

FOUR COWS

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Beyond the joy that your favourite cattle breed brings, any **sustainable livestock enterprise must rely on the productivity of the breeding cows.** No two animals are the same, they all differ, even full sibs. There are many ways to judge which ones are there to carry the burden and which are only in it for the ride. One can even go so far as to simply divide them in different groups, according to their characteristics and how they respond on the physical and production environment they must reproduce and produce in. Irrespective of any decision in defining and describing typical differences, one should be aware that there are fine anatomical and physiological balances at play. **A simplified division or grouping is therefore the result of complex sets of genetic differences that govern the anatomy and, more especially, the physiological processes leading to differences in response and even behaviour among animals on the same farm.**

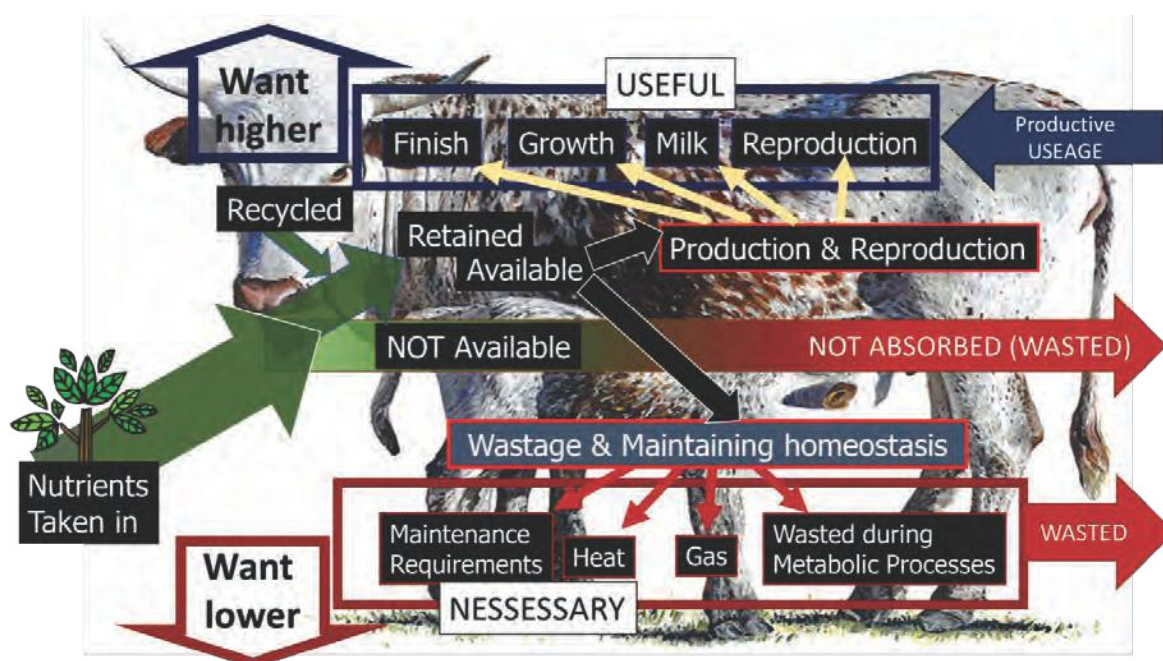
In the first place, **cows differ in their ability to take in feed** above own maintenance requirements. This can simply be due to an unknown inability, limited rumen capacity or because of being unable to properly adapt to environmental constraints, such as walking ability or ill adaptation to weather conditions. Limited intake means limitations in the available energy for productive

processes as the major channelling of available nutrients will be for homeostasis (maintaining body functions).

Animals also differ in their ability to absorb roughage at macro level (in the rumen and rest of the digestive tract). It is known that grasses in the tropical and sub-tropical areas, for example, are less palatable and cause higher heat increments when digested. This, in turn causes slower passage through the digestive tract and more heat, raising body temperature in an already hot (and mostly humid) environment.

The following figure serves as a simplified illustration of the utilisation and channelling of nutrients (especially energy) in a productive beef cow.

