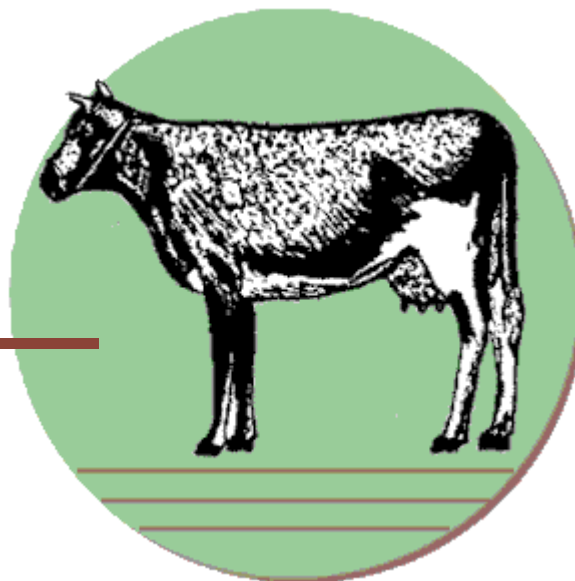


FRAME SCORES AND FEEDER CATTLE GRADES

Ron Torell
Ben Bruce
J. Don Dansie



Introduction

For an efficient cow calf operation, estimates of cow performance can help plan management strategies. Frame scores are one way that producers can predict performance of their cattle. Frame scores project mature size, indicate carcass composition, and estimate performance potential and feed requirements.

Frame scores are classifications of skeletal size. Skeletal size indicates mature proportions and subsequently cattle growth patterns. Frame scores are objective number scores that typically range from 1 to 9. Hip height measurements adjusted for age calculates the numbers. With proper age adjustment, the frame score for the animal should be the same its entire life. This should hold true no matter at what age the measurements taken. This assumes that there will be proper nutrition and management for that animal. In real life situations, management or nutrition may not be consistent. Because of this, sometimes animals will change frame scores (usually no more or less than 1) in their lifetime.

Cattle with low frame scores are smaller and shorter. Cattle with this type of frame usually mature earlier and at lighter body weights. They finish for slaughter earlier and at lighter weights in the feedlot. Cattle with high numbered frame scores are taller and usually later maturing. They weigh more at maturity. They finish at higher weights in the feedlot, but they tend to gain faster and convert feed to gain better. They may not carry as much marbling. Which frame size is more desirable depends upon environmental conditions that the cattle are in as well as management goals and objectives. Figure 1 is an example of various frame sizes.

Frame Scores

The Beef Improvement Federation (BIF) in "Guidelines for Uniform Beef Improvement Programs" instructs measuring hip height at the hip directly over the hook bones (Figure2). A specially designed stick measures hip height. It has a bubble level on a sliding arm on a pole with scaled measurements. You can also use other



methods. It is important, however, that the animal is standing squarely and its head held in a normal position for any measuring technique used.



Figure 1. Three different frame scores.

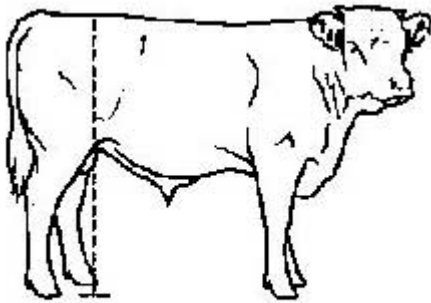


Figure 2. Proper Measurement Location for Hip Heights.

The BIF recommends age and dam adjustments when frame scoring at 205 and 365 days of age. For the 205-day weights, take hip height measurements between 160 and 250 days of age. For the 365 weight, cattle should be at least 330 days of age to take the measurements. Table 1 shows the proper adjustment factors for calf age and age of dam. For an example, a calf born on 1 March and weaned on 20 October with a 2-year-old dam that measured 43 inches would have an adjusted reading of:

$$\begin{aligned} \text{Adjusted height} &= \{ \text{actual height} + [(205 - \text{actual age}) * \text{calf age} \\ &\text{adjustment}] \} * \\ &\text{dam adjustment} \\ &= \{ 43 + [(205-234) * .033] \} * 1.02 \\ &= 42.9 \end{aligned}$$

Table 1. 205 day and 365 day Height Adjustment Factors and Formulas

Formulas

205 day Height: Adjusted Height = {actual height + [(205 - actual age)* age of calf adjustment]} * age of dam adjustment

365 day Height: Adjusted Height = {actual height + [(365 - actual age)* age of calf adjustment]}

Factors for Adjusting Weaning Height

| | bulls | heifers |
|-------------|-------------------|---------|
| Age of Calf | 0.033 | 0.025 |
| Age of Dam | | |
| | 2 and 13 or older | 1.02 |
| | 2 and 13 or older | 1.015 |

| | | |
|--------------|-------|-------|
| 3 and 12 | 1.015 | 1.015 |
| 4 and 11 | 1.01 | 1.01 |
| 5 through 10 | 1.00 | 1.00 |

Factors for Adjusting Yearling Height

| | | | |
|-------------|----------------|-------|---------|
| | | bulls | heifers |
| Age of Calf | under 365 days | 0.033 | 0.025 |
| | over 365 days | 0.025 | 0.025 |

Source: BIF Guidelines for Uniform Beef Improvement Programs, 1990

Calculations are similar for adjusting yearling weights with the exception of the age of the dam factor (not used).

