Texas A&M AgriLife Extension

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# Texas Adapted Genetic Strategies for Beef Cattle X:
# Frame Score, Frame Size, and Weight

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Body size is an important genetic factor in beef cattle production. Historically, size was first estimated by measurements such as height or length. As scales were developed, weight became more common as a measure of size. Although measurement and weight are related, their rates of maturity differ. By 7 months of age, cattle reach about 80 percent of mature height but only 35 to 45 percent of mature weight. At 12 months, about 90 percent of mature height is reached, compared with only 50 to 60 percent of mature weight.

## Frame scores

Beef Improvement Federation (BIF) Frame Scores, a method of estimating skeletal size based on hip height, are shown in Table 1. Frame scores represent differences in height at the same age of about 2 inches. Values in the chart represent averages of thousands of cattle, but individual animals may vary in how they change in height while growing.

Heights should be determined on the topline directly over the hips or hooks (Fig. 1). The most common device for determining height is a measuring stick, available through some livestock supply companies. It consists of a cross-arm (with a bubble level) attached in a 90-degree angle to an upright containing a rule. Figure 2 depicts measuring hip height with such a device.

The chart lists only six scores but may be expanded either way for individuals outside the listed values. Formulas in the chart can be used to calculate scores for animals

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Texas Adapted Genetic Strategies

Table 1. Cattle Frame Scores based on hip height in inches[1].

| Males[2] | | | | | | | Females | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Frame Score[3] | | | | | | | Frame Score[3] | | | | | |
| Age in months | 3.0 | 4.0 | 5.0 | 6.0 | 7.0 | 8.0 | Age in months | 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 | 5 | 37.2 | 39.3 | 41.3 | 43.4 | 45.5 | 47.5 |
| 6 | 38.8 | 40.8 | 42.9 | 44.9 | 46.9 | 48.9 | 6 | 38.2 | 40.3 | 42.3 | 44.4 | 46.5 | 48.5 |
| 7 | 40.0 | 42.1 | 44.1 | 46.1 | 48.1 | 50.1 | 7 | 39.2 | 41.2 | 43.3 | 45.3 | 47.4 | 49.4 |
| 8 | 41.2 | 43.2 | 45.2 | 47.2 | 49.3 | 51.3 | 8 | 40.1 | 42.1 | 44.1 | 46.2 | 48.2 | 50.2 |
| 9 | 42.3 | 44.3 | 46.3 | 48.3 | 50.3 | 52.3 | 9 | 40.9 | 42.9 | 44.9 | 47.0 | 47.0 | 51.0 |
| 10 | 43.3 | 45.3 | 47.3 | 49.3 | 51.3 | 53.3 | 10 | 41.6 | 43.7 | 45.7 | 47.7 | 49.7 | 51.7 |
| 11 | 44.2 | 46.2 | 48.2 | 50.2 | 52.2 | 54.2 | 11 | 42.3 | 44.3 | 46.4 | 48.4 | 50.4 | 52.4 |
| 12 | 45.0 | 47.0 | 49.0 | 51.0 | 53.0 | 55.0 | 12 | 43.0 | 45.0 | 47.0 | 49.0 | 51.0 | 53.0 |
| 13 | 45.8 | 47.8 | 49.8 | 51.8 | 53.8 | 55.8 | 13 | 43.6 | 45.5 | 47.5 | 49.5 | 51.5 | 53.5 |
| 14 | 46.5 | 48.5 | 50.4 | 52.4 | 54.4 | 56.4 | 14 | 44.1 | 46.1 | 48.0 | 50.0 | 52.0 | 54.0 |
| 15 | 47.1 | 49.1 | 51.1 | 53.0 | 55.0 | 57.0 | 15 | 44.5 | 46.5 | 48.5 | 50.5 | 52.4 | 54.4 |
| 16 | 47.6 | 49.6 | 51.6 | 53.6 | 55.6 | 57.5 | 16 | 44.9 | 46.9 | 48.9 | 50.8 | 52.8 | 54.8 |
| 17 | 48.1 | 50.1 | 52.0 | 54.0 | 56.0 | 58.0 | 17 | 45.3 | 47.2 | 49.2 | 51.1 | 53.1 | 55.1 |
| 18 | 48.5 | 50.5 | 52.4 | 54.4 | 56.4 | 58.4 | 18 | 45.6 | 47.5 | 49.5 | 51.4 | 53.4 | 55.3 |
| 19 | 48.8 | 50.8 | 52.7 | 54.7 | 56.7 | 58.7 | 19 | 45.8 | 47.7 | 49.7 | 51.6 | 53.6 | 55.5 |
| 20 | 49.1 | 51.0 | 53.0 | 55.0 | 56.9 | 58.9 | 20 | 46.0 | 47.9 | 49.8 | 51.8 | 53.7 | 55.6 |
| 21 | 49.2 | 51.2 | 53.2 | 55.1 | 57.1 | 59.1 | 21 | 46.1 | 48.0 | 50.0 | 51.9 | 53.8 | 55.7 |
| Mature | 52.3 | 54.1 | 55.9 | 58.0 | 60.0 | 62.0 | Mature[4] | 48.2 | 50.0 | 52.0 | 53.9 | 55.8 | 57.5 |
| Frame Score (5–21 months) = 0.4878 (ht) - 0.0289 (days of age) + .00001947 (days of age)$^2$ + 0.0000334 (ht) (days of age) - 11.548 | | | | | | | Frame Score (5–21 months) = 0.4723 (ht) - 0.0239 (days of age) + 0.0000146 (days of age)$^2$ + 0.0000759 (ht) (days of age) -11.7086 | | | | | | |
| Steer slaughter weight[5] | 1,000 | 1,100 | 1,200 | 1,300 | 1400 | 1,500 | Heifer slaughter weight[5] | 900 | 1,000 | 1,100 | 1,200 | 1,300 | 1,400 |
| Mature bull weight[6] | 1,570 | 1,730 | 1,890 | 2,050 | 2,200 | 2360 | Mature cow weight[7] | 1,000 | 1,100 | 1,200 | 1,300 | 1,400 | 1,500 |

