

Making sense out of maturity types in beef cattle

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Due to long term selection and possibly evolutionary changes to adapt to different environments and production systems, beef cattle breeds differ in mature size and therefore can also be classified as different maturity types.

Maturity types basically refer to the differences in physiological ages at the same chronological age (or differences in chronological ages at the same physiological age). In practical terms, that means later maturing animals will be physiologically "younger" at the same age compared to earlier maturing animals.

These differences have a large impact on differences among cattle in terms of:

- Growth rate, as measured at a specific age interval.
- Gain efficiency (kilogram feed intake in relation to kilogram live body gain).
- Dressing percentage and also subsequent lean muscle yield at a specific live weight (range).
- Carcass class, especially in terms of fat content at a specific age or carcass weight range.
- Time and feed needed for a specific degree of finish (millimetres subcutaneous fat).

Figure 1 is an attempt to illustrate three possible maturity types within a breed.

From Figure 1, the following can be seen:

- Later maturing cattle will generally be heavier at mature age than earlier maturing cattle.
- Rump (or shoulder) height will be higher in later maturing cattle. This difference can be observed at a fairly young age by comparing differ-

ences in cannon bone length (as young as days after birth) or using rump height measurements prior to puberty. This fact can also be used very eloquently in identifying maturity type early in life, even for genetic selection purposes.

These differences were already described by Brungardt (Brungardt, V.H. Undated, *Efficiency and profit differences of Angus, Charolais and Hereford cattle varying in size and growth*, as quoted by Berg, R.T. and Butterfield, R.M. 1976), where he stated:

- At the same weight, cattle with fast weight gains are more efficient than smaller, slower gaining cattle.
- At the same grade, cattle with rapid weight gain are almost as efficient as smaller cattle.
- Faster gaining cattle are approximately as efficient at their heavier weights as smaller cattle at their lighter weights.
- Cattle selected for growth reach choice carcass grade or a compositional constant end point at significantly heavier weights. Thus evaluating cattle of different breeds and growth patterns at weight end points has less practical significance than composition or grade end points.

His last statement is especially significant when evaluating the value of feeding cattle differing in maturity type. Effectively, this means that the end-purpose of finishing cattle will determine the type of cattle considered due to differing feeding regimes, markets and also taking the ratio of feed and carcass price into consideration.

To clarify, Figure 2 and Figure 3 can serve as illustration.

Figures 2 and 3 illustrate a few important points:

- The rate of growth for bone, muscle and fat differ with age. The rate of reaching maturity also differs and the order is: Bone, followed by muscle and lastly, fat.

