



The Ranchers' Guide to EPDs

The Playbook for profit minded producers...

With the goal of simplifying ranchers' profit equation, Red Angus continues blazing new trails in the pursuit of providing commercial producers with concise genetic predictions.

Based on the concept of Economically Relevant Traits (ERTs), producers are equipped with tools that allow for selection on traits that directly impact profitability. These tools simplify the selection process, and arm producers with the ability to better identify range bulls whose genetics will more positively impact profitability.

With a long standing commitment to better serve this continually changing beef industry, Red Angus has prepared for tomorrow's challenges through

New & Improved Genetic Predictions (EPDs). Red Angus has combined databases with the American Simmental Association in order to simplify producers' use of crossbreeding programs by supplying them with true multi-breed EPDs. Additionally, with the recent changes to carcass value Red Angus has added Carcass Weight and Yield Grade to its arsenal of ERTs.

EPDs are the most reliable predictors of an animal's true genetic merit. As the only major beef breed to mandate Total Herd Reporting (THR), Red Angus EPDs have the built in advantage of being calculated from 15 years of complete contemporary group data. EPDs have "fast-tracked" beef cattle improvement and removed much of the guesswork associated with selecting range bulls.



EPDs: What, Why & How?

EPDs predict differences in progeny performance, and are calculated from comparisons within Contemporary Groups. (A group of calves that were born in the same year, calving season, herd, and are of the same sex and were fed and managed alike.)

EPDs have a clear advantage over less sophisticated predictors such as actual weights or within-herd ratios. Actual and adjusted weights are affected by environment, nutrition and management. Contemporary group ratios are an improvement, as they account for these environmental variables. However, they do not incorporate comparative performance data on related individuals in countless herds throughout the country. Red Angus EPDs account for these sources of variation in performance as well as mating bias (which cows were bred to which bulls). The power of these genetic predictions is multiplied by including every contemporary group from herds in the entire Red Angus breed.

Multi-Breed EPD Revelation – made possible through collaboration with American Simmental Association. This advancement incorporates a true multi-breed EPD model which accurately accounts for variation in animal performance due to heterosis, as well as accurately accounting for additive genetic differences between breeds. This enhancement enables Red Angus to provide reliable EPDs on all animals in the database, regardless of breed composition.



