SBTS SOUTHERN BEEF TECHNOLOGY SERVICES
TBTS TROPICAL BEEF TECHNOLOGY SERVICES

TECH TALK
JUNE 2017

The Importance of Recording the Performance of Your Cattle

The saying "You only get out of something what you put into it" is particularly true of performance recording for genetic evaluation purposes. While it is possible for animals which have little or no performance data recorded to have EBVs, this TechTalk explains the benefits of recording as much trait information on your animals as practical.

Specifically, this article will discuss how we use recording to identify genetic merit, how recording more information can increase EBV accuracy, how identifying curve benders is impossible without recording, why recording is still important with genomics and how trait records can be used for non-genetic purposes. In addition, this article will discuss how to find out what traits have been recorded for each animal on the BREEDPLAN database and the value of recording traits for which BREEDPLAN does not currently calculate EBVs.

Identifying the Genetic Merit of Your Animals

With genetics, what we see is not always what we get. This is because environmental factors also have a considerable influence on most production traits. Therefore we cannot simply say that all of the observed differences in performance between animals raised in different environments and/or different management groups is due to their genetics.

In the example illustrated in Figure 1, we are comparing three bulls used on three different properties that have differing levels of feed availability. Based purely on the raw average yearling weights of each bull's progeny, it is impossible to know whether Bull B has superior genetics or whether his progeny's heavier weights are a function of the environment in which they were raised (on irrigated pasture). Nutrition is just one of the many environmental factors that can influence production traits. It is important to note that these factors can occur not only between properties, but between mobs and even within a single mob on a property. Two classic within mob examples are the presence of twins or individuals being sick or injured in an otherwise healthy herd.

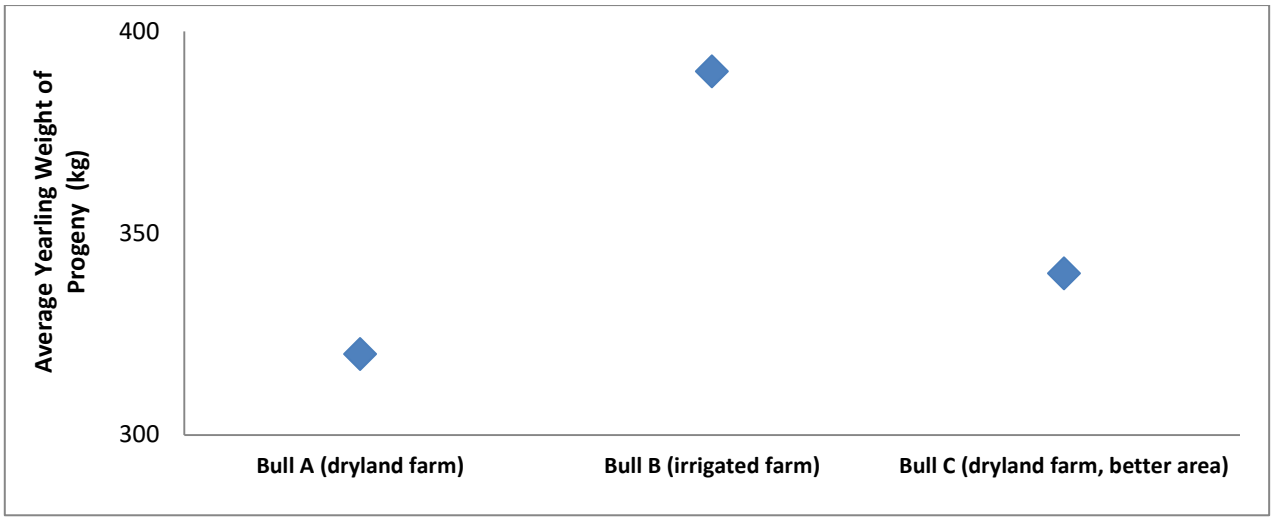

Figure 1. The average progeny yearling weight of Bull A, Bull B and Bull C, where the progeny were breed and raised on different properties.

The BREEDPLAN analysis removes the environmental factors from each animal's raw performance and calculates Estimated Breeding Values (EBVs). To achieve this, BREEDPLAN uses three sources of information; these are pedigree, trait records (from the individual itself and its recorded relatives) and, for some breeds, genomic information.

