Fact sheet – Intramuscular Fat %

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Consumers desire juicy, flavoursome and tender meat products, but are also seeking lower fat, healthier food options. These consumer drivers are linked to intramuscular fat percentage (IMF%), or marbling.

Current IMF% levels and targets

To make a 'low fat' claim, meat has to contain less than 3% fat (FSANZ Food Standard 1.2.7). However, to obtain a National Heart Foundation recommendation, a product must contain less than 10% fat, for which lamb could easily qualify.

Table 1. Comparison of Sheep CRC Information Nucleus flock (INF) IMF% measurements and consumer preference.

	INF Mean	INF Range	Consumer Preference
IMF%	4.2	2 – 7	4 – 6

Data from the INF lambs has shown a range of genetic and non-genetic factors that were significantly associated with IMF%.

Physical associations with IMF%

A higher IMF% is associated with:

- an older slaughter age
- a heavier carcase weight
- a higher carcase fatness
- a lower carcase muscling
- higher meat eating quality sensory scores
- lower lean meat yield
- lower colour stability and poorer retail colour

Slaughter age

Age is in important determinant of IMF%.

The mean slaughter age from the INF lambs measured for IMF% was 268 days, with a range of 134–504 days. As the lambs increased in age across this range, IMF% increased by 2% units.

Carcase weight

Heavier lambs had higher IMF%, with levels increasing by 2% units across the 28kg carcase weight range. Adjusted at the same age, reflecting growth rate, confirms growth rate as a strong driver of IMF%.

Carcase fatness

Fatter lambs, as indicated by short loin fat weight (trimmed fat from the short loin) and GR fat depth, had higher IMF% levels. For the same hot carcase weight, IMF% increased about 1.2% between 10–500g short loin fat weight, and by about 1.6% between 0.5–25mm GR tissue depth (Figure 1). For both traits IMF% did not increase anymore beyond 500g of short loin fat weight and 25mm GR tissue depth.

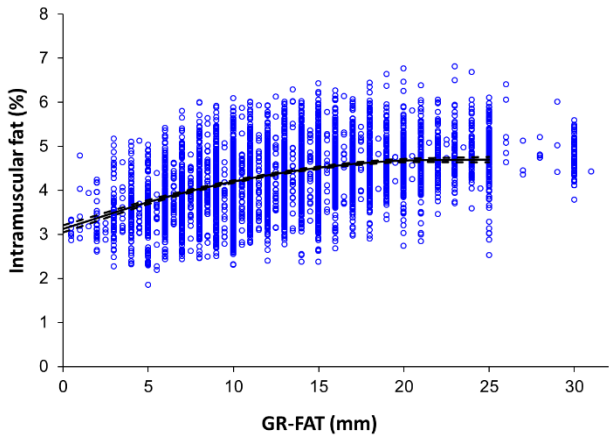

Figure 1: GR fat depth association with IMF%.

Carcase muscling

Muscling measured by short loin muscle weight and eye muscle area has a negative relationship with IMF%. The mean short loin muscle weight measurement was 356g, with a range of 140–670g. Between 200–500g, IMF% decreased by 1.4%.

The mean eye muscle area was 15cm2, with a range of 7.5–25cm2. Between 10–20cm2, IMF% decreased by 0.6%.

Consumer eating quality

Animals with higher IMF% levels will produce meat that is more acceptable for consumers. Untrained consumers tasted and scored (1–100 score) grilled loin and topside samples of 1,471 lambs for tenderness, juiciness, flavour, odour and overall liking.

The results showed that IMF% is a strong driver of the consumer sensory scores, increasing all sensory traits (Figure 2). With an increase of 4.5% IMF, sensory scores increased by 11 scores for juiciness, 10 scores on overall liking, followed by flavour (9 scores) and tenderness (6 scores).