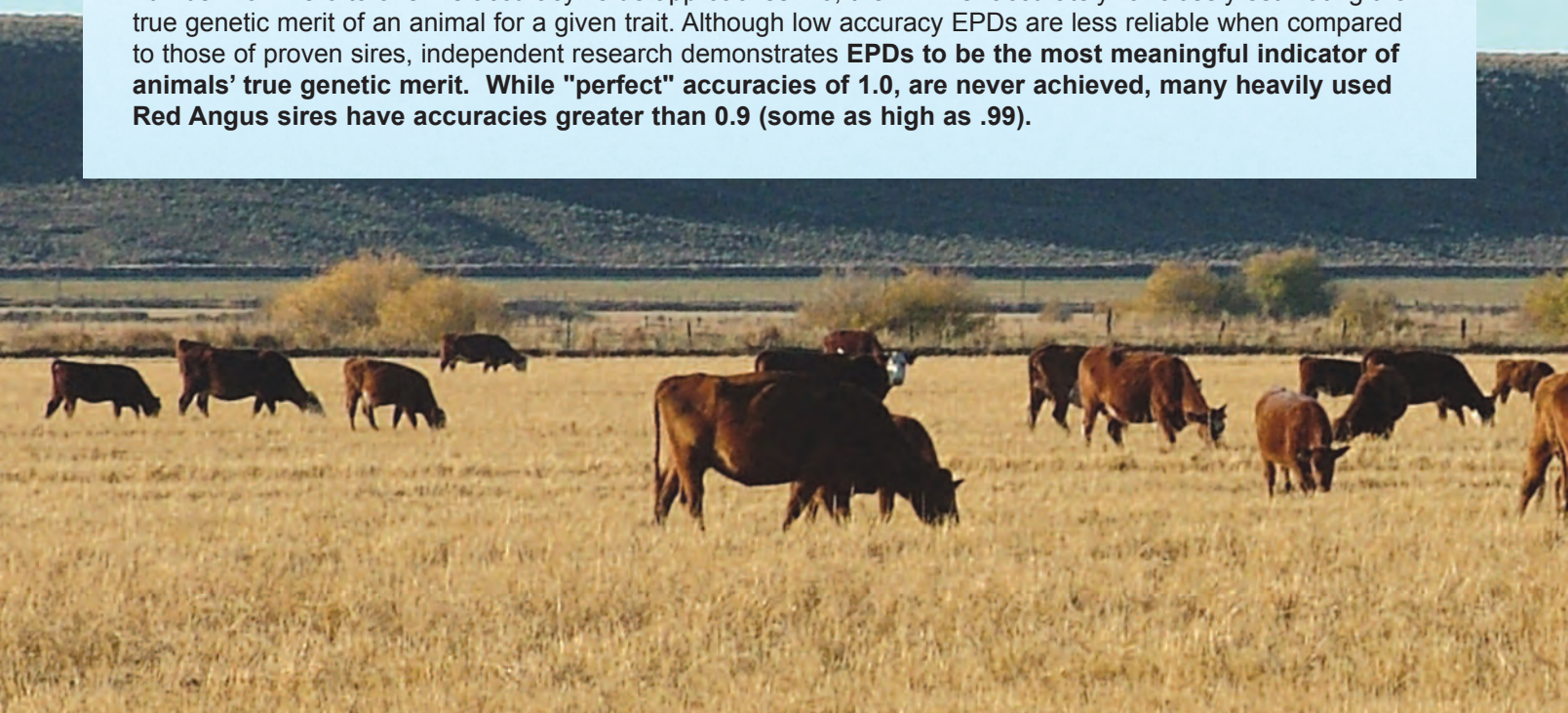
Absolute performance is not predictable... Relative performance is. For Example: Suppose your old herd bull has a yearling weight EPD of 50. You buy a new bull with a yearling weight EPD of 70. How much will the new bull boost your calves' yearling weights?

The Answer...

We cannot predict how much performance will change from one year to the next because of varying environmental conditions (rainfall, temperature, available feed-stuffs, etc). However, we do know this: the calves raised in the same contemporary group sired by your new bull will have the genetics to weigh an average of 20 pounds more at 365 days of age as compared to calves sired by the old bull.

Understanding ACCURACY

Red Angus EPDs are often presented with a corresponding accuracy value, which measures the strength of the relationship between the genetic prediction (EPD) and true genetic value. Accuracies are reported as a decimal number from zero to one. As accuracy value approaches 1.0, the EPD is "accurately" or closely estimating the true genetic merit of an animal for a given trait. Although low accuracy EPDs are less reliable when compared to those of proven sires, independent research demonstrates **EPDs to be the most meaningful indicator of animals' true genetic merit. While "perfect" accuracies of 1.0, are never achieved, many heavily used Red Angus sires have accuracies greater than 0.9 (some as high as .99).**



More Data + Cleaner Data Equals the Industry's Most Reliable EPDs

Red Angus history was made in 2010... Through a shared vision of ensuring producer profitability, Red Angus and American Simmental Association (ASA) combined their datasets for EPD production.

Combining data is nothing new to Red Angus. For the last 8 years, Red Angus has pooled their data with the Canadian Angus Association (CAA). The result of these collaborations is a true multi-breed database with over 9 million animals...Over a million of which are common to both Red Angus and Simmental. Why go to the effort to merge different breeds' datasets? To provide higher accuracy EPDs which allow our customers to make better informed breeding decisions.

The strength of this database is magnified through the use of Total Herd Reporting (THR), which eliminates reporting bias from data used to calculate EPDs. In 1995, Red Angus implemented mandatory THR, which requires the annual production of every Red Angus cow and the performance of every calf raised through weaning to be reported. Shortly after, ASA and CAA followed suit with optional THR - which allows members to choose if they wish to participate in THR. While enrollment is not mandated by ASA and CAA, only data from herds participating in THR are used in EPD calculations.



