

Identifying Curve Bender Animals



The term curve bender gets thrown around quite a bit in bull breeding circles. This TechTalk article will discuss what a curve bender is and why curve benders are important to beef producers.

In addition, this article will discuss how to identify curve benders and address a common concern: what to do if your breed doesn't have curve benders.

WHAT IS A CURVE BENDER?

To understand what a curve bender animal is, we first need to think about the relationships between the different BREEDPLAN traits.

The BREEDPLAN traits are not inherited in isolation; there are a number of relationships between the traits. In some cases the relationships between traits are favourable, and selection pressure on one trait will drive the second trait in a desirable direction. Some examples of favourable relationships between traits include:

- **200 Day Weight and 400 Day Weight:** These two traits are positively correlated; generally, as 200 Day Weight increases, 400 Day Weight also increases.
- **Rib Fat Depth and Rump Fat Depth:** These two traits are positively correlated; generally, as Rib Fat increases, Rump Fat also increases.
- **Scrotal Size and Days to Calving:** These two traits are negatively (but favourably) correlated; generally, as Scrotal Size increases, Days to Calving decreases (becomes shorter).

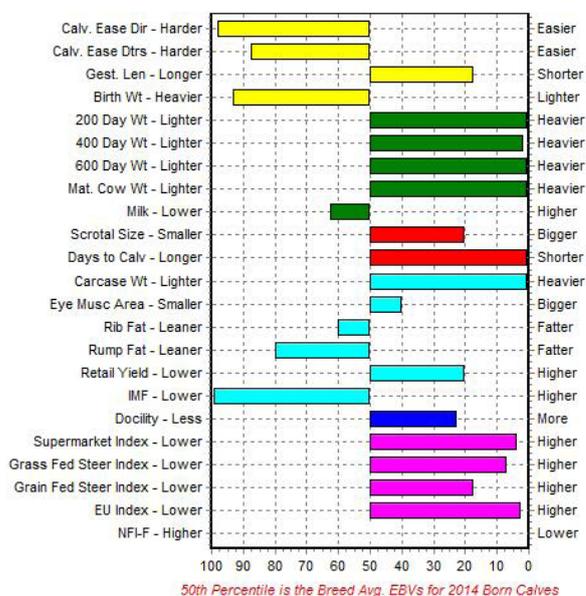
However, some relationships between traits are antagonistic, and selection pressure on one trait will cause the second trait to move in an unfavourable direction. Examples of antagonistic relationships between traits include:

- **200 Day Weight and Birth Weight:** These traits are positively correlated; generally, as 200 Day Weight increases, Birth Weight also increases.

- **600 Day Weight and Mature Cow Weight:** These traits are positively correlated; generally, as 600 Day Weight increases, Mature Cow Weight also increases.
- **Retail Beef Yield and Intramuscular Fat:** These two traits are negatively correlated; generally, as Retail Beef Yield increases, Intramuscular Fat decreases. Conversely, as Retail Beef Yield decreases, Intramuscular Fat generally increases.

While favourable relationships between traits don't pose much of a problem for beef producers, antagonistic relationships between economically important traits do. As antagonistic relationships between traits push one trait in a favourable direction and the second trait in an unfavourable direction, it can be difficult for beef producers to make genetic progress in both of the economically important traits.

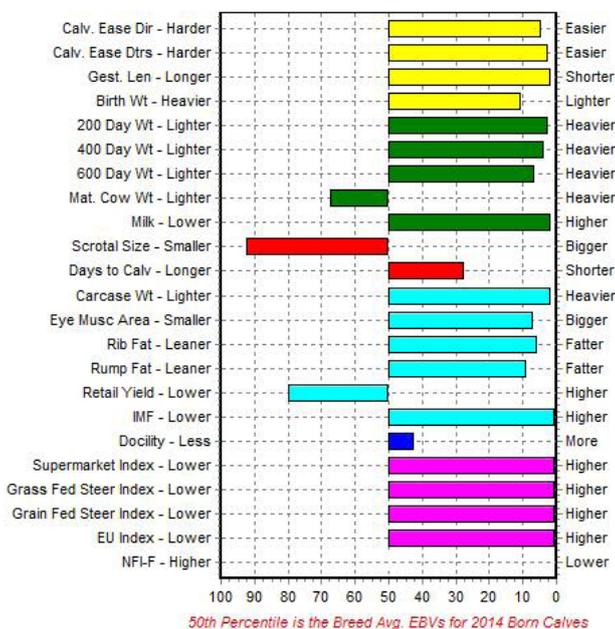
This is illustrated by considering the following bull, who we will refer to as Bull A. Bull A is in the top 5% of the breed for 200, 400 and 600 Day Weight (heavier than breed average). However, Bull A is also in the Top 90% of the breed for Birth Weight (heavier than breed average) and in the top 5% of the breed for Mature Cow Weight (heavier than breed average). While Bull A could be used to improve 200, 400 and 600 Day Weight in a herd, the use of this bull is likely to cause unfavourable increases in Birth Weight and Mature Cow Weight.



