



# BREEDING VALUES FOR LONGEVITY

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## THE IMPORTANCE OF LONGEVITY

Longevity of cows has an economic impact on a herd. Mature cows which have produced many calves are without a doubt more profitable than cows that only produce one or two calves and then have to be culled. It is expensive to raise a heifer, and if she only produces one calf before being culled, she will most likely not be profitable. Longevity is also one of the major contributing factors towards genetic progress when selection pressure is applied in livestock. A lack of fitness (survival and fertility) necessitates lower selection pressure among the animals eligible as selection candidates as more replacements are needed to fill the void caused by the non-survivors.

**L**ongevity has a genetic component, which is in fact a composition of many underlying traits, of which the ability to adapt to the environment and fertility are probably the main factors. The genotypes that are most adapted to the environment can usually be identified as animals that remain in relative good condition throughout their lives and reproduce regularly. These are cows that remain in the herd for many years and produce many calves. Adapted cows that calve every year are the ideal type of cow, especially if her daughters also remain in the herds.

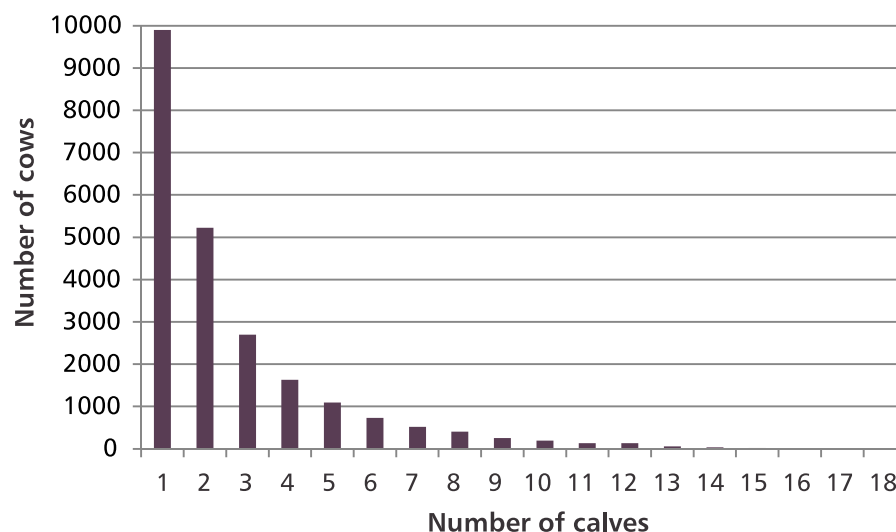
The question is why do cows leave the herd? Sometimes a cow culls herself – she doesn't show heat, doesn't become pregnant, becomes ill, or dies. She may also be culled due to structural defects, for example leg and hoof problems or scrotal abnormalities in bulls. This is known as involuntary culling. Voluntary culling happens when the breeder decides to cull the cow – usually for poor production, or for example, if she weaned a poor calf. She may also simply be the poorest cow in the herd, but if she is genetically acceptable, she could be sold off to another breeder.

There is therefore a huge difference in profitability between these two types of animals. If a large proportion of animals in the herd cull themselves, the breeder has no option but to keep the poor producers as well, which has a long term effect on the productivity of the herd and the reaching of selection goals.

Longevity therefore measures the composite ability of animals to remain in the herd. It reflects the ability of a cow to reproduce and wean calves while remaining sound and resistant to diseases for as long as possible. In bulls it reflects the ability to breed daughters that have a long herd life (longevity). On request by the Nguni council, S.A. Stud Book has now developed Phenotypic measures of longevity.

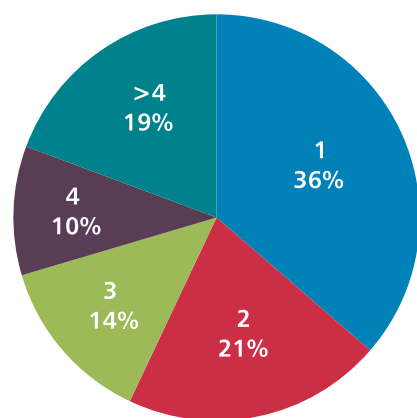
## PHENOTYPIC MEASURES OF LONGEVITY

Data of cancelled Nguni cows on the Logix database were used to ascertain phenotypic measures of longevity in Nguni cows, for example maximum number of calves born and erosion of cows over time. Only data of cancelled cows were used, as they have calved for the maximum number of times and only cows born before 2007 were included, as they could already have at least 8 calves. The data choice for this particular study ensured the avoidance of possible biased conclusions as it allows equal chances for survival of the animals included.



**Figure 1:** Erosion of fertility records: only around 50% of cows that calve for the first time, calve for the second time of which 50% calve for the third time. After that, around 60-70% of cows calve again each year, up to a maximum of 18 calves.

The distribution of number of calves born among current live Nguni cows are also shown in figure 2. Of the currently active Nguni cows, 35% have one calf on record, 21% have 2 calves and only 19% have more than 4 calves. This shows that many cows are lost after producing only one calf. If a greater proportion of cows can be moved from the group that are culled after producing one calf, to the group that produce a calf each year, longevity and profitability will increase. Although this is typical of what happens in most breeds, it shows that there may be some room for improvement in the longevity of Nguni cows.



**Figure 2:** The distribution of the number of calves of live Nguni cows currently on the Logix database

## ESTIMATION OF BREEDING VALUES FOR LONGEVITY

**Breeding values for longevity needs to take into account when an animal is cancelled and therefore leaves the breeding herd. It also has to take into account other influencing factors, for example the sex of the animal and the herd or contemporary group to which it belongs.**

A large *multi-trait model*, which tracks the activity of all animals born in their specific contemporary groups each year for a period of 10 years, are used for the estimation of breeding values for longevity (also known as herd life). This contemporary group stays intact for a period of 10 years. Animals are classified as 2 when alive and present, or 1 when cancelled. All animals in the breed are classified as alive in their birth contemporary groups. Should an animal be present at weaning, 18 months, 2 years and every year in between up to 10 years, it is classified as alive for each period (which constitute a trait).

