



Cow Values, a combined genetic Selection Index for South African Beef Cattle breeders: A Case Study for the Nguni breed

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Introduction

The use of BLUP breeding values for the identification of differences in the genetic merit among breeding animals is well established. Setting and application of breeding goals, based on independent culling levels for individual traits is challenging. The establishment of selection indices, based on the additive genetic variance and covariance structure and the economic value of the different traits with BLUP breeding values has lead to easier assessments of the suitability of animals as replacement candidates.

The further use of 'sub values' (also referred to as 'ERTs') also enable breeders to apply a measure of assortative or non-assortative (corrective) mating.

The Cow Value, developed by the S A Stud Book and Animal Improvement Association and its sub values are described in the following table (adapted from the explanation in use on sale catalogues).

Subvalues of Cow Value	Breeding values in subvalue and % contribution to Cow Value*	☆	General guidelines for selection						★★★★★
			<70	80 ★★	90 ★★☆	100 ★★★	110 ★★★★☆	120+ ★★★★★	
Calving Ease	Birth weight (0.3 - 6.5%)* Maternal birth weight (0.2% - 0.5%)*	More difficult calving (Heavier birth weight)							Easier calving (Lighter weight)
Calf Growth	Weaning weight (23 - 26.5%)*	Lighter weaner							Heavier weaner
Milk	Milk (14 - 16%)*	Less milk							More milk
Maintenance	Postwean (0 - 20%)* and /or Mature Weight (0 - 20%)*	Higher maintenance (heavier cows)							Lower maintenance (lighter cows)
Fertility	Age at first calving (10%) Intercalving period (ICP) (27%)	Less fertile	X						More fertile

* Values vary according to breed

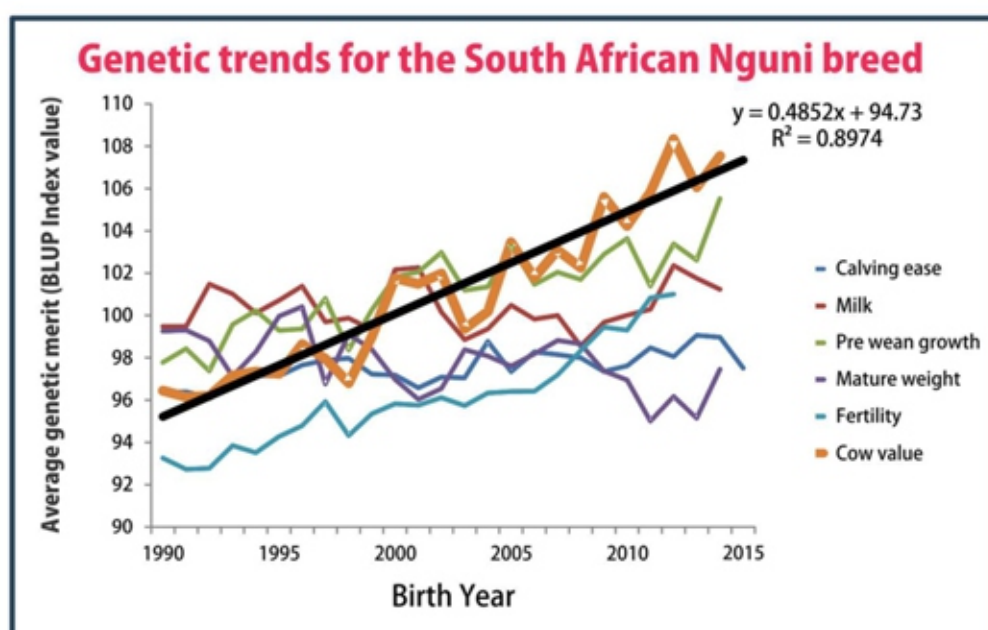
Material and Methods

Results obtained from the South African Nguni genetic (BLUP) evaluation conducted by SA Stud Book in May 2015 were used. Results for the cow value as a complete selection index plus the contributing sub indices (ERTs), namely calving ease, pre wean growth, milk, female fertility and cow mature weight were used in the study. All additive genetic merit values are expressed as values deviating from the mean of the active breed population.

The population mean additive genetic merit has been set to a value of 100 with a standard deviation of 13 units. The genetic trends for these indices, defined as average genetic index value per birth year were calculated. To furthermore quantify genetic change over time, linear regressions were fitted on average values over birth year. The genetic trends are presented in line graph format.

Results

Table 1 reflects the genetic trends for animals born between 1990 and 2015 for the sub indices: calving ease, pre wean growth, milk, female fertility, mature cow weight; and ultimately the combined index: Cow Value (and its linear regression) of the Nguni breed.



The equations for the linear regressions (and their respective R² values), expressing genetic changes, genetic changes in standard deviation units over a ten year period for the sub indices and cow value are presented in the following table:

Index	Slope	STD unit change in 10 years	R ²
Calving ease	0.072	0.056	0.50
Pre wean growth	0.237	0.182	0.75
Milk	0.015	0.012	0.50
Female fertility	0.334	0.257	0.90
Cow mature weight	-0.110	-0.085	0.33
Cow Value	0.4852	0.373	0.897

Discussion and Conclusion

The genetic changes show substantial progress in Cow value over time. The linear fit (R² = 0.897) for Cow value show that the average Nguni has improved genetically by 0.37 standard deviation units (b = 0.485 per year) in terms of monetary value compared to animals born 10 years ago.

This achievement were mainly the result of genetic changes in Pre wean growth rate (0.18 STD units; R² = 0.75) and Female fertility (age at first calving and calving interval) (0.33 STD units; R² = 0.90). No substantial genetic changes took place in Calving ease (birth weight direct and maternal) (b = 0.072; R² = 0.50), Milk (wean maternal) (b = 0.015; R² = 0.50) and Mature cow weight.