Reporting bias is demonstrated in Tables 1 & 2. (Ratios are used in the example since they reflect the variation between an individual weight and the group average. used to calculate EPDs.) When only the top three calves are reported, the ratios are negatively affected for all calves (Table 2), because the group average is raised.

Obviously, incorrectly raising the group average will incorrectly reduce the ratio and incorrectly report progeny data on representative sires. Perhaps even more significant is the overestimate of performance of sires whose poorer performing calves are not reported.

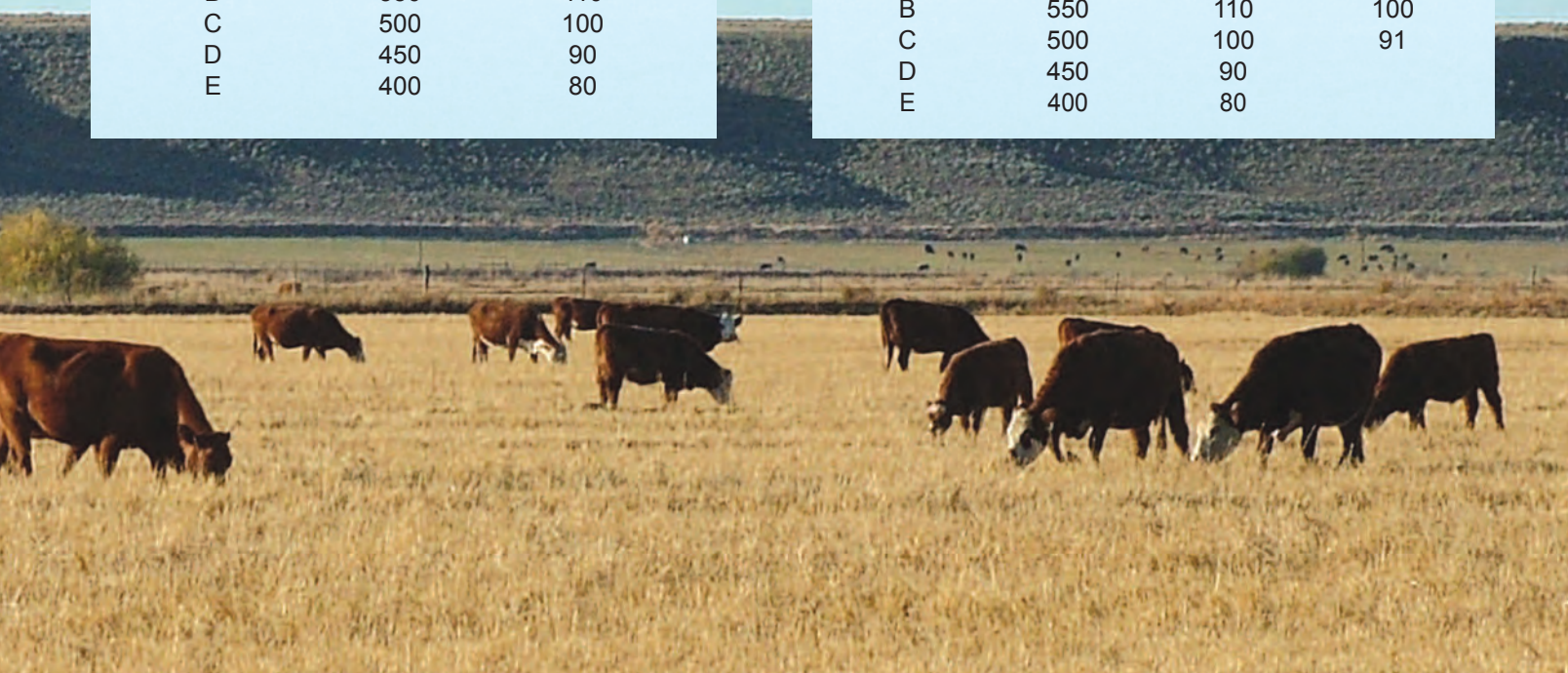
Only THR builds EPDs from the entire contemporary group - not just the data from the calves good enough to register.

