Rationalised classing of fine wools

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ABSTRACT

Fleeces from 2000 mixed age Merino ewes in each of 6 years were classed traditionally (i.e. by subjective assessment of fineness into 2 or 3 lines) or objectively (i.e. fleeces put into one line). Off-type fleeces (about 10%) which differed markedly from the bulk of the clip were excluded from all the lines. The fleeces from 800 to 1000 Merino hoggets in each of 6 years were also used in comparisons of traditional and objective classing.

The fibre diameter of each objective (OCP) line was very similar to the weighted mean of the corresponding traditional (TP) lines. Clean auction prices for the OCP lines were 0.8% and 1.0% lower than the weighted means of the TP lines for the ewes and hoggets, respectively.

Research in Australia has shown that there is no difference in the processing performance of traditionally or objectively classed lines of fleece wool. The optimum classing method is therefore determined solely by the relationship between price and diameter. Wools 21 μ m and coarser should be classed objectively because the price *v* diameter relationship is stable and approximately linear. Objective classing of finer wools would be satisfactory in some years, but because the steeply curvilinear price *v* diameter relationship that can occur is not easily predicted, either objective or subjective methods of clip separation on mean fibre diameter are recommended.

Keywords Fine wools; traditional classing; quality number; mean fibre diameter; objective clip preparation; clean wool price.

INTRODUCTION

Mean fibre diameter (MFD) is the most important characteristic determining the processing performance and end use of Merino and other fine wools (reviewed by Hunter (1980)) and accounts for at least 80% of the variation in its auction price (Pattinson, 1981; Wiggins, 1985). Because MFD is the most important fibre characteristic in selling and processing it is logical that it should also dominate the preparation of fine wools for sale.

Wool classers have traditionally divided fine-wool clips into numerous fleece types based mainly on an assessment of quality number (QN) which is closely associated with crimp frequency and assumed to accurately reflect fibre diameter. However research undertaken in Australia and New Zealand has shown this procedure to be quite ineffective. Typical maximum differences in MFD between lines classed from a uniform flock (i.e. rams from the same source used each year, a consistent management routine adhered to and the sheep run together since the previous shearing) decrease with fineness from about 2 μ m for strong halfbreds to well below 1 μ m for superfine Merinos (Whiteley and McKinnon, 1974; Agar and Thompson, 1973; Dunlop and McMahon, 1974).

Traditional classing is ineffective for 2 reasons:

1. When the means of different breeds, or different strains within a breed, are compared, there is a strong relationship between QN and MFD. However, within fine-wool flocks this relationship is inconsistent and QN rarely accounts for more than 50% of the variation in MFD (Lang, 1947, 1961; Roberts and Dunlop, 1957). There is consistently a range of about 8 μ m in MFD between the finest and coarsest fleeces in a fine-wool flock (Dunlop and McMahon, 1974; Andrews and Rottenbury, 1975; Henderson, 1975), but most of this variation eludes subjective assessment and therefore cannot be exploited by a classer.
2. Of the total variation in fibre diameter (FD) found in a flock, about 85% exists *within each fleece* (Quinnel, *et al.*, 1973; Dunlop and McMahon, 1974). In fact much of the variation exists between and along the fibres within any one staple. Therefore a classer only works with the 15% of the total variation in FD that exists *between fleeces*. No matter how skilled a classer is, the total variation in FD in an individual classed line is at least 98% of that in an unclassed clip (Dunlop and McMahon, 1974).

Research evidence from both Australia and New Zealand has shown that visually similar lines from different clips often differ in MFD by as much as 6 μ m, i.e. 4 times the 1.5 μ m average difference between visually different lines from the same clip (Agar and Thompson, 1973; Whiteley and Charlton, 1975). The above evidence led in Australia to the concept of objective clip preparation (OCP) where 90% or more of the fleeces from a uniform clip are put in one line (Andrews and Rottenbury, 1975). Only the small proportion of fleeces obviously different from the majority (doggy, poor colour, tender etc) is excluded. The experimental results of Lipson and Walls (1965) predict that the processing performance of OCP and traditionally classed lines of fleece wool would not differ, and this has been confirmed by Andrews *et al.* (1979). The benefits of OCP are that average lot sizes are increased and

therefore handling and testing charges reduced, while buyers can assemble their lots into mill consignments more efficiently. With OCP the shed classer's role is modified to one of screening out off-type fleeces but remains all important because the classer has the final influence on the quality of the raw product before manufacture.