[1]Approved by the Beef Improvement Federation.
[2]Steers continue growth longer than bulls, being about ½ to 1 inch taller at 18 to 21 months.
[3]USDA Medium Frame Size is a Frame Score of approximately 4.0 to 5.5.
[4]If calved first at 2 years old. Add 1 inch if calved first at 3 years.
[5]At 0.5 inch fat cover.
[6]At 12 months, bulls weigh 50 to 60% of this mature weight, under most development programs.
[7]Moderate body fatness, cow Body Condition Score 5 (where 1 = extremely thin and 9 = obese; cow weight varies 7% to 8% per condition score and up to 10% for extremes in muscling). For breeding at 14 to 15 months, heifers should weigh 60 to 65% of this mature weight.

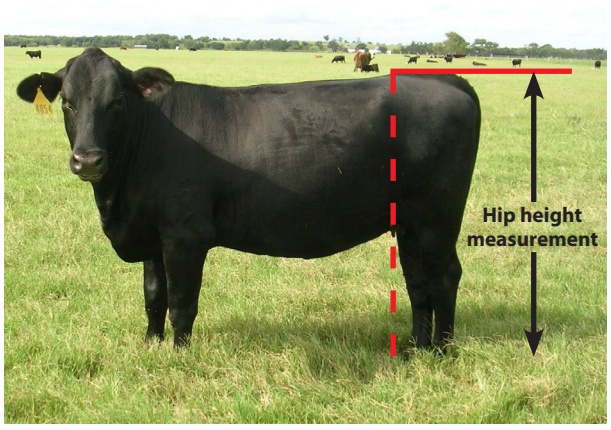


Figure 1. Determine height by measuring to the topline directly over the hip or hooks.

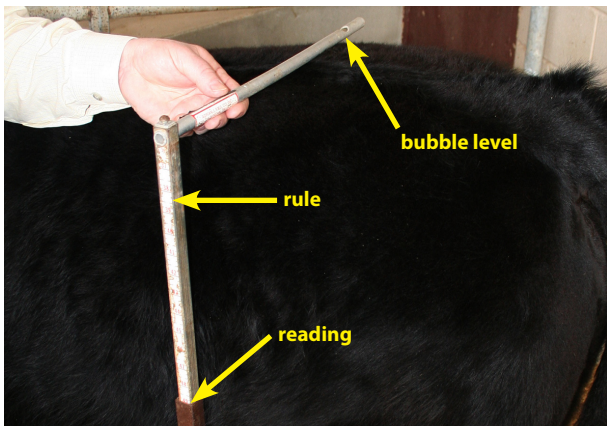


Figure 2. A measuring stick is the most common tool for determining height.