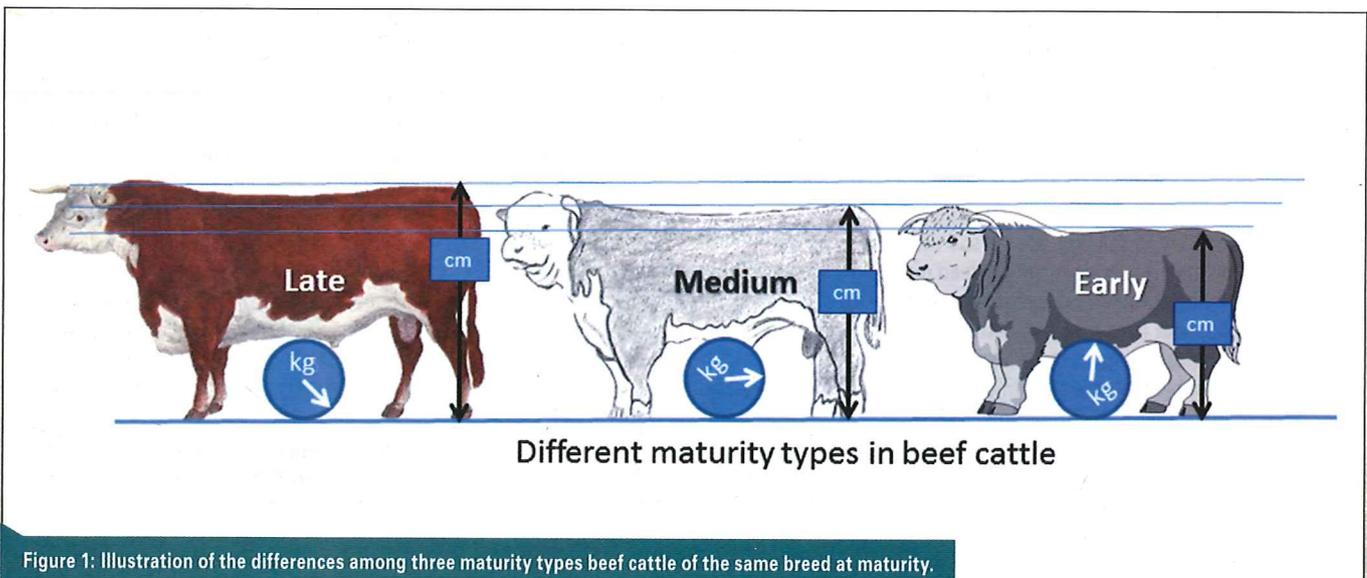


Figure 1: Illustration of the differences among three maturity types beef cattle of the same breed at maturity.

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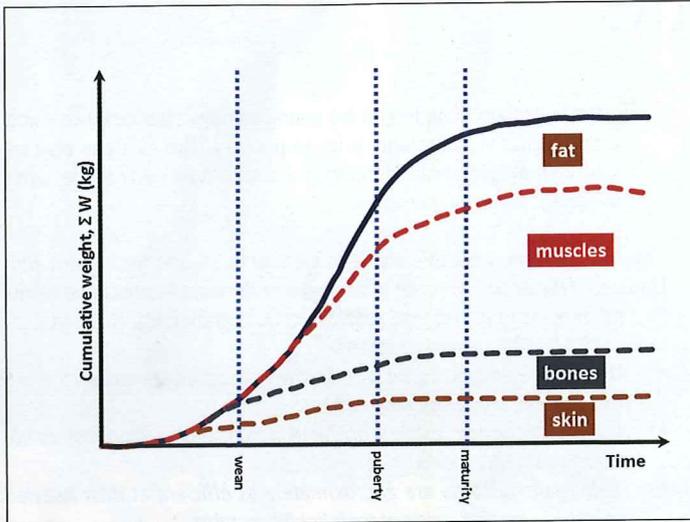


Figure 2: Total (cumulative) body weight changes and relative weight contribution in skin, bones, muscles and body fat over time for individual growing cattle.

- Due to the differing growth and maturity rates of bone, muscle and fat, the percentages will also depend on the total maturity age of the specific animal.
- Classification or grading systems depending on fat cover (subcutaneous fat) will therefore award the same class or grade at differing body weights in those cases where individuals differ in reaching the desired fat cover.
- Both figures depict an example of the growth curve and pattern for an individual animal. Figure 2 indicate three important growth points, namely weaning, puberty and maturity. The last two points especially will be later in life and at higher weights. Late maturing cattle will therefore have less body fat at the same body weight compared to early maturing cattle.
- Later versus early maturing cattle finished in feedlots therefore implicate for example:
 - At the same fat cover (subcutaneous fat thickness); the later maturing cattle will yield larger carcasses.
 - At the same weight, later maturing cattle will yield carcasses with relatively more muscle and less fat.
 - Later maturing cattle will generally grow faster and will generally be better converters of high energy feed to carcass weight. This is the result of a leaner (less fat) carcass during the feedlot period and depositing fat at a later chronological age.
 - Later maturing cattle will spend a longer time in the feedlot to reach the same carcass fat cover (as required by the classification and price) system.
 - The profitability of feeding late versus early maturing cattle will depend on the price margin and the feed margin respectively.
 - Generally a favourable feed margin (low grain price and high beef price) will favour later maturing cattle. The objective is to maximise the gain (total kilograms) during the feeding stage.
 - An unfavourable feed margin can sometimes lead to a favourable price margin, that is a big difference between the per kilogram value of the weaner carcass versus the same value for the finished carcass. In these cases the objective is to maximise the turnover without having to put on too much gain per carcass. These conditions will favour earlier maturing cattle.
- The optimum carcass weight for a specific market is also very important. The South African market is a prime example of where carcass weights need to be within a relatively narrow weight range to secure maximum prices per kilogram. This is generally in contradiction with many global markets where bigger carcasses are favoured due to the lower per unit costs (per carcass costs) in meat processing plants.
- Due to the preference of an optimum carcass weight range, linked to an optimum (mm) fat cover and age restriction (A or A/B classification) there is also a limit on the range of maturity types suitable.

