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Merino breeding objectives & selection indexes to increase wool profit

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Key Outcomes

- In all three Merino strains, clean fleece weight and mean fibre diameter have both improved.
- As a result, average fleece values have increased by between $5.91 (broad 8% MP) and $11.32 (fine 8% MP) above those of the control line ewes of each strain.
- These represent improvements in fleece value of between 14% and 35% in a period of historically low premiums for fine wool.

Background

Around 90% of the value of a Merino fleece is determined by two traits – clean fleece weight and mean fibre diameter. Because both traits are strongly inherited, inexpensive to measure and so important to profit, they represent ideal selection criteria for Merino breeding programs focused on maximising genetic improvement in wool revenue.

Although there is some genetic antagonism between fleece weight and fibre diameter such that selection on either trait on its own will lead to slow deterioration in the other, it is easy to achieve simultaneous improvement in both traits by using an appropriate selection index to rank sheep on their combined performance for both. Further, depending on a breeder's predictions of future premiums for fibre diameter, by adjusting the weightings in the index, it is possible to vary the relative selection emphasis and resultant rate of improvement in fibre diameter relative to fleece weight.

One of the reasons for creating the QPLU$ selection lines and imposing 10 years of selection on them was to provide Merino breeders with evidence that this approach to selection works in a number of Merino strains and that both traits will continue to improve in the long term.

The annual improvements in both traits from 1995 to 2004 in each selection line are presented in Primefact 578 *Selection indexes work for all Merino strains & breeding objectives*, together with some background on the selection process.

The line averages for clean fleece weight, mean fibre diameter and fleece value for the final drop of hogget ewes are shown in the Table 1 overleaf. In the table, 'MP' = 'micron premium' and 'µm' = 'micron'

Calculating fleece values

Average fleece values were estimated for the 2004 drop hogget ewes of each selection line based primarily on clean fleece weight and mean fibre diameter but the values included any premiums and discounts for staple length, staple strength, percent mid-breaks and yield differences between the lines. Prices per kilogram were calculated using wool cheque based on average prices paid during the 2003 to 2005 wool market period. Prices across all lines assume 2% VM and an MF6 type (average style) because of the extent of dust penetration due to drought conditions prevailing during 2005.

Table 1. Trangie QPLU$ breeding objectives and 2004 drop line means for fleece weight, fibre diameter and fleece value resulting from 10 years of selection.

Strain	Line	Breeding objective	Clean fleece weight (kg)	Fibre diameter (µm)	Average fleece value ($)	Fleece value increase (%)
Fine	8% MP	Equal emphasis on increasing fleece weight and reducing fibre diameter	4.0	18.3	43.52	35.2
	Control	Random selection	3.5	19.7	32.20	–
Medium	Industry	Increase fleece weight, reduce fibre diameter by 0.5 µm, improve/ maintain fleece quality and conformation	5.0	19.8	46.60	18.3
	3% MP	Increase fleece weight, maintain fibre diameter	5.2	20.5	47.11	19.6
	8% MP	Equal emphasis on increasing fleece weight and reducing fibre diameter	5.0	19.3	50.05	27.1
	15% MP	Reduce fibre diameter, maintain fleece weight	4.7	18.4	50.34	27.8
	Control	Random selection	4.4	20.8	39.38	–
Broad	8% MP	Equal emphasis on increasing fleece weight and reducing fibre diameter	5.5	21.6	47.96	14.1
	Control	Random selection	5.0	23.2	42.05	–

Results

All lines show substantial improvements in fleece weight and fibre diameter. The 8% MP lines of each strain have increased fleece weight by around 0.5 kg and reduced fibre diameter by about 1.5 µm compared to the control lines of each strain. Among the medium wool lines, the 3% MP line has recorded the largest increase in fleece weight (+0.8 kg) with a small reduction in fibre diameter (0.3 µm) while the 15% MP line achieved the largest reduction in fibre diameter (2.4 µm) with a small increase in fleece weight (+0.3 kg). The Industry line also achieved valuable improvements in both traits (+0.6 kg, –1.0 µm) while imposing additional selection on wool quality and physical conformation.

Together these improvements have resulted in large increases in the value of fleeces of all selection lines compared to the unselected controls of each strain. The final (2004) drop of hogget ewes from the QPLU$ selection lines have produced average fleece values that range from $5.91 (broad 8% MP) to $11.32 (fine 8% MP) above those of the control line ewes of each strain. These represent improvements in fleece value of between 14% and 35%. Ewes from the selected medium wool lines produced fleeces that ranged from around 18% to almost 28% above the value of the fleeces of control line ewes. These estimates are based on a market period of relatively low wool prices and historically low premiums for fine wool.

The fleeces also suffered the effects of drought. As part of ongoing research to evaluate optimal Merino breeding objectives, improvements in hogget and adult fleece values for each selection line will be estimated under a range of wool market and micron premium scenarios in future Primefacts.

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