The actual frame score is a conversion from the adjusted hip height and the animal's age. The frame score can be calculated by formula or read from a chart (Tables 2 and 3). Charts and formulas are different for each sex. In addition, some breed associations have developed their own charts and formulas that they consider more accurate for their respective breeds. For an example, choose a bull measuring 50 inches (adjusted) at 345 days of age. From the chart, he would be approximately a frame score six. The formula is more precise, but neither is accurate and unless proper measurement technique is used. Height is the adjusted height (see previous example) and days of age is the animal's age in days. The formula calculates as follows:

$$\begin{aligned}
 \text{Frame Score} &= -11.548 + 0.4878 (\text{Height}) - 0.0289 (\text{Days of Age}) + \\
 &0.00001947 \\
 &(\text{Days of Age})^2 + 0.0000334 (\text{Height}) (\text{Days of Age}) \\
 &= -11.548 + .04878 (49) - 0.0289 (345) + 0.00001947 \\
 &(345)^2 \\
 &+ 0.0000334 (49) (345) \\
 &= 5.77
 \end{aligned}$$

| Table 2. Frame score formulas and charts (in inches) for bulls. | | | | | | | | | |
|---|-------------|------|------|------|------|------|------|------|------|
| $\text{Frame Score} = -11.548 + .4878 (\text{Height}) - 0.0289 (\text{Days of Age}) + 0.00001947 (\text{Days of Age})^2 + 0.0000334 (\text{Height}) (\text{Days of Age})$ | | | | | | | | | |
| Age in 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 | 54.1 | 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 |

Source: BIF Guidelines for Uniform Beef Improvement Programs, 1990

Table 3. Frame score formulas and charts (in inches) for heifers.

$$\text{Frame Score} = -11.7086 + 0.4723 (\text{Height}) - 0.0239 (\text{Days of Age}) + 0.0000146 (\text{Days of Age})^2 + 0.0000759 (\text{Height}) (\text{Days of Age})$$

| Age in Months | Frame Score | | | | | | | | |
|---------------|-------------|------|------|------|------|------|------|------|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 5 | 33.1 | 35.1 | 37.2 | 39.3 | 41.3 | 43.4 | 45.5 | 47.5 | 49.6 |
| 6 | 34.1 | 36.2 | 38.2 | 40.3 | 42.3 | 44.4 | 46.5 | 48.5 | 50.6 |
| 7 | 35.1 | 37.1 | 39.2 | 41.2 | 43.3 | 45.3 | 47.4 | 49.4 | 51.5 |

| | | | | | | | | | |
|----|------|------|------|------|------|------|------|------|------|
| 8 | 36.0 | 38.0 | 40.1 | 42.1 | 44.1 | 46.2 | 48.2 | 50.2 | 52.3 |
| 9 | 36.8 | 38.9 | 40.9 | 42.9 | 44.9 | 47.0 | 49.0 | 51.0 | 53.0 |
| 10 | 37.6 | 39.6 | 41.6 | 43.7 | 45.7 | 47.7 | 49.7 | 51.7 | 53.8 |
| 11 | 38.3 | 40.3 | 42.3 | 44.3 | 46.4 | 48.4 | 50.4 | 52.4 | 54.4 |
| 12 | 39.0 | 41.0 | 43.0 | 45.0 | 47.0 | 49.0 | 51.0 | 53.0 | 55.0 |
| 13 | 39.6 | 41.6 | 43.6 | 45.5 | 47.5 | 49.5 | 51.5 | 53.5 | 55.5 |
| 14 | 40.1 | 42.1 | 44.1 | 46.1 | 48.0 | 50.0 | 52.0 | 54.0 | 56.0 |
| 15 | 40.6 | 42.6 | 44.5 | 46.5 | 48.5 | 50.5 | 52.4 | 54.4 | 56.4 |
| 16 | 41.0 | 43.0 | 44.9 | 46.9 | 48.9 | 50.8 | 52.8 | 54.8 | 56.7 |
| 17 | 41.4 | 43.3 | 45.3 | 47.2 | 49.2 | 51.1 | 53.1 | 55.1 | 57.0 |
| 18 | 41.7 | 43.6 | 45.6 | 47.5 | 49.5 | 51.4 | 53.4 | 55.3 | 57.3 |
| 19 | 41.9 | 43.9 | 45.8 | 47.7 | 49.7 | 51.6 | 53.6 | 55.5 | 57.4 |
| 20 | 42.1 | 44.1 | 46.0 | 47.9 | 49.8 | 51.8 | 53.7 | 55.6 | 57.6 |
| 21 | 42.3 | 44.2 | 46.1 | 48.0 | 50.0 | 51.9 | 53.8 | 55.7 | 57.7 |

Source: BIF Guidelines for Uniform Beef Improvement Programs, 1990

Frame scores help predict mature cow size. The larger the frame score, the higher the mature weight. The larger the size of the cow, the greater the nutrient demand. When there are sufficient nutrients available, reproductive rates are similar between frame sizes. However, if nutrition is short, such as in arid regions, a more moderate frame size will be more successful because they will be more likely to meet their nutrient needs. This is also important in heifer development programs, more moderate frame size will reach puberty easier.

