Building Lines of Wool Based on OFDA2000 Fibre Diameter Results

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Summary

On-farm wool-testing devices, such as the OFDA2000, allow wool producers to objectively class their wool clip. This study investigated the capability and economic viability of using the OFDA2000 in building lines of wool. A single staple was taken from the mid-side of 3,290 Merino sheep, managed as 4 flocks, prior to shearing. The samples were tested for mean fibre diameter (MFD) using OFDA2000. The average MFD of the flocks and other details were entered into Virtual Woolclasser© to establish optimum fibre-diameter cut-off points. Fleeces were weighed at shearing and allocated to the predetermined lines. Fleeces with faults were removed from all lines. The compiled lines were submitted for pre-sale testing. A weighted average MFD from the OFDA2000 was calculated for each line, and these were compared to the pre-sale core test result. The OFDA2000 MFD results were highly correlated to certified core tests (R^2=0.96). The calculated profit from objective classing was variable (estimates ranged from –$1.76 to +$0.49 per head) and was influenced by a tendency for the finer lines to have a lower staple strength and by reduced wool volume due to the loss of fleeces with faults into cast lines. There would be further income from on-farm wool testing if the information was used for culling broader animals and objective classing in subsequent years utilising the same information. These likely future incomes were not included in the profit value calculated in this study. Building lines of wool utilising the OFDA2000 is feasible and can be profitable. However, growers need to identify the correct market conditions and examine a number of possible wool-fault and price scenarios to ensure the profitability of objective wool classing.

Introduction

The OFDA2000 on-farm wool-testing instrument allows wool producers to objectively class their clip to minimise the errors associated with subjective classing (Brims *et al.* 1999). These devices are widely used in the wool industry for animal classing and also for building sale lines of wool. Building sale lots utilising the mean fibre diameter (MFD) results from the OFDA2000 allows wool producers to present some lots of wool for sale that are significantly finer than the average of their clip. In doing so, wool producers are potentially able to capture price premiums and increase the revenue generated from their wool. The profitability of objective classing is dependent on the premiums available for lines finer than the average of the clip. If the MFD of the lines is at a point where the MFD and price relationship is linear, there will be no economic benefit from objective classing (Peterson and Gherardi 2001). Wool producers would benefit from an analysis of the likelihood of objective classing being profitable, particularly as the use of on-farm wool testing involves additional costs.

The aims of objective classing for marketing purposes can be summarised into three main areas: to build several wool lots with different core-test MFDs from fleeces that would normally be bulked into one or two main sale lots; to be able to predict the core test of a given lot, or series of lots, so that the wool can be marketed for a particular purpose; and to build sale lots of wool to specification to meet a marketing opportunity. A sufficient level of accuracy and precision is therefore required of the testing instrument for its use to be practical. Accuracy and precision estimates for the OFDA2000 have been provided previously and are at a similar level to conventional testing laboratories (Baxter 2001, Behrendt *et al.* 2001). This study investigated the capability and economic viability of using the OFDA2000 in building lines of wool.

Materials and Methods

A total of 3,290 Merino sheep of varying age were utilised in this study. The sheep studied were in 4 flocks (A, B, C and D) of different bloodlines on 3 different properties. Between October and December 2000, the sheep were loaded into a handling race and tagged for identification purposes; and a single staple was removed from the mid-side. The samples were measured prior to shearing for MFD and other quality traits using OFDA2000, following procedures described by the manufacturers (Brims *et al*. 1999). The measurements were undertaken using the factory preset calibration and grease correction factor, and no attempt was made to adjust the grease correction factor to the individual flock.

The average MFD of each flock and other required details were entered into a software package, Virtual Woolclasser© (Semple and Atkins 2000). This package utilises market information and data from the individual flock to establish fibre-diameter cut-off points that optimise the economic returns from objective classing. Fleeces were weighed at shearing, skirted and then allocated to the predetermined lines. Fleeces with faults were removed from all lines. The compiled lines were submitted for testing and sold between December 2000 and January 2001. A weighted average MFD of all fleeces that went into a line was calculated for each line, and these were compared to the pre-sale core test result.

Likely quality attributes of theoretical lines of wool (if all fleeces from each flock were combined) were calculated using core test results from each line from within that flock. Prices for these theoretical lines of wool were obtained from the Australian Wool Exchange, based on premiums and discounts that applied on the day of sale. The difference between gross revenue from the wool if sold as one lot from each flock (determined by valuation of theoretical lines) and that of the gross revenue from the wool as it was sold in differentiated lines was used to determine the gross increase in wool value achieved by objective classing. Profit (or loss) was then calculated by subtracting $2.10/head (covering OFDA2000 testing, labour and extra line testing costs) from the gross increase in wool value.

Results

The results revealed a close correlation (R^2 = 0.96; r.s.d. = 0.3) between the weighted average fibre diameter from the OFDA2000 and the core test for each line from the four flocks (A, B, C and D) (Figure 1). The deviation of OFDA2000 MFD from the core test MFD ranged from –0.4µm to +0.5µm and averaged –0.1µm.

