Proc. Assoc. Advmt. Anim. Breed. Genet: 24: 255-258

VARIATION BETWEEN MERINO SIRES IN LAMB CARCASS VALUE

S.I. Mortimer[1], J. L. Smith[2], B.C. Hine[2], S.M. Fowler[3], B.W.B. Holman[3], D.L. Hopkins[3], K.L. Egerton-Warburton[4] and A.A. Swan[5]

[1] NSW Department of Primary Industries, Armidale, NSW, 2351 Australia
[2] CSIRO, Agriculture and Food, F.D. McMaster Laboratory, Armidale, NSW, Australia
[3] NSW Department of Primary Industries, Cowra, NSW, 2794 Australia
[4] NSW Department of Primary Industries, Orange, NSW, 2800 Australia
[5] Animal Genetics and Breeding Unit*, University of New England, NSW, 2351 Australia

SUMMARY

Carcass value and its components were evaluated for a range of Merino sires based on progeny performance in diverse climates and production systems. Sire adjusted means for carcass value had a range of $31.33 under a mixed farming system while the range under a fine wool production system was $62.48. This preliminary analysis shows that considerable variation exists in carcass value of individual Merino sires when based on a simple economic model.

INTRODUCTION

Incorporating meat production traits together with traditional fine wool traits into sheep breeding programs is driven by an increased demand for sheep meat and changes in relative prices paid for wool and meat. Gross margin analyses of 10 model sheep enterprises by the NSW Department of Primary Industries (NSW DPI) have shown over time that sheep enterprise performance over a 10-year period has been steadily improving, driven by increases in both returns from wool and sheep sales (G.C. Casburn, personal communication).

Genetic benchmarking of Merinos through central test sire evaluation has been focussed on the performance recording of measured and visually assessed traits that are relevant to wool production, such as yearling, hogget and early adult fleece traits. Establishment of the Merino Lifetime Productivity (MLP) project, through a partnership between Australian Wool Innovation Limited and the Australian Merino Sire Evaluation Association combined with committees and hosts at 5 sites (Ramsay *et al.* 2019), has enabled the design of a sire evaluation scheme, which will assess lifetime productivity of ewe progeny across a range of environments. At 2 sites, an additional project has recorded the performance of sire progeny for a range of carcass composition and meat quality traits, providing comparative information on Merino sires for these traits. Previously, Clarke *et al.* (2019) reported variation between sires in value of production (wool and meat), based on live animal data being used to assign animals to market segments and therefore estimate sale value. For Merino producers looking to diversify their businesses and take advantage of the potential higher returns from running self-replacing flocks and selling trade wether lambs, such information would assist in identifying sires more suited to their commercial enterprises.

A preliminary study of carcass value and its components for a range of Merino sires based on their wether progeny born and raised in diverse climates and production systems is presented in this paper.

MATERIALS AND METHODS

Data were recorded on the carcasses produced from F1 wethers at 2 MLP sites managed within

* A joint venture of NSW Department of Primary Industries and the University of New England

mixed farming (Macquarie, MCQ) and fine wool production (New England, NE) systems. The design of the MLP project has been described by Ramsay *et al.* (2019), with the protocols that produced the F1 progeny at the MCQ site described by Egerton-Warburton *et al.* (2019). These protocols were implemented also at the NE site. The data were recorded on the F1 wethers born in 2017 and 2018 following AI mating of industry sires in each of two years to foundation ewes. The MLP project web site (https://merinosuperiorsires.com.au/mlp-project) provides details on the sources of sires and foundation ewes at each site. The wethers were the progeny of 30 (MCQ) and 28 (NE) sires, with 2 sires used across both sites. From weaning to slaughter, the wethers were production fed to achieve a target liveweight of 48 kg due to drought conditions affecting both sites. Following supplementation on pasture, the NE wethers were finished in a commercial feedlot, whilst MCQ wethers were finished on-site. The wethers were weighed and transported to a commercial abattoir, and held overnight in lairage with water before slaughter the next day.

The MCQ wethers were slaughtered during mid-March to late-May in 2018 and mid-February to early-May in 2019, whereas the NE wethers were slaughtered in early-August and mid-September in 2018 and early-July and mid-August in 2019. MCQ wethers were slaughtered at an average age of 11.6 months and 11 months while NE wethers were slaughtered at an average age of 11.7 and 10.8 months in 2018 and 2019, respectively.

Assessments on each carcass included: hot carcass weight (HCWT, kg), dressing percentage (DP, %), and tissue (fat) depth at the 12th rib, 110 mm from the backbone and measured using a GR knife (GRFAT, mm). The carcass data were collected from 462 and 499 MCQ wethers and 242 and 244 NE wethers in 2018 and 2019, respectively. Carcass value (CVAL, AUD$ per head) was calculated for each carcass using its HCWT, GRFAT and over the hook (OTH) price information from the abattoir feedback reports for the slaughters. GRFAT was used to adjust for carcasses being outside specifications i.e. deductions of $0.30 per kg for carcasses with fat score 1 (≤5 mm) or of fat score 5 (≥21 mm). Summary statistics for the sites are shown in Table 1.

