What Do The Angus EPDs Really Mean?

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To truly understand what is represented by each EPD available in the Angus breed is to be able to design the genetic base and true value of a group of animals. The following is an explanation of what the EPD represents, how it is measured, and its value to you as a breeder in making informed genetic decisions. To start, producers need to know what measures of genetic measurement are available to them.

**Expected Progeny Difference (EPD)**, is the prediction of how future progeny of each animal are expected to perform relative to the progeny of other animals within the same breed. EPDs are expressed in units of measure for the trait, plus or minus. Interim EPDs may appear on young animals when their own performance has yet to be incorporated into the National Cattle Evaluation (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.

**Accuracy (ACC)**, is the reliability that can be placed on the EPD. An accuracy of close to 1.0 indicates higher reliability. Accuracy is impacted by the number of progeny and ancestral records included in the analysis. Accuracy value normally range from .05 to .90 with younger animals understandably having lower accuracy due to age limiting the number of progeny records or personal performance data.

**$Value Indexes**, are multi-trait selection indexes, expressed in dollars per head, to assist beef producers by adding simplicity to genetic selection decisions by incorporating multiple EPD's into a single value. The $Value is an estimate of how future progeny of each sire are expected to perform, on average, compared to progeny of other sires in the database if the sires were randomly mated to cows and if calves were exposed to the same environment.

**PRODUCTION**

**Calving Ease Direct (CED)**, is expressed as a difference in percentage of unassisted births, with a higher value indicating greater calving ease in first-calf heifers. It predicts the average difference in ease with which a sire's calves will be born when he is bred to first-calf heifers.

**Birth Weight EPD (BW)**, expressed in pounds, is a predictor of a sire's ability to transmit birth weight to his progeny compared to that of other sires.
**Weaning Weight EPD (WW)**, expressed in pounds, is a predictor of a sire's ability to transmit weaning growth to his progeny compared to that of other sires.

**Yearling Weight EPD (YW)**, expressed in pounds, is a predictor of a sire's ability to transmit yearling growth to his progeny compared to that of other sires.

**Yearling Height EPD (YH)**, is a predictor of a sire's ability to transmit yearling height, expressed in inches, compared to the that of other sires. Height is normally measured level across the hip in line with the hook bones.

**Scrotal Circumference EPD (SC)**, expressed in centimeters, is a predictor of the difference in transmitting ability for scrotal size compared to that of other sires. There is an indication that bulls with larger Scrotal Circumference not only breed more cows in a shorter time period, but daughters of bulls with larger scrotal circumference reach puberty faster.

**MATERNAL**

**Calving Ease Maternal (CEM)**, is expressed as a difference in percentage of unassisted births with a higher value indicating greater calving ease in first-calf daughters. It predicts the average ease with which a sire's daughters will calve as first-calf heifers when compared to daughters of other sires.

**Maternal Milk EPD (Milk)**, is a predictor of a sire's genetic merit for milk and mothering ability as expressed in his daughters compared to daughters of other sires. In other words, it is that part of a calf’s weaning weight attributed to milk and mothering ability of the sire’s daughters.

**Herds (MkH)** indicate the number of herds from which data from the bull’s daughters are reported.

**Daughters (MkD)** reflects the number of daughters that have progeny weaning weight records included in the analysis for maternal milk EPD.

**Mature Weight EPD (MW)**, expressed in pounds, is a predictor of the difference in mature weight of daughters of a sire compared to the daughters of other sires.

**Mature Height EPD (MH)**, expressed in inches, is a predictor of the difference in mature height of a sire's daughters compared to daughters of other sires.

**Cow Energy Value ($EN)**, expressed in dollar savings per cow per year, assesses differences in cow energy requirements as an expected dollar savings difference in daughters of sires. A larger value is more favorable when comparing two animals (more dollars saved on feed energy expenses). Components for computing the cow $EN savings difference include lactation energy and other energy costs associated with differences in mature cow size.
Carcass merit and value has become one of the major criteria for selection within the beef cattle business. Value, and ultimately potential profit rely heavily upon the value of the carcass and the amount of usable product when the animal is harvested. As a result, predictors of carcass value, both carcass and ultrasound EPD’s have become important in identifying differences in genetic values. Carcass EPD’s have been used for a number of years and differ from ultrasound EPD’s in a number of ways. Marbling is listed as a fractional difference in the USDA marbling score for carcass EPDs while it is listed as a percentage of intramuscular fat in Ultrasound EPDs. Fat thickness while measured in inches in both instances, is measured at the 12th rib for Carcass and the 12th rib and rump for Ultrasound. The largest difference in Carcass and Ultrasound EPDs is the animal must be harvested and actual measurements taken for carcass while ultrasound EPDs involve the collection of an image which is then analyzed by a certified technician for numerical definition. It is likely the industry will start to phase out carcass EPDs and standardize with Ultrasound information. Producers who know some information about the carcass merit of their herd will be able to make more informed decisions with these tools. Therefore it is highly encouraged that producers ultrasound animals within their herd at the appropriate time to gather information on all individuals over time.

