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Selection indexes work for all Merino strains & breeding objectives

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Key Outcomes

- In all three Merino strains, 10 years of index selection resulted in substantial improvements in fleece weight and fibre diameter.
- Selection indexes that differed in selection for fleece weight relative to fibre diameter delivered improvements in each trait in accord with each breeding objective.
- Selection based on visual assessment in conjunction with an index of measured performance also delivered substantial improvements in fleece weight and fibre diameter.

Background

The Trangie QPLU$ Merino flock was established in 1992 to demonstrate the genetic improvements resulting from 10 years of within-flock selection based on a range of indexes of clean fleece weight (FW) and mean fibre diameter (FD), to meet various breeding objectives. As well as the traits under selection, changes in a comprehensive list of other wool quality and production traits were monitored.

A number of selection lines were established in 1995 from a base flock bred in 1993 and 1994 from stud ewes and rams purchased from flocks representing fine, medium and broad wool Merino strains. Table 1 describes the breeding objectives of each of the selection and control lines created.

The selection lines

The lines were created by selecting sires from among the highest ranking 1993 and 1994 drop rams according to indexes of clean fleece weight and mean fibre diameter appropriate to the breeding objectives of each line. Initially, purchased and base flock ewes of each strain were randomly allocated to selected and control lines. From that point on, the lines were closed with no further introduction of sheep. From 1995 through to 1997 all selection was imposed via the selection of sires.

Table 1 Trangie QPLU$ selection lines and breeding objectives.

Strain	Line*	Breeding objective
Fine	8% MP	Equal emphasis fleece weight, fibre diameter
	Control	Random selection
Medium	Industry	–0.5 µm, improve fleece weight, wool quality, conformation
	3% MP	Increase fleece weight, maintain fibre diameter
	8% MP	Equal emphasis fleece weight, fibre diameter
	15% MP	Reduce diameter, maintain fleece weight
	Control	Random selection
Broad	8% MP	Equal emphasis fleece weight, fibre diameter
	Control	Random selection

*Each line joined eight sires to 200 ewes each year.
MP = micron premium.
µm = micron

From 1998 to 2004, selection was imposed on both sexes as the predetermined age structure of the ewe flock was realised. Although all sheep were visually assessed by professional sheep classers for fleece quality and physical conformation, these traits were only considered (together with index rankings) in the selection of sires and dams for the Industry line each year. The other selected lines were selected solely on fleece weight and fibre diameter index rankings. Sires and dams for the control lines of each strain, were randomly selected for the life of the experiment. Regardless of selection line, black or physically deformed sheep were culled at weaning.

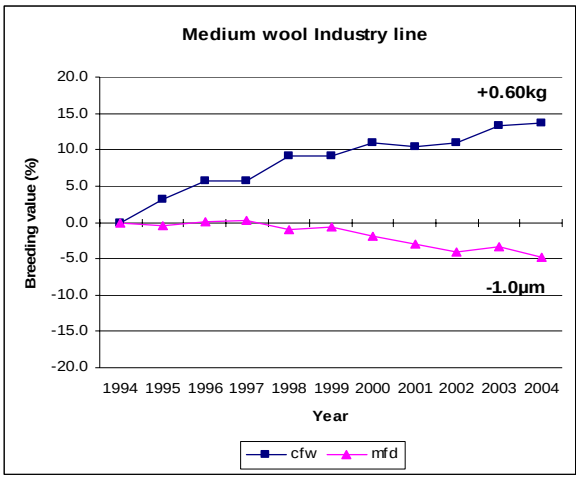
Improvements in hogget fleece weight and fibre diameter between 1995 and 2004 drops for each selected line within each strain are shown below.

