Carcass Merit: Using Carcass EPDs Can Add Value to Beef Cattle Operations

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When we consider the use of carcass EPDs, we must remember that genetic improvement of livestock is somewhat like mapping out a trip. First, one must know where their herd is genetically. Next, one must determine the genetics they want their herd to possess (determine where you want to go). And finally, one must plan a course of action (how you are going to get there).

Before we can make improvements in carcass traits, we must establish some knowledge of the genetic merit of the herd for these traits. This can be accomplished through participation in state steer futurities, breed association carcass programs, university sponsored ranch-to-rail evaluations, etc. The time tested means of retrieving carcass data, of course, is through retained ownership from conception to slaughter, with cooperating feedlots and packers.

When measuring carcass merit, we are concerned with those traits which effect carcass value, namely yield and carcass grades.

* **Yield grade** is an attempt to classify carcasses on basis of yield of closely trimmed retail cuts or cutability. Four characteristics considered in determining yield grade are:

1. External fat thickness over the 12th rib.
2. Percent kidney, heart, and pelvic fat.
3. Area of the ribeye muscle at the 12th rib.
4. Hot carcass weight.

* **Quality grade** is determined by age and marbling. Age of youthfulness as determined by the color of the bone and the hardness or degree of ossification of the split dorsal processes of the vertebrae. The youngest classification, "A" maturity, is less than approximately 30 months. Figure 1 and Table 1 illustrate various quality grades and corresponding marbling scores.

Because of access to carcass data through my employment, the balance of this article will utilize examples from the data base accumulated from Angus structured sire evaluation since 1974 (see Table 2). For carcass weight (755 lb) and marbling (Small 81, Low Choice), the average of the Angus breed is excellent. However, from an idealistic standpoint, one should perhaps strive for an average range in fat thickness from .30 to .40 in. and slightly increased average ribeye area. The question is "How can this be accomplished?" The answer is genetic selection. It has been said that most traits expressed by animals are a result of two factors: genetics and environment. Genetics, controlled by individual genes, regulate portions of inheritance passed from parents to offspring.

Table 3 illustrates the genetic and phenotypic relationship between carcass traits and heritability estimates of specific traits. Note the trait heritabilities on the diagonal are .37 for carcass weight, .46 for marbling, .33 for ribeye area, .33 for fat thickness, and .29 for percent retail product. These traits are moderate to highly heritable, which means that one can make progress through sire selection.

Also, note the genetic correlations expressed above the diagonal. The genetic relationship between marbling and ribeye area at -.03 is slightly negative, but close to zero. The genetic relationship between marbling and fat thickness is even less at -.02. This means that each of these traits can be improved independently of the other traits. For example, the Angus data suggests that one can increase marbling and ribeye area, and simultaneously reduce fat thickness through proper selection procedures.

At this point, it is important to understand exactly how the four carcass EPDs are defined and what the EPD means.

Carcass Weight EPD

Carcass weight EPD is the differences in hot carcass weight from breed average of the progeny of sires at 480 days of age. It is expressed in pounds. Like other EPDs, the absolute value is not as important as the differences between the sires. As previously pointed out, the average adjusted carcass weight of the steer progeny in the Angus data base is 755 lb; however, due to differences in environment and the genetic values in commercial cows, the majority (or about 70% of progeny carcass weights for sires that are zero or breed average) have ranged from approximately 765 lb to 845 lb. Ribeye Area EPD

Ribeye area EPD is the differences from breed average of ribeye area of the progeny of sires at 480 days. The measurement is taken at the 12th rib and expressed in square inches. At a constant weight end point, ribeye area has shown to account for significant variation in percent retail product. There is also a high genetic correlation between ribeye area and total retail product. Care should be taken when using the ratio of ribeye area to carcass weight as selection on this index will result in changes in mature size. Generally, the higher the ratio, the smaller the mature size. Ranges in ribeye area for the majority of the progeny of sires with zero EPDs are from approximately 11.0 to 14.0 sq. in. with the steer average at 12.41 sq. in.

Marbling EPD

Marbling EPD is the differences from breed average of the marbling score of the progeny of sires at 480 days. It is expressed as a percent of 1/3 of a marbling score. The average marbling score of the steers in the data base is 5.81 or Small 81 which corresponds to Low Choice 81, which is very close to Average Choice. Sires with zero marbling EPD sired steers the majority of which exhibited marbling scores ranging from 4.80 or Slight 80 (which corresponds with High Select) to 6.80 (which is Modest 80 and Average Choice). Again, these averages depend on nutrition, environment, and the genetic strength of the cow herd for marbling.

Fat Thickness EPD

Fat thickness EPD is the differences from breed average of the average external fat thickness of the progeny of sires at 480 days. It is measured over the 12th rib and expressed in inches. Fat thickness has a negative genetic relationship to percent retail product.

Percent Retail Product EPD

Percent retail product EPD expresses the difference from breed average in percent retail product of a given sire's progeny. This EPD combines the traditional carcass traits used in calculating yield grade and is heavily influenced by external fat thickness.

Scenario

The following scenario illustrates how carcass EPDs can be effectively applied. Let's assume we run a 200 crossbred cow herd and the cows were bred to a bull named Henry VIII who had the following EPD:

Carcass Weight +10
Marbling +.0
Ribeye Area +.0

The steer calves were retained and kept in the same group from birth to slaughter and all were processed the same day. The data revealed the following:

Average Carcass Weight: 700 lb
Average Marbling Score: 4.80 (Slight 80)
Average Grade: Select
Average Ribeye Area: 12.0 sq. in.

The following year, in an effort to increase quality and yield, a bull named Richard II was selected for use. Richard II posted the following carcass EPD:

Carcass Weight +20
Marbling +.30
Ribeye Area +.30

Assuming that nutrition and environment were the same, the following averages of the next calf crop would be expected:

Average Carcass Weight: 710 lb
Average Marbling Score: 5.10 (Small 10)
Average Grade: Low Choice
Average Ribeye Area: 12.3 sq. in.

If yield grades of both groups were the same assuming a $4.00 spread/cwt. between the select grade and the choice grade, Richard II's steer progeny is worth, on the average, $28.40 more than Henry VIII's. Multiply this by 100 head of steers and the increased value is $2,840.

Conclusion

Profit in the beef industry is influenced by many factors. Carcass merit is only one factor. From a genetic standpoint, reproduction is by far the most important trait, followed by early growth per unit of feed, and maternal ability. Through proper sire selection, we can keep reproduction, maternal, and growth traits at optimum levels, while simultaneously improving carcass merit. When these traits have been improved through genetic selection, the end result is "added value."

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