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Fat score is highly genetically correlated across adult ewe reproductive cycles

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Lifetime Wool guidelines have provided producers with a strong understanding of the link between changes in ewe live weight and body condition during the reproductive cycle and its impacts on ewe and progeny performance (Young *et al.* 2011). Body condition targets at joining are more readily achieved by either maintaining ewe condition during lactation and or gaining condition after weaning. This paper looks at the strength of genetic correlations between measurements of fat score between joining and weaning, testing if selection for a higher fat score at one time will lead to genetic improvements in fatness throughout the production cycle.

This study used data from Maternal Central Progeny Test described in full by Fogarty *et al.* (2005). In brief, the F₁ ewe population (n = 2841) were joined to terminal sires over 3 years with the first joining at 7 months of age. The ewes were fat scored at pre-joining, post-joining, mid-pregnancy and weaning across their first three parities. A sire mixed model was fitted with fixed effects of site, year, ewe maturity, sire breed, and the ewe's maternal performance within the previous and current breeding period.

The heritability of fat score was moderate and there were strong genetic correlations between the four measurements during the reproductive cycle. By contrast, there was a low to moderate environmental correlations with the fat score after weaning a lamb (0.17 – 0.25). This suggests that while there is little genetic re-ranking, there is phenotypic re-ranking of individuals due to differences in maternal performance. Sire breed variation in fat score accounted for 18% of phenotypic variation and 62% of the total genetic variation in comparison to between sire variation which only accounted for 4% of phenotypic variation and 16% of the genetic variation. This demonstrates large breed effects in condition and fat thresholds shown in other studies to influence subsequent maternal productivity.

Table 1: Genetic (below diagonal) and environmental (above) correlations between fat score measurements at pre-joining, post-joining, mid-pregnancy and weaning across the first three parities of the production life of maternal first cross Merino ewes. Heritability estimates at the four time points are presented on the diagonal.

	Pre-joining	Post-joining	Mid-pregnancy	Weaning
Pre-joining	0.25	0.45	0.39	0.17
Post-joining	0.84	0.18	0.43	0.18
Mid-pregnancy	0.91	0.89	0.22	0.25
Weaning	0.82	0.85	0.84	0.21

Selection of fatter ewes regardless of when they are selected will result in ewes that are genetically fatter throughout the reproductive cycle. Ewes with an increased ability to deposit fat during the good times will remain fatter and potentially more productive during tough times as a result of maternal pressures or feed deficits.

Fogarty N.M., Ingham V.M., Gilmour A.R., Cummins L.J., Gaunt G.M., Stafford J., Hocking Edwards J.E. and R.G. Banks (2005) *Australian Journal of Agricultural Research* **56**(5), 443-453.

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