To allow BREEDPLAN to compare animals in different management groups (e.g. the scenario given in Figure 1), there needs to be a genetic link between each group and/or property. A sire used in multiple groups passes on the same genetic merit regardless of the group (or environment) he is used in. Therefore, by comparing the progeny of the link sire against the progeny of Bulls A, B and C on each individual property, we can evaluate the relative genetic merit of all the bulls involved.

As Figure 2 shows, the progeny of Bull A were 10kg heavier on average at 400 days of age than the link sire's progeny, while the progeny of Bull B were on average 10kg lighter at 400 days of age than the link sire's progeny. The progeny of Bull C were on average 20kg heavier than the progeny of the link sire at 400 days of age. Given that the genetic merit of the link sire does not change (e.g. any difference in average 400 day weight of the link sire's progeny on each property is due to environmental factors), we can deduce that Bull A and C are genetically superior to the link sire for 400 day weight, and Bull B is genetically inferior to the link sire for 400 day weight. As a result, we would expect that the 400 Day Weight EBVs for Bulls A, B and C will be 20kg heavier, 20kg lighter and 40kg heavier, respectively, than the 400 Day Weight EBV of the link sire.

Accuracy of Your Genetic Merit Estimates and Thus the Accuracy of Your Subsequent Selections

While it is possible to generate reliable EBVs from performance that has been recorded on correlated traits, generally speaking EBVs will be of lower accuracy if animals have not been directly recorded for the trait of interest. By definition, an EBV is an estimate of an animal's true breeding value. The higher the accuracy, the more likely the EBV will predict the animal's true breeding value and the lower the likelihood of change in the animal's EBV as more information is analysed for that animal, its progeny or its relatives. Ultimately, the higher the EBV accuracy, the more informed and reliable the selection decisions are that are made, and the more genetic improvement that can be achieved.

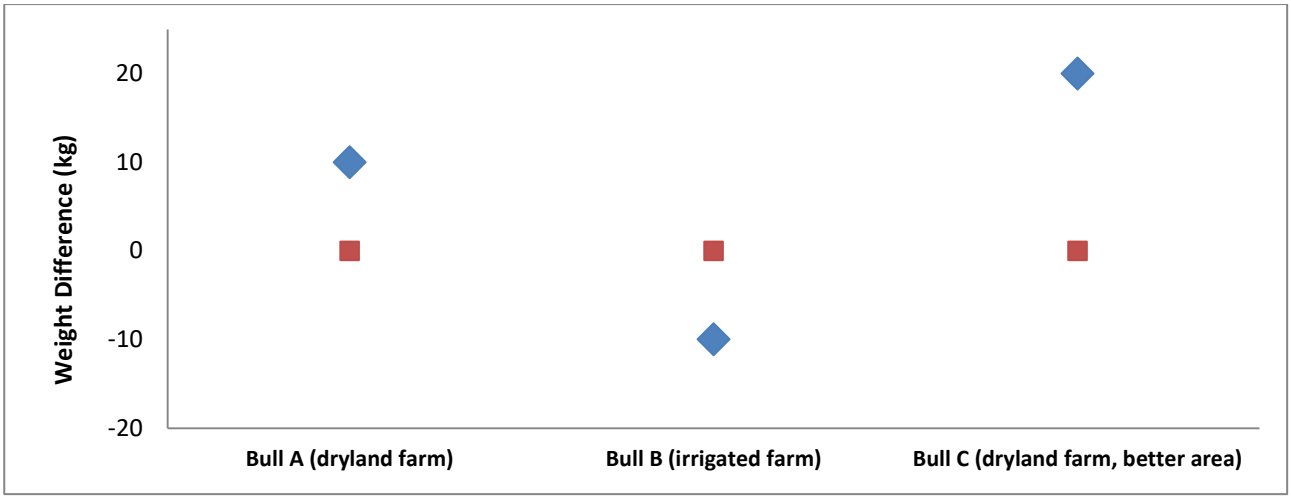

Figure 2. Average adjusted progeny performance for the 3 different sires (blue diamonds) benchmarked against the average adjusted progeny performance of the link sire (red square).

Consider these animals:

1. Animal A with no trait records (no birth weight or 200 day weight).
2. Animal B with a correlated trait record (200 day weight) but no record for the trait in question (birth weight).
3. Animal C with a record for the trait in question (birth weight) but no correlated trait records.

