SUMMARY

Average fleece weights and fibre diameters of young Merino rams recorded by the NSW Fleece Measurement Service were analysed to estimate phenotypic time trends over the period 1979 to 1989. A total of 60 flocks, each with at least five annual records, were included in a least squares regression analysis. Over the whole period, total responses in fleece weight and fibre diameter were +7.7% (linear) and +0.50 microns (curvilinear) respectively. There was substantial variation between flocks in estimated trends.

INTRODUCTION

Achieved rates of genetic progress in the Australian Merino population have been the subject of speculation but little actual data. Ferguson (1976) examined statistical records of average fleece weights over a 40 year period and concluded that there was little evidence of genetic improvement in wool production. A major criticism of this conclusion is that using commercial flock information does not give a very direct estimate of changes at the stud level since substitution of bloodlines and environmental changes may mask genetic improvement. McGuirk et al (1982) and Rose (1987) estimated selection differentials for fleece weight in a small number of studs in NSW and Queensland. These studies confirmed that these studs did place relatively heavy emphasis on measured fleece weight in identifying stud sires. However, these estimates were restricted to a very limited number of studs which were specifically chosen because of their history of objective measurement. For this reason they may be unrepresentative of the gains being achieved in the whole population.

In this study, we examined phenotypic time trends in flocks of stud rams throughout NSW over the period 1979 to 1989. The data were derived from the Fleece Measurement Service at Trangie Agricultural Research Centre. The operation of this service has been detailed by Kearins and Rogan (1987). The advantages of this database were:

* Represents a high proportion of NSW studs and so is a more likely reflection of genetic trends within the Merino population.
* Strong emphasis was placed on encouraging whole-flock recording of males so that current generation selection influences were minimised.
* Flock means for both fleece weight and fibre diameter were recorded which might allow conclusions on the relative emphasis being applied to the two dominant traits affecting the economic value of Merino wool production.

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MATERIALS AND METHODS

A total of 60 flocks each containing at least 50 recorded rams per year for at least 5 years between 1979 and 1989 were identified. Groups were included provided that they were from a second shearing (after an earlier lamb shearing), recorded both greasy fleece weight and fibre diameter, and the animals were less than 18 months of age. Any group described as a selected or part group, or not clearly designated young rams was not included. For each group, the year of measurement, age at test shearing, interval from lamb shearing, average greasy fleece weight and average fibre diameter were retained. A total of 585 groups, representing 280,372 individual rams, were present in the data set. Variation between flocks in recording history and testing procedures are shown in Table 1.

Table 1 Characteristics of 60 NSW stud flocks

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Range</th>
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</thead>
<tbody>
<tr>
<td>Number of rams recorded</td>
<td>4664</td>
<td>488 - 20990</td>
</tr>
<tr>
<td>Years of recording</td>
<td>8.2</td>
<td>5 - 11</td>
</tr>
<tr>
<td>Age at test shearing</td>
<td>11.5</td>
<td>8.5 - 16.6</td>
</tr>
<tr>
<td>(months)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Period of wool growth</td>
<td>7.1</td>
<td>5.5 - 11.6</td>
</tr>
</tbody>
</table>

Analysis of greasy fleece weight and fibre diameter was by least squares procedures. The groups were not weighted by the number of animals as the age at shearing and period of wool growth for each group were nominated by the breeder without any independent means of validation. The analytical model included an effect for flock and regression coefficients for age at shearing (deviation from 12 months), period of wool growth (deviation from 7.5 months) and year trend. Both linear and quadratic regression coefficients were fitted. Interactions between flock and the regression variables were also tested for significance.

RESULTS

Since wool growth period had only a linear effect on fleece weight and no influence on fibre diameter, average fleece weights were adjusted to 7.5 months wool growth and period was dropped from the model. At 12 months of age, average production levels of young rams was a wool growth rate of 0.57kg per month and an average fibre diameter of 20.5μ. Increasing age beyond 12 months but retaining the same shearing interval increased fleece weight and fibre diameter by 3.5% (0.15kg) and 0.29μ respectively for each additional month of age. If rams had been shorn at 16-17 months with a full 12 months fleece, the estimated average production levels of the 60 flocks would be 7.46kg greasy wool with an average fibre diameter of 21.8μ.

The overall trends in production over the period 1979-89 are presented in Fig. 1. Flock by trend interaction was a significant source of variation for both fleece weight and fibre.
The average trend for greasy fleece weight was equivalent to a percentage change of 7.7% (±3.1%) over 11 years with an increase in fibre diameter over the same period of 0.50 (±0.14) microns. The significant curvilinearity in the fibre diameter response indicated that most of the increase occurred in the early years of the period.

**Figure 1.** Time trends in greasy fleece weight and fibre diameter (estimated year effects for 1979–1989 as deviations from overall means of 4.24kg and 20.5μm respectively)

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**DISCUSSION**

Estimates of phenotypic trend in this population of stud flocks were 0.7% per year in fleece weight and small upward response in fibre diameter. Atkins (1987) suggested achievable responses in Merinos of at least 1.5% per year with zero change in fibre diameter. If we initially accept the estimated trends as indicative genetic responses, then slightly less than half the maximal within-flock response is being achieved in NSW stud flocks recording with the Trangie Fleece Measurement Service.

Since the studs analysed here represent a wide range of geographical locations throughout
the State it is unlikely that systematic trends in environmental levels would have occurred over this period. However, the widespread drought years of 1982-83 may have contributed to lower levels of performance in the early part of the period. If we assume that genetic change in fibre diameter over the whole period was zero, a statistical model could be fitted to the data that included fibre diameter as a covariate and year trend in fleece weight estimated at zero change in diameter. The trend estimated from this analysis was equivalent to 0.2% per year in fleece weight or only 15% of the maximal within-flock response. The main point arising from this additional analysis was that the 'environmental' regression of fleece weight on diameter as estimated by the fitted covariate was substantially larger (11% per μ change) than the likely genetic regression (about 2% per μ change). Thus, ascribing positive fibre diameter trend to environmental influences substantially reduced the estimate of genetic trend in fleece weight.

We conclude that the likely genetic trend in fleece weight in Merino studs between 1979 and 1989 was substantially below the level that could be achieved in a well designed breeding program. There was no evidence of any genetic reduction in fibre diameter over this period. Downward response in fibre diameter would have been unexpected since worthwhile premiums for finer wool have only been a feature of the wool market since about 1987. Importantly, however, trends in individual flocks were not estimable by this procedure and better methods, including the use of across-year sire links and monitoring within-year selection differentials, need to applied across a wide range of stud flocks in future to allow breeders to monitor the effectiveness of their breeding programs. Such efforts would be particularly timely as many breeders are presently altering their objectives in response to the massive changes within the wool market.

ACKNOWLEDGMENTS

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REFERENCES


