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BREEDING VELD PRODUCTIVE CATTLE

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Generally speaking, no progress has been made in the breeding of veld productive cattle. The few veld productive cattle around are not the product of present day breeding. Cattle that are considered productive are only "productive" thanks to modern technology in the form of centre pivots, substitute feeds, dips, drenches and antibiotics as well as selective grazing. No wonder ranchers achieve such a pathetic return on capital investment. This is a terrible indictment against animal scientists and animal breeders.

The current state of affairs is by default. It is the result of breeding and management practices contrary to natural laws. There are two choices. We can follow the whims and arbitrary standards of man and be content with the resulting chaos. Or, we can breed and manage our cattle in accordance with the dictates of nature and reap rewards modern agriculture is unaccustomed to.

There is a vast difference between veld cattle on the one hand and stud show cattle, together with their derivatives, on the other hand. Whereas conventional cattle are evaluated in terms of show results and/or Phase C and D performance figures, veld cattle are evaluated in terms of maximum sustainable profit/ha. This means that veld cattle have to fulfil a dual role – efficiently convert veld into quality beef whilst improving the land on which they are dependent. This requires unique breeding and management practices that will at least double stocking rate as well as return on capital investment.

To improve veld and increase stocking rate is a relatively easy and quick task. Management focuses on time-controlled severe and non-selective grazing as well as high animal impact. The optimum stock density and timing will depend on climate, veld type, soil type and season. The more pressing issue is the breeding of veld productive cattle.

Before assessing where we have gone astray and deciding on the appropriate path forward, we have to determine what constitutes a good veld animal. In order to maximise profit/ha, cattle have to exhibit the following characteristics:

- A high relative intake (intake: size). This determines efficiency of grass conversion (measured as energy in and energy out, not kilogram in and kilogram out) and is the foundation upon which all other traits must be built. The determinants are size (larger animals are handicapped), climatic adaptation, resistance to parasites and diseases and voluntary intake. These determinants are all highly heritable.
- A high level of fertility. Cows must calve annually from the age of two years on veld with rumen stimulating licks where necessary. The determinants of practical fertility are also highly heritable.
- A cow must wean a calf approximately half her own weight.
- A functional conformation including a high meat: bone ratio. Although a certain hide type, colour (pigment) and other attributes may be functional requirements in a specific climate or environment, they must not be predetermined on an arbitrary basis.

In the context of veld productivity, current institutes and breeding structures have a questionable objective. Breed societies need to be restructured completely. There is no place for show judges and breed inspectors. Phase C and D tests as advocated by the Agricultural Research Councils' Animal Improvement Institute need to be scrapped in favour of more appropriate tests. Research stations need to become model farms and professors must first be model farmers.

Fortunately individual cattle breeders do not have to wait for the rest of the world to catch up. The basic principles that need to be implemented, via breeding and management, in order to attain maximum sustainable/profit/ha, are now known.

To understand the way forward we need to know where we went wrong.

Performance testing of cattle is essential, but official performance testing is not conducive to the breeding of veld productive cattle. The problems with current performance tests are:

