

The ABC of BLUP Breeding Values in Beef Cattle

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The measurement of an animal, e.g. weaning weight, is influenced by both the environment where the animal is kept (herd, rainfall, nutrition, age of mother, etc) as well as the animal's own genetic potential to grow to weaning age. The animal's estimated breeding value (EBV) is a prediction of his genetic ability, i.e. how future progeny of this animal should perform within the particular breed.

BLUP (acronym for Best Linear Unbiased Prediction) is the method used to calculate EBVs. EBVs are expressed in the measurement unit of the particular trait (e.g. kg for weight). The following data is used in the calculation of EBVs:

- The performance of an animal relative to its contemporaries (animals exposed to exactly the same feeding, management and environmental conditions);
- Similarly, performance of all the animal's relatives (parents, siblings, progeny, etc.), taking into account the heritability of the trait;
- The performance in other traits, taking into account the genetic correlations between traits; and
- The genetic links between herds, years, seasons, groups, etc.

Breeding values of animals are always relative to each other. An animal with a breeding value of, for example +18kg for yearling weight will be genetically heavier than an animal with a breeding value of -5kg, irrespective of the environment they are raised in.

EBVs can change as more information (performance data) becomes available. Therefore, the latest EBVs should always be used. The accuracy value (varying between 0 and 99%) accompanying an EBV is an indication of the amount of information available for calculating that particular EBV. If an accuracy value is relatively low, it usually is because the animal itself was not tested for that trait. Widely used AI bulls with many tested progeny, will have very high accuracies.

TRAIT DEFINITIONS

Calving Tempo (CT) EBV is an indication of fertility as well as the retention of a bull's female progeny. In order for a bull to receive a high breeding value for calving tempo, his daughters must regularly calve up to 6 years of age. Bulls with low breeding values do not necessarily have fewer daughters, but they do have poor retention.

Scrotum Circumference (SC) EBVs reflect the difference in scrotum circumference between animals measured in growth tests.

Birth Direct (BD) EBV reflects the animal's own ability to grow up to birth. Animals with lower values will produce lighter progeny, which should in turn result in fewer calving problems.

Birth Maternal (BM) EBV reflects a cow's ability to restrict a calf's growth until birth (as a natural protection against calving problems). Maternal EBVs for bulls reflect this ability in their progeny.

Weaning Direct (WD) EBV reflects the animal's own ability to grow up to weaning.

Weaning Maternal (WM) EBV reflects a cow's maternal (milk, etc.) ability to create an environment in which her calves can achieve optimal growth. The weaning maternal EBV of a bull indicates the maternal ability of his daughters.

Yearling Weight (YW) EBVs reflect the differences between animals for total growth ability up to one year of age.

18 Month Weight (18W) EBV reflects not only the growth ability of an animal, but also to a degree, the mature weight of an animal.

Mature Weight (MW) EBVs reflect the differences between animals in mature weight.

Average Daily Gain (ADG) EBVs reflect the differences between animals for post-weaning growth, as measured in Phase C and D growth tests.

Daily Feed Intake (DFI) EBVs reflect the differences between animals for post-weaning daily feed intake, as measured in Phase C tests.

Feed Conversion Ratio (FCR) EBVs reflect the differences between animals to efficiently convert feed to body weight. Animals with a **lower** FCR EBV are more efficient,

Kleiber Ratio (KR) EBVs serve as an indirect indication of feed conversion efficiency. Animals with a higher KR EBV are more efficient, as measured in Phase D tests.

Feed Profit Index (FPI) EBVs reflect the differences between animals in their genetic ability to generate a profit in a feedlot. Animals with a higher FPI EBV are more efficient,

Shoulder Height (SH) EBVs reflect the genetic differences between animals for shoulder height.

Body Length (BL) EBVs reflect the genetic differences between animals for body length.

Estimated Breeding Values (like performance test indexes) should always be used in a balanced way with other selection criteria, especially frame size and functional efficiency.