Other perspectives

The largest majority of the breeding cattle are dependant on natural grazing or planted pasture. This also places more perspective on the value of maintenance requirements of cattle under conditions of limited feeding, both in terms of quantity and many times also quality.

It is also a known fact that the first very important function to suffer from low levels of energy and protein feeding will be reproduction. Figure 4 illustrates the priority in nutritional needs and the impact of nutritional state on the allocation of nutrients in cattle.

Figure 4 indicates that, in order for an animal to survive, there will be priorities in the allocating of nutrients to different bodily functions. Obviously, the most important will be the maintenance of crucial bodily functions (such as the brain, liver, heart, etc.).

Due to the order of development, as illustrated in Figures 2 and 3, the order of allocation will follow the developmental path of bone, muscle and fat. In cases where the maintenance requirements are high, the other bodily functions will suffer or will not function properly.

It can generally be stated that later maturing animals, due to bigger body sizes, will have bigger maintenance requirements. Furthermore, in cases of lower grass cover (droughts, for example) more energy is needed to ensure rumen fill (animals need to walk longer distances to take in enough grass) needing more energy and therefore elevating metabolism and subsequently maintenance, even more.

Cattle that are ill adapted (the anatomical and physiological process is not in tune with environmental constraints such as high/low temperatures, humidity, external/internal parasites, etc.) will result in the animal to suffer even more, often elevating the maintenance requirements further.

The reproductive rate in females (heifers and cows) is influenced by the energy levels in the body, as dictated by the total body fat. In these extreme cases where the animal is unable to take in enough or the quality of feed is inadequate, the reproduction process will be halted.

It is therefore important for primary producers to take the maintenance requirements of breeding females into consideration, while at the same time producing an acceptable product to the feedlots or other finishing units.

The genetic selection focus of primary producers should still, in order of importance, be:

- Reproduction efficiency (including ease of calving).

