AMPC/Sheep CRC/MLA Case Study

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Fact sheet – Lean Meat Yield Current and Future Technologies

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Lean meat yield is one profit driver within lamb supply chains, driving on-farm efficiency, reducing wastage and new product development at processing.

Lean meat yield percentage (LMY%) *is the amount of lean meat that can be boned out from a carcase and is displayed as a percentage of carcase weight.*

Determining lamb LMY% is valuable for processors. While LMY% proved to be difficult to measure at chain speed, there are a number of methods that can predict LMY% with varying accuracy.

Identifying appropriate in-plant measurement technologies could increase value by up to $10 per carcase, depending on the ease and degree of fabrication or retrofitting to existing processing plant.

Current measurements to predict LMY%

In Australia, most carcasses are graded and traded on the basis of carcase weight and GR tissue depth.

GR tissue depth *is a single point measurement taken 110 mm from the spine over the 12th rib (the GR site), representing the total depth of tissue (muscle and fat) at this point.*

While grading carcasses on the basis of GR tissue depth is an industry standard, the way in which this is measured is not.

Table 1 compares methods of predicting LMY%. The accuracy is determined by both the measurements and carcase weight. In most cases, technologies are trained or calibrated using bone-out data generated by professional butchers, however, in recent years the use of Computed Tomography (CT) scans for benchmarking and training has increased In Australia (Figure 1).*

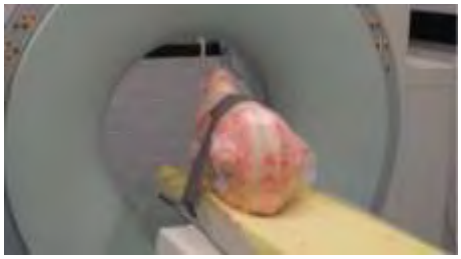

Figure 1: Lamb carcase CT scan

Improving LMY% Prediction

Plants currently palpating GR fat score, could more accurately predicted LMY% by using a GR Knife, AUS-MEAT Sheep Probe or VIAscan®.

Table 1: Current methods of LMY% determination

LMY Prediction Method	Accuracy to predict LMY% *	Most suited to and Benefits	Limitations
HSCW	HSCW 12%		
HSCW plus Palpated Fat Score (AUSmeat accredited operators)	Fat score + HSCW 20%	Measure on hot carcasses, end of chain	Higher operator error (especially at fast speed)
HSCW plus GR Knife Fat Score (measured fat scores)	GR Fat score + HSCW 30%	Slower chain speeds End of the chain	Fast chain speed
HSCW plus GR Knife (mm) (measured with ruler)	GR mm + HSCW 35%	Slower chain speeds End of the chain	Fast chain speed

HSCW plus AUSmeat Sheep Probe Blade driven through GR tissue until it strikes the rib	Probe + HSCW 34.6%**	Measure on hot bodies Slower chain speeds End of the chain	Operator error and no longer commercially supported
VIAscan® HSCW, carcase dimensions and light reflectance measured	47%	Operates with modern kill chains, no human error	Ageing technology

*Precision of new yield prediction technologies based on their ability to predict CT lean %.

Measuring alternate tissue depths

The Sheep CRC Information Nucleus Flock has measured tissue depths at key points within the carcase to determine their ability to predict LMY%, when used in conjunction with carcase weight (Table 2). These combinations do slightly increase the accuracy of prediction, although the task of measuring the additional points is only likely to provide additional value to plants routinely cutting and sorting carcasses.

Table 2 Accuracy of measuring alternate tissue depths to predict LMY%

Accurately measured tissue depths	Accuracy to predict LMY% *
HSCW + GR (mm)	35
HCSW + EMD + C-fat	36
HCSW + EMA + C-fat	40
HCSW + GR (mm) + EMD + C-fat	47

* Precision of yield prediction measurements based on their ability to predict CT lean %.

HSCW: hot standard carcase weight
GR (mm): GR tissue depth measured by ruler or GR knife
EMD: eye muscle depth
C**FAT**: fat depth measured at the C-site (over the 12th rib 5 cm from the spine)
EMA: eye muscle area
FS: fat score, corresponds to GR depths measured in 5 mm graduations

Future methods of LMY% determination

A number of new devices with potential for future use are being investigated through collaboration with commercial partners.

Point measures:

- Modification of the Carometec Fat-o-Meat'er: a probe type device to measure the GR site.
- High resolution camera imaging for determining fat depth and eye muscle area at the C-site of cut carcasses.
- An intramuscular fat probe based on electrical impendence detected via insertion into the muscle.

Image analysis:

- VIAscan® records and analyses carcase surface images to extract measurements to predict the lean meat yield of the carcase. Use of 2D X-ray to steer robotic cutting devices is increasing. Research into more accurate LMY% determination is being trialed with modifications to dual energy x-ray absorptiometry (DEXA) technology.

Tested/failed methods of LMY% prediction

A range of devices have also been assessed within the Sheep CRC, in many cases pursued on the basis of their capacity to capture tissue depths at key points within the carcase. At this stage none of these are considered accurate enough for use or capable on their own of determining LMY% prediction in lamb.

- Hennessy Grading Probe
- Pork Scan Ultrasound Probe
- Cut-based weighing yield prediction
- 2D X-ray scanning

Summary

Plants currently palpating GR fat score, especially at high speeds, could more accurately predict LMY% by simply using a GR Knife to measure either fat score or GR depth (mm). For increased accuracy use an AUS-MEAT Sheep Probe or VIAscan®.

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