

EPDs and \$ Indexes

Donna L. Lofgren, Department of Animal Sciences, Purdue University

Development of animal breeding models and advances in computer technology have provided beef producers with selection tools which allow animals within a breed to be compared for their genetic merit. These selection tools are Expected Progeny Difference (EPD) for individual traits, and \$ Indexes which combine several EPDs into one economic value. Individual beef breed associations conduct National Cattle Evaluations (NCE) once or twice each year. The NCE combine individual records with pedigree and progeny data to calculate EPDs. Interim EPDs are calculated for young animals whose records are processed between the times of the NCE.

The difference in EPD of two bulls is the difference in expected progeny performance of their progeny, if the bulls are mated to similar cows and their progeny are in similar management and environmental conditions. EPDs are expressed in the same units as the trait. For example, Birth Weight, Weaning Weight, and Yearling Weight EPDs are in pounds, while Carcass Fat EPD is in inches. The sign of the EPD indicates direction; positive means larger (heavier weights), and negative (-) means smaller (lighter weights). Which direction is “good” depends on the trait. Positive EPDs would be good for weaning weight but may be bad for birth weight. EPDs are valid only for comparing bulls of the same breed. Do not compare EPDs of bulls in different breeds. (There is one exception. The Simmental, Red Angus, Chianina, Maine Anjou and Gelbvieh associations combine their data in one multi-breed evaluation. Therefore, EPDs from those breeds, including SimAngus and Gelbvieh Balancer, can be directly compared.)

Growth and Maternal Traits

- Birth Weight, in pounds, predicts the weight at birth of the bull’s progeny compared to progeny of other bulls. A bull with an EPD of -1 is expected to have progeny which average 3 lb lighter than progeny of a bull with an EPD of +2.
- Weaning Weight, in pounds, is a measure of the weaning growth of the bull’s progeny. Higher EPDs mean heavier calf weights.
- Yearling Weight, in pounds. Higher EPDs mean heavier weights for the bull’s progeny.
- Maternal Milk, in pounds, is measured by the weaning weight of the calves. It predicts the milking and mothering ability of the bull’s daughters, expressed as her calf’s weaning weight. Higher EPDs mean heavier calf weights due to the daughter’s milking and mothering ability.
- Direct Calving Ease is a measure of the ease with which a bull’s calves are born to first calf heifers. Higher EPDs mean fewer assisted births.
- Maternal or Daughters’ Calving Ease is a measure of the ease with which a bull’s daughters calve as first-calf heifers. Higher EPDs mean fewer assisted births.
- Docility is a measure of the temperament or disposition of the bull’s progeny. Higher EPDs mean more favorable docility.

Carcass Traits

Carcass traits may be measured at slaughter, or measured on live animals using ultrasound. Many breeds report EPDs for carcass traits, using one type of measurement or a combination of both. All measure the expected performance of the bull’s progeny. Different breeds calculate EPDs for different traits. Most breeds use a constant age endpoint for carcass data; however, Gelbvieh use a constant fat endpoint. Some breeds update interim EPDs after the bulls are scanned during the test.

- Carcass Weight, in pounds. Higher EPDs mean heavier weights of the bull's progeny.
- Marbling is a measure of the marbling score of a bull's progeny. It is a subjective measure of % intramuscular fat. Higher EPDs mean higher marbling scores.
- Fat Thickness, in inches, measures the fat thickness at the 12th rib of the bull's progeny. Higher EPDs mean greater fat thickness.
- Ribeye Area, in square inches. Higher EPDs mean a larger ribeye area of the bull's progeny.
- Yield Grade is a measure of the relative proportion of closely trimmed, boneless retail cuts from the bull's progeny. Higher EPDs mean higher yield grades, and thus a lower proportion of retail cuts.
- Percent Retail Cuts is a measure of the percentage of closely trimmed, boneless retail cuts from the bull's progeny. Higher EPDs mean a higher percentage of retail cuts.

\$ Indexes

These are multi-trait selection indexes, which combine EPDs for several traits into a single economic value, which can be used to make selection decisions. The index values are interpreted like EPDs; the difference in index value between two bulls is the expected difference in average dollar value of their progeny, when the bulls are bred to similar cows. Typical beef production and economic values are used in calculating the indexes. Indexes are expressed in dollars per head, and higher indexes mean a higher dollar value per head. An index value only has meaning when it is compared to the index value of another animal of the same breed. Currently, indexes are calculated for Angus, Charolais, Gelbvieh, Hereford, Limousin, Red Angus, Shorthorn, Simmental, and SimAngus bulls.

- Angus \$M is Maternal Weaned Calf Value. This is the expected value of future progeny due to genetics from conception to weaning. It has the objective that commercial cattlemen replace breeding females with heifers from their herd, and remaining female and male progeny are sold as feeder calves.
- Angus \$W is Weaned Calf Value. This is the expected average of future progeny for preweaning performance, within a typical beef cowherd. It accounts for the economic impact of birth weight, weaning weight, maternal milk, and mature cow size.
- Angus \$F is Feedlot Value. This is the expected average of future progeny for postweaning feedlot performance.
- Angus \$G is Grid Value. This is the expected average of future progeny for carcass grid merit. It assumes cattle are marketed on a carcass grid, so it focuses on both quality grade and yield grade.
- Angus \$B is Beef Value. This is the expected average of future progeny for postweaning performance and carcass value. The \$B value combines information from \$F and \$G.
- Angus \$C is Combined Value. This combines maternal (\$M) and terminal (\$B) indexes. It has the objective that commercial cattlemen replace breeding females with heifers from their herd, and remaining female and male progeny are sold on quality-based carcass merit grid.
- Charolais TSI is Terminal Sire Index. It is the expected profit potential of terminal progeny. It incorporates growth and carcass EPDs.
- Gelbvieh \$Cow is the value of an animal when retained as a replacement female. It includes maternal productivity, but also considers her future progeny's feedlot and carcass value.
- Gelbvieh EPI is Efficiency Profit Index. It aids producers in selecting for feed efficient cattle with acceptable amounts of gain.

