Cattle Business in Mississippi – May 2010
"Beef Production Strategies" article

Selecting for Optimum Trait Levels

Jane Parish – Extension Beef Cattle Specialist, Mississippi State University

One of the challenges in beef cattle selection and culling involves finding optimum levels of individual traits for the herd. Optimum does not necessarily mean maximum or minimum. Sometimes these extreme levels can lead to performance tradeoffs, increased expenses, or decreased product marketability. With many traits evaluated in beef cattle production, it is advisable to avoid extremes.

The Birth Weight Trap

Many producers select herd sires with low birth weight expected progeny differences (EPDs) in the hopes of promoting calving ease in the females to which these bulls are bred. In fact, many Extension Service agents endorsed this concept heavily over the years. However, this approach can be taken too far. Very lightweight calves at birth can have reduced vigor and more health challenges. In addition, lighter calves must gain at faster rates to match weaning weights of heavier-born contemporaries. In many cases, calves that are lighter at birth are also lighter at weaning and yearling ages. This is because birth weight is highly, positively correlated to weaning and yearling weights. Selection for increased growth rate may increase weight at all ages, including birth, while selection for low birth weight alone may decrease weaning and yearling weights. Make sure that, by selecting a calving ease bull, not too much ground is given up in these other economically relevant traits.

Furthermore, birth weight is only one factor affecting calving ease, and a better selection tool for calving ease is calving ease EPDs. Breeders have done a very effective job of addressing calving difficulty due to high birth weight in many breeds previously saddled with a stigma in this area. Calving ease sires are readily available in all breeds. However, due to the common genetic antagonism between low birth weight and high growth rates, only a subset of these bulls will also produce fast growing calves that will top the scales at weaning and yearling time.

It is also useful to interpret EPDs literally to see what differences in production levels are really being compared. Birth weight EPDs are expressed in pounds of calf at birth. Some bull buyers will readily purchase a bull with a birth weight EPD of 2 or lower (breed average or better in this example) but will not even consider a bull of the same breed with a birth weight EPD of 5. The difference between the two bulls is that the average of the second bull's calves is expected to be 3 pounds heavier at birth than the average of the first bull's calves. If male calves for this breed weigh 80 pounds on average at birth, then the comparison here is 80-pound calves versus 83-pound calves, or not much difference.

Producers would be best advised to first evaluate if calving ease is even a problem needing improvement in their herds before placing extreme selection pressure on birth weight. If calving ease is acceptable in the herd, then selection of breeding animals with higher growth genetics would likely be most profitable. If calving ease is a problem in a herd, then taking a well-rounded approach to address any calving ease concerns would be warranted. This would include making sure heifers are well developed prior to breeding and calving and managing other factors affecting calving ease instead of just honing in on a single EPD.

Fitting within Production Windows

Some trait levels must fit within production target ranges or consumer windows of acceptability. Ribeye is a good example of this. To achieve a particular number of ounces in a ribeye steak serving, the meat will have to be cut to different thicknesses as ribeye size varies. A very large ribeye steak would need to be sliced thinner than a smaller such steak to achieve the same number of ounces in the serving. This could create challenges with steak cooking. On the other end, an extremely small ribeye steak might have poor eye appeal to consumers. Depending on the specific market outlet there is a range of acceptable ribeye size, often 11 to 15 square inches. Beef carcasses and cuts that fall outside of this ribeye area range will either be rejected or discounted.

Carcass weight is another trait for which a defined range of acceptability affects product marketability and value. As evidenced by the most recent National Beef Quality Audit, cattle are often too large, finish at a very large frame size, and do not “fit the box” for packing and shipping. The industry window of acceptability for carcass weight is between 600 and 850 pounds. By adhering to the live weight standard for finishing cattle between 1000 and 1350 pounds with a Yield Grade of 1 or 2, a 600- to 850-pound carcass should result.

Threshold Traits

Some traits such as scrotal circumference are threshold traits. Although increasing scrotal circumference to a certain point has proven benefits including reducing daughter age at puberty and increasing sperm-producing capacity, there is a limit to how far selection efforts should increase this trait level. There is no apparent advantage in increasing scrotal circumference beyond 38 to 40 centimeters despite advantages to increases in scrotal size below this threshold.

Calving ease is another threshold trait. If no calving difficulty is experienced in a herd, then there are no benefits to further emphasizing selection for calving ease. Similarly, if reproductive rates are high in a herd, there may be no room for further improvement. This does not mean that threshold traits for which selection has been very effective should be ignored in future selection decisions but that, instead, the relative selection emphasis should be shifted to other traits where notable economic gains can be made.

Environmental Interactions

Optimum trait levels are dependent on the production environment. For instance, desired hair coat length, density, and shedding pattern would differ for beef cattle operations in Mississippi as compared to cooler, drier climates in other regions of the

country. Similarly, pulmonary arterial scores as an indicator of brisket disease (altitude sickness, high-mountain disease) would be an important selection criterion in mountainous regions of the U.S. but not a major concern in Mississippi.

Another classic example of environment influence on optimum trait levels is that differences in forage availability and quality affect ideal milk production and cow mature size. The level of milk production must fit the forage and feed environment to ensure that nutrient requirements of lactating cattle are met and rebreeding is not compromised by inadequate nutrition. In general, larger body size is more suitable with larger quantities of forage, and high milk production fits better with adequate levels of high quality forage.

Selection decisions must consider production and marketing goals and the production environment. Aiming for trait leaders across the board may not make good economic sense to the operation. In addition, focusing too much on one or a few traits may also not be wise. The best selection approach is one tailored to the specific operation that appropriately weights selection emphasis on a variety of economically relevant traits or suitable indicators. For more information about beef cattle production, contact an office of the Mississippi State University Extension Service.