

**THE PERFORMANCE OF AUSTRALIAN MERINOS  
SELECTED FOR WEANING WEIGHT AFTER THE  
SUSPENSION OF SELECTION**

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# DECLARATION

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*I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any degree or qualification.*

*I certify that to the best of my knowledge any help received in preparing this thesis, and all other sources used, have been acknowledged in this thesis.*

Bernardo G. Amores

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BERNARDO G. AMORES

# DEDICATION

*To my wife Vicky and son Bern Tristan,  
for their unwavering support, patience  
and understanding;*

*To my late mother and late brother Luis Jr.,  
for their encouragement and inspiration;*

*To them, I dedicate this thesis.*

## **ABSTRACT**

The present study involved genetic analyses of three lines of Australian Merino sheep previously selected for high and low weaning weights. Direct and correlated responses of lambs and hoggets were evaluated for growth traits and wool weights after selection for high and low weaning weight was suspended following thirty years of selection. The genotypes were also evaluated for their growth and wool performance in two locations, and phenotypic and genetic parameters were determined with emphasis on the importance and influence of maternal effects.

Only one model was used in the analyses of the data with six co-variances (residual variance, direct additive variance, maternal additive variance, direct-maternal additive co-variance, permanent environmental variance and temporary environmental variance) fitted. The study revealed that body weight and birth weight have moderate estimates of maternal heritability with the value decreasing with animal age. Maternal effects for wool traits were minimal. Similarly, the permanent maternal environmental effect decreased with age for body weights and had only a small effect on wool traits. Direct additive and maternal correlations between body weights was found to be low and positive and was low and negative for wool traits. These results are in agreement with previously published estimates confirming the importance of maternal effects for body weight parameters.

Genotype x environment interactions reveal the potential for maximum performance of a genotype in a particular environment and in this study the two locations provided contrasting environments and the results revealed a number of significant genotype x location interactions for lamb traits. However as there was no change in ranking of the lines and only the extent of differences between lines altered, the interactions had minimal practical significance. Significant location x year interactions also indicated the presence of large yearly fluctuations in environmental factors in the two locations.

The significant differences of performance for growth rate and wool traits of the three lines after the suspension of selection have implications for selection experiments.

The results indicate that two or more generations after the suspension of selection differences between performance of the lines had not altered, with the Weight Plus line still performing better than the Random and Weight Minus lines for most traits. The realised heritability of  $0.17 \pm 0.01$  obtained from the divergence of the Weight Plus and Weight Minus lines was in close agreement with estimates of Davis (1987) in the later periods of the experiment, but lower during the first period of the experiment when selection for weaning weight was being implemented. Correlated responses of other lamb and hogget traits showed similar results. The decline in genetic response could be attributed to the effect of the suspension.

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