Feeder Cattle Grades

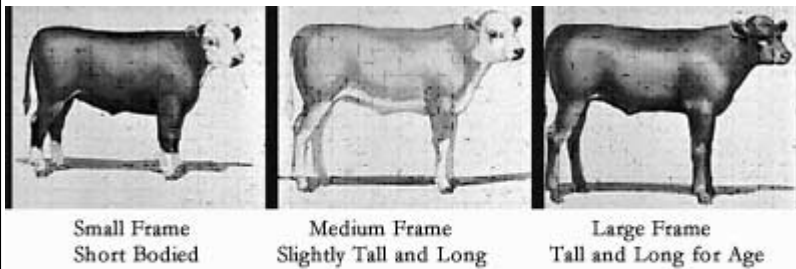


Figure 3. Feedlot Feeder Cattle Frame Scores.

Large frame scores also indicate feedlot performance. Large framed animals grow faster, take longer to finish and have heavier slaughter weights. The USDA feeder cattle grading system is based on frame scores and muscle thickness. For feeder cattle, instead of using frame scores, designations of large, medium, and small frames are used (Table 3, Figure 3). Large-frame feeder cattle have large skeletons, being tall and long bodied. Large-frame steers produce a choice carcass at about 1200 pounds and heifer at about 1000 pounds. Medium-frames are smaller than large frames, but frames are still called a slightly large frame and produce a choice carcass at 1000-1200 pounds for steers and 850-1000 for heifers. Small-frame cattle are shorter and steers produce choice carcasses at 1000 pounds and heifers at 850.

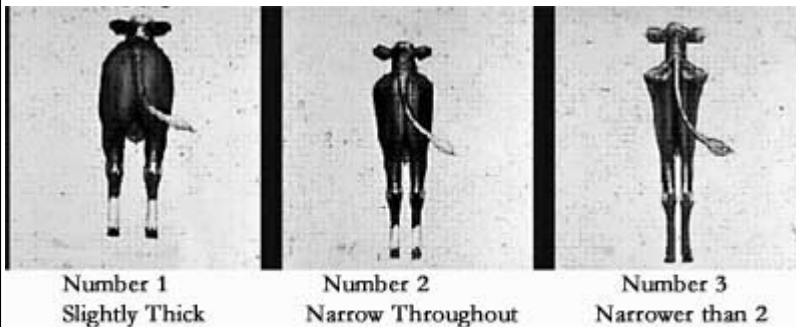


Figure 4. Feeder Cattle Muscle Scores.

Three muscle scores are used, 1, 2, and 3, with number 1 being thick throughout. Number 2 is narrow and legs are set closer together. Number 3 are described as thinner than 2's. Combining these two classifications gives a possibility of one of nine choices. For example, L-1, is a large framed heavier muscled animal. There is one more feeder cattle grade, called inferior. It is used for cattle that will not perform normally and includes unthrifty animals because of mismanagement (disease parasites, poor feed, etc) and double muscled cattle. The purpose of the USDA Feeder Cattle Grades is to sort feeder cattle into similar groups that will facilitate their selling and buying. These grades also sort feeder cattle into similar outcome groups in a feedlot. An indication of frame size is very important when estimating growing and finishing cattle nutrient requirements and projected feed intake.

Table 3. Relationship of frame size to projected mature cow weight and slaughter weight at choice quality grade.

| BIF frame score | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|------------------------------|-------|------|--------|------|-------|------|------|------|
| Feeder calf frame size | small | | medium | | large | | | |
| Mature cow weight, lb. | 955 | 1030 | 1100 | 1175 | 1250 | 1320 | 1400 | 1470 |
| Steer slaughter weight, lb. | 850 | 950 | 1050 | 1150 | 1250 | 1350 | 1450 | 1500 |
| Heifer slaughter weight, lb. | 700 | 800 | 900 | 1000 | 1100 | 1200 | 1300 | 1400 |

Source: Adapted from Boggs, South Dakota State University, 1991

Summary

Frame score is considered to be moderately to highly heritable. As such, selection can significantly change frame scores, primarily achieved through sire selection. With a heritability estimate of .40, about 40% of a bull's difference in frame score from herd average will appear in the progeny. Frame score measurements are descriptive of animal type and growth patterns in beef cattle. They are useful in evaluating animal nutritional requirements, characterizing target market weights, and aid in selection decisions.

UNIVERSITY
OF NEVADA

The University of Nevada, Reno is an Equal Opportunity/Affirmative Action employer and does not discriminate on the basis of race, color, religion, sex, age, creed, national origin, veteran status, physical or mental disability or sexual orientation, in any program or activity it operates. The University of Nevada employs only United States citizens and those aliens lawfully authorized to work in the United States. 9/92