“sustainable livestock enterprise must rely on the productivity of the breeding cows”

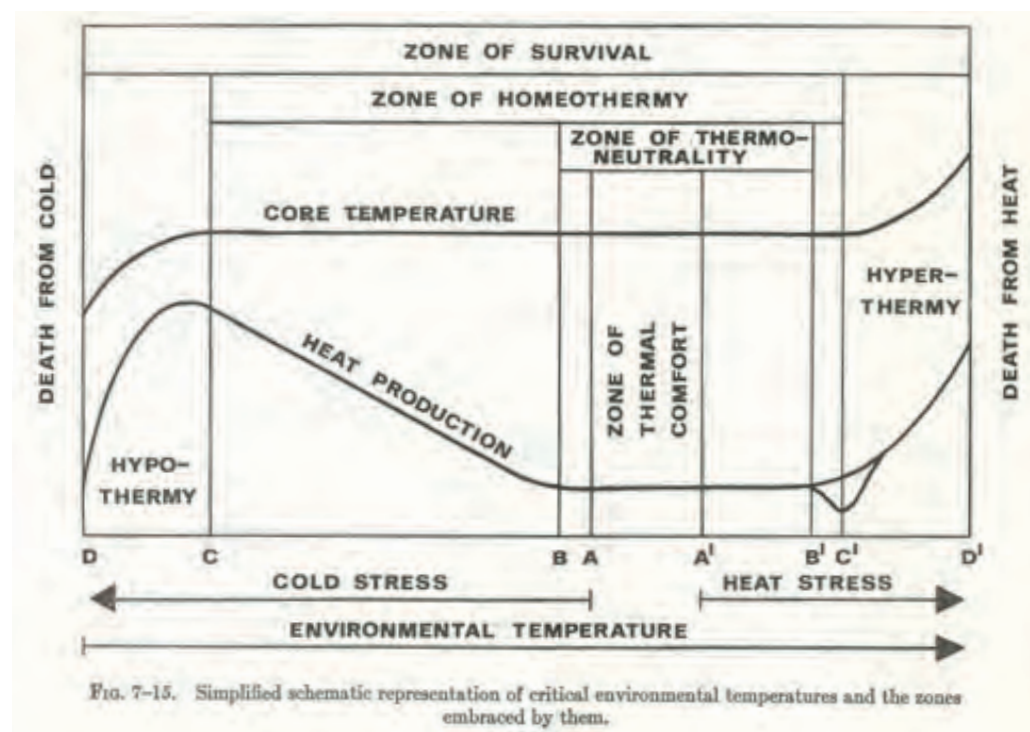


This “negative spiral” causes ill adapted animals to lower their roughage intake even further with less nutrients (especially energy) available for production and reproduction. Ill adapted animals will even waste the available energy with behavioural patterns such as panting and therefore causing the downward spiral to accelerate (this also happens in extreme cold conditions to animals not adapted to those extremes). Well adapted animals will also have the anatomical (and possibly physiological) mechanisms to rid themselves more easily from an excessive heat increment and not to be subjected to an additional heat load from the environment.