**CARCASS**

**Carcass Weight EPD (CW),** expressed in pounds is a predictor of the differences in hot carcass weight of a sire's progeny compared to progeny of other sires. A value neither larger or smaller than the breed average would be expected to result in little change in carcass weight from where the average for the herd is currently.

**Marbling EPD (Marb),** expressed as a fraction of the difference in USDA marbling score of a sire's progeny compared to progeny of other sires. A higher value will most likely result in greater quality and acceptance.

**Ribeye Area EPD (RE),** expressed in square inches, is a predictor of the difference in ribeye area of a sire's progeny compared to progeny of other sires. Larger values will result in progeny with larger ribeye areas when needed

**Fat Thickness EPD (Fat),** expressed in inches, is a predictor of the differences in external fat thickness at the 12th rib (as measured between the 12th and 13th ribs) of a sire's progeny compared to progeny of other sires. Selection for less external fat reduces the amount of trim needed at the packing plant and can increase the value of the animal.

**Group/progeny (Grp/Pg)** reflects the number of contemporary groups and the number of carcasses for each sire included in the analysis for carcass EPD values.
ULTRASOUND

Intramuscular Fat EPD (%IMF), is a predictor of the difference in a sire's progeny for percent intramuscular fat in the ribeye muscle compared to other sires.

Ribeye Area EPD (RE) is a predictor of the difference in square inches of ultrasound ribeye area of a sire's progeny compared to the progeny of other sires.

Fat Thickness EPD (FAT), expressed in inches, is a predictor of the difference in ultrasound fat thickness at the 12th rib of a sire's progeny compared to the progeny of other sires. It includes the weighted average of 60% of the rib fat measurement and 40% of the rump fat measurement.

Group/progeny (GP/PG) is the number of contemporary groups and number of progeny considered in this analysis.

$VALUE INDEXES

$Value indexes are multi-trait selection indexes, expressed in dollars per head, to assist beef producers by adding simplicity to genetic selection decisions. The $Value is an estimate of how future progeny of each sire are expected to perform, on average, compared to progeny of other sires in the database if the sires were randomly mated to cows and if calves were exposed to the same environment. The use of multi-trait selection indexes as tools for commercial cow-calf operators and seedstock breeders is rapidly evolving in the beef industry. Selection indexes are a tool to select for several traits at once. An index approach takes into account genetic and economic values to select for economic merit. A multi-trait index approach can be contrasted to single-trait selection or independent culling levels.

To reduce the confusion of evaluating all the available EPD values, and individual performance information, indexes have been developed and calculated to simplify multi trait selection. Weaned Calf Value ($W), Feedlot Value ($F), Grid Value ($G) and Beef Value ($B) are bioeconomic values, expressed in dollars per head, to assist commercial and purebred beef producers by adding simplicity to genetic selection decisions. Also, a Cow Energy Value ($EN) is available for fine-tuning the cow herd. Purebred breeders need to understand these values to assist commercial customers in selection and purchasing decisions.

$Values encompass the revenue generated from genetically derived outputs and associated costs of required inputs. $Values only have meaning when used in comparing the relative merit or ranking of two individuals within the same breed. $Values are sensitive to the assumptions for the industry-relevant components used in calculating the indexes. As with EPDs, variation in $Values between animals indicates expected differences in the relative value of progeny if random mating is assumed.
**Weaned Calf $W\text{Value},** an index value expressed in dollars per head, is the expected average difference in future progeny performance for pre-weaning merit. $W$ includes both revenue and cost adjustments associated with differences in birth weight, weaning direct growth, maternal milk, and mature cow size.