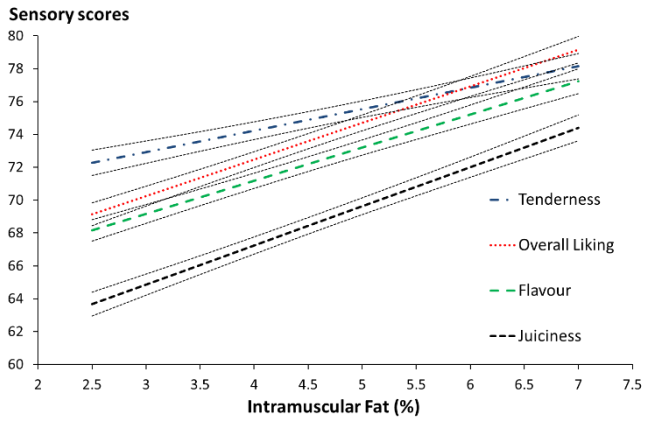

Figure 2: IMF% impact on consumer sensory scores.

Lean meat yield

Selection for lean meat yield (LMY) will reduce IMF%. Predicted lean meat yield (estimated from a combination of weight, muscle and fat dimensions) has a negative phenotypic association with IMF%.

Colour stability

IMF% is negatively associated with colour stability resulting in meat becoming discoloured slightly more rapidly and less red in colour during retail display.

Genetic associations with IMF%

Genetic correlations

IMF% has a moderate to high heritability indicating the potential for genetic manipulation of the trait. Consistent with the phenotypic associations, IMF% has a positive genetic correlation with hot carcase weight and GR fat depth, however has a negative genetic correlation with shear force (high IMF% increases tenderness), lean meat yield, eye muscle area and colour stability.

Sire

There were no differences in IMF% between sire types (Maternal, Merino, Terminal), however, when adjusted at the same hot carcase weight, the Merino-sired progeny had the highest IMF% (4.49%) and the terminal-sired progeny had the lowest (4.17%).

Sire breeding values

Current selection objectives targeting leaner sires with low PFAT Australian Sheep Breeding Values (ASBV) are likely to reduce IMF content (Figure 3).

PFAT is the ASBV that estimates the genetic difference of GR fat depth at 45kg live weight

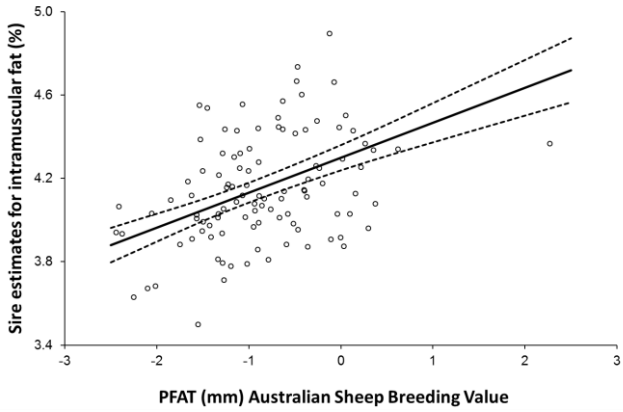

Figure 3: PFAT ASBV association with IMF%.

***PEMA** is the ASBV that* estimates the genetic difference of the eye muscle depth at the C-site in a 45kg live weight animal

To some extent, selection for more muscular animals using the PEMD ASBV reduces IMF%. However, this was only driven by few extreme sires (PEMD <3.5 mm). Hence there is potential to select for lean meat yield using PEMD without incurring the negative impact on IMF%.

Key Messages

Lamb meat is considered a healthy product, however, maintaining sufficient IMF% levels are important to ensure the sensory appeal for consumers.

Continuous selection for LMY will reduce IMF% given the current industry focus on selecting sires with low PFAT. Given this pressure and the high heritability for IMF%, genetic selection for redistribution of fat towards the IMF% depots would be advisable rather than finishing to heavier weights or maintaining minimum carcase fatness.

The new breeding values developed by the Sheep CRC and Sheep Genetics will enable continued selection for leanness while maintaining IMF%.

Further information

Sheep CRC Information Nucleus: http://www.sheepcrc.org.au/genetic/summary-of-progress-in-genomics-and-genetics/information-nucleus.php

AMPC Fact Sheet: Lamb Eating Quality

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