By the Numbers

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Economically relevant traits and indicator traits

Today's genetic evaluation systems are complex. The calculations of expected progeny differences (EPDs) and economic index values ($Values) result from a massive amount of phenotypic data and genomic information, processed through sophisticated statistical models. Back when the Angus genetic evaluation was conducted only twice a year, it was difficult to observe the impact of just a few progeny records. Now that results are updated weekly, changes in EPDs and accuracy values due to new information can be more directly observed. This sometimes raises questions about the impact of seemingly small amounts of progeny data on a sire's EPDs.

Understanding indicators

Traits measured on Angus cattle, and for which EPDs are calculated, fall into two categories: economically relevant traits (ERTs) and indicator traits. ERTs are traits that represent an expense or revenue stream for a commercial beef producer, while indicator traits help add accuracy to EPD calculation for ERTs. For example, calving ease is an ERT, while birth weight is an indicator of calving ease.

The first priority for most commercial cow-calf producers selecting heifer bulls is calving ease, because the costs associated with a difficult calving — such as labor costs, calf mortality and cow rebreeding rate — are significant. Birth weight itself has no economic importance to a commercial producer, except as an indicator of calving ease.

Yet, it's critical that seedstock breeders submit accurate birth weights on their calves because those birth weights are used, along with calving ease scores, in the calculation of calving ease EPDs. Those birth weights greatly increase the accuracy of calving ease EPDs, especially when most or all of the calves in a group are born unassisted.

Genomic test results are another form of indicator, and are also used in the calculation of all Angus EPDs when available. Still, the most accurate selection occurs when based upon EPDs for the relevant trait, in this case calving ease EPD, which optimally combines calving ease scores, birth weights and genomic information.

Under the hide

Probably the most common question presented to Association staff about ERTs and indicator traits involves the genetic evaluation for carcass traits. For decades, Angus breeders have collected ultrasound measurements of fat thickness, ribeye area and marbling score, along with weights at scanning for use in calculation of carcass EPDs.

Angus carcass EPDs calculated from a combination of carcass records, ultrasound scans and genomic tests provide the most accurate estimates of genetic merit for product quality and yield in the beef industry.

While ultrasound measures of yearling bulls and heifers are meaningful indicators of genetic merit for carcass traits, they are not the ERTs. Carcass EPDs predict measurements on fed steer and heifer progeny. When available, carcass records of progeny have the greatest contribution to EPDs for marbling, ribeye area, fat thickness and carcass weight.

However, young animals cannot have carcass progeny and, even for important older sires, collection of carcass data can be expensive and logistically challenging. That's why decades ago, the American Angus Association helped pioneer the use of ultrasound measurements in genetic evaluation for carcass traits.

Today, more than 1.7 million animals have ultrasound measurements in the Angus genetic evaluation database, along with more than 100,000 carcass records. Angus carcass EPDs calculated from a combination of carcass records, ultrasound scans and genomic tests provide the most accurate estimates of genetic merit for product quality and yield in the beef industry.

However, it's not unusual for carcass EPDs on sires with genomic test results and many ultrasound progeny to change once their first carcass progeny records are submitted. Genetic correlations between ultrasound measures of breeding cattle and carcass records of fed cattle range from around 0.50 to 0.75, and genomic correlations for carcass traits currently range from 0.60 to 0.70.

So, while ultrasound measures and genomic tests are highly useful indicators of genetic merit for carcass traits, they are not perfect predictors. Differences due to age at measurement, developmental differences among bulls, heifers and steers, and diet and growth-curve differences all contribute to deviations between ultrasound measurements of breeding animals and carcass-based values. For those reasons, while most sires don't show significant changes when carcass progeny records become available, on the rare occasion that a sire's carcass progeny perform differently than predicted by ultrasound and genomics, those sires' carcass EPDs may increase or decrease, sometimes to a fairly large degree.

The bottom line is that carcass progeny records, while difficult to collect, are highly valuable, especially for widely used sires, because they are the best predictors of true carcass merit. Until that data is available, sires have potential for change in their carcass EPDs, and the accuracy and possible change values provided reflect that.

Many Angus breeders and semen companies have gone to great effort to collect significant amounts of carcass data, adding to the accuracy of our genetic evaluation programs. It's our goal at the Association to make carcass evaluation easier and more accessible, so that more young sires can be progeny-tested for carcass traits.

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