- Growth is measured in terms of absolute figures such as average daily gain (ADG) or time constant weight (205 day weaning weight, 365 day weight and 18 month weight). These figures are strongly correlated to size at all ages in an animal's life. This results in calving problems and animals requiring improved nutrition in order to be "productive". Efforts are currently afoot to select for growth whilst limiting mature size (shoulder height). This is an admission of the current problem and a step in the right direction. However, we are still working with absolutes that need to be interpreted by humans with subjective minds. For instance, is there a minimum acceptable shoulder height (size) or growth rate (ADG)?
- Feed conversion efficiency (FCE) figures resulting from a mathematical error. In Phase C tests efficiency is measured as kilograms feed required to achieve one kilogram gain. Although the feed eaten is the same for all animals, the energy content of a kilogram gain differs between animals of varying maturity rate. For example, a small and early maturing breed (Nguni, Boran or Afrikaner) will deposit more fat relative to lean meat and water in a kilogram live weight gain than a late maturing breed (Charolais or Limousin). There is a vast difference in energy content of live weight gain from the same food between early and late maturing animals – even within the same breed. It is therefore mathematically wrong to compare animals in terms of FCE on a kilogram for kilogram basis. More than this; it results in the breeding of animals that cannot fatten on veld. In order to improve "productivity", particularly reconception rate, improved nutrition is required. This is generally achieved through low stocking rates (selective grazing) and production licks. In the more "advanced" performance tested herds it appears that centre pivots and two-month weaning onto calf meal are required practices (Landbouweekblad, 26 January 2007).
- Insufficiently discriminating measures of fertility. Although fertility is universally recognised as the most important characteristic required by cattle, there is no active selection for it. Currently used inter calving periods (ICP) are so strongly influenced by environmental factors that they are of very little value in terms of genetic merit. Similarly, culling cows that do not reconceive does not constitute selection. It is akin to trying to select for growth rate by culling a small percentage of poor growing bulls and keeping the rest for breeding. In order to be able to select for fertility, all cows need to be ranked from most fertile to least fertile, using a genetically discriminating measure. The same applies to bulls.
- Non recognition of the problems and limitations of BLUP. Writing in Beef Breeding in South Africa, MJ Bradfield and GJ Erasmus state BLUP "will allow EBV's (estimated breeding values) of different beef cattle breeds to be directly comparable nationally and internationally". This may be true, to a degree, for measurements taken in a controlled environment such as Phase C, ADG and FCE. The dilemma faced in this case is accurate measurement of undesirable criteria. Where traits are subject to genotype x environment interaction, BLUP has no place. This refers to the economically important traits such as fertility, efficiency of grass conversion and resistance to parasites and diseases. There is absolutely no way that a bull excelling in the same traits in Scotland, for example, will produce progeny excelling in the same traits in Zambia. The reverse also applies. Where herds are compared in similar environments, EPD's are arguably more accurate than indices.

We know what constitutes a good veld animal. We also know where we have gone wrong in trying to breed them. What remains, is to make an about-turn in order to go in the right direction. Where we selected for production/animal using absolute values, we now need to select and manage for production/ha. This requires different selection criteria. Before looking at these criteria, certain truths need to be understood. These are:

- Genotype x Environment + Hormones = Phenotype. An animal's performance and appearance is subject to genotype x environment interaction plus the modifying effect of hormones. A certain environment demands a specific genotype related to climate

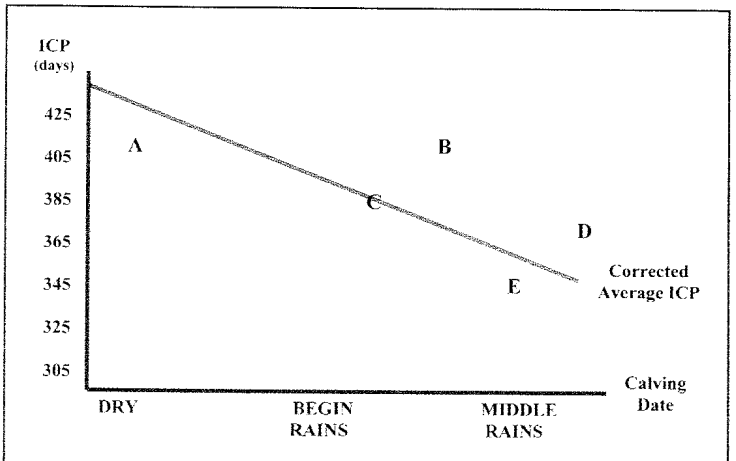
adaptation, nutritional adaptation and resistance to parasites and diseases. In addition to this, the hormonal balance (male hormones, female hormones and growth hormone) modifies the fertility, size, growth rate and appearance of an animal. For example, a physiologically and sexually early maturing bull has a stocky and muscular appearance with a relatively low absolute growth rate (ADG). They are referred to as a "pony type" and usually culled. Yet, they are the type needed to produce veld productive females.