- Gelbvieh FPI is Feeder Profit Index. This is the expected performance of progeny in the feedlot and sold on a grade and yield standpoint. It is a terminal index, including growth and carcass traits.
- Hereford BMI\$ is Baldy Maternal Index. This is the expected average performance of progeny of Hereford bulls used in rotational crossbreeding programs on Angus-based cows and heifers, with the progeny marketed on a Certified Hereford Beef LLC pricing grid.
- Hereford BII\$ is Brahman Influence Index. This is similar to BMI\$, except that the bulls are mated to Brahman-influenced cows, and progeny are marketed on a commodity-based program. It puts more emphasis on cow fertility and longevity.
- Hereford CHB\$ is Certified Hereford Beef Index. This is the expected average performance of progeny of Hereford bulls mated to mature commercial Angus cows, with all progeny sold as fed cattle on a Certified Hereford Beef LLC pricing grid. It is a terminal sire index, including growth and carcass information only, since all progeny are marketed and no females are retained in the herd.
- Limousin \$MTI is Mainstream Terminal Index. This is the expected average profit per carcass of progeny of Limousin bulls mated to British-cross cows, with all calves placed in the feedlot and sold on a mainstream grid. It is a terminal sire index, including growth and carcass information only, since all calves are marketed and no females are retained in the herd.
- Red Angus ProS is Profit and Sustainability Index. This is the expected average performance of progeny where replacement heifers are retained in the herd and remaining progeny are fed out to slaughter and marketed on a quality-based carcass grid.
- Red Angus ProS is Profitability and Sustainability Index. This is an all-purpose index that covers economically relevant traits from conception to carcass, and is expressed as dollars per head born.
- Red Angus HB is HerdBuilder Index. This is the expected average performance of progeny where replacement heifers are retained in the herd and all remaining progeny are marketed at weaning.
- Red Angus GM is GridMaster Index. This is the expected average performance of progeny which are fed out to slaughter and marketed on a quality-based carcass grid.
- Shorthorn \$CEZ is Calving Ease Direct. This index assumes a bull will only be mated to heifers. It is the expected average performance of progeny for profitability, which is measured by the incidence of live calves at birth.
- Shorthorn \$BMI is British Maternal Index. This is the expected average performance of progeny of Shorthorn bulls when mated to a British cow base. It has a balance of growth and carcass traits, with a strong maternal component.
- Shorthorn \$F is Feedlot. This is the expected average performance of progeny when sold on the fed market. It has a strong emphasis on growth and carcass traits.
- Simmental and SimAngus API is All-Purpose Index. This is the expected average performance of progeny of Simmental bulls used on the entire Angus cowherd, with a portion of the daughters being retained for breeding and the remaining progeny being put on feed and sold grade and yield.
- Simmental and SimAngus TI is Terminal Index. This is the expected average performance of progeny of Simmental bulls mated to mature Angus cows, with all offspring placed in the feedlot and sold grade and yield. It includes growth and carcass information only, since all progeny are marketed.

Accuracy

Most EPDs are reported with an Accuracy (ACC) value, which ranges from 0 to 1. It is a measure of the reliability of the EPD. EPDs will change and become more accurate as additional data on the bull and his relatives are processed by the breed association. For most yearling bulls, ACC is low, because they have not sired any progeny; however, genomic testing will increase the accuracy of the EPDs. Some breeds report the accuracy of these EPDs as BK, I, P, P+, or PE. These indicate that the EPD is based on pedigree data, or is an interim EPD based on pedigree data and the bull's own performance.

Percentile Tables

Average EPDs for most traits are not zero. The actual average will be different for each breed. Percentile tables must be used to determine where a bull's EPDs and indexes rank within the breed. EPDs and \$ Indexes for the bulls in the IBEP test should be compared to percentiles for non-parent bulls of the same breed. Look up the bull's EPD in the table to determine where he ranks in his breed. For example, an Angus bull with a Yearling Weight EPD of +110 lb. is in the top 35% of Angus non-parent bulls. An Angus bull with a Birth Weight EPD of +1.0 lb. is in the top 45%. Remember that for most traits, a positive EPD is desirable. However, for Birth Weight, Carcass Fat, and Yield Grade, a negative EPD is desirable.

The EPDs and \$ Indexes in the sale catalog are reported with the bull's percentile ranking in *'s. These are in 10% groups. An EPD with *10* is in the top 1-10% of the non-parent bulls of the breed, *9* is 11-20%, and so on; *2* is 81-90%, and *1* is 91-100% or the bottom 10%.

Percentile tables provided by the breed associations for breeds in the current IBEP test are available on our web site, <https://ag.purdue.edu/ansc/ibep/>. (Although Simmental, Red Angus, Chianina, Maine Anjou and Gelbvieh association EPDs can be directly compared, percentile tables will be different for each breed.)