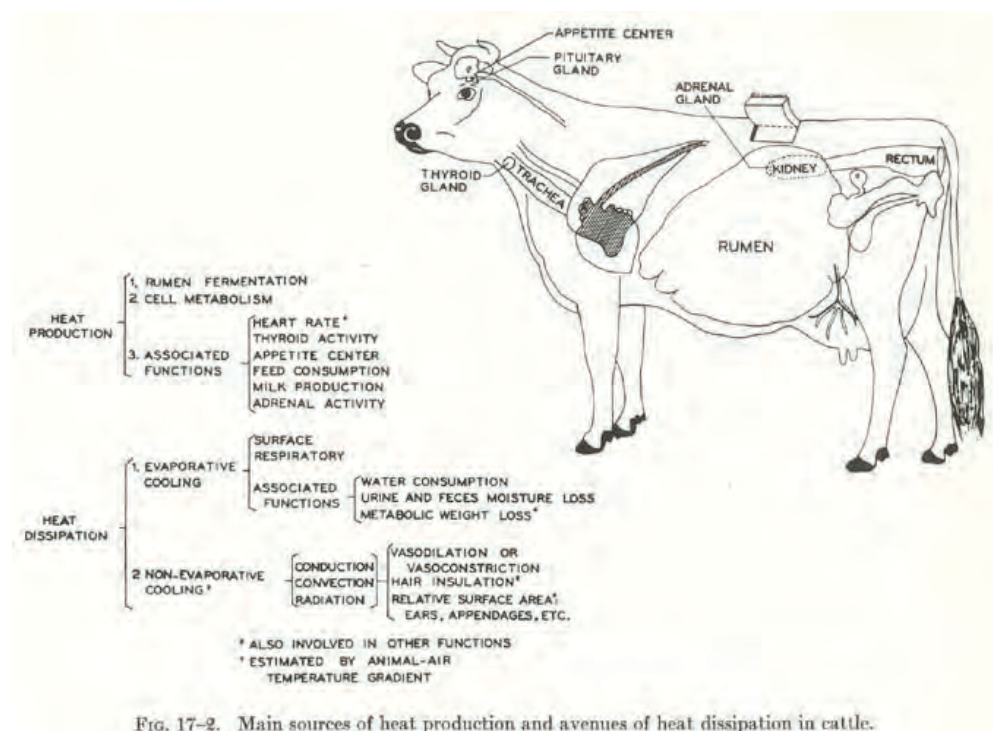
These mechanisms are known to observers, namely, effective sweating (effective sweat glands per surface area, short and smooth hair causing sweat to evaporate directly from the skin, relatively big skin surface ratio to body area), adaptive behavioural patterns (like night time grazing), shiny skin or coat (smooth hair coat, well pigmented skin and sebum secretion), effective respiration (in relation to the heat caused by digestion or the metabolic processes) and even things like selective

It can therefore be concluded that those animals not thriving under a certain set of environmental constraints will look different and also behave differently to the ones that do. These are the types of observations from pioneers like the late Professor Jan Bonsma that made the headlines and book chapters 40 to 60 years ago. The well-known diagrams of Professor Bonsma are still used by scholars and serious breeders and it is also amusing that this pioneering work is re-discovered from time to time by some.

The following 2 figures reflect the thought processes by these pioneers.



From: ESE Hafez. Adaptation of Domestic Animals. Lea & Febiger, 1968.



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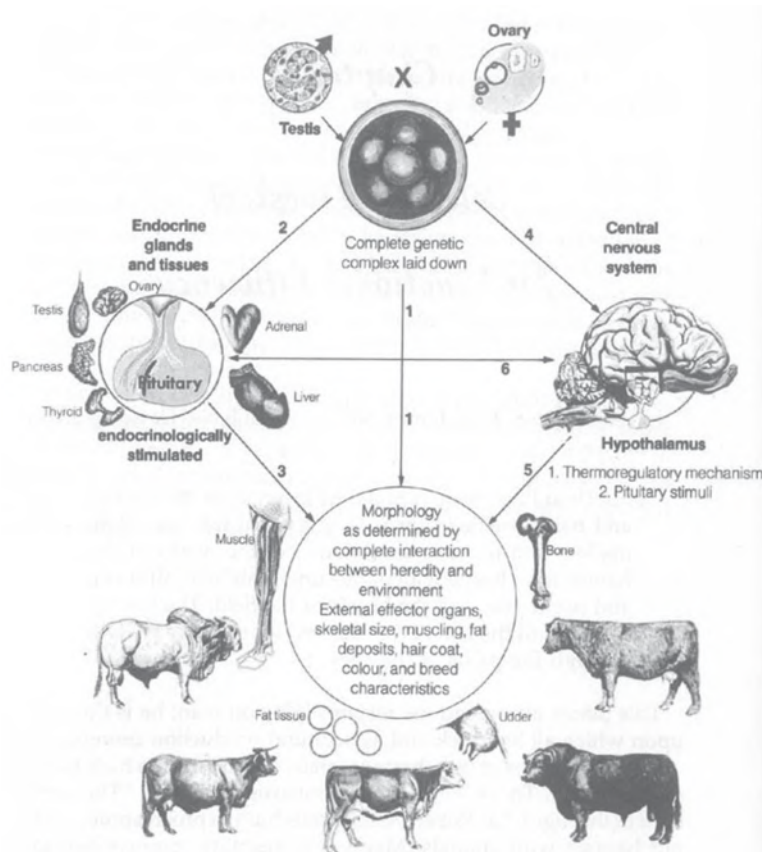


