



FIONA ANDERSON, ANDREW WILLIAMS, LISELOTTE PANNIER, DAVID PETHICK & GRAHAM GARDNER

It's all in the breeding: Selective breeding to improve lamb muscle mass

The financial value of a carcass is influenced by its lean meat yield percentage, which represents the proportion of the carcass that is lean meat (muscle).

Australian and international consumers prefer cuts of meat that are large and lean. To meet this consumer preference, Australian lamb producers select for lean meat yield percentage indirectly via three existing Australian Sheep Breeding Values (ASBVs): post-weaning weight, c-site fat depth, and eye muscle depth. These breeding values are used to select for improved growth, leanness and muscling, respectively.

The effects of selection using the ASBVs have previously been investigated using indicators like muscle depths, and weights of specific cuts. However, the breeding values have not been quantified in terms of the change in whole carcass muscle composition or distribution of muscle between carcass regions.

Methods and results

Lambs were born and raised at one of six research sites across Australia from 2007 to 2010. 1,665 lambs of known genetics (ASBVs) were slaughtered at a target carcass weight of 23kg, with slaughter age ranging from 168 to 420 days of age. Carcasses underwent computed tomography (CT) scanning within 72 hours of slaughter to determine the proportions of fat, muscle,

and bone. Prior to scanning, the carcasses were split into three (fore-, saddle or mid-, and hind-sections) to enable more rapid post scanning processing of the CT images for the distribution analysis.

Eye muscle depth. Sires of high eye muscle depth breeding values had lambs with a greater proportion of muscle. Lambs from sires of the highest eye muscle depth breeding values had 7.7% more muscle

than those from the lowest breeding value sires (Figure 1). This muscle was preferentially distributed to the saddle (mid-) section, where muscle weight increased by 3.8%, at the expense of muscle in the fore-section of the carcass.

C-site fat depth. The lambs from sires with the lowest breeding values for c-site fat depth (i.e. very lean sires) had 9.5% more muscle than the lambs from sires that had

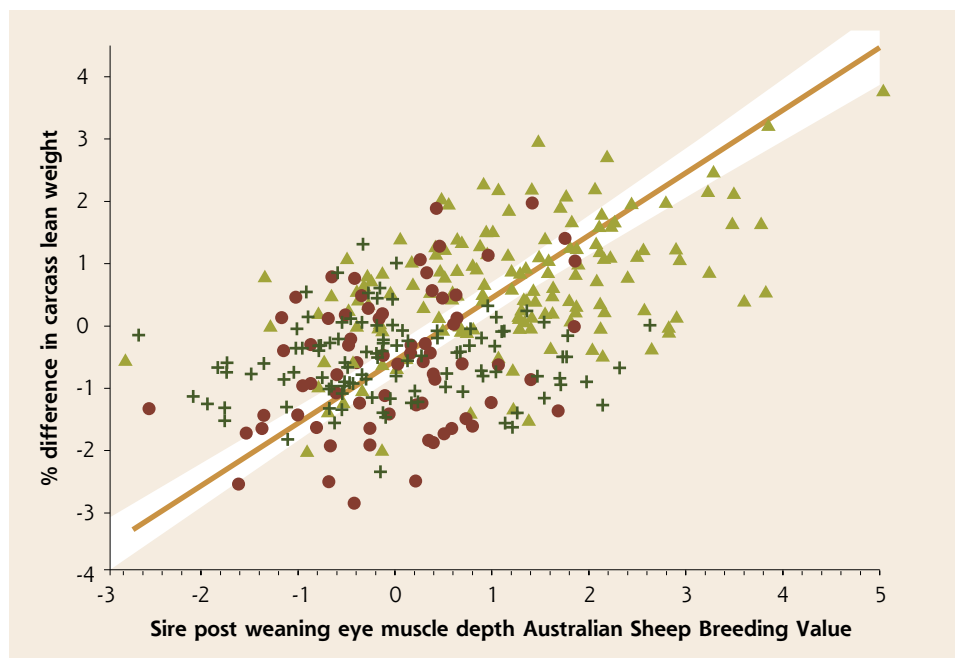


FIGURE 1 The relationship between lamb sire estimates for percentage of lean and post-weaning eye muscle depth (PEMD). Symbols represent sire estimates plus the least squared means for (●) Maternal, (+) Merino (▲) Terminal sired lambs and are obtained from the ASBV model in which PEMD was removed. The line represents least squared means (\pm SE; white area) for PEMD from the model containing the Australian Sheep Breeding Values

the highest c-site fat depth breeding values. Similar to the eye muscle depth breeding value, there was a preferential increase in saddle section muscle weight.