Table 1. Contemporary Group with **complete** data

Calf ID	Weaning Weight	WWT Ratio
A	600	120
B	550	110
C	500	100
D	450	90
E	400	80

Table 2. Contemporary Group with **incomplete** reporting

Calf ID	Weaning Weight	True/THR WWT Ratio	"Selected" WWT Ratio
A	600	120	109
B	550	110	100
C	500	100	91
D	450	90	
E	400	80	



Cow Herd Building

Profit starts at Reproduction!

Placing selection pressure on traits that will have a direct impact on your marketed product (weaned calves, yearlings, carcasses sold in the meat) can certainly increase your revenue on a per calf basis. However, in order to achieve the higher goal of increased revenue per cow exposed, selection pressure must be placed on cow herd building traits. Red Angus' commitment to Total Herd Reporting allows for the measurement of each female's lifetime production history; from being exposed to breeding as a yearling, to measuring females' productive lifespan. Implementing these tools into your selection decisions will have a long term impact on your operation's profitability.

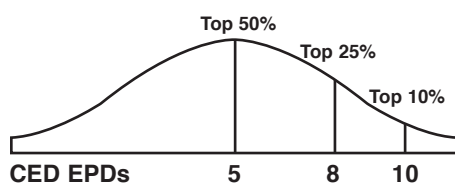
The data reported for these EPDs are categorical measures (yes or no answers) to the respective observation.

TRAIT	Positive Observation	Negative Observation
CED	unassisted birth	assisted birth
HPG	pregnant	open
CEM	unassisted calving	assisted calving
STAY	still productive after age six	not productive after age six

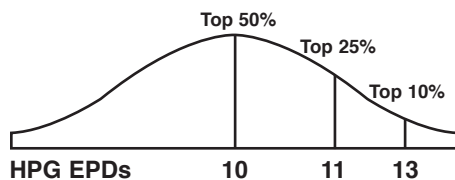


Profitable Reproduction can be boiled down to success in these four Economically Relevant Traits.

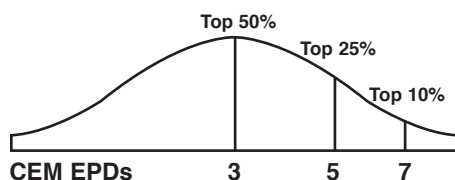
Each is expressed in percent probability, meaning the higher the EPD, the more likely the positive observation.



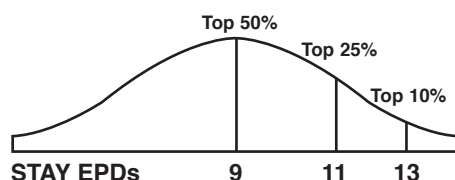
Calving Ease Direct (CED) - predicts the probability of calves being born unassisted out of two year-old heifers. Producers want live calves - born unassisted. Selecting on actual birth weight is flawed; it is influenced by non-genetic factors such as nutrition and weather (ambient temperature). While BW EPD removes these non-genetic factors, Red Angus' CED EPD is the best predictor of calving ease. The CED EPD includes variation in BW plus other influential genetic factors such as gestation length, calf shape, etc.



Heifer Pregnancy (HPG) - predicts the probability of heifers conceiving to calve at two years of age. Many breeds offer genetic predictions of yearling bull scrotal circumference as an indicator of age of puberty. While puberty is a prerequisite, many factors influence pregnancy rate. Red Angus' HPG EPD offers a tool which selects for what is economically relevant to ranchers - pregnant heifers.