Luckily, there are animals out there that don't follow the expected trends. These animals are referred to as curve benders. Examples of curve bender animals include:

- An animal with a low/moderate Birth Weight EBV and high 200 Day Weight EBV.
- An animal with a high 600 Day Weight EBV and a low/moderate Mature Cow Weight EBV.
- An animal with a high Retail Beef Yield EBV and a high Intramuscular Fat EBV.

The bull below, who we will refer to as Bull B, is a good example of a curve bender. Like Bull A, Bull B is also in the top 5% of the breed for 200, 400 and 600 Day Weight (heavier than breed average). However, unlike Bull A, Bull B is in the top 10% of the breed for Birth Weight (lighter than breed average) and in the Top 65% of the breed for Mature Cow Weight (lighter than breed average). Therefore, the curve bender Bull B could be used to improve 200, 400 and 600 Day Weight in a herd, without causing unfavourable increases in Birth Weight and Mature Cow Weight.



Curve bender animals provide beef producers with the opportunity to make genetic progress in antagonistic traits at the same time. This is because these curve bender animals do not follow the normal trend (e.g. high growth associated with high birth weight), but 'bend the curve' (e.g. high growth but low birth weight). Curve bender animals are therefore highly valuable animals for beef producers trying to make genetic progress.

IDENTIFYING CURVE BENDERS

Given the important role that curve bender animals play in allowing genetic progress in antagonistic traits, how can beef producers identify curve bender animals within their own herds?

The answer is that breeders interested in identifying curve benders in their herds need to measure their animals for all of the relevant traits. For example, if a breeder wishes to identify curve bender animals with low to moderate Birth Weight EBVs, high 200, 400 and 600 Day Growth EBVs, and moderate Mature Cow Weight EBVs, then it is imperative that this herd records not just 200, 400 and 600 day weights on as many calves as possible, but also records birth weights and mature cow weights.

If the breeder only records 200, 400 and 600 day weights, and does not record birth weights, then the BREEDPLAN analysis has to rely on pedigree information and the correlations between other traits and birth weight when calculating the Birth Weight EBV. In this case, the 200, 400 and 600 day weight observations will largely drive the Birth Weight EBV. Given that the correlations between the growth traits and birth weight are positive, in the absence of birth weight records, an animal with high Growth EBVs will normally have a high Birth Weight EBV.



Similarly, if the breeder only records 200, 400 and 600 day weights, and does not record mature cow weights, then the BREEDPLAN analysis has to rely on pedigree information and the correlations between other traits and mature cow weight when calculating the Mature Cow Weight EBV. In this case, the 600 day weight observations will largely drive the Mature Cow Weight EBV. Given that there is a high positive correlation between 600 day weight and mature cow weight, in the absence of mature cow weight observations, an animal with high Growth EBVs will normally have a high Mature Cow Weight EBV.



Therefore, the only way that curve bender animals can be identified is for the BREEDPLAN analysis to have direct observations for all of the relevant traits. When this is not the case, the analysis will be forced to rely on pedigree information and information from correlated traits only. In this case, curve bender animals will not be identified. Remember, if the trait is important to you and/or your clients, then make sure you are recording it.

BUT MY BREED DOESN'T HAVE CURVE BENDERS?

This is one comment we hear, particularly from those beef producers who have a breed which is either few in numbers, or where only a small percentage of the breed population is being performance recorded. This may be true in one sense - for some breeds there may be no animals which have been identified as curve benders by their EBVs.

However, this does not mean that there are no curve bender animals within the breed. There is very likely to be curve benders animals in the population, but they have not been identified because they do not have complete performance data. The only way to identify these curve bender animals is to continue to collect good quality performance information on as many animals for as many traits of interest as possible and include this data in the BREEDPLAN analysis.

For further information on curve bender animals please contact staff at Southern Beef Technology Services (SBTS) or Tropical Beef Technology Services (TBTS).