1. **Birth Weight** - birth weight influences on calf death losses related to dystocia (assisted births), weaned calf crop percentage, and resulting revenue per cow.
2. **Weaning Weight - direct growth impact** on weaning weight revenue (pre-weaning growth and pounds of calf sold) and energy requirements and related costs necessary to support pre-weaning calf growth.
3. **Maternal Milk** - revenue from calf pre-weaning growth and pounds of calf sold as influenced by varying cow milk levels, and costs related to lactation energy requirements. Measured in pounds of weaning weight of daughter’s calves that are attributed to increased milking ability of the daughter.
4. **Mature Cow Size** - expense adjustments are made for maintenance energy as related to differing mature cow size, including mathematical linkages between mature weight and yearling weight. The assumption is that larger frame sizes would incur greater maintenance costs.

The impact areas are combined into a bio-economic value expressed in dollars per head from birth through weaning. Resources used to form the Wean Calf Value ($W$) include National Research Council (NRC), US Meat and Animal Research Center (USMARC), Cattle-Fax, SPA and university cow-calf budgets, and breed performance databases.

$W$ provides the expected dollar-per-head difference in future progeny pre-weaning performance in a multi-trait fashion, within a typical U.S. beef cowherd. If Bull A has a $W$ of +25.00 and Bull B has a $W$ of +15.00, and these sires were randomly mated to a comparable set of females and the calves were exposed to the same environment, and a normal number of replacement females were saved from both sires, on average you could expect Bull A’s progeny to have a +10.00 per head advantage in pre-weaning value over Bull B’s progeny (25.00 - 15.00 = +10.00 per head). As with any $W\text{Value}$, $W$ only has meaning when used in comparing the relative merit or ranking of two individuals.

Weaned Calf Value uses these assumptions. As every producer knows, calf prices vary, feed costs vary, as well as the other values assumed in the calculation of this index. It is important to remember that while these values may not be current, as long as the values change for all the population, the relative ranking of the animals, and their differences when compared will stay in the same relative order. **In other words, the value of this performance measure is to predict average genetic differences in individuals, not to measure actual performance**

Base Price=$115\text{ per cwt},\text{ Cow/Heifer Mix}=80%/20,\text{ Cow w}t. =1300\text{ lb},\text{ Feed energy cost of }\$0.06\text{ per MCal NEm}
Cow Energy Value ($EN)

A Cow Energy Value ($EN) is available to assess differences in cow energy requirements, expressed in dollars per cow per year, as an expected dollar savings difference in future daughters of sires. A larger value is more favorable when comparing two animals (more dollars saved on feed energy expenses). Components for computing the cow $EN savings difference include lactation energy requirements and energy costs associated with differences in mature cow size. For example, an individual with a $EN of +15.75 compared with an individual with a $EN of +4.68 would result in an expected savings of 11.07 for the first individual’s future daughter’s feed energy costs. As feed costs change, it is important to remember that the measurement is the expected difference in two individuals that can be attributed to genetics. The $EN is an additional tool for breeders wanting to fine-tune cowherd maintenance attributes in their breeding programs.

For years, commercial bull buyers have requested a multi trait selection tool that focused on traits that have great effect on profitability in fed cattle. Profitability for feeder calf producers, backgrounders and feeders rely heavily upon growth and carcass merit. As a result, the Feedlot Value $F, Grid Value $G, and Beef Value $B were created. While the traits encompassed in these values are indeed important, they should not be used as a single selection criteria as they only address post-weaning performance and carcass merit. These values again only have merit when used to compare genetic differences of two individuals and cannot be used to predict actual performance of an individual.

Feedlot Value ($F), an index value expressed in dollars per head, is the expected average difference in future progeny performance for post-weaning merit compared to progeny of other sires. $F incorporates weaning weight (WW) and yearling weight (YW) EPD along with trait interrelationships. Typical feedlot gain value, feed consumption and cost differences are accounted for in the final calculations, along with a standard set of industry values for days on feed, ration costs and cash cattle price. As with other $values, assumptions are made for required inputs and prices received. Even when these prices are not current, relative rankings of the individuals and associated differences will still be accurate. In other words, the value of this performance measure is to predict average genetic differences in individuals, not to measure actual performance. Feedlot assumptions are:

Time on feed of 160 days, Ration cost of $190 per dry ton, and Fed market of $ 84 per cwt.

Grid Value ($G), an index value expressed in dollars per head, is the expected average difference in future progeny performance for carcass grid merit compared to progeny of other sires. The $G combines quality grade and yield grade attributes, and is calculated for animals with carcass EPDs, ultrasound EPDs or both types of EPDs. A three-year rolling average is used to establish typical industry economic values for quality grade and yield grade schedules. Quality grade premiums are specified for Prime, CAB and Choice carcasses, as well as Select and Standard discounts. Yield grade premiums are incorporated for YG 1 and YG 2 (high-yielding carcasses), with discounts for YG 4 and YG 5 (low red meat yields). Grid impact in dollars per
hundredweight (cwt.) and dollars per head is calculated from the yield and quality grade components, and then combined to arrive at the $G.