These principles have been demonstrated in trials carried out with fleece wool from Merino ewes and hoggets.

EXPERIMENTAL

At Tara Hills High Country Research Station, Omarama, the fleeces from approximately 2000 pre-lamb shorn mixed age Merino ewes in each of 6 years (1974-76, 1979-80, 1982) were classed experimentally. Classing experiments were also carried out at Tara Hills with fleeces from 1000 Merino hoggets in each of 4 years (1981-84). At Ruataniwha Station, Twizel (Lands and Survey Department) the fleeces from 800 Merino hoggets were classed experimentally in each of 2 years (1980 and 1982). All sheep in their respective ewe and hogget flocks had been grazed together.

The classing was done by 2 experienced fine-wool classers.

The fleeces were lightly skirted, with seedy back wool removed, and classed into either TP (traditional preparation) or OCP (objective clip preparation) lines (Fig. 1) after the exclusion of "off-types" that were markedly different from the majority because of discolouration, tenderness, heavy condition, dogginess, short staple etc. There were on average about 10% of "off-type" fleeces but this varied between years from 0 to 23%. In *traditional* classing the fleeces were put into 2 or 3 lines depending on the number of fleeces and the range of fineness qualities encountered. In OCP classing the fleeces formed a single line. Within each experiment TP and OCP methods were alternated so that the number of bales in each of the TP lines was as far as practicable similar to that in the OCP line (Fig. 1). In 1974-76 and 1979-80 the lines were sold at auction in the conventional manner, but with accompanying test certificates (NZWTA) for fibre diameter and yield. In 1981-84 the lines were sold by sample. Staple length and colour (brightness and yellowness) were measured on probe and core samples, respectively. All lines were sold each year in the November Dunedin sale. The results reported here are based on auction floor clean prices (c/kg) and exclude any supplementation. Weighted mean FD and price were calculated for the TP lines in each experiment because the amount of wool in each line varied.

RESULTS AND DISCUSSION

The difference in MFD between the finest and coarsest TP lines varied from 0.5 to 2.1 μ m between years for the ewes (Table 1) and from 0.1 to 1.1 μ m for the hoggets (Table 2). These results are consistent with the previously described findings in Australia (Whiteley and McKinnon, 1974) and New Zealand (Agar and Thompson, 1973). The corresponding differences in price were largest when overall MFDs were fine and/or the diameter separation between lines was wide. The relative prices for the traditional hogget lines in 1984 reflect the steep price *v* diameter relationship that was a feature of that selling season.

In each experiment the MFD of the OCP line was between the means of the TP lines and very close to their weighted mean, with the exception of the ewes in 1980 when fine Merinos dominated the clip. For the other wool characteristics measured (yield, length and colour) the weighted means of the TP lines agreed closely with the OCP lines for both the ewes and hoggets (Table 3). Across TP ewe lines, yield and length increased with MFD, but for the hoggets this relationship was inconsistent. There was no consistent relationship for either the ewes or hoggets between MFD and either brightness or yellowness. These results show that objective characteristics of ewe fleeces can be predicted with modest success from subjective assessments, but with hogget fleeces the relationship is very poor.

TABLE 1 Mean fibre diameters (μm) and relative auction prices (% of weighted mean price of TP lines) for TP and OCP lines of ewe wool.

	1974		1975		1976		1979		1980		1982		Mean	
	μm	%	μm	%	μm	%	μm	%	μm	%	μm	%	μm	%
TP														
Fine	22.2	101	22.3	103	21.5	100	21.3	99	21.8	102	20.2	105	21.6	101.7
Medium	23.2	99	23.7	97	23.3	101	21.8	101	23.6	92	21.3	99	22.8	98.2
Strong	—		—		—		—		—		22.3	96	22.3	96.0
Diameter separation (m)	1.0		1.4		1.8		0.5		1.8		2.1		1.4	
Mean (weighted)	22.5	100	23.5	100	22.2	100	21.6	100	22.2	100	21.3	100	22.2	100.0
OCP	22.7	97	23.0	100	22.1	100	21.7	94	21.7	103	20.9	101	22.0	99.2

TABLE 2 Mean fibre diameters (μ m) and relative auction prices (% of weighted mean price of TP lines) for TP and OCP lines of hogget wool.