Should the animal be cancelled at any stage, it is classified as cancelled from that period onwards up to 10 years. If the status of an animal is unknown, it is classified with a value of zero.

**Measurements are taken for both males and females, but both sexes are not placed in the same contemporary groups, as selection pressure is much higher on bulls than on cows.**

Other factors that are taken into account are a sire by herd interaction and the fact that it is repeated measures on the same animal. The herd in which the animal remains for each measurement is also considered, as retention in herds may differ. While some herds may be building numbers, others may remain stable. An animal may be sold to a herd which wants to increase herd size for example, in which case a higher proportion of animals would be retained in this specific herd. This herd effect is also therefore taken into account and breeding values are corrected for it.

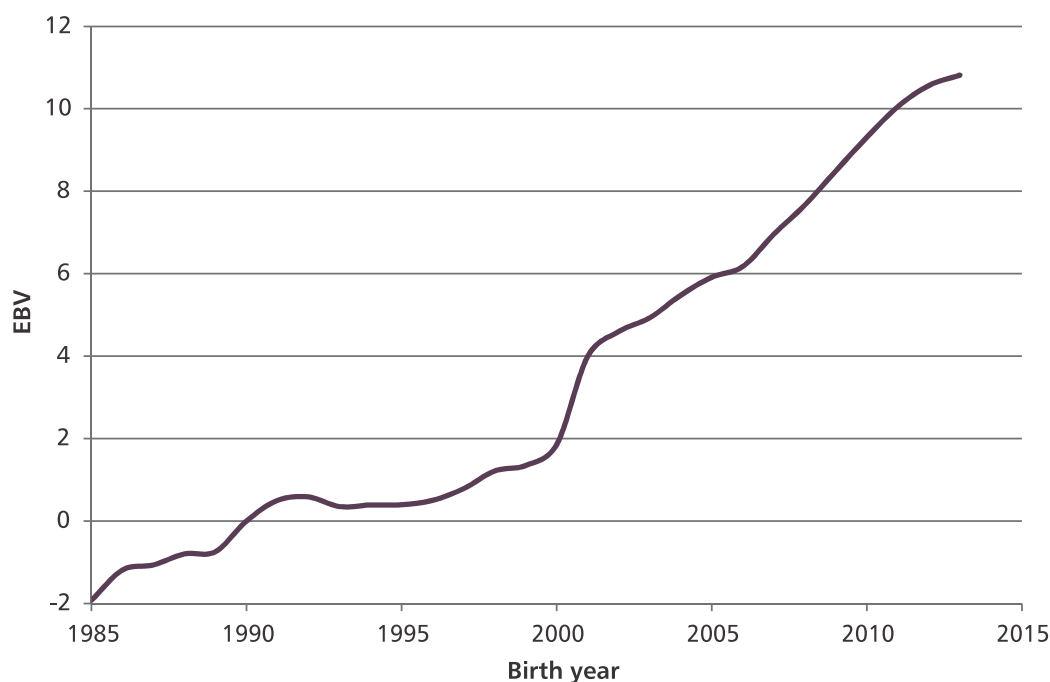


Figure 3: Genetic trend for longevity in Nguni cattle show genetic improvement.

Breeding values are then estimated in a multi-trait model and an average Breeding Value for Longevity, also known as Herd Life, is released. The heritability for the separate traits (chances of an animal to still be alive at a specific age) range between 9% and 23% and all genetic correlations between individual longevity periods are high positive.

From Figure 3 it can be seen that the genetic trend for longevity in the Nguni is positive and that Nguni breeders have genetically improved longevity over time. Nguni breeders have directly or indirectly selected for longevity – these are cows that tend to be well adapted to the environment and calve regularly. If this type of cow is used for the breeding of sires, longevity will be further enhanced and genetically ingrained in the Nguni.

Longevity breeding values take pedigree information and the performance of family members into account as well. Should a heifer come from a genetically strong cow family where cows tend to become old with many calves becoming parents themselves, this will show in her longevity breeding values.

An old cow that have been very successful herself and due to a superior environment, weaned many calves, but no or only a few calves tended to be retained in the breed. Her calves' performance will negatively affect her longevity breeding values. An example will be a cow that have been in a very good environment her whole life – even though it was easy for her to calve every year, and she was never exposed to diseases or other adverse conditions, and she therefore became old herself. If her calves tended to be culled at an early age, her longevity breeding value will be penalized.

#### LONGEVITY IS ALSO INCLUDED IN THE COW VALUE

The effect of longevity, which is an important characteristic of a 'perfect' cow, has been missing from the Cow Value. Sometimes older cows or 'grande dames' with many calves and a short ICP would have poor fertility breeding values due to small contemporary groups when they were young or some other reason, while not having many female family members to add information regarding fertility.

Longevity has a genetic component, which is in fact a composition of many underlying traits, of which the ability to adapt to the environment and fertility are probably the main factors.

These cows will now find redemption in the adding of the longevity breeding value as part of the fertility sub value, which will influence the Cow Value.

#### SELECTION FOR LONGEVITY

Selection for the composite longevity trait is possible in the Nguni, as is shown by the strong positive genetic trend. The goal would be to select both cows and bulls that are genetically programmed to be able to adapt to their environment, and nonetheless produce a calf each and every year. Longevity breeding values can be used to select animals that conform to these characteristics, and at least identify animals that don't. This will result in the increase of profitability for the beef cattle producer. ■