- Nature only functions within the context of wholes. The whole we, as cattle producers, are concerned with comprises the grass-grazer-predator relationship. In reality this means veld, cattle and electric fences. The results of tests done outside this context (Phase C tests) have no bearing on reality and affect veld productivity negatively.
- Fat meat contains more energy than lean meat. Figures quoted vary between twice and four times more, depending on fat and water content. In order to be productive on veld, cattle must have the ability to fatten quickly and carry energy reserves for lean periods.
- Body condition is the primary determinant of practical cow fertility. Selection for ADG and FCE has a negative effect on body condition.
- Equal efficiency is only attained when growth rate is proportional to size. In measuring growth, one has to use figures relative to size (maturity%) and not absolute figures (ADG). This measures an animal's intake relative to size which is a determinant of efficiency of grass conversion.
- Intake is in relation to metabolic size and not absolute size. This figure becomes proportionally smaller the larger the animal. Relative to its size and maturity needs (body condition), the larger animal has a smaller intake. Large animals are therefore handicapped when it comes to veld productivity.
- Grass conversion efficiency is determined by relative intake. Animals of similar size, adaptation and resistance to parasites and diseases will differ in intake. This is related to a genetic ability to graze faster and longer. Measures of efficiency should reflect this highly heritable attribute.
- Most herds have unidentified productive cows. The problem with current selection methods is that productive cows are not being identified, leading to the use of bulls with inferior productivity. The productivity of progeny of these superior cows is consequently lower than that of their dams. This results in mediocre herd productivity. The top cows need to be identified, particularly in terms of fertility, so that herd improvers (bulls) can be selected from them.

The following selection criteria and procedures will result in veld productive cattle measured in terms of profit/ha. The selection criteria are all genetically discerning and positively correlated. They are:

(i) Fertility as determined by body condition and hormonal balance.

- Cow fertility index based on corrected ICP, preferably between the first two calvings, where all heifers are given the chance to calve at two years of age. According to this index, all cows can be ranked on a scale from 1 to 100 in terms of fertility.



COW	INDIVIDUAL ICP	CORRECTED AVERAGE ICP	FERTILITY INDEX	FERTILITY RANKING
A	405	430	106	1
B	405	373	92	5
C	385	385	100	3
D	365	345	95	4
E	345	355	103	2

- Scrotal circumference index based on 12 month scrotal circumference/100kg predicted mature weight. This is a measure of early sexual maturity, but is not the ultimate test of bull fertility.
- Bull breeding ability. This is measured as the proportion of calves produced by individual bulls in a contemporary multi-sire situation. It is the ultimate test of bull fertility, but bulls must first pass a maturity (body condition) test in order to ensure they produce female progeny with practical fertility. Hormonally balanced bulls without the ability to fatten on veld will produce females with academic fertility.

(ii) 12 month maturity is a measure derived from an animals' 12 month weight relative to its predicted mature weight as calculated from hip height (or shoulder height) measurement. It measures grass conversion efficiency, is an indication of overall adaptation and body condition and is also a reflection of weaning weight (dam's milk). This is an extremely important criterion in bull selection. Maturity rate is the ultimate measure of overall adaptation.

CALCULATING MATURITY RATE

Bull	12 Month Hip Height (cm)	Estimated Mature Kg	12 Month Kg	12 Month Maturity %	12 Month Kg Ranking	12 Month Maturity Ranking
A	98	500	360	72	3	1
B	105	600	380	63	2	2
C	115	760	420	55	1	3

(iii) Cow efficiency expressed as calf : cow weight at weaning or, more appropriately, as 6 month maturity calculated on the same basis as 12 month maturity. Breeders need to guard against cows with too much milk that will be inclined to miss conceiving due to poor body condition.