	Tara Hills										Ruataniwha			
	1981		1982		1983		1984		Mean		1980		1982	
	μm	%	μm	%	μm	%	μm	%	μm	%	μm	%	μm	%
TP														
Extra fine	—	—	18.9	103	18.5	110	18.6	121	18.7	111.3	—	—	—	—
Fine	19.1	104	19.0	103	18.5	106	18.9	98	18.9	102.8	19.7	104	20.6	99
Medium	20.0	97	19.9	94	19.4	94	19.5	81	19.7	91.5	20.8	95	20.7	100
Diameter separation (m)	0.9		1.0		0.9		0.9		0.9		1.1		0.1	
Mean (weighted)	19.6	100	19.3	100	19.0	100	19.0	100	19.2	100.0	20.2	100	20.6	100
OCP	19.6	100	18.9	102	19.3	95	18.9	99	19.2	99.0	20.2	99	20.3	101

Auction prices received for the OCP lines varied between years from 6% lower to 3% higher than the weighted mean of the corresponding TP lines (Tables 1, 2). On average the OCP ewe lines were discounted by 0.8% and the OCP hogget lines by 1.0%.

When these classing comparisons began (1974-76) the concept of OCP was vigorously opposed by the wool trade in general. That the OCP lines were not discounted appreciably compared with TP lines indicates that the principle of OCP is soundly based and should be widely endorsed. Currently nearly all fine wools are sold by sample with accompanying objective specifications and this has highlighted the ineffectiveness of traditional classing.

Traditional classing is unnecessary from the viewpoint of processing performance and end use (Andrews *et al.*, 1979). The optimum method of classing is therefore determined solely by the nature of the price *v* diameter relationship over the relevant part of the range. Fig. 2 shows typical clean price ($/kg) *v* diameter relationships for the 1985-86 and for the previous 3 selling seasons (R. Sperry, pers. comm). For the 1985-86 season a typical relationship is given by the exponential equation

$$PRICE = 537 + 953225\ e^{-0.4FD}$$

where price = c/kg clean ($R^2 = 0.97$).

While this and the other relationships are all strongly curvilinear across the Merino range, the important question is whether curvilinearity is significant within the 1-2 μ m segment of the diameter range that is relevant to a particular clip.

From the above equation and the mean figures from Tables 1 and 2 it can be calculated that the OCP hogget line would be discounted by 0.7% and the OCP ewe line by 0.3%, relative to the corresponding TP lines. These discounts are similar to those observed (Tables 1, 2).

The price *v* diameter relationship below 21 μ m is volatile (Fig. 2) and the price discount associated with OCP could in some years be significant. OCP cannot therefore be generally recommended for such wools.

TABLE 3 Mean (and weighted mean of TP lines) for yield (%), staple length (SL (mm)), brightness (Y) and yellowness (Y-Z) of TP and OCP lines of ewe and hogget fleeces.

	Yield	SL	Y	Y-Z
Ewes (Tara Hills)				
TP				
Fine	71.7	84	66.3	0.6
Medium	72.8	89	66.2	0.7
Strong	73.3	—	66.5	-0.5
Mean of TP	72.3	86.0	66.0	0.6
OCP	71.6	89	65.9	0.3
Hoggets (Tara Hills)				
TP				
Extra fine	72.0	71	67.4	-0.4
Fine	71.8	76	66.5	-0.3
Medium	71.2	—	67.2	0.3
Mean of TP	71.6	73.5	67.1	-0.1
OCP	71.8	71	67.5	-0.1
Hoggets (Ruataniwha)				
TP				
Fine	71.6	—	62.5	-2.2
Medium	72.6	—	66.3	-0.3
Mean of TP	72.0	—	64.2	-1.4
OCP	72.3	—	64.2	-1.3

However, classers are in a no-win situation because as the FD of the clip decreases, and price/kg increases, the effectiveness of traditional classing decreases (Whiteley and McKinnon, 1974). In any given year all 3 TP and the OCP hogget line(s) would contain approximately 20% superfine (and hence high price) fleeces, but these cannot be identified subjectively. An accurate (although less practical) way of exploiting a markedly curvilinear price *v* diameter relationship (such as 1984-85) would be to measure the FD of each sheep in the flock, and then draft the flock on measured FD into several lines prior to shearing. This is a side-benefit of screening for low MFD and high clean fleece weight which is currently being carried out with

Merinos in several large selection programmes. In "normal" seasons, however, the greatly increased effectiveness of classing would not outweigh the $2.50/sheep cost of fleece measurement. For small clips finer than 21 μm traditional classing must be recommended, despite its relative ineffectiveness.

