CONCLUSION

This paper has shown the range of values for the main processing variables for New Zealand wool, and has attempted to relate the variation of price with each property to technical considerations. Such considerations will always underlie price variation, although actual prices will obviously also be markedly influenced by supply and demand forces. If optimisation of wool growing and usage is to be achieved, it will be the responsibility of all persons in the wool trade to attempt to appreciate fully the technical basis for variation in prices. It is hoped that this paper will go some way to assisting in this.

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Implications of objective measurement for sheep management

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ABSTRACT

Management factors under the direct control of the wool grower which influence objectively measured wool characteristics are breed, age, sex, level of feeding, frequency and time of shearing, breeding status and control of disease. Choice of breed has the greatest overall effect on wool type and resultant price level. Within the prevailing price structure wool returns for each breed type are more influenced by quantity than shifts in objective characteristics because of short term management decisions. This has resulted in considerable emphasis by growers, advisers and researchers on maximising overall wool production. Of the flexible management decisions, level of feeding and frequency and time of shearing have the greatest effect on objective fleece characteristics important in manufacture.

Objective measurement will provide an objective basis for payments to growers through a better understanding of the technical effects of changes in measured characteristics. This will result in clearer price signals for differential changes in fleece characteristics and improved product specification ensuring the long term viability of wool production .

INTRODUCTION

Product specification and quality control are essential at all stages of production in any industry. The wool trade is no exception, with specifications being obtained by objective measurement at various processing stages between the growing fibre and the end product.

Objectively measured wool attributes of importance to wool growers are wool production of individual sheep, as measured by fleece weight, and the physical attributes of importance during manufacture (Elliott, 1986b) namely fibre diameter, mean fibre length after carding, scoured colour, loose wool bulk, vegetable matter content and medullation. Use by buyers and processors of the measurements important to manufacture should guide them as to the suitability of wools for particular end-uses and the prices they can therefore afford to pay. The implication of objective measurement for sheep management will be in providing clearer price signals with respect to quality and therefore greater objectivity in balancing the effects on quality and quantity due to management changes. Emphasis will be placed in this paper on Romcross type wools (coarser than 30 μ m) which comprise approximately 80% of the New Zealand clip.

FLEECE WEIGHT

Most farmers are aware of the overall significance of the quality characteristics important in manufacture. However, in the context of their management decisions, price variations due to quality differences have tended to be small relative to the value of wool itself (Wiggins and Beggs, 1979). An important exception is mean fibre diameter in Merino and other fine wool flocks. Consequently, because of the overwhelming importance of fleece weight, farmer emphasis has been on quantity rather than quality *per se*. This has, however, not been detrimental to the national clip as there is a positive association between fleece weight and some of the quality characteristics important in manufacture.

Fleece weight is easily measured at shearing with hogget fleece weight being the best parameter for selection to improve a flock's overall wool production. Because of problems in adjusting mixed age ewe fleece weights for effects associated with lambing status, weighing individual ewe fleeces is impractial. Mean fleece weight of the flock is an adequate indicator of productivity. After shearing, individual fleeces lose their identity and fleece weight has no further relevance during subsequent stages of production.

MANAGEMENT FACTORS THAT AFFECT WOOL PRODUCTION

Management, in the context considered here, relates to factors under the direct control of the wool grower and which affect quantity and quality of wool grown. These may be listed as choice of breed, age, sex, level of feeding, frequency and time of shearing, breeding status and control of disease. Breed, age structure and sex are essentially fixed in the short term by farm locality and type of enterprise. Decisions on whether to mate ewes, feeding, shearing and disease control can be readily changed to meet specific requirements. Although the effects of these management factors on traditionally evaluated wool characteristics have been appreciated by growers, the wider use of objective measurement will enable growers to appreciate the real significance of their management actions as they relate to the subsequent processing performance of their clip.

EFFECT OF MANAGEMENT FACTORS

With the overall production emphasis on fleece weight, farmers, advisers and researchers have attempted to develop management strategies to optimise wool production for all stock classes within a flock. Particular attention has been directed towards breeding (Binnie and Elliott, 1986) and controlled feeding. Nevertheless, other factors listed above also have major effects on specific wool characteristics. The effect of each factor will be considered separately to illustrate its likely significance to the wool grower.

Breed

Breed, especially the inclusion of Merino blood, has a potentially large influence on wool characteristics. Objective measurement has been particularly important for those fine wool producers whose sheep grow wool with a mean diameter less than 20 μm. Many of these wools which were not recognised by subjective appraisal have attracted considerable premiums over recent seasons. In comparisons between longwool breeds, Perendales have had substantially lower fleece weights than Romneys and Coopworths (Smeaton *et al.*, 1985), but higher loose wool bulk (Bigham *et al.*, 1985). The ranking of Coopworths and Romneys for fleece weight has varied (Baker *et al.*, 1985; Smeaton *et al.*, 1985). Lincoln and Leicester type sheep grow high lustre wools.

Age

Wool production