EPDs - Understanding Expected Progeny Differences

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Expected progeny differences, EPDs, measure the degree to which specific traits are passed from a bull to its offspring, assuming the cows are of similar quality. EPDs measure expected differences in performance, not what the actual performance will be.

When choosing bulls, determine which EPDs are most important to you. Selection goals must include structural and reproductive soundness to determine which sires best fit the operation.

EPD scores between two sires of the same breed predict performance differences between their offspring, if given mates of the same genetic merit. EPDs are calculated for birth, growth, maternal, and carcass traits and are reported in the same units of measurement as the trait, normally pounds. EPD values may be directly compared only between animals of the same breed. Adjustments must be made to account for breed differences.

Most major beef breed associations report EPDs. They are calculated using statistical equations and models using all known information on a particular animal. This includes performance data (i.e.,

Table 1.

	Birth Weight EPD	Calving Ease EPD	Weaning Weight EPD	Yearling Weight EPD	Maternal Milk EPD	Maternal WW EPD
Bull A	+5	+0	+20	+40	+15	+25
Bull B	+1	+5	+10	+20	+10	+15

Using EPDs

Dick Beck is an NCBA member and the chief executive officer of Three Trees Ranch in Sharpsburg, Ga. Three Trees Ranch ranked 13th on the 2007 Directions list of top seedstock producers. *National Cattlemen* asked Dick for his advice on buying genetics.

What's your advice for a first time genetics buyer?

EPDs are best used as a comparative tool. You compare them to standards. Whatever breed of bulls you're trying to buy, find out what the breed average is for the various traits in that breed. Each breed has slightly different variations.

We're in the Angus business. If you're buying an Angus bull for calving ease, you should buy a bull who's below breed average for birth EPD. If you're planning to keep daughters, he needs to be above average for milk EDP; and if you care about the end product, you need a high marbling EPD. If I'm just looking for end product, look at growth, the weaning EPD or yearling EPD.

Breed associations are now going beyond EPDs and offering dollar indexes for EPDs. We use 17 different bits of information. We've made it extremely complicated, but if I was going to advise someone who is brand new, I'd say buy as much dollar beef index as you can with moderate birth EPD and an above average milk EPD.

How can producers avoid choosing antagonistic traits?

I don't think we can avoid it ever. Those antagonisms exist. Seedstock producers are striving to create the cattle that defy the antagonisms. Those that do cost more. The key is not trying to find the perfect animal that does everything. That doesn't exist.

If I go car shopping, I'm looking for a different car to go to church than one to check cows in. They're both cars but I look at them for different criteria. We need to learn to look at our herds like that.

They (buyers) need to find the bulls that meet their needs and not get hung up worrying about the antagonisms that might not exist. If you're not going to own those cattle to the rail, don't get hung up on the carcass traits. Focus on what you get paid for. Remember. If you choose to keep heifers, that bull buying decision affects your next 12 calf crops.

How difficult is it to select for multiple traits and what are some of the traps of doing that?

Selection for multiple traits is not an impossible dream. The breed associations are creating the dollar indexes to do that for us and hopefully in that process simplify it. Know what you want to do and select from the index that meets your goals.

weight records), information from its sire and dam, grandsire, great grandsire, maternal grandsire, etc., brothers and sisters, and progeny.

Performance records are adjusted for age and sex of the animal and age of the dam prior to inclusion in EPD databases. Genetic merit of mates is considered in evaluating progeny information, so progeny records are not influenced by superior or inferior mates. EPD calculation also accounts for the effects of environment (nutrition, climate, geographical location, etc.) that exist between herds.

Growth and Maternal EPDs - An example set of growth and maternal EPDs for two hypothetical bulls mated to the same set of cows is on the previous page (Table 1).

Birth Weight EPDs shown in Table 1 indicate that Bull A would be expected to sire calves that average 4 pounds heavier at birth. Most calving difficulty is caused by heavy calves at birth. Emphasize birth weight EPDs when selecting bulls for use on heifers.

Calving Ease EPDs predict the ease with which a bull's calves are born to first-calf heifers and are reported as deviations in percentage of unassisted births. In the example, expect the heifers bred to Bull B to have 5% more unassisted births. Calving ease EPDs consider differences in calf birth weights and actual observed levels of calving difficulty. Use these for avoiding dystocia problems.

Weaning and Yearling Weight EPDs are indicators of the genes for growth. The example uses a standard weaning age of 205 days. Expect calves sired by Bull A to weigh 10 pounds more at weaning than calves sired by Bull B. The effect of the cow's milking ability is not predicted by this EPD. Rapid early growth is important for cow-calf producers since feeder cattle are sold by the pound.