Calving Ease Maternal (CEM) - predicts the probability of a given animal's daughters calving unassisted at two years of age. Replacement heifers should be able to calve on their own. Red Angus' CEM EPD offers the industry's most reliable prediction to address that concern. It includes not only the predisposition for a female to calve unassisted, but also her contribution to her calf's traits (birth weight, calf shape, etc.) that make it more likely to be born unassisted.



Stayability (STAY) - predicts the probability that a bull's daughters will remain in the herd until at least six years of age. University studies have shown the breakeven point on replacement heifers is five to six years of age. Females that don't stay in the herd that long are losing money, and they also contribute to a higher rate of replacement females that producers must retain instead of being cash cropped.

Traits

Cows Eat Money! Operating in an era of high production costs, Red Angus stakeholders are armed with a tool to reduce the expense side of their profit equation: **Maintenance Energy EPD (ME)**.

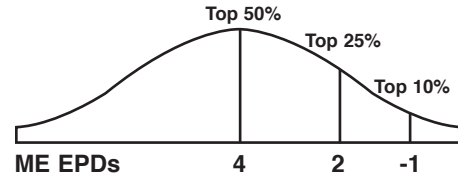
Accounting for 30 - 40% of the annual cow costs, requirements for Maintenance Energy is typically the single largest expense of cow/calf operations. Red Angus' ME EPD allows producers to select bulls whose daughters will require less feed to maintain their body weight and condition; thus, increasing profitability.

How does this affect me? The energy content of average quality range forage is approximately 0.86 Mcal per pound of dry matter. If a sire has an ME EPD of +20 Mcal/month his offspring will require approximately 23 lbs (20/0.86) more dry matter per month than offspring of the sire with an ME EPD of 0. Magnify that difference over 12 months and 100 cows: you'll need another 14 tons of feed, or to get rid of a few cows.

How is ME EPD calculated?

There are three components of ME EPD: Mature Weight, Milk, and Body Condition Score (BCS). To calculate ME EPD, Red Angus breeders collect mature cow weights (taken when calves are weaned) and BCS (cows should be scored when weighed). The Mature Weights are adjusted to 5 years of age, and to a common BCS of 5. It is essential that all cows in the same contemporary group are scored by the same person. BCS plays an important role in calculating Red Angus' ME EPD as it is essential that mature weight be standardized to body condition.

Think of it this way: A BCS 7 cow that weighs 1200 lbs is really a "FAT" 1100 lb cow. Likewise, a BCS 3 cow that weighs 1200 lbs is really a "Skinny" 1350 lb cow.



ME EPD helps ensure environmental fit.

Cattle run in all types of environments, and each has different available feedstuffs. When cattle have higher maintenance energy requirements than their environment will support, producers must supplement feed, decrease stocking rate or accept decreasing body condition scores of their animals, which can adversely affect reproductive performance.

Maintenance "Curve Benders"

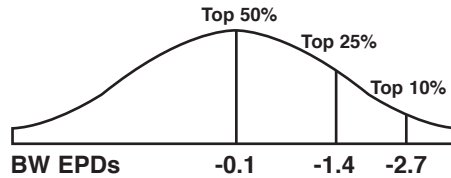
While higher milking, higher growth (larger mature size) cattle typically have higher maintenance requirements, there are many Red Angus sire choices that defy these antagonisms - actually combining positive revenue traits (Growth and Milk) with negative Expense Traits (ME).

The Expense side of ranchers' profit equation Profit equals revenue minus expenses. Select for ME EPD in conjunction with revenue trait EPDs to ensure feed costs don't get out of line with selection for greater performance and production. Single trait selection for ME ignores revenue, thus ignoring profit.

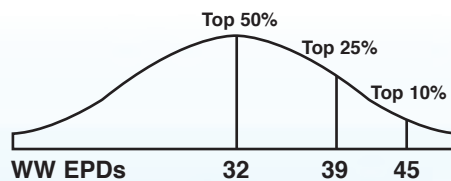


Traits that add weight to your bank account!