For the majority of Merino clips, where the mean FD of the mixed age ewes or wethers is typically above 21 m, OCP should be encouraged because the price *v* diameter relationship is relatively stable and a discount of 0.3% should be easily outweighed by the resulting labour and cost savings.

With OCP the guidelines for "off-types" should be agreed on by the classer and leading shed hand. This will ease the classer's workload and allow him/her to save labour by combining classing with other duties such as organising the contracting gang and experting. At the industry level, if OCP is widely accepted the increase in average lot size will lead to reduced handling costs and test house charges. The principle is clear—it is up to all sectors of the industry to promote OCP and ensure that the growers reap the benefits.

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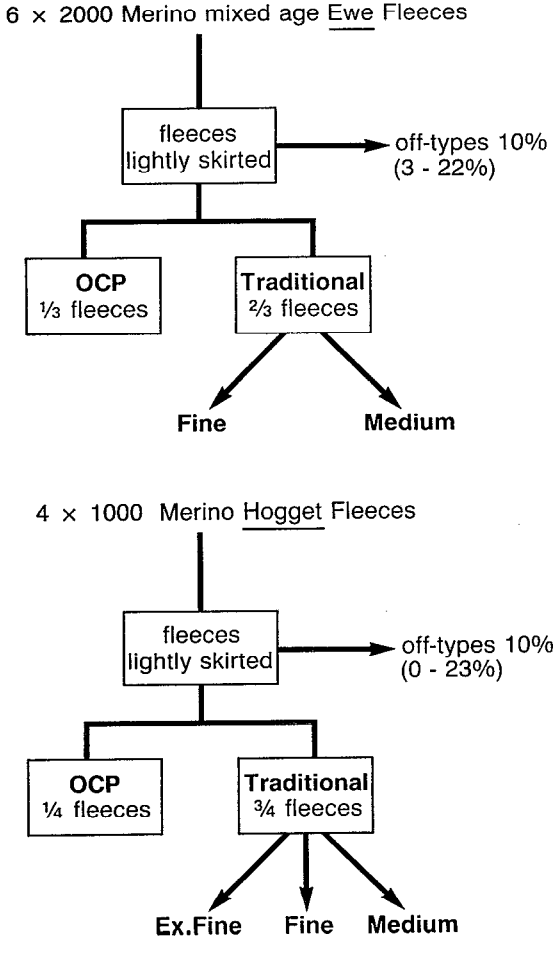

FIG. 1 Experimental design.

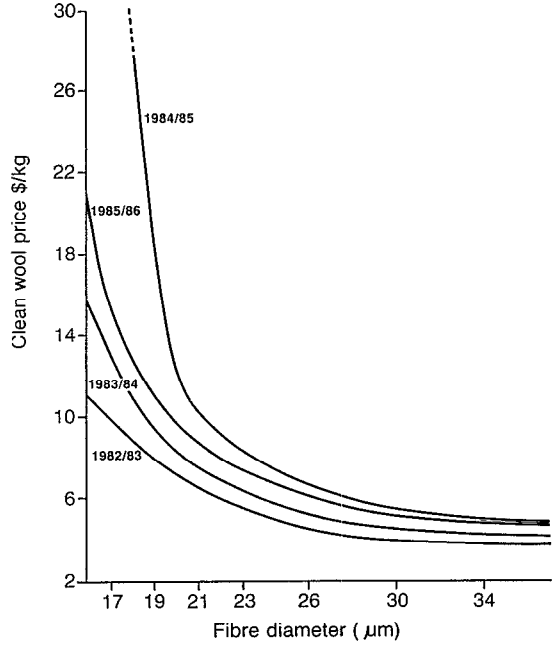

FIG. 2 Relationship between clean wool price and fibre diameter.

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