Preparing for MSA score in lamb: What are the drivers of variation?

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In the Australian sheep industry, lamb is currently graded using crude indicators of lean meat yield (LMY), specifically, hot carcase weight (HCWT) and palpated girth rib (GR) tissue depth. To ensure consistent consumer eating quality, a Meat Standards Australia (MSA) grading system has been introduced in sheep. However, industry is now demanding a more comprehensive cuts-based grading system, based on individual carcase measurements, similar to that used in beef (Polkinghorne *et al.* 2008). A preliminary MSA model has now been developed to predict untrained consumer scores of tenderness, juiciness, flavour, and overall-liking which are combined into a single index (MQ4). This model includes HCWT, LMY and intra-muscular fat measurements developed using lambs from the Sheep CRC Information Nucleus and MLA Resource Flocks. This study aimed to examine the key determinants of variation in MQ4 scores for sheep.

There were 11,231 Terminal and 2,572 Maternal breed-type lambs with sufficient information to generate an MQ4 score based on a preliminary sheep MSA model. These data were then analysed using a random effects model in ASReml, fitting various production factors and genetic effects to estimate the variance in MQ4 score that each explained. Average MQ4 score was 71.3 for the loin (range, 52.5–89.3) and 51.4 for the topside (range, 33.2–64.3). The MQ4 score range within kill groups averaged 10.1 and 7.4 for the loin and topside respectively.

The heritability of MQ4 score was 0.35 ($\pm$0.12) in maternal breeds and 0.63 (0.08) in terminal breeds. The ratio of the variance between breeds to that within breeds was 0.15 for maternal and 0.21 for terminal breeds, suggesting genetic variation within breeds is greater than that between breeds. However when all breeds were included in a single analysis there were significant differences between breed types. The genetic correlation (r_g) and phenotypic correlation (r_p) between MQ4 score and intramuscular fat were very high (r_g and r_p >0.95) while the correlations with HCWT were lower (rg = -0.26 and rp = -0.12). The genetic and phenotypic correlations between MQ4 score and LMY were -0.73 ($\pm$0.01) and -0.76 ($\pm$0.04) respectively. These results highlight the need for balanced selection for LMY and eating quality.

A range of environmental and production factors affected the MQ4 score, including lamb age, birth type, dam age, flock and year (Table 1). The key drivers of variation were breed, genetic merit within breed, flock x birth year and kill group. These 4 factors explained 51% and 75% of the variation in MSA score in maternal and terminal breeds respectively.

Table 1. Proportion of variation in MQ4 score explained by each effect for Loin and Topside cuts

	Maternal breeds		Terminal breeds	
	MQ4 - Loin	**MQ4 - Topside**	**MQ4 - Loin**	**MQ4 - Topside**
Lamb age	0.01%	0.01%	0.01%	0.01%
Dam age	0.07%	0.06%	0.04%	0.03%
Birth Type	0.31%	0.38%	0.02%	0.03%
Flock	1.49%	1.67%	0.00%	0.00%
Sire x Flock	2.95%	2.96%	0.00%	0.00%
Kill Group	6.48%	6.80%	3.60%	3.94%
Breed	2.88%	3.45%	9.28%	8.69%
Flock x Year	15.18%	15.14%	13.39%	13.48%
Within breed genetics	25.77%	25.82%	47.84%	47.13%

Similar to experience in the beef industry, sheep producers will have a range of genetic and management decision options to target premium eating quality through the cuts-based MSA system in lamb. It will also be important that the industry can develop an MSA scoring system that works efficiently across the breed diversity observed in the commercial lamb slaughter.

References

Polkinghorne, R., Watson, L., Thompson, J. M., Pethick, D. (2008) *Animal Production Science.* **48(11)**, 1459-1464.

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