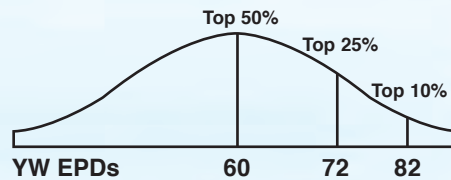
Realizing the vast majority of commercial operations' revenue comes from the sell of pounds, Red Angus strives to provide industry leading genetic predictions for growth. This can only be achieved through the implementation of Total Herd Reporting. Red Angus further ensures the reliability of performance data through the use of data filters, which eliminates data outside biological norms. The net result of these efforts - no surprises on pay day.



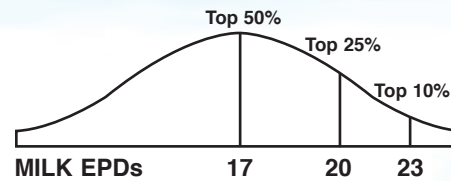
Birth Weight EPD (BW) predicts the difference, in pounds, for birth weight, and is also used in the calculation of Red Angus' Calving Ease Direct (CED) EPD.



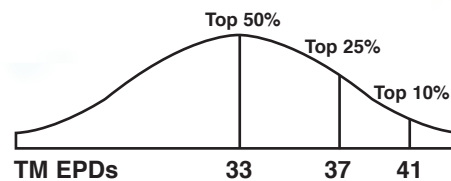
Weaning Weight EPD (WW) predicts the difference, in pounds, for weaning weight (adjusted to age of dam and a standard 205 days of age). This is an indicator of growth from birth to weaning.



Yearling Weight EPD (YW) predicts the expected difference, in pounds, for yearling weight (adjusted to a standard 365 days of age). This is an indicator of growth from birth to yearling.



Milk EPD (MILK) predicts the difference in maternal production of an individual animal's daughters as expressed by the weaning weight of their calves.



Total Maternal EPD (TM) predicts the rancher's actual observation of weaning weights of calves raised by an animal's daughters. TM includes the daughters milk EPD plus half of her genetic contribution to her calf's weaning weight EPD. The formula for TM EPD is:

$$\text{TM EPD} = \text{Milk EPD} + \frac{1}{2} (\text{WW EPD})$$



Bred in Carcass Value...

Red Angus is preferred among producers who retain ownership of their calf crop.

This demand is driven from consistent feedyard performance combined with reaping premiums from value-based grids. Furthering the mission of providing genetic predictions that directly impact producer profitability, Red Angus recently added Carcass Weight (CW) and Yield Grade (YG) to its arsenal of ERTs. Incorporation of these selection tools have the power to take your profitability to the next level.

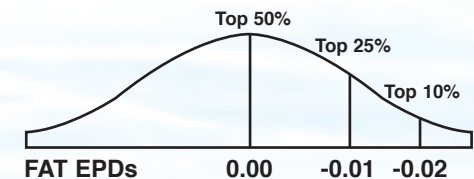
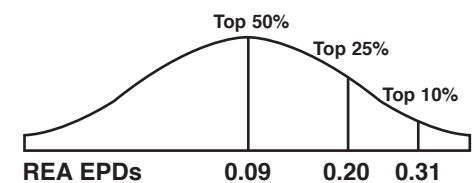
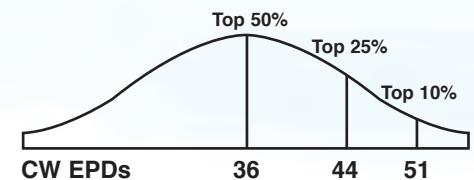
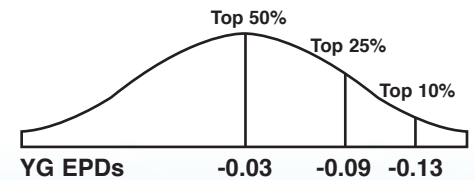
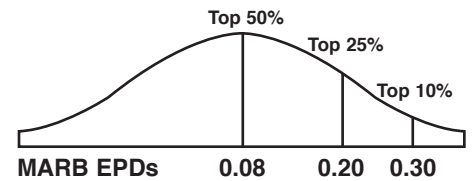
Marbling Score (MARB) predicts differences for carcass marbling score as expressed in marbling score units. Higher marbling scores are positively correlated with higher carcass quality grades.