Medium wool strain

Improvement in the Industry selected line

Breeding objective: Increase FW, reduce FD by 0.5 µm, improve/ maintain fleece quality and physical conformation

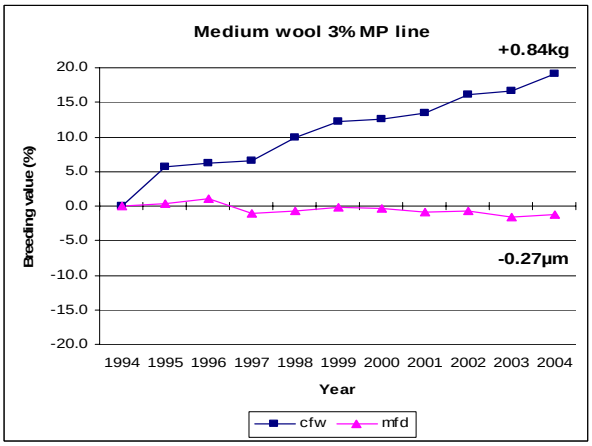
The Industry line recorded improvements in fleece weight from 1995 to 2004 culminating in an increase of 0.6 kg in the final drop. Fibre diameter changed little between 1995 and 1999, but declined thereafter to be 1.0 µm finer in the 2004 drop.



Improvement in the 3% MP line

Breeding objective: Maximum increase in FW and maintain FD.

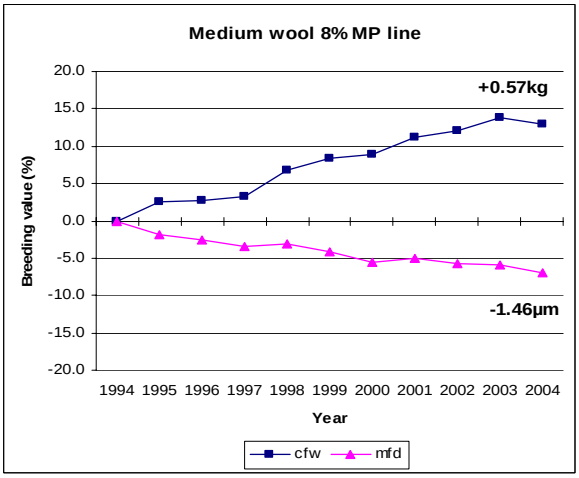
In accord with the breeding objective, the 3% MP line showed the largest increase in fleece weight of 0.84 kg with a small reduction in fibre diameter of 0.27 µm in the 2004 drop.



Improvement in the 8% MP line

Breeding objective: Equal emphasis FW and FD

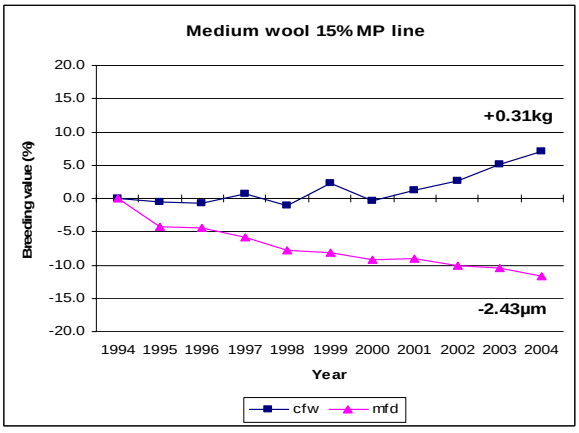
The 8% MP line recorded intermediate improvements in both traits with a 0.57 kg increase in fleece weight and a 1.46 µm reduction in fibre diameter after 10 years of selection.



Improvement in the 15% MP line

Breeding objective: Maximum reduction in FD and maintain FW.

The 15% MP line recorded the largest reduction in fibre diameter of 2.43 µm in the 2004 drop with consistent reductions from 1995 onwards. Changes in fleece weight were negligible between 1995 and 2000 but increased steadily in the next four drops to an increase of 0.31 kg in the final drop.