Table 1. Descriptive statistics for carcass traits in MCQ and NE data

Birth year		Macquarie		New England	
		Mean (SD)	Range	Mean (SD)	Range
2017	HCWT	24.4 (1.87)	19.3 - 33.7	23.8 (2.64)	16.7 - 33.0
	DP	45.0 (2.31)	38.5 - 61.9	46.7 (2.11)	35.6 - 51.8
	GRFAT	10.8 (4.04)	2 - 25	13.8 (3.81)	3 - 25
	CVAL	153.21 (15.16)	110.01 - 215.68	174.90 (26.24)	113.56 - 254.10
2018	HCWT	25.9 (1.86)	21.4 - 32.3	29.5 (3.38)	21.4 - 40.1
	DP	46.7 (1.94)	38.8 - 52.0	47.9 (2.18)	35.3 - 54.5
	GRFAT	14.4 (3.32)	7 - 31	21.7 (5.13)	11 - 42
	CVAL	164.64 (12.76)	128.40 - 206.72	224.20 (29.11)	149.80 - 308.77

For each data source, separate analyses to calculate adjusted sire means for each trait were performed using ASReml (Gilmour *et al.* 2015). The fixed effects of sire, ewe bloodline and their interaction were first tested, with non-significant effects then excluded from the model. Random effects fitted in the model were birth type (single, twin, triplet (MCQ data only)), rearing type (single, twin) and dam age (2 (NE data only), 3, 4, 5, 6 and 7 year old at mating), as well as a contemporary group effect (accounting for management and slaughter group effects).

RESULTS AND DISCUSSION

Sire was significant for all traits at both sites ($P < 0.001$), while ewe bloodline was significant for HCWT ($P < 0.05$) and CVAL ($P < 0.05$) at the MCQ site only. The interaction between sire and ewe bloodline was not significant for any trait at either site.

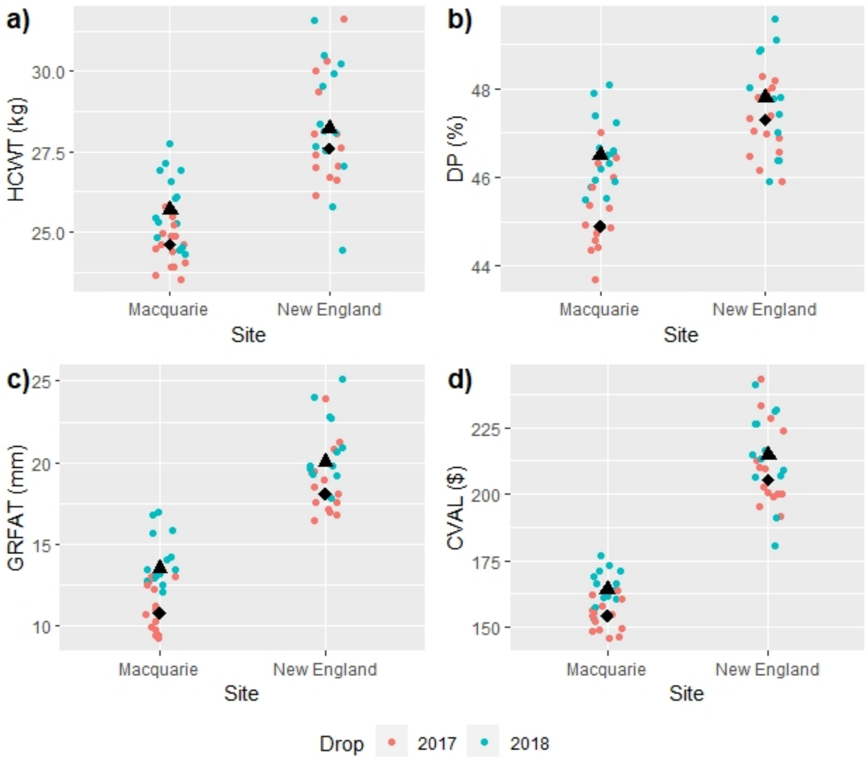

Figure 1. Adjusted sire means for a) HCWT, b) DP, c) GRFAT and d) CVAL at MCQ and NE sites, with black diamonds and triangles representing median values within site for 2017 and 2018 birth years respectively

At the MCQ site, sire adjusted means for HCWT, DP, GRFAT and CVAL ranged between 23.5±0.30 and 27.8±0.30 kg, 43.7±0.35 and 48.1±0.35%, 9.2±0.67 and 17.0±0.57 mm and $145.78±2.24 and $177.11±2.20 per head, respectively (Figure 1). Across both birth years, the averages were 25.2 kg, 45.9%, 12.5 mm and $159.06 per head for these traits, respectively. The ranges in sire adjusted means at the NE site, where the wethers were finished in a commercial feedlot, were 24.4±0.85 to 31.6±1.00 kg, 45.9±0.50 to 49.6±0.53%, 16.4±1.25 to 25.1±1.20 mm and $180.82±7.91 to $243.30±9.21 for HCWT, DP, GRFAT and CVAL, respectively (Figure 1). The average values across birth years for these traits were 28.2 kg, 47.5%, 19.7 mm and $212.49 per head, respectively. Among the sires of the 2017 born progeny at the MCQ and NE sites, the ranges in CVAL means were $17.99 and $51.87, respectively. The ranges in CVAL for the 2018 born progeny were $23.46 and $60.23, respectively.

