended site for hip height measurement is at a point directly over the hooks or hips of an animal (Figure 1). Care should be taken to ensure that the bull is standing on solid, level ground with his legs set firmly beneath him. This measurement should be adjusted to a yearling-age endpoint of 365 days for the feed-based test or 452 days for the forage-based test.

Table 2. Hip heights and frame scores for 5- to 21-month-old bulls

Age of bull (months)	Frame Score								
	1	2	3	4	5	6	7	8	9
5	33.5	35.5	37.5	39.5	41.6	43.6	45.6	47.7	49.7
6	34.8	36.8	38.8	40.8	42.9	44.9	46.9	48.9	51.0
7	36.0	38.0	40.0	42.1	44.1	46.1	48.1	50.1	52.2
8	37.2	39.2	41.2	43.2	45.2	47.2	49.3	51.3	53.3
9	38.2	40.2	42.3	44.3	46.3	48.3	50.3	52.3	54.3
10	39.2	41.2	43.3	45.3	47.3	49.3	51.3	53.3	55.3
11	40.2	42.2	44.2	46.2	48.2	50.2	52.2	54.2	56.2
12	41.0	43.0	45.0	47.0	49.0	51.0	53.0	55.0	57.0
13	41.8	43.8	45.8	47.8	49.8	51.8	53.8	55.8	57.7
14	42.5	44.5	46.5	48.5	50.4	52.4	54.4	56.4	58.4
15	43.1	45.1	47.1	49.1	51.1	53.0	55.0	57.0	59.0
16	43.6	45.6	47.6	49.6	51.6	53.6	55.6	57.5	59.5
17	44.1	46.1	48.1	50.1	52.0	54.0	56.0	58.0	60.0
18	44.5	46.5	48.5	50.5	52.4	54.4	56.4	58.4	60.3
19	44.9	46.8	48.8	50.8	52.7	54.7	56.7	58.7	60.6
20	45.1	47.1	49.1	51.0	53.0	55.0	56.9	58.9	60.9
21	45.3	47.3	49.2	51.2	53.2	55.1	57.1	59.1	61.0

Scrotal Circumference

Measurement of yearling scrotal circumference provides an indication of a bull's sperm-producing capacity. Scrotal circumference is also negatively correlated with age at puberty of a bull's daughters and female siblings. In other words, the daughters of a bull with larger scrotal circumference should reach puberty at an earlier age than the daughters of a bull with smaller scrotal circumference. Yearling scrotal circumference measurements should be taken at the end of the test or on the first weigh date after the bulls average 365 days of age.

Scrotal circumference should be measured in centimeters with a circular tape by palpating the testicles gently but firmly down into the bottom of the scrotum. Place the scrotal tape around the testicles close to the body, tighten loosely and slide carefully downward allowing the loop to enlarge until the largest scrotal circumference is obtained (Figure 2). Beef Improvement Federation minimum recommended scrotal circumferences at various ages appear in Table 3. It should be noted that **breed associations may recommend higher minimum scrotal circumferences than the ones listed in Table 3.** Breed differences in scrotal circumference may result from differences in rate of maturing. For example, smaller scrotal circumferences have been reported in young Brahman bulls when compared with British and Continental bulls of the same age.

Table 3. Minimum recommended scrotal circumference

Age of bull	Scrotal circumference (cm)
≤ 15 months	30
> 15 ≤ 18 months	31
> 18 ≤ 21 months	32
> 21 ≤ 24 months	33
> 24 months	34

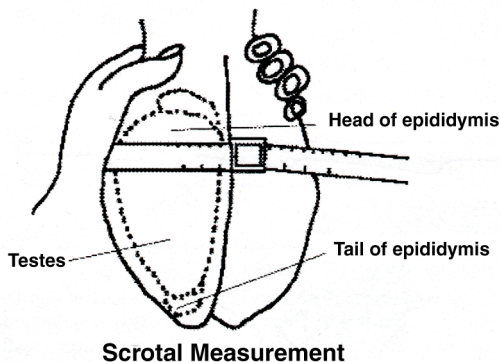


Figure 2. Scrotal measurement at the widest point on the scrotum.