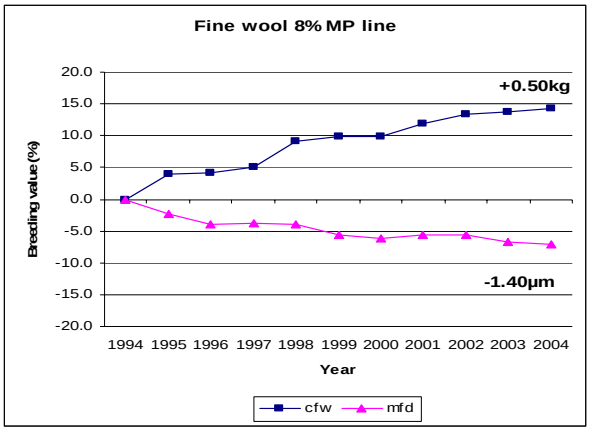


Fine wool strain

Improvement in the fine wool 8% MP line

Breeding objective: Equal emphasis FW and FD

The fine wool 8% MP line achieved consistent improvements in fibre diameter resulting in a reduction of 1.4 µm in the 2004 drop. Changes in clean fleece weight varied between years but had increased by 0.50 kg after 10 years of selection.

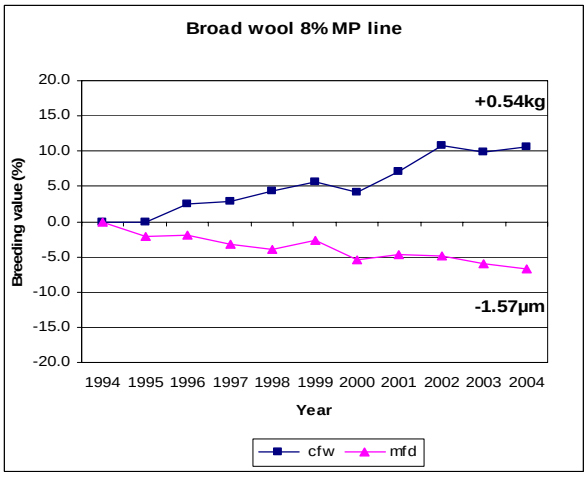


Broad wool strain

Improvements in broad wool 8% MP line

Breeding objective: Equal emphasis FW and FD

The broad wool 8% MP line achieved similar improvements in fleece weight and fibre diameter to the fine and medium wool 8% MP lines. Clean fleece weight increased by 0.54 kg and mean fibre diameter reduced by 1.57 µm in the 2004 drop.



Implications for Industry

Fleece weight and fibre diameter together account for between 80% and 90% of the value of Merino fleeces, so these two traits should be given priority as breeding objectives in Merino wool breeding programs. Because they are strongly inherited and inexpensive to measure they also represent ideal selection criteria. By using an appropriately weighted selection index, breeders have the option to determine their preferred improvement in fleece weight relative to fibre diameter depending on their predictions of future premiums for fine wool. By using this approach the Trangie QPLU$ selection lines have demonstrated the improvements possible in three different strains of Merino sheep following 10 years of selection.

With the same selection index imposing equal selection for fleece weight and fibre diameter (the 8% MP lines of each strain), the improvements observed in each trait were very similar in all three strains. The improvements ranged from 0.50 to 0.57 kg increases in clean fleece weight and 1.40 to 1.57 µm reductions in mean fibre diameter.

With three different selection indexes that differ in selection for fleece weight relative to fibre diameter, the 3% MP, 8% MP and 15% MP lines within the medium wool strain clearly demonstrate the trade-offs in potential improvements in fleece weight relative to fibre diameter (0.84 kg and –0.27 µm; 0.57 kg and –1.46 µm; 0.31 kg and –2.43 µm respectively).

The Industry line which emulated stud flock selection for visually assessed fleece quality and physical conformation in conjunction with a selection index of fleece weight and fibre diameter also demonstrated substantial improvements in both traits (0.6 kg and –1.00 µm).

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Further Reading

Primefact No. 579, 580, 581

A Few Selected Lines Issues 1–7

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