- **Quality Grade ($QG)** $QG$ represents the quality grade segment of the economic advantage found in $G$. $QG$ is intended for the specialized user wanting to place more emphasis on improving quality grade. The carcass marbling (Marb) EPD and ultrasound-derived percent intramuscular fat (%IMF) EPD contribute to $QG.

- **Yield Grade ($YG)** $YG$ represents the yield grade segment of the economic advantage found in $G$. $YG$ is intended for the specialized user wanting to place more emphasis on red meat yield. It provides a multi-trait approach to encompass ribeye, fat thickness and weight into an economic value for red meat yield.

$G$ combines both $QG$ and $YG$, and may be the best carcass decision tool for focusing on quality and red meat yield simultaneously. The assumptions used in the calculation of this index are listed below. As with other $S$ values, assumptions are made for prices, premiums, and discounts. Even when these are not current, relative rankings of the individuals and associated differences will still be accurate. In other words, the value of this performance measure is to predict average genetic differences in individuals, not to measure actual performance.

**Quality components:**

Prime premium(above Choice)=$8.00,  
CAB premium (above Choice)=$3.50,  
Choice-Select spread=$11.00,  
Standard discount=$-15.00

**Yield components:**

YG 1 premium=$3.00,  
YG 2 premium=$1.50,  
YG 3 base=$0.00,  
YG 4 & 5 discount=$-25.00,  
Avg. carcass wt., lb.=816,  
Heavyweight discount=$-20.00

**Beef Value ($B)** facilitates what almost every beef breeder is already seeking - simultaneous multi-trait genetic selection for feedlot and carcass merit, based on dollars and cents. $B$ represents the expected average dollar-per-head difference in the progeny post-weaning performance and carcass value compared to progeny of other sires. The $B$ value is comprised of two pieces: $F$ and $G$. To align $B$ with marketplace realities and appropriately valued carcass weight, the following factors are incorporated into the final calculations for $B$:

- $B$ is not simply the sum of $F$ and $G$.
- Projected carcass weight and its value are calculated, along with production cost differences.
- $B$ takes into consideration any discount for heavyweight carcasses.
• Final adjustments are made to prevent double-counting weight between feedlot and carcass segments.

The resulting $B$ value is not designed to be driven by one factor, such as quality, red meat yield or weight. Instead, it is a dynamic result of the application of commercial market values to genetics for both feedlot and carcass merit.

**Docility EPDs**

More than ever, emphasis is being placed on temperament in cattle. The influence of temperament on carcass quality issues as well as personal safety has made measurement of this trait important from an economic standpoint. It has been documented that highly excitable cattle will be more likely to have higher incidences of dark cutters, as well as tenderness and taste issues in retail cuts. It is also more expensive to feed highly excitable cattle as more of the dry matter intake will go towards body maintenance, leaving less available for growth and finishing. With the losses associated with losses from carcass quality, combined with the personal safety issue, the economic impact of temperament can be significant. Docility EPDs can provide a means of predicting genetic differences between individuals in the same breed in regards to temperament. The values for the docility EPDs are reported in percentages, with higher percentages being most favorable. For example, if Bull A had a docility EPD of 9% and Bull B had a docility EPD of 4% one could expect 5 more calves out of 100 born by Bull A to be in the most docile score (docile score=1). In herds where temperament is not an issue, the expected difference would not be realized. Cattle are scored for docility by the breeder in the following scores:

- **Docility Score=1** Mild disposition, does not pull on headgate, exits chute calmly.
- **Docility Score=2** Quiet, but stubborn, may pull back on headgate and exits chute quickly
- **Docility Score=3** Nervous and impatient but manageable. Repeated pushing and pulling on headgate, exits quickly.
- **Docility Score=4** Flighty, wild, jumpy, or out of control. Defecates and urinates during chute work, continually flicks tail. Has large flight zone and runs fence and jumps when pushed
- **Docility Score=5** Same attributes as score of 4 but is also aggressive. May exhibit attack behavior when worked singly. Very vocal in chute.
- **Docility Score=6** Extremely aggressive. Thrashes about or attacks when pressed. Pronounced attack behavior.