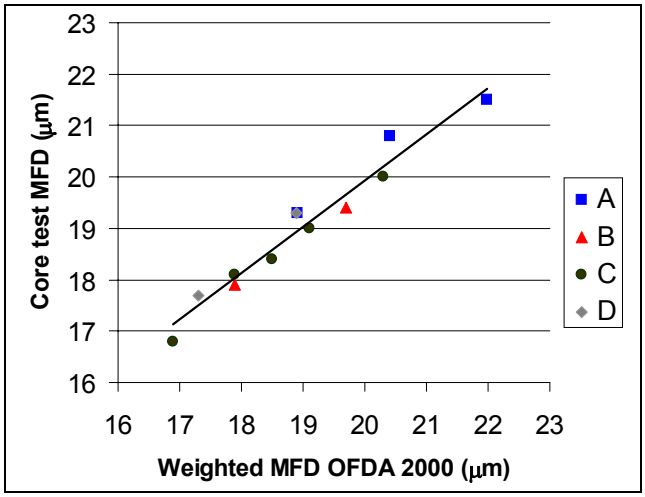

Figure 1. Correlation of core test MFD and weighted average OFDA2000 MFD for 4 flocks (A, B, C and D). (Core test MFD = 0.91[OFDA2000 MFD] + 1.84, R^2 = 0.96, r.s.d. = 0.3.)

In all flocks, there was a net increase in the value of the wool sold by splitting lines; however, when costs are deducted, the profit/loss was variable (Table 1). The MFD difference between lines within a flock was as low as 0.8µm, demonstrating the ability to differentiate based on MFD between fleeces with a high degree of precision. In flock C, a significant amount (36%) of wool was removed from the main lines due to either very low staple strength or water stain as previously reported by Brien *et al.* (2001); this proportion was considerably higher than expected. Around one-third of the fleece wool in flock D was also removed from the main lines due to low staple strength. In flocks A and B, there was no wool removed due to staple strength at shearing, although a small number of fleeces were removed due to colour faults.

Table 1. Flock information and profit/loss achieved for 4 flocks (A, B, C and D), including staple strength (SS) and core test MFD of the finest (Fine) and broadest (Broad) line in each mob.

Flock	Number of lines	Total clean weight (kg)	Average core test MFD (µm)	SS (N/kt)		MFD (µm)		Increase in wool value	Profit/loss per head
				Fine	Broad	Fine	Broad		
A	3	3,239	20.6	31	30	19.3	21.5	$2,420	$0.49
B	2	857	18.7	25	18	17.9	19.7	$177	– $1.76
C	5	1,671	18.7	26	36	16.8	20.0	$3,652	$0.29
D	2	330	18.7	25	34	17.7	19.3	$448	– $0.61

Discussion

In this study, profitability was influenced by a tendency for the finer lines to have a lower staple strength, thus reducing their value. The gross increase in wool value predicted by the Virtual Woolclasser© software package was much greater than that realised. The majority of the predicted benefit comes from the large premium paid for wools of very low MFD. However, these very fine fleeces tend to have a low staple strength, as would be expected based on the reported positive phenotypic correlation (0.25 to 0.29) between MFD and staple strength (Greef 2001). The net result is a large reduction in the price received for these superfine lines because of the discounts associated with low staple strength. This was evident in two of the four flocks studied.

The correlation between the averaged OFDA2000 MFD and the certified core tests was strong; therefore, splitting lines or building lines to specification is feasible using the OFDA2000. The correlation here is similar to that found if results from Hansford *et al.* (2002) are further analysed.

The profitability of objective classing can be variable and is highly dependent on the point on the micron-price curve (Baxter 2000). Two of the flocks studied had very little increase in gross revenue from objective classing. This effect was a result of the increase in revenue achieved for the finer line being almost cancelled out by the decrease in revenue from the broader line. The lines were at a point where the price–fibre diameter relationship was almost linear. The flock that had the greatest increase in value and largest profit from the exercise was the broadest flock, with the average fibre diameter of the lines being close to the optimum point for the market conditions prevailing at the time of sale. It can be concluded from this and other studies that objective classing is not always profitable and that the market conditions at the time of selling are extremely important (Atkins 2002; Dominik 2002). It is also important for wool producers to examine a number of scenarios when using programs such as Virtual Woolclasser©. The market is likely to change between when the cut-off points are decided and when the wool is sold, affecting the overall profit from the exercise. It should be remembered that fleeces with faults will almost always need to be removed, reducing the amount of wool in each line and also reducing the overall profit from the exercise. Wool producers who are contemplating using objective classing to increase profitability need to carefully study the prevailing market conditions. They should carry out an appropriate risk assessment, determine the likely effects of market changes and/or of having high proportions of fleeces not suitable for the main lines, and only proceed if the conditions are favourable.

This study took no account of possible profits achieved in subsequent years. The year-to-year repeatability of a group's MFD ranking in relation to other animals within a flock is high (Gillies and Stadler 1997). Therefore, it is possible to use historic MFD results from individual sheep to predict their ranking within a flock and objectively class their wool accordingly (Andrews *et al.* 1997). If animals (especially dry sheep) are tagged into their groups according to OFDA2000 MFD, the wool can be objectively classed based on the historic MFD result in future years. This practice is likely to result in a MFD differentiation for each of the following shearings and, if market conditions are favourable, future profits.

The OFDA2000 is also used for sheep selection purposes, and the device has been shown to have a sufficient level of accuracy and precision to be used for this purpose (Behrendt *et al.* 2001; Brien *et al.* 2001). If the results from the OFDA2000 were also used to cull broader, less productive sheep, its use would result in an overall improvement in the MFD of the flock. This would increase the general flock's profitability and genetic potential, especially if used in each generation with appropriate ram selections.

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