Indicative EBV accuracies for Animals A, B and C are displayed in Figure 3. It is important to note that these values are indicative only, as the exact EBV accuracies for an animal will vary depending on a number of factors. These factors include 1. the heritability of the trait, 2. the EBV accuracy of the parents, 3. the amount of performance information available, 4. the effectiveness of the performance information (e.g. contemporary group structure) and 5. genetic correlation with other measured traits. For example, we would expect that the EBV accuracies would be lower for traits (e.g. fertility) that are less heritable than birth weight. Equally, if the genetic correlation between the two traits was lower, then the difference in EBV accuracy between animals B and C would be greater.

The take home messages from these results are that EBV accuracy is improved by:

- Recording as much data as possible.
- If recording a trait is not practical (e.g. expensive or difficult to measure), then recording a correlated trait is beneficial though not as effective as recording the actual trait.
- Using information from correlated traits is also ineffective if you are trying to select against the known relationships between traits. See the following 'Curve Bender' section for more detail.
- To collect effective information for the BREEDPLAN analysis, breeders should aim to have a minimum contemporary group size of six animals, with at least two sires represented in each contemporary group.

BREEDPLAN can analyse up to two weights for each of 200, 400 and 600 day weights, and up to four mature cow weights per animal. Recording such repeated records can improve the accuracy of the resulting EBVs.

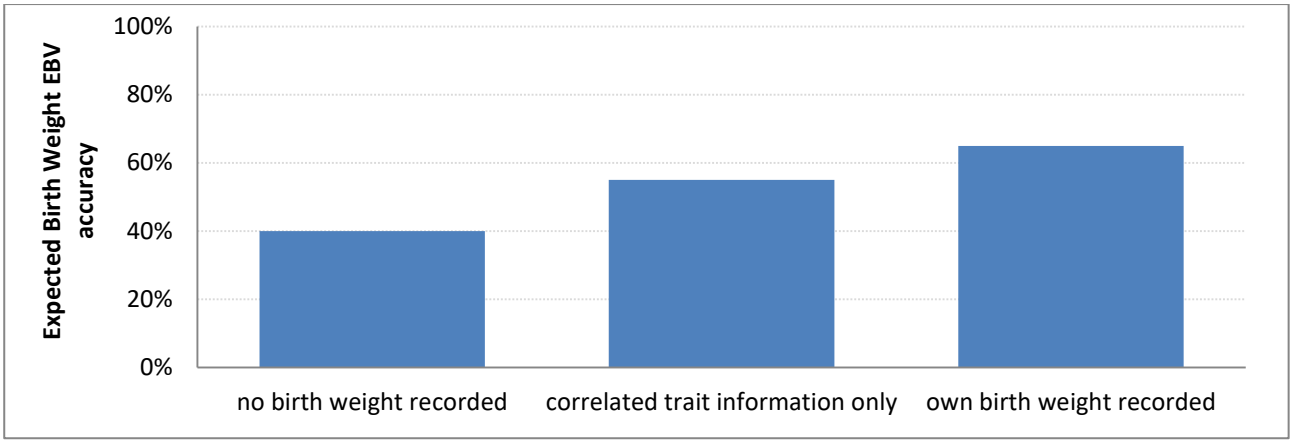

Figure 3. The expected Birth Weight EBV accuracy for three animals with differing levels of trait recording.

Identifying 'Curve Benders'

'Curve Benders' 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/moderate birth weight). Due to the strong genetic relationships between these trait pairings, we would typically expect that selection for growth would lead to an increase in both birth and mature weights, even if no selection emphasis is placed on birth and/or mature weight. This would have in turn have undesirable consequences for calving ease and mature cow feed requirements.

Fortunately, the correlations that govern these relationships are not absolute and are calculated from the average of the population. Therefore if a breeder records both traits, they should be able to identify individuals that deviate from the average correlation, and thus find animals that bend the growth curve. However, in situations where the breeder does not record both traits, the BREEDPLAN analysis has to rely on pedigree information and the correlations between traits to estimate the missing breeding value(s). In these circumstances, identifying curve benders is not possible. For example, if birth weight isn't recorded then the Birth Weight EBV will be estimated based on the correlations with the 200, 400 and 600 day weight observations. Given that the correlations between the growth traits and birth weight are positive, an animal with high Growth EBVs will receive a high Birth Weight EBV. Thus, identifying 'curve benders' cannot occur.

Relevance of Trait Recording When Using Genomics

In breeds where genomic information is currently incorporated into the BREEDPLAN analysis, a genomic test will give you an estimate of your animal's genetic merit (in the form of BREEDPLAN EBVs). However, the accuracy of the genomic EBVs for your herd will depend on a number of factors, including how closely related your animals are to what is termed the 'reference population'. The reference population is a group of animals which have both trait records and genotypes, and is critical for the success of genomic selection.