Figure 3.1 The interaction between genes and the phenotype. At the moment of conception the complete genetic potential of the animal is laid down. This determines irrevocably the potential boundaries within which the individual

From: J Bonsma. Livestock Production A Global Approach. Tafelberg 1980.

The conclusion is therefore that there is a genetic base causing animals to differ in terms of how they make use and respond on environmental factors and the available (feed) resources.

The next important genetic difference among cows is to be found in how they effectively make use of the available nutrients retained for production, reproduction and maintenance of body condition.

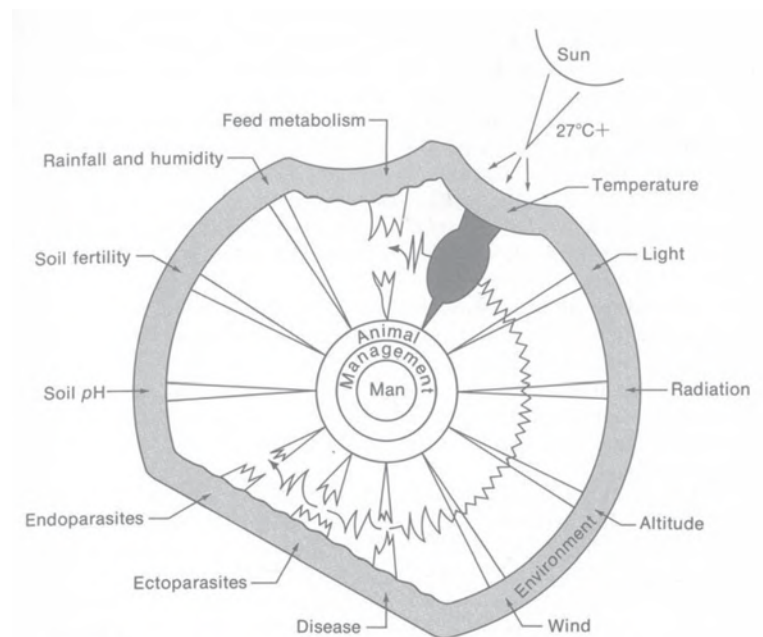


FIGURE 2.2 The probable direct and indirect influences (interaction effects) that 27°C or above air temperature will have on livestock in the N-S 30° latitudes. (From McDowell, 1968).

From: RE McDowell. Improvement of Livestock production in warm climates. WH Freeman and Company, 1972.

As in the case of genetic differences in the percentage availability of these nutrients, the channelling of nutrients to these functions also differ. These, sometimes unfavourable relationships are well described by the genetic correlations among traits associated

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with the utilisation of these nutrients (examples of genetic correlations among reproduction, milk/maternal ability, growth rate, maturity age/weight).

Simple solutions, such as selection for cow condition therefore negates all the known facts related to the availability of nutrients on the macro scale and genetic differences in channelling these nutrients for different functions.

On a more practical level

I was taught by one of the star students of the late Professor Bonsma, **Dr Herman Venter**. He concluded that good observers will recognise four types of cows in herds, irrespective of the production system or other constraints. Obviously, nothing in biology (nature) can be put in boxes or can be separated in very distinct classes as there will be a continuous or gradual change from one class to the next.