Due to the assumptions used in this study, carcass value was essentially determined by carcass weight (Figure 2a; unity correlation between CVAL and HCWT at both sites). However, for sires with similar adjusted means for carcass value, a range in mean carcass fat levels was evident (Figure 2b, correlations of HCWT with GRFAT of 0.81 at the MCQ site and 0.69 at the NE site).

Sires were only compared within site and consequently within their own finishing system, where both systems had a target liveweight of 48 kg at slaughter. This, together with the NE progeny being finished under feedlot conditions, produced fatter carcasses from the NE wethers at the same weight and similar ages to carcasses from the MCQ wethers. Adjusted sire means for GRFAT were 21 mm and over for 29% of NE sires, versus none for MCQ sires. This contrasts with the perception that fine wool Merinos are late maturing (Hopkins *et al.* 2005) and suggests that the progeny of certain NE sires may not have been managed for best expression of their genetic potential for growth balanced with fat level, probably due to feedlot finishing. This was not apparent for progeny of sires at the MCQ site that were pasture finished.

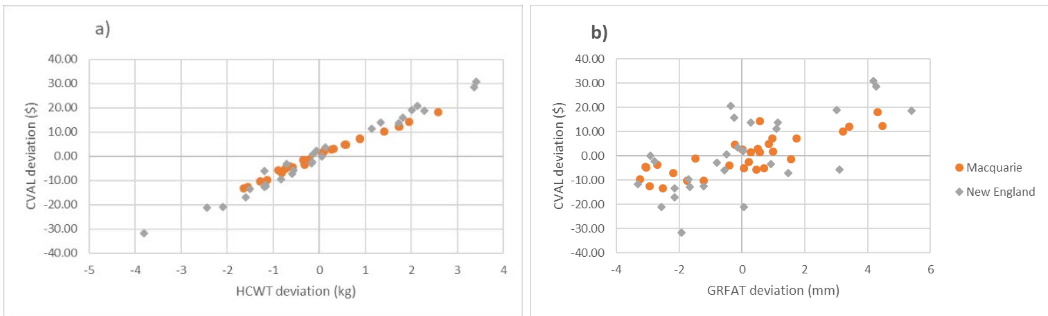

Figure 2. Deviations of adjusted sire means from the average at each site for carcass value relative to a) hot carcass weight and b) fat depth at the GR site

MLA market reports of OTH indicators for NSW show that during both 2018 and 2019 prices received at the time of slaughters of NE progeny were much higher than when MCQ wethers were processed (as for the feedback reports), hence their higher carcass values. Also, information was not readily available on the impact of price differentials for fat levels on carcass prices to use in predicting carcass value. Future work will involve more rigorous economic analyses, where both returns and costs are considered for both finishing systems, wool value is included, the impacts of reproduction are evaluated and relationships with breeding values are estimated (following Hall *et al.* 1997). Furthermore, rather than relying on actual prices received at one point in time, the analyses will evaluate the sensitivity of income from carcasses to changes in the relative value of component traits. In conclusion, this preliminary study has shown that considerable variation exists in carcass value of individual Merino sires when based on a simple economic model.

ACKNOWLEDGEMENTS

We acknowledge the co-investment by Meat & Livestock Australia in the conduct of this study through its funding (P.PSH.1032). Australian Wool Innovation Limited is the owner of pedigree and fixed effect data from the MLP Project used by this study. Staff are thanked at: NSW DPI Cowra, for the recording of data in the abattoir; Fletcher International Exports, for their support; and NSW DPI Trangie and CSIRO Armidale, for their contributions to sheep management.

REFERENCES

Clarke, B.E., Young, J.M., Hancock, S. and Thompson, A.N. (2019) *Proc. Assoc. Advmt. Anim. Breed. Genet.* **23**: 516.

Egerton-Warburton, K.L., Mortimer, S.I. and Swan, A.A. (2019) *Proc. Assoc. Advmt. Anim. Breed. Genet.* **23**: 520.

Gilmour, A.R., Gogel, B.J., Cullis, B.R., Welham, S.J. and Thompson, R. (2015) 'ASReml User Guide Release 4.1 Functional Specification'. VSN International Ltd, Hemel Hempstead, UK.

Hall, D.G., Fogarty, N.M. and Holst, P.J. (1997) *Proc. Assoc. Advmt. Anim. Breed. Genet.* **12**: 355.

Hopkins, D.L., Hatcher, S., Pethick, D.W., and Thornberry, K.J. (2005) *Aust. J. Exp. Agric.* **45**: 1225.

Ramsay, A.M.M., Swan, A.A. and Swain, B.C. (2019) *Proc. Assoc. Advmt. Anim. Breed. Genet.* **23**: 512.