Recording traits for your animals in addition to having genomic tests done will mean your animals will become part of the reference population. In turn, the genomic tests are likely to be more accurate for animals in your herd, thus increasing the accuracy of your breeding values and allowing you to make more genetic progress. For further information see the SBTS & TBTS Technical Note 'An Introduction to Genomic Selection'.

Recording Isn't Just For Genetic Purposes

The traits that you record can also serve a purpose outside of identifying the genetic merit of your herd. For example, the loss of weight in an individual can be an indicator of ill health, while weight loss in a whole mob can indicate that more feed is required. Recording your herd also allows you to benchmark where your herd is

so that you can compare it against where you want to be and make appropriate management and strategic genetic decisions in order to reach your production system targets.

How Can I Tell What Traits an Animal Has Been Recorded For on BREEDPLAN?

The traits for which data has been submitted to BREEDPLAN are listed below the EBVs on the Individual Animal Page on Internet Solutions. An example of this is shown in Figure 4. In this particular example, the animal has had a calving ease score, a birth weight, two 200 day weights, a 400 day weight, a scrotal circumference and ultrasound scan data (eye muscle area, rib fat depth, rump fat depth and intramuscular fat) recorded with BREEDPLAN. Below the 'Traits Observed' listing it is also worth noticing that the animal has 688 progeny in 33 herds recorded, 351 of which have been scanned and 48 daughters with their own progeny recorded (grand progeny of the original animal listed). These progeny trait records also increase the accuracy of this animal's EBVs.

Some breed societies display the Completeness of Performance herd rating for individual BREEDPLAN herds on Internet Solutions. For these breeds, it is also possible to look at the general recording level within a herd by checking the individual herd's Completeness of Performance Star rating. The star rating is a 1 to 5 scale (with 5 stars being the 'gold standard') and reflects how much data each breeder submits to BREEDPLAN. Some breeders also make the traits recorded with BREEDPLAN available by listing the measurements taken and/or the raw observations for some traits in their sale catalogues.

What Happens if BREEDPLAN Doesn't Calculate EBVs for Some of the Traits I Want to Record?

There are a number of breeds for which the full range of BREEDPLAN EBVs is not yet available. This is usually due to the lack of sufficient records within these breeds to analyse for that trait. The most commonly unavailable are the Days to Calving, Calving Ease, Structural Soundness and Temperament EBVs (either Docility or Flight Time). In addition, BREEDPLAN has recently commenced recording some new traits in some tropical breeds. These are Buffalo Fly Lesion Score, Tick Score and Coat Score.

If either of the above scenarios apply to you and you already record that trait in your herd (e.g. Calving Ease EBVS not available but you record calving difficulty scores for calves), then this data can be submitted to BREEDPLAN for storage and potential use in future BREEDPLAN analyses.

Remember, if the trait is important to you and/or your clients then make sure you are recording it! For further information on recording performance data, please contact staff at Southern Beef Technology Services (SBTS) or Tropical Beef Technology Services (TBTS).

GROUP BREEDPLAN															
	Calving Ease DIR (%)	Calving Ease DTRS (%)	Gestation Length (days)	Birth Wt. (kg)	200 Day Wt (kg)	400 Day Wt (kg)	600 Day Wt (kg)	Mat Cow Wt (kg)	Milk (kg)	Scrotal Size (cm)	Days to Calving (days)	Carcase Wt (kg)	Eye Muscle Area (sq cm)	Rib Fat (mm)	Rump Fat (mm)
EBV	+0.2	+2.0	-0.3	+6.6	**+48**	**+78**	**+107**	+89	+17	**+4.7**	-3.8	+75	+5.6	+1.7	+2.9
Acc	80%	67%	98%	98%	97%	97%	96%	89%	87%	97%	55%	86%	78%	81%	86%
Breed Avg. EBVs for 2015 Born Calves Click for Percentiles															
EBV	+0.2	+1.3	-0.2	+4.3	+30	+49	+70	+64	+14	+1.7	-2.4	+45	+2.9	+0.4	+0.5

Traits Observed: CE,BWT,200WT(x2),400WT,SS,FAT,EMA,IMF

Statistics: Number of Herds: **33**, Progeny Analysed: **688**, Scan Progeny: **351**, Number of Dtrs: **48**

Figure 4. Traits observed section on an Individual Animal Page on Internet Solutions.