



# GENETIC IMPROVEMENT OF THE COW HERD

Dr Bobbie van der Westhuizen  
& Dr Helena Theron

**Selection of beef cattle using breeding values is a common practice worldwide. However, it is necessary to select for a combination of traits simultaneously some traits are economically more important than others.**

**T**he traits that the ideal cow or heifer should have differ from breeder to breeder and from herd to herd. However, some traits are not negotiable or debatable. Females can only contribute to the profitability and sustainability of the herd if they are genetically fertile. Heifers must produce a first calf as early as possible and produce a calf every year after that. Heifers and cows should calve easily and have superior mothering abilities (especially milk production), while weaning a calf with good growth ability. Her maintenance requirements in relation to the weaning weight of her calf should be low.

Selection of beef cattle using breeding values is a common practice worldwide.

However, it is necessary to select for a combination of traits simultaneously, which can be difficult. One of the methods used to simplify selection and select for multiple traits simultaneously, is an economic selection index (selection value). Selection values combine breeding values of different traits for each trait's relevance to the profitability of the farming enterprise, into a single value. Dairy cattle breeders have been using this method of selection with great success.

However, breeding values are not simply averaged into a single value as some traits are economically more important than others and heritabilities of traits also differ. Fertility, for example, is more important than Calving Ease.

Therefore each trait has a different relative economic weight, which is scientifically determined and multiplied with the animals' breeding value for each trait. Selection values also take into account the genetic correlations (which can be negative or positive) between traits.

Three selection values are published for Nguni cattle, namely the Cow Value, Growth Value and Production Value. The Cow Value combines eight different breeding values into one value, describing an ideal cow that will calve easily early in her life, calf regularly thereafter and will wean an acceptable calf in relation to her mature weight. The Cow Value has been sub divided into 5 sub-values, namely Fertility, Calving Ease, (Pre-wean) Calf Growth, Milk and Maintenance.

**Selection of beef cattle using breeding values is a common practice worldwide. However, it is necessary to select for a combination of traits simultaneously, which can be difficult.**

The breeding values for Age At First Calving and Inter Calving Period are combined into the Fertility Value. The Birth Weight Breeding Value is combined with the Maternal Birth Weight Breeding Value into the Calving Ease Sub-value. The breeding value for Weaning Weight is the building block for the Calf Growth Sub-value and the Milk Breeding Value is also the only trait in the Milk Sub-value. Lastly, Post-wean and Mature Weight Breeding Values are combined to obtain the Maintenance Sub-value. All three selection values as well as these sub-values of the Cow Value are expressed as index values relative to 100, where 100 indicates the average of the live animals in the breed.

The "ideal" animal will theoretically have the highest possible positive values for all sub-values. Sub-values are scaled to indicate that above 100 values are generally in the more desirable direction, for example a smaller calf at birth is more desirable and therefore has a higher calving ease value, and a smaller cow is more efficient and therefore also has a more desirable maintenance value. Both these traits however are optimal when average – so extremely high is also not beneficial, but this is counteracted in the cow value by the requirement of high calf growth.

*Please note that if the Calving Ease Value is more than 1.8 standard deviation units from average (EBVi of 130), then the Calving Ease Value will become less desirable (expressed as a lower value) again. A calf that is genetically too small at birth will therefore be penalized and its Calving Ease Value will contribute less to its Cow Value.*

The Growth Value is an indication of the animal's genetic merit to grow efficiently in a feedlot system. Some animals are genetically more able to grow efficiently in feedlot environments than others, whose genetic makeup may be less favourable to growth but more suitable for example milk production. Sometimes there are more variations within a breed than across breeds.

Breeding values and economic weights for growth rate and marketable live weight at the end of a feeding period, together with predicted dressing percentage are included as components in the Growth Value. The Production Value is a combination of the Cow Value (60%) and Growth Value (40%).

### Advantages and disadvantages with the use of selection values

The use of a selection value, like the Cow Value, will not improve individual traits genetically, but rather overall profitability of animals.

- Selection values make it easier to interpret an animal's overall merit and therefore its profitability. Variation in profitability among different animals could therefore be because of different reasons.
- One important aspect of a selection value is that an animal has the chance to compensate for some of its weaknesses through exceptional merit in other traits. This can however also be disadvantageous at times when extreme values overcompensate for weaknesses.
- Economic selection indices only include traits that are truly economically important, are measurable and can make a difference in a breeding objective. Economically important traits that are not directly measurable are selected for through indicator traits, such as AFC and ICP.
- A disadvantage of a selection value is that it is impossible to apply corrective mating for specific traits.
- Economically important traits and economic weights might change over years as the market and economic situations change.
- It is also important to keep the number of traits to a minimum to obtain faster genetic improvement and increase the pool of animals from which to select. ■

**I CAN EXPLAIN IT TO YOU,  
BUT I CAN'T UNDERSTAND  
IT FOR YOU.**

Anonymous