Yield Grade (YG) predicts differences in USDA Yield Grade score, and is expressed in USDA Yield Grade units. YG EPD is calculated using the genetic predictions of CW, REA and FAT EPDs. The reliability of Red Angus' YG EPD is enhanced by using both ultrasound and actual carcass data in the calculation of REA and FAT EPDs.

Carcass Weight (CW) predicts differences in hot carcass weight and is expressed in pounds. Because Red Angus' CW EPD is a multi-trait model which includes birth, weaning, and yearling weight data, the prediction is not subject to culling bias. Thus, it provides a more reliable EPD as compared to only using actual carcass weights. This computation allows for the use of weights taken on ~57,000 animals per year as compared to only ~1,500 animals per year with actual carcass weight observations. Increased Carcass Weight tends to detrimentally affect Yield Grade; the calculation of which also includes Rib Eye Area and Fat Thickness.

Rib Eye Area (REA) predicts differences of carcass Rib Eye Area between the 12th and 13th rib. Increased Rib Eye Area has a beneficial effect on Yield Grade which also includes Carcass Weight and Fat Thickness.

12th Rib Fat Thickness (FAT) predicts differences for carcass fat depth over the 12th rib, as expressed in inches. Increases in fat thickness has a detrimental effect on Yield Grade.



Bull Selection Simplified.



Follow these simple steps to match bull power to your program's goals.

- 1) Know your target markets: feeder calves, yearlings, value based grids, replacement females.
- 2) Have a true appraisal of how close your cow herd is to those targets; always understanding your cows have to continue to live and reproduce in your environment.
- 3) Identify bulls whose EPDs predict the ability to move your cow herd in the right direction for the traits required to hit your market endpoint.

What is your breeding objective?

1. Building a cow herd?

- Combine low expense traits (ME EPD) with acceptable revenue traits to breed efficiency into the cow herd.
- Improve fertility with selection pressure on HPG EPDs.
- Sleep through the night by selecting high CEM EPDs.
- Improve longevity and lower replacement rates by selecting higher than average STAY EPDs.

2. Breeding virgin heifers?

- Select for CED EPD as the most meaningful predictor of calving ease. Red Angus' CED combines birthweight and other factors affecting calving ease scores.

3. Selling calves or yearlings?

- Heavier payweights may be achieved by selecting higher WW EPDs, but...make sure heavier is what you want. Heavier weaning weights mean heavier payweights for calf feds. However, for those who background their calves, too much weaning weight could translate into yearlings that are too heavy when they enter the feed yard, and finish too heavy. **Overshooting performance goals can be just as detrimental as falling short.**
- Enhance your reputation - improve traits that impact feeder profits, such as carcass traits and post-weaning gain (YW).

4. Retaining Ownership?

- Docile and fast starting, Red Angus are easy to start on feed and keep on feed.
- Balance YW EPD of potential bulls with the existing cow herd to pinpoint needed improvement for post weaning gains.
- Increase payweight with selection for improved CW EPD.

5. Selling on a Grid?

- Fine-tune marbling (MARB), rib eye area (REA), and back fat (FAT) EPDs to target value based grids.
- Target YG 1 & 2 premiums and avoid YG 4 discounts by applying selection pressure on YG EPD.
- Optimize carcass weights to increase payweights while avoiding discounts for heavy weight carcasses.
- Balance Carcass EPDs against existing cow herd genetics:
 - Cowherds of higher continental influence may require additional selection pressure on marbling EPD to improve quality grade.
 - High percentage British cowherds typically benefit from selection pressure to reduce YG and increase CW.

Please feel free to contact the Red Angus Association of America if you have further questions about EPDs or the selection of new herd sire(s).

Building Better Beef...

Red Angus

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