



By the Numbers

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EPD principles

Expected progeny differences (EPDs) are beef cattle selection tools providing a prediction of future progeny performance. The word “difference” implies comparison. In order for EPDs to be useful in making genetic improvement in your herd, it is important to understand their application and limitations.

Breeding value

As a review, breeding value is defined as the value of an individual as a parent. Thus, estimated breeding value gives us an estimate of the transmitting ability of the parent. Each parent of interest in your herd, or each prospective artificial insemination (AI) sire you may use, transmits a random sample of half of its genes to its offspring. An EPD is one-half the estimated breeding value.

EPD basics

EPDs are expressed in units of measure for the trait, plus or minus. For example, weight traits are reported in pounds (lb.). The EPDs available through the American Angus Association may be used to compare only those animals within the breed. For example, a Hereford EPD is not directly comparable to an Angus EPD.

When breeders are first becoming familiar with EPDs, they ask a classic question: “What are my calves going to weigh?” The answer is that EPDs do not predict actual performance; they only predict performance differences. A birth weight EPD (BW EPD) example for two Angus bulls will serve as an illustration.

The wrong way

EPDs do not predict actual performance. Do not add or subtract a BW EPD from a birth weight average.

	BW EPD, lb.	Breed birth wt.
Bull A	+4.0	81 lb. for bulls

Bull A's calves are *not* expected to weigh 85 lb.

The right way

	BW EPD, lb.
Bull A	+4.0
Bull B	-2.0
Expected progeny performance difference, lb. =	6.0 lb.

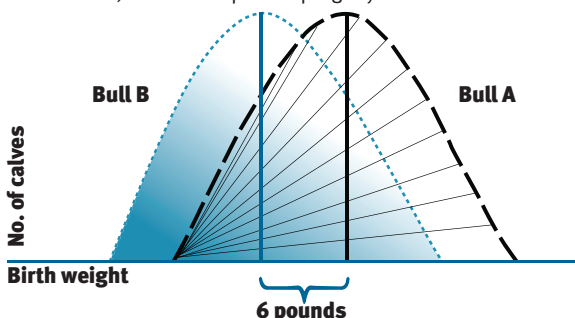
In this example, assume the EPDs of both Angus sires have the same accuracy value. Their EPDs are used in comparison with other sires or a breed average EPD. We cannot estimate how much their calves are going to weigh, but we can predict the average progeny performance difference for this trait.

On the average, we would expect the calves sired by Bull A to be 6 lb. heavier at birth than the calves sired by Bull B, assuming both bulls were mated to comparable females and exposed to the same environment and management conditions. The predicted difference is 6 lb., and it is not possible to estimate the actual birth weight average for these calves. For example, the environment, management and genetic influence of the female having the calf all have an effect on a calf's birth weight, making it impossible to project an actual birth weight.

Fig. 1 depicts this comparison, in which each sire's calves are a distribution of weights, normally distributed about the mean or average birth weight for the group. The future calf crops of each bull when mated to comparable cows and managed alike would ultimately produce two sets of calves with birth weights averaging a 6-lb. difference.

Fig. 1: Expected difference in future calves sired by Bull A and Bull B

Assumes Bull A has a BW EPD of +4.0 and Bull B has a BW EPD of -2.0, for a BW expected progeny difference of 6.0 lb.



The mean or average birth weights, illustrated by the two vertical lines, are the average for each sire's calves. In the distribution of calves out of each sire, there will be calves with birth weights above and below the two averages.

In one herd using these two bulls, the two birth weight averages may be 80 lb. and 74 lb. In another herd, the averages for the two sets of calves may be 86 lb. and 80 lb.

Environments vary; that's why genetic selection tools are so important, since corrections have been made for environmental effects. The point is to focus on the difference among EPDs, as EPDs do not predict actual birth weight in the calves.

Do not be mistaken. Even if you know the Angus average for birth weight in 2004 is 81 lb. for bulls and 76 lb. for heifers, you cannot utilize these phenotypic averages or means to project a calf birth weight. [A phenotype is just the weight or measure of interest: a birth weight, weaning weight, height measure, ultrasound percent intramuscular fat (%IMF), or ribeye area (REA), for example].

Phenotypes, better known as the weights and measures that we collect and summarize, contain genetic and environmental components. This is unlike an EPD, which is a genetic value, or breeding value prediction as defined earlier.

Trends and breed averages

The genetic progress a breed is making in a trait is best depicted by reviewing the genetic trend. These trends are published by trait with each National Cattle Evaluation (NCE, see www.angus.org/sireeval/genetic.html). A plot of the birth weight genetic trend is given in Fig. 2.

Since about 1990, the genetic trend for birth weight has remained relatively unchanged, with no increases in the average BW EPD for the breed. The breed average EPD for nonparent bulls in the fall 2005 NCE was +2.3 lb. and +2.4 for current sires.

In the previous example for Bull A and B, either one of these bulls could have been

compared to breed average EPDs. Bull B's future progeny, on the average, are expected to be about 4.3 lb. lighter than the average nonparent Angus bull [$2.3 \text{ lb} - (-2 \text{ lb.}) = 4.3 \text{ lb.}$ difference].

Note that breed average EPDs can be found at www.angus.org/sireeval/breed_avg_epd.html.

Another point of interest for some is where the average EPD is equal to zero. The base year for the Angus BW EPD is 1982. Note that the trend line in Fig. 2 crosses the zero mark at the year 1982. This is a fixed base that is specific to this trait and to the Association's genetic evaluation.

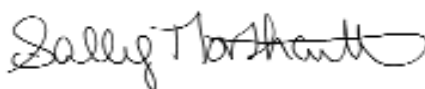
EPDs are best applied when using the basic principle of relying on differences and making relative rankings among individuals. Do not fall into the trap of trying to predict actual performance differences.

Other EPD topics

Interim EPDs may appear on young animals when their performance has yet to be incorporated into the American Angus Association NCE procedures. This EPD will

be preceded by an "I," and may or may not include the animal's own performance record for a particular trait, depending on its availability, appropriate contemporary grouping or data edits needed for NCE.

Details on interim EPDs can be found at www.angus.org/performance/documents/interim_epd.html. A comparison of interim vs. NCE EPDs was published in the "By the Numbers" column appearing on page 211 of the October 2005 *Angus Journal*.



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Editor's Note: "By the Numbers" is a column authored by Association performance programs staff to share insights with Angus members about data collection and interpretation, the National Cattle Evaluation, genetic selection, and relevant technology and industry issues. If you have questions or would like to suggest a topic for a future column, contact Sally Northcutt, director of genetic research, or Bill Bowman, director of performance programs, at (816) 383-5100.

Fig. 2: Angus genetic trend for BW EPD, by year

