

The “Raw” Performance of an Animal

Is it Useful When Making Bull Selection and Purchasing Decisions?



The major influence that beef producers have on the genetics of their herd is through the bulls that they select for use within their breeding program. Selecting bulls with the best genetic package for their operation represents a powerful opportunity to significantly improve the future profitability of their beef enterprise.

Importantly, beef producers have a range of information to assist them with bull selection and purchase decisions. When presenting animals for sale, seedstock producers usually provide purchasers with a wide range of information on the lots available. This may include pedigree information, various appraisals of structural soundness, animal performance information such as live weights and ultrasound scan measurements, animal status for genetic conditions, bull breeding soundness information, BREEDPLAN EBVs and a range of vendor comments aiming to highlight the relative merit of each particular lot.

An important question that purchasers must ask is how valuable is each piece of information in describing the value of the lots available, and hence the value of each prospective bull purchase.

This technical note discusses how informative the performance of animals such as its live weight, weight gain per day or ultrasound scan measurements (often referred to as “raw” performance information) is in describing the genetic merit of prospective purchases.

WHAT INFLUENCES THE RATE OF GENETIC IMPROVEMENT IN A BEEF ENTERPRISE?

Before considering the value of raw performance information, it is necessary to reflect on what influences the rate of genetic improvement in a beef enterprise. Many beef producers will have an appreciation of the factors that influence the rate of genetic improvement being achieved within their breeding program, however this can be more formally defined by the equation below. This equation equally applies to the genetic improvement that is made for an individual trait or the overall breeding objective.

$$R = \frac{i \times r \times \sigma_g}{L}$$

Where:

- R** = Response to Selection (or Genetic Improvement)
- i** = Selection Intensity
- r** = Accuracy of Selection
- σ_g** = Genetic Variation
- L** = Generation Length

Of most importance in the context of using raw performance information when making bull purchasing decisions is the accuracy of selection, or “r” component of this equation.



Accuracy of selection is the magnitude of the correlation between the true breeding value of the animal's available for selection (eg. the bulls in a sale catalogue), and the information on which the selection decisions are based. The higher the accuracy of selection, the more informed and correct the selection decisions that are made are, and the more genetic improvement that is achieved.

THE VALUE OF RAW PERFORMANCE INFORMATION

When considering the value of using raw performance information as the basis for bull selection and purchasing decisions, there are a number of important considerations that need to be made.

- The raw performance of an animal (such as live weight or ultrasound scan measurements like eye muscle area) is a result of both the animal's genetics and a range of non-genetic factors.

The most obvious of these non-genetic factors, particularly when comparing the raw performance information of animals from different seedstock enterprise are differences in nutrition and management, however there are a range of other non-genetic factors that purchasers often overlook. These include factors such as differences in age, age of the dam, whether the bull was raised as a single or twin calf, or whether the bull is an embryo transfer calf and was reared by a recipient dam that made a different maternal contribution to the performance of the bull than that made by other dams.

Selection decisions that do not take into account differences in these non-genetic effects will result in selection simply for differences between animals in these non-genetic factors, rather than genetic differences.

- While it is possible to adjust the raw performance for differences in the non-genetic factors described above (or fixed effects), further consideration must also be given to how much genetic control each trait is under. This is termed by geneticists as "heritability".

The heritability of a trait is the proportion of differences in the performance for a trait (once fixed effects have been accounted for) that are due to genetic differences and will consequently passed on

FAST // FACTS

- A number of important considerations must be made when using raw performance information as the basis for bull selection and purchasing decisions
- Consideration must be made to take into account differences in non-genetic factors, the heritability of the trait, and the relationship between the trait being measured and the trait of importance
- Selection decisions based on raw performance information that do not take account of these factors will not be based on genetic differences between animals

to the next generation (or progeny). In beef animals, traits such as coat colour and polledness have high heritability, traits such as live weight and carcass quality have medium heritability, and traits such as female fertility have lower heritability.

The lower the heritability of the trait, the less the differences in the raw performance between animals will be reflected in the performance of their progeny.

- The relationship between the trait that has been measured and the trait that purchasers wish to select for (ie. the trait in their breeding objective) needs to be taken into account. The lower this relationship, the more compromised selection decisions will be based on differences in raw performance information.

For example, if increasing live weight at 22 months of age is the trait of interest, then selection decisions based on differences in live weight of prospective sale lots at 12 months of age may be limited. Similarly, if selection for increased muscularity is of importance, then selection on differences in raw eye muscle area measurements will be limited if no account is taken for the live weight of the animal. In many cases,



purchasers may select animals with the biggest eye muscle area measurement, but these animals also are the heaviest animals, and their large eye muscle areas predominantly reflect their high growth genetics, rather than any perceived genetics for greater muscularity.

The consequence of the above considerations is that if bull selection and purchasing decisions are based on differences in the raw performance information of animals that do not take into account differences in non-genetic factors, the heritability of the trait, and the relationship between the trait being measured and the trait of importance, then the selection decisions will not be based on genetic differences between animals and any selection decisions will be compromised. Put another way, selection decisions based on differences in raw performance information that do not take these considerations into account will result in a lower accuracy of selection, and lower resultant genetic improvement.

MAKING ACCURATE SELECTION DECISIONS

Importantly, bull purchasers now have information available to them in the form of BREEDPLAN EBVs that take into account all these considerations and provide an estimate of the genetic merit of each sale lot for a range of economically important traits.

To make the most accurate bull purchasing and selection decisions, purchasers should:

1. Identify the selection index of most relevance to their enterprise
2. Rank animals on this selection index
3. Consider the individual EBVs of importance
4. Consider other traits of importance such as assessment of a bull's temperament, structural soundness, phenotype, bull fertility information, carrier status for any relevant genetic disorders, and DNA results for qualitative traits like coat colour and polledness.

One strategy that can be used successfully is to firstly rank lots in a sale catalogue on the selection index of relevance, exclude any animals whose individual EBVs fall outside of an acceptable range and then assess the animals for these other traits of importance, excluding any animals from selection who are not acceptable in each area.

Selecting animals in this manner will enable beef producers to make the most informed bull selection and purchasing decisions and provides the best possibility of maximising the value of the genetics that are introduced into the beef operation.

To further discuss the value of raw performance information, please contact staff at Southern Beef Technology Services (SBTS) or Tropical Beef Technology Services (TBTS).