5 to 21 months of age, although 12 months is probably most useful for determining Frame Score. Variation in angularity of skeletal junctions influences height, so Frame Score is not an exact measure of skeletal dimension. But Frame Score is the simplest, most useful method for estimating relative skeletal size.

## Frame size

The U. S. Department of Agriculture–Agriculture Marketing Service Standards for Grades of Feeder Cattle include evaluation of frame (skeletal) size, body thickness, and thriftiness (evidence of health). A depiction of Frame Size by the USDA is shown in Figure 3. Frame Size relates to projected weight after finishing to carcass fat cover at the

**Figure 3. Frame Size can differ among cattle of the same age.**

12th rib of 0.5 inch. According to the standards, Medium Frame steers are projected to finish at 1,100 to 1,250 pounds. Small Frames are projected to finish below that range and Large Frames above. Heifers are projected to finish at 100 pounds less than their genetically equivalent steer mates.

## Skeletal size, body weight, and composition

Weight is often used to characterize body size. But a mature cow weighing 1,200 pounds in medium fatness or body condition weighs about 900 pounds when extremely thin and 1,600 pounds when extremely fat. So, if weight is to be used as an accurate measure of size, it must include consideration of body condition.

When Frame Scores were first developed in the 1970s, some guidelines related it to weight. The most common figure was that a finished steer with a Frame Score of 5 (at 0.5 inch fat) weighed 1,200 pounds, with a change of 100 pounds for each variation in Frame Score. The weight of mature cows in medium body condition (those with a Body Condition Score of 5) averages about the same as that of genetically equivalent steers with 0.5 inch fat. Mature bulls weigh about 55 to 60 percent more than cows of the same Frame Score. For a complete discussion of the body condition 1 through 9 scoring system, consult Texas AgriLife Extension publication B-1526, *Body Condition, Nutrition and Reproduction of Beef Cows.*

Research is limited relating Frame Score to weight. Iowa State University reported results on over 4,000 records of females contained in the American Angus Association database. In their analysis, a mature (4- to 7-year-old) cow with mid-5 Frame Score in mid-5 BCS averaged 1,245 pounds. Weight varied about 95 pounds for each Frame Score from 4 to 7.

The U. S. Meat Animal Research Center analyzed data from 5-year-old cows of 12 breed groups ranging from 4 to 6 in Frame Score. Angus cows of mid-5 Frame, mid-5 BCS averaged 1,222 pounds. However, across the entire 12 breed groups, the average was 1,282 pounds, with a range of 113 pounds per Frame Score.

In addition to variation in body condition, muscularity affects weight at a particular Frame Score. As an example, in the Meat Animal Research Center study, mid-5 Frame, mid-5 BCS Limousin weighed 1,365 pounds. Also, cattle can have relatively shorter legs (or longer) in relation to their body size, which affects the relationship of Frame Score and weight.

Overall, mature cows with mid-5 Frame Scores in mid-5 BCS appear to weigh on average about 1,250 pounds (or 1,200 pounds for Frame Score 5.0) with about a 100-pound variation per Frame Score. Since USDA Medium-Frame slaughter steers weigh 1,100 to 1,250 pounds, this equates to Frame Scores of probably low 4 to mid 5. Small-Frame steers weighing 950 to 1,100 pounds are probably mid Frame Score 2 through 3. And Large-Frame steers weighing 1,250 to 1,400 pounds are probably upper Frame Score 5 through 6. Frame Score 7 and higher should probably be called Very Large.

The most useful measure of body size is weight at a particular level of fatness or condition, which also accounts for differences in muscling, a shortcoming of the Frame Score system. Frame Score is perhaps most useful as a **predictor** of future weights at slaughter, puberty, and maturity rather than as a measure of body size.

## For further reading

To obtain other publications in this Texas Adapted Genetics Strategies for Beef Cattle series, contact your county Extension office or see the Extension Web site *http://AgriLifebookstore.org* or the Texas A&M Animal Science Extension Web site *http://beef.tamu.edu*.

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