Nevertheless, the division can broadly be as follows:

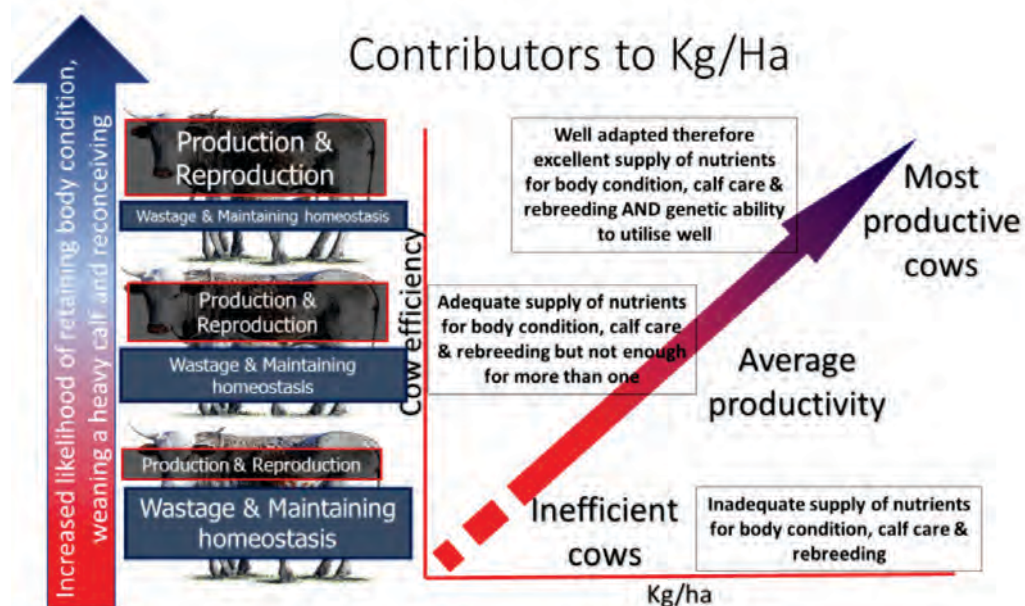
1. Cow maintaining (or gaining) her body weight and/or condition and weaning a heavy calf.
2. Cow maintaining (or gaining) her body weight and/or condition and weaning a light calf.
3. Cow losing her body weight and/or condition and weaning a heavy calf.
4. Cow losing her body weight and/or condition and weaning a light calf.

Since female reproduction traits can be seen as the prime means of ascertaining **suitability and adaptation to the specific set of environmental and management constraints** (hence the terms **“Natural selection”** or even **“Survival of the Fittest”**) and the

dependence on body condition for rebreeding, cows in groups 1 and 2 are more likely to be in calf in the next cycle.

Selection for body condition alone will, however favour both these groups of cows, without any distinction.

These differences are illustrated in the next figure:



FOUR

The bottom line is therefore to be wise and vigilant enough to observe the anatomical differences amongst the breeding cows and to use common sense to only select those or from those that are more likely to produce offspring that will thrive under the climatic conditions and production system favoured. It is also furthermore wise to record the traits that will contribute directly to profit, such as female fertility, mothering ability, pre-weaning growth rate and mature (maintenance) weight.

The premise is furthermore that the very first traits that will point out ill adapted females, will be reconception. Selection should therefore concentrate on that. This will advertently lead to selection of well adapted progeny. By adding mothering ability ("milk") and pre-weaning growth rate, breeders and other beef producers are assured that breeding cows are more efficient in utilising the available nutrients effectively. Where there is fear that maintenance requirements might increase to levels that might lead to lower productivity or loss of adaptability, selection against high cow weight can be included in the objectives.

Perspective

Based on the background, it can be concluded that any breeder and/or beef producer has two important tools in his or her arsenal to ensure that the brooding cows in the herd are more efficient, and more importantly more efficient cows will be bred. The first important tool is visual assessment, based on knowledge linked to functional efficiency. The second tool is to record traits of economic importance and to use methodologies that clearly point out the genetic differences among the selection candidates. It is known that phenotypes alone only account for a (sometimes small) part of these genetic differences that will be transferrable and therefore distinguishable in performance among progeny. BLUP breeding values is therefore a better tool to point out these genetic differences and should be used wisely as part of a selection objective, together with visual appraisal.

In selecting productive animals:

Visual appearance should count 100%
Genetic merit for traits contributing to productivity and efficiency should count 100%

AND

Measurement tools should not be confused with selection objectives

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