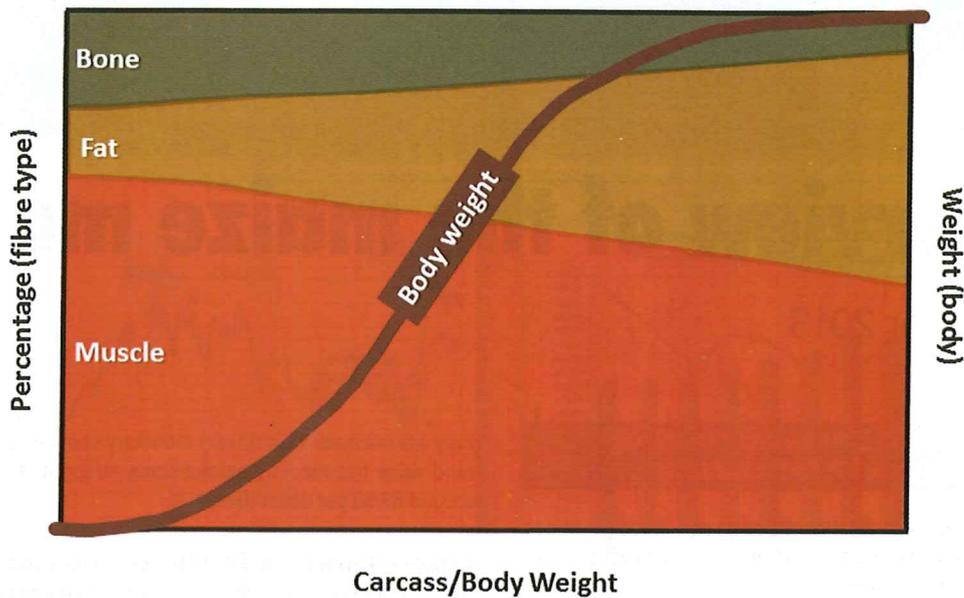


Figure 3: Changes in proportions of muscle, total body fat and bone at changes in body weight during growth of individual cattle.

- Mothering ability of cows (heavy weaning weights relative to cow maintenance requirements).
- Growth rate within the nutritional and other environmental constraints, not only as an indicator of growth merit, but also as an indicator for adaptation. Successful selection can also take place where replacement bull calves are subjected to growth tests simulating feedlot conditions while heifers are subjected to the same conditions the cows have to perform.

Keeping the balance

Utilising the phenotypic and genetic variation among beef cattle to ensure profit at all levels of the production chain is important. There could be some kind of tension between primary producers and feedlots (or other finishers) regarding the traits and areas of importance.

For example, beef farmers should concentrate on traits enhancing repro-

duction, mothering ability and low cow costs, while feedlots should focus on growth, feed efficiency and carcass characteristics.

It is however also important that the two groups should invest in the other's well-being. Allowing for selection for growth should therefore also be a priority for seedstock (stud) breeders, while buyers of weaners should acknowledge differences in genetic merit among the bought-in stock and pay accordingly.

Utilising other means of reaping the full benefit of growth rate and efficiency differences as well as differences in maturity type performance in feedlots, are also possible. These include the correct use of cross bred cattle using sires of differing maturity types, depending on the price or feed margin, as well as the possibility of adjusting weaning ages or back rounding periods to allow for skeletal development to take place prior to finishing in the feedlot. ■

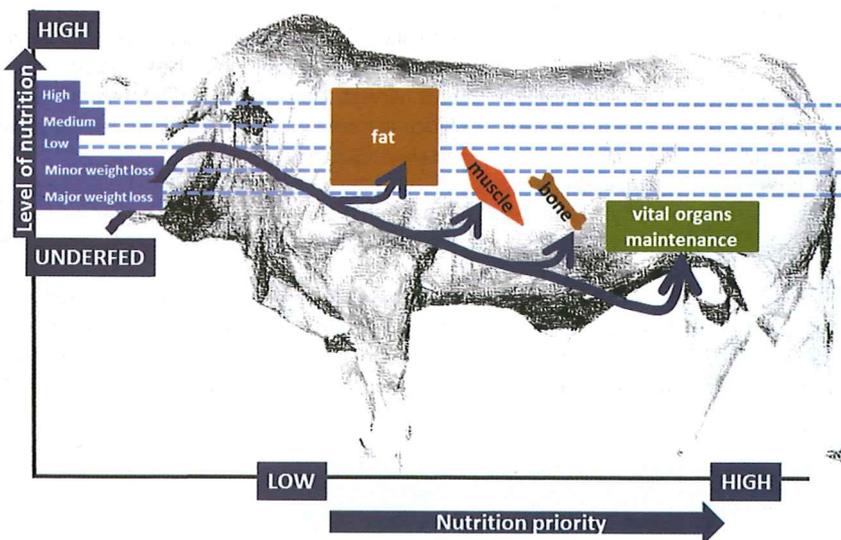


Figure 4: Nutrient priorities at differing levels of nutrition in cattle.