Post-weaning weight. Increasing sire post-weaning weight breeding value only increased lamb carcass muscling at some sites and over some years. This breeding value increased the amount of muscle in the saddle region by up to 4%.

Conclusions and recommendations

Selecting for Australian Sheep Breeding Values can increase lamb carcass muscle mass and result in a redistribution of muscle to the saddle region — the more valuable lamb meat cuts.

This experiment has for the first time allowed the impact of ASBVs to be quantified at a whole body level, rather than just using cut weights and carcass tissue depths to indicate these trends. The results demonstrate the large and favorable impact that the c-site eye muscle and fat depth ASBVs have on muscle within the lamb carcass, with an impact of the post weaning weight breeding value on carcass muscle more limited. All three carcass

breeding values increased muscle in the highly valued saddle section which will increase carcass value.

Results of this experiment will be used to determine the financial gains of using carcass ASBVs to improve carcass composition in addition to the improvements in hot carcass weight that they provide. ■

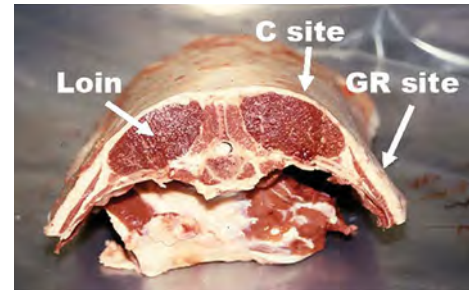
More information

Contact Fiona Anderson
E: F.Anderson@murdoch.edu.au

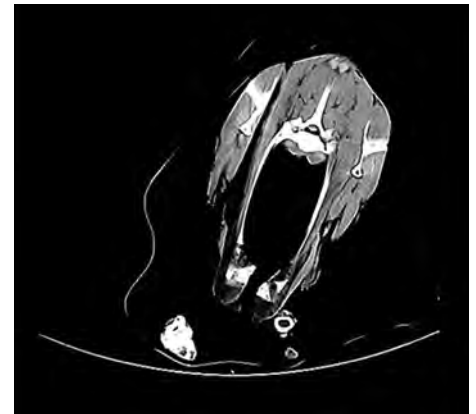
Acknowledgements

The CRC for Sheep Industry Innovation is supported by the Australian Government's Cooperative Research Centre Program, Australian Wool Innovation Ltd. and Meat & Livestock Australia.

This article is an excerpt from: Anderson, F., Williams, A., Pannier, L., Pethick, D. W., and Gardner, G.E. (2015). Sire carcass breeding values affect body composition in lambs — 1. Effects on lean weight and its distribution within the carcass as measured by computed tomography. *Meat Science*, 108, 145–154.



ABOVE: A cross sectional view of the lamb loin at the 'c-site' which is between the 12th and 13th rib. The c-site measurement for fat and muscle depths are taken 45mm from the midline at the point indicated in the diagram.



ABOVE: An example of a cross sectional image of a lamb carcass undergoing computed tomography scanning. These images are used to accurately calculate the proportions of fat, lean and bone in the lamb carcass.



ABOVE: Australian Sheep Breeding Values can help us improve lamb carcass composition.

INSET: CT scanning lamb carcasses.



If you are interested in our research and would like to know more, then please contact us on vlsresearch@murdoch.edu.au
Our research bulletins can be downloaded from www.murdoch.edu.au/School-of-Veterinary-and-Life-Sciences/Our-research/Our-Bulletins/
Undergraduate or postgraduate degrees, please see www.murdoch.edu.au/School-of-Veterinary-and-Life-Sciences/Our-courses/