Ultrasound Scanning for Carcass Traits

In recent years, ultrasound scanning for carcass traits has evolved as a useful tool for obtaining valuable carcass information from a live animal. Body composition traits that can be measured include 12th to 13th rib fat thickness, rump fat thickness, ribeye area and intramuscular fat percentage (marbling). Scanning locations on the live animal are illustrated in Figure 3. Intramuscular fat percentage is measured at position 1, ribeye area and rib fat thickness are measured at position 2 and rump fat thickness is measured at position 3. Each of these traits is at least moderately heritable and is significant in the determination of red meat quality and yield for individual animals. With information flow increasing throughout the beef industry, it is becoming increasingly important to learn as much as you can about how your animals and their progeny perform in the feedlot. Ultrasound scanning of bulls in a finishing environment provides information for a live potential breeding animal and will help you to produce calves that fit market specifications.

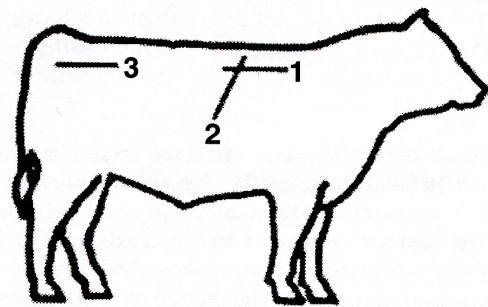


Figure 3. Ultrasound scanning locations on the live animal.

Yearling bulls can be scanned at approximately 365 days of age to provide a good indication of how sibling steer and heifer mates will perform on the rail. Each breed association has established a window for age at scanning that must be complied with in order for the data to be used in the national cattle evaluation. A certified technician can perform this service for a fee. This often needs to be scheduled well in advance of the desired scanning date. Many breed associations have additional breed specific ultrasound guidelines and publish a list of technicians who are certified for the particular breed. It may be advantageous for several producers interested in having their bulls scanned to arrange for a technician to service multiple farms in one area in one trip. This may help lower the cost of scanning for an individual farm by spreading the travel costs of the technician out across several farms.

Other Considerations

At the conclusion of the test and prior to utilizing a bull in a breeding program or selling a bull, a breeding soundness evaluation (**BSE**) should be per-

formed. A BSE is a practical method for identifying bulls with less than satisfactory breeding potential. A breeding soundness evaluation consists of a physical examination, scrotal circumference measurement and semen evaluation. Your local veterinarian can perform a BSE on your bulls.

Developing bulls from weaning to yearlings on rations and pastures can be costly. Keeping records of costs associated with developing bulls will help in determining a market price that will cover the costs of bull development. Sometimes it may be tempting to sell bulls enrolled in a performance test during the actual testing period. By waiting until the completion of the test to sell a bull off the test, you will gain valuable information and will increase the accuracy of the performance information for the other bulls in the test. In addition, bulls sold right off a performance testing program, particularly a feed-based test, and placed immediately in a pasture breeding situation may not adapt well to the sudden change in diet. Just as the “warm-up” period was important for starting bulls on a performance test, bulls can benefit from a four- to six-week “hardening” period off a feed-based test to readjust to a forage-based diet. Reducing grain intake and increasing exercise prior to cow herd exposure can facilitate reproductive performance.

For a bull test to be most effective in separating bulls based on genetic potential for growth performance, **it is important that bulls placed on test remain on test throughout the duration of the test.** The main objective of an on-farm bull test is to evaluate postweaning performance of bulls under uniform conditions. Data collected from bulls that do not complete the test cannot be used in comparisons with the animals that remained on test for the duration of the testing period. Removing bulls from the contemporary group lowers the value of the test and can bias

the results, especially if high- or low-performing bulls are removed. Removing low-performing bulls from the test based on interim test weights may increase the test average for growth performance; however, the performance of the high-performing bulls will then be closer to the average of the group.

To Farm Test Bulls

Contact your county Extension agent if you are interested in participating in or learning more about on-farm bull-testing programs in Arkansas. Your Extension agent and an Extension specialist will consult with you regarding bull-testing program guidelines and coordinate your on-farm bull performance test. Participating in an on-farm bull-testing program can provide valuable selection and marketing information that can help improve the genetics of your herd, increase the amount of information available to prospective bull buyers and increase the value of the bulls you sell.

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BRYAN KUTZ is instructor/youth extension specialist - animal science, with the University of Arkansas Division of Agriculture, Department of Animal Science, Fayetteville.

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