Yearling weight EPDs predict the average difference in weight of a bull's progeny at a year of age. Yearling weight EPDs are the most useful indicators of growth rate of progeny in the feedyard.

Maternal Milk EPD reflects the milking ability of an animal's daughters expressed as additional pounds of calf weaned by a bull's daughters. In the example, expect daughters of Bull A to wean calves that are 5 pounds heavier at weaning than calves out of daughters of Bull B. Milk EPDs are reflected in weaning weight of a bull's grandprogeny (calves by his daughters).

Milk EPDs are important when replacements will be kept in the herd. Optimum milk EPDs need to match the feed resources and environment of the operation. More milk is not necessarily better. Heavier milking cows may require more nutritional inputs to maintain body condition and reproductive efficiency.

Maternal Weaning Weight EPD predicts the total difference in weight of a bull's daughters' calves at weaning. A portion of this weight difference comes from the milking ability of the bull's daughters (milk EPD), and part comes from the genes for growth passed from the bull to his daughters, then on to her calves.

Maternal weaning weight = the milk EPD + 1/2 the weaning weight EPD. For Bull A, maternal weaning weight EPD = 15 + (1/2 x 20) = 25. Maternal weaning weight EPDs are important when daughters will be retained in the herd. This is the best predictor of how daughters of a bull will perform for calf weaning weight.

Carcass EPDs

The beef industry has placed an increased emphasis on end product. These EPDs may be used to make desired directional changes in carcass traits. Carcass trait EPDs are expressed at a constant slaughter age, usually around 480 days.

Data for calculating carcass EPDs come from two sources:

1. slaughter steer and heifer progeny,
2. ultrasound scan data from primarily yearling bull and heifer progeny.

Carcass Weight EPDs predict differences in progeny carcass weight. In Table 2, Bull A should produce calves that have carcasses that are 10 pounds heavier than calves sired by Bull B. Carcass weight is an indicator of the total amount of retail product in a carcass, but is a poor indicator of carcass quality and cutability.

Marbling and % Intramuscular Fat EPDs - Marbling EPDs reflect genetic differences in marbling potential. These values are expressed as a numerical marbling score.

The table indicates that a 1.0 unit change in numerical marbling score equals a change of a full quality grade (4.5 = Select vs. 5.5 = Choice). In the example, Bull A would sire slaughter progeny with superior marbling scores compared to Bull B. Higher marbling EPDs increase the likelihood of a bull's progeny getting higher quality grades.

EPDs generated from ultrasound scan data reflect differences in chemical fat content within the ribeye muscle (intramuscular fat). Research has shown a strong

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Table 2. An example of carcass trait EPDs for two bulls.

	Carcass Weight EPD	Marbling EPD	% Intramuscular	Ribeye Area EPD	Fat Thickness EPD	% Retail Product EPD
Bull A	+20	+.20	+.15	+.50	-.04	+.5
Bull B	+10	+.00	+.00	+.25	+.00	-.3

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relationship between marbling score and % intramuscular fat. Selection for higher % intramuscular fat EPDs would be expected to increase marbling scores and associated quality grade in slaughter progeny.

Ribeye Area EPD is expressed in square inches. It is an indicator of total muscle in the carcass or live animal. Bulls with larger ribeye area EPDs will sire calves with more muscle and a higher percentage of carcass retail product.

Fat Thickness EPDs are expressed in inches and predict differences in carcass fat thickness between the 12th and 13th rib. Fat thickness is the primary indicator of saleable product in the carcass, and is the primary factor affecting USDA beef carcass yield grades. As fat thickness increases, the percentage of carcass retail product declines.

In addition to EPDs for the component traits determining carcass merit, most breeds publish index EPDs related to end product merit. These indexes allow for selection of several traits simultaneously. For each trait contained in the index, both genetic and economic values are considered, and the end result is a comprehensive genetic prediction value that represents overall economic merit of the animal. Multi-trait index EPDs differ from individual trait EPDs in that they are expressed in economic terms. They predict differences in progeny performance in dollars rather than pounds or other indicators.

Table 3. Relation Between quality grade and numerical marbling score

Quality Grade	Numerical Score	% Intramuscular Fat
Prime+	10.0-10.9	
Prime	9.0-9.9	> 12.2%
Prime-	8.0-8.9	9.9-12.1%
Choice+	7.0-7.9	7.7-9.8%
Choice	6.0-6.9	5.8-7.6%
Choice-	5.0-5.9	4.0-5.7%
Select	4.0-4.9	2.3-3.9%
Standard	3.0-3.9	< 2.3%