Meat Quality

SIL TECHNICAL NOTE

Subject:	**Meat Quality Traits**
Relates to:	Loin intra-muscular fat (IMF), meat colour, pH, tenderness
Date:	Updated October 2026

Summary

- The Meat Quality module is based on genetic parameters, carcass quality measurements, genomic information developed by the South Island Genomic Calibration flock (SIGC) and ultra-sound IMF calibration on progeny in the Central Progeny Test flock (CPT)
- The four key meat quality traits are loin intra-muscular fat (IMF; a measure of fat marbling), meat tenderness measured as shear force, meat colour 24 hours post-slaughter and carcass meat pH.
- Additional measures of IMF that have been calibrated against chemical measurement of fat such as hyperspectral analysis, near infra-red scanning, CT from Invermay and ultra-sound from approved operators are included in the evaluation.
- There are likely to be a lot more IMF data than tenderness, colour and pH so the module is split into two goal trait groups Meat Quality IMF (MQIMF) and MQ which contains shear force, meat colour and pH.
- Sub-indexes are additive and can be added to other combined indexes e.g., TW+TSMQIMF or TW+TSMQIMF +TSMQ.
- Like all indexes a higher value indicates greater merit.

Background

Genetic selection has played an important role in improving productivity gains, with an 83% increase in weight of lamb produced per ewe and up to 28% (+4.1kg) increase in carcass weight from 1990 to 2012 (Beef + Lamb New Zealand). Meat sheep breeding programmes have focused on selection for fast growth and high lean yield; however, there is evidence that continued selection for higher lean meat yield may adversely affect aspects of eating quality from sheep and other species.

For the lamb industry to remain competitive with other proteins, it is important to ensure that selection for growth and leanness is also accompanied by maintenance of, or an improvement in commercially acceptable levels of meat quality traits. Marbling, tenderness, meat colour and pH influence the eating experience and consumer acceptance of lamb. These traits are more difficult and expensive to measure than direct live animal measurements, and genomics and continued measurement of slaughter animals are important tools.

Meat quality breeding values

Each year a selection of industry sires are used in the South Island Genomic Calibration (SIGC) flock and the resultant progeny genotyped and meat quality measured at processing. This information is used to calibrate genomic breeding values for meat quality traits for a range of breeds and composites.

Meat quality information from other progeny test flocks or from in-plant technologies such as hyperspectral analysis, near infra-red, and live animal IMF measures such as CT IMF and Ultra-sound IMF that have been calibrated against wet chemistry are also used in the evaluation when available.

There are four meat quality breeding values.

- Intra-muscular fat (marbling) is associated with meat juiciness, flavour and overall sensory acceptability.
- Tenderness is influenced by the amount and solubility of connective tissue and impacts of rigor on muscle fibres and proteins *post-mortem*. It is measured by the kg of force required to shear a sample of meat using a calibrated blade.
- Meat colour (red/brown) 24 hours post-mortem is an important aspect of consumer perception of "freshness" with a bright red colour being desirable.
- Carcass pH is related to many elements of meat quality including shelf life, colour, tenderness, flavour and juiciness. Carcass pH has a low heritability and is impacted by stock handling pre-slaughter and post slaughter processing.

Table 1: Meat quality traits, abbreviations and approximate heritability.

Name	BV name	Definition	Heritability*
Loin Intra-muscular fat	IMF	Loin marbling based marble score, hyperspectral analysis, near infra-red data, approved computer tomography (CT) and approved ultra-sound operator visual assessment of intra-muscular fat flecks in the cross-cut loin (1 low, 5 high) *A higher BV value is better*	0.30 or 30%
Carcass Tenderness	SHF	Shear force/tenderness Kilograms shear force. *A lower BV value is better*	0.24 or 24%
Colour stability	COLA24	Carcass redness 24-hour post-slaughter *A higher BV value is better*	0.19 or 19%
Carcass pH	CPH	Ultimate Carcass loin pH measured on the day after slaughter Breeding values greater than +0.1 pH selected against.	0.10 or 10%

* Heritability = approximate proportion of variation in the trait that is genetic (additive) and responsive to selection

Ultra-sound IMF values

In October 2026, updates to the Meat Quality Module were made to include ultra-sound intra-muscular fat measurements from approved operators (IMFUSCS from Chris Spark and IMFUSPC from Peter Clulee) in the calculation of the intra-muscular fat breeding value (IMFgBV).

This is the culmination of two years of work using animals sourced from the B+LNZ Genetics Central Progeny Test to calibrate ultra-sound scanners against the 'gold standard' IMF measurement of wet chemistry IMF from samples of the loin. Two ultra-sound operators were demonstrated to predict wet chemistry IMF with sufficient accuracy for genetic selection purposes and have therefore been incorporated into the NZGE.

Given ultra-sound IMF is a live animal measurement collected on-farm, many more animals will have IMF breeding values informed by an approved IMF ultra-sound operator measurement than was previously the case for carcase and CT IMF measures. The Meat Quality IMF US+CT Decision Tree shows the criteria for a flock to access the IMF BV and TSMQIMF Index in SIL and nProve Breeder, and to show as recording and connected for Meat Quality IMF in nprove.nz.

Meat quality sub-indexes

The meat quality (MQ) sub-index consists of meat colour at 24 hours, tenderness as measured by shear force and meat pH.

The meat quality intra-muscular fat (MQIMF) sub-index only consists of the IMFgBV. It is likely many more flocks will have IMF data than the other three measures of meat quality.

Meat Quality sub-indexes are available to both Dual Purpose and Terminal breeds and it is recommended to use them in conjunction with Meat yield -DPM or TSM. All sub-indexes are additive and can be combined with other indexes to represent the flocks breeding objective.

e.g. TW + TSMQIMF - if only IMF records available

or TW + TSMQIMF + TSMQ - if all four meat quality traits are recorded

Breeding values for meat quality are genomically enhanced when breeds meet the genomic inclusion rules for the Maternal or Terminal evaluations. Like all indexes, a higher value indicates greater merit and is expressed in cents per ewe lambing for maternal and cents per lamb for terminal flocks.

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Reference Material

Genetic parameters for various growth, carcass and meat quality traits in New Zealand sheep population. Brito LF, McEwan JC, Miller S, Bain W, Lee M, Dodds K, Newman S, Pickering N, Schenkel FS, Clarke S. Small Ruminant Research Vol 154 (2017) pages 81-91

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