(iv) Conformation that will be related to fleshing (meat: bone ratio) and function. Both can be assessed visually. The challenge lies in deciding what is important and what is totally irrelevant. The functional attributes related to adaptation as well as fleshing will be reflected to a large degree in 12 month maturity.

(v) Temperament can be assessed after weaning by considering the time it takes for an individual animal to be gentled (touching or flight distance). A further assessment of herd instinct can be made when animals are concentrated in a herd using electric fences. Habitual fence creepers and jumpers must be culled.

The production traits of fertility, cow efficiency and maturity rate (as measured above) are all positively correlated with each other and with nutritional adaptation, climatic adaptation as well as resistance to parasites and diseases, where no dosing and no (or minimal) dipping occur. Growth, measured as maturity rate, is determined solely by a high relative intake and not large size – a true measure of grass conversion efficiency. All traits are self regulating according to the limits set by nature. The only extremes are extreme veld productivity.

As an outsider convinced of the tremendous value of the Nguni and its potential to revolutionise cattle production, I pose the following questions together with some suggestions:

- How can Nguni genes be used to best advantage?

Most breeders seem to think the market requires females and a few bulls. There is a tremendous need for the introduction of Nguni blood, together with that of other African breeds, into all herds in South Africa. This can be done by breeding appropriately structured crossbred bulls to crossbred cows in a programme of rotational x breeding or genotype fixation. Nguni breeders should concentrate on breeding the desired bulls and marketing them successfully. Efforts must be made to increase the muscling (meat: bone ratio) of bulls.

- Why are all breeders not breeding heifers to calve at two years of age?

Adaptation and fertility (particularly early sexual maturity) are the strong points of the Nguni. Currently no other breed in South Africa comes close. Why not concentrate on the strong points of the breed and promote them? The few weaknesses should be improved simultaneously. Rather than concerning themselves with irrelevant points, breed inspectors should downgrade any cow that has not produced her second calf by the age of three years.

- Why are Ngunis dipped and dosed?

Today's Ngunis are the survivors of centuries of being exposed to ticks and other parasites together with the accompanying diseases. Why not promote these attributes rather than risk the chance of destroying them?

- Is the obsession with colour patterns not limiting the Ngunis' potential?

The Nguni is an ecotype (cousin) of a large group of African cattle collectively termed as Sanga. In addition to indigenous Namibian cattle (accepted as Ngunis) they include the Landim of Mozambique, Nkone, Tuli, Tonga and Mashona of Zimbabwe as well as the Barotse and Tonga of Zambia. Individual breeders should be afforded the opportunity of broadening the genetic base from which they can make subsequent selections. This can be done under the Sanga umbrella and will result in superior animals.

- What is natural?

To many outsiders it appears that Nguni breeders adopt certain management practices, in the guise that they are natural, regardless of their effect on selection progress.

It may be natural to leave bulls year-round with the cows, but it is definitely not natural to single-sire.

Both practices adversely affect selection. Keeping horns on animals may also be natural (unless they are polled), but so is reintroducing lion and hyena. The sole standard by which management and breeding decisions should be made, is how they ultimately affect the goal of maximum sustainable profit/ha.

The Nguni Society and breeders are at a crossroad. They have been entrusted with a genetic resource that can enable us to breed animals that are capable of maximising profit/ha. Together with the appropriate calving seasons and grazing management, veld productive animals can ensure a doubling (even trebling) of profit/ha and a doubling of interest on capital investment. Performance testing is essential for the improvement of any breed. What is critical, however, is the goal aimed for, the selection criteria used as well as breeding and management practices implemented. Breeders must make a choice. They can actively breed veld productive cattle or they can follow the mainstream. Those who choose the former route and promote their cattle effectively will find an insatiable market for their bulls.