

## 6 NFSC010 - Beef tenderness model (Phase 2)

By Dr L. Frylinck

**Research Institute:** ARC Animal Products Institute  
**Industry Sector:** Beef  
**Focus Area:** Animal Products Quality and Value-adding (4)  
**Contract dates:** 01/04/2004 to 31/13/2008  
**Total Funding:** R 1 379 200.00  
**Final report approved:** 17 Mar 2010

The aim of this study was to evaluate the meat quality differences (colour of meat and subcutaneous fat, drip loss, water holding capacity, tenderness and other sensory attributes such as juiciness and aroma) of A-age (feedlot and pasture) animals, AB-age (feedlot and pasture) animals, and B-age (pasture) animals under the determined ideal slaughter conditions for South African crossbred beef breeds.

Each age-feed group consisted of 10 animals of each cross breed (Brahman-X, Simmental-X, Nguni-X). Feedlot animals were raised until required age-classes (A-age (zero permanent incisors) and AB-age (one-two incisors)). These test groups will be referred to as AF and ABF. The pasture animals were introduced to pasture after weaning until required age-classes (A-, AB- and B-age (three - six permanent incisor)). These three test groups will be referred to as AP, ABP, and BP. The animals were slaughtered according to normal South African slaughter procedures and the carcasses were electrically stimulated for 15 sec (400 V peak, 5 ms pulses at 15 pulses per sec). Carcasses were chilled directly after dressing at room temperature before loading at 0 – 4 °C.

Depending on the production system, careful controlled slaughter conditions and breed type, Warner Bratzler shear force and sensory judged first bite, tenderness, and residue results showed that older animals can produce more tender meat than younger animals. On average the AB-age feedlot produced animals were the most tender followed by the B-age veld produced animals, then the A-age feedlot animals similar to the AB-age veld animals, with the A-age veld animals producing the least tender meat.

Differently from the results from Phase 1, the Simmentaler-cross animals produced the most tender meat compared to that of the Brahman-crosses and Nguni-crosses as should be expected from a *Bos taurus* breed. This indicates to the importance of choosing the right agent to source animals from a bonafidé source according to stipulated specifications and that not all Simmentaler-crossings

are beneficial to meat tenderness (i.e. Simmentaler – Brahman crosses). Breeders should be made aware of the genetic consequences on all levels including meat quality characteristics.

The Nguni-crosses produced the most tender meat when produced from AB-age feedlot and B-age veld production systems showing that they adapt better to these production systems.

The genetic expressed calpain proteolytic ageing system plays a pivotal role in determining the ultimate meat tenderness, but although connective tissue becomes less soluble the older the animal it did not play an important role in determining tenderness in the age-groups A, AB and B.

What did seem to play an important role in the tenderness outcome of the age-feed groups seemed to be the % intra muscular fat (i.e. marbling) thus the fat condition of the animal at slaughter. The Nguni-crosses seemed to marble well at the AB age group that gave it the competitive edge in this production group.

The Nguni-crosses also seemed to produce the juiciest and most flavoursome meat with the best aroma according to the sensory panel. The older animals seemed to produce the most flavoursome meat; feed regime can change the flavour of the meat.

The energy status of the muscle of the animal at slaughter influences the biochemical mechanisms that have an effect on meat tenderness, juiciness and flavour. The energy levels should be controlled by means of optimum feeding conditions and avoiding unnecessary stress at slaughter. The Nguni-type is more prone to stress than the other breeds.

Judging eating quality on the grounds of visual subcutaneous fat colour is not reliable because carcasses from older animals and certain production systems produce yellower fat, but is not necessarily tougher. The South African classification system and resultant remuneration should be revisited and consumers should be educated accordingly. Production systems should be optimised to provide optimum pre- and post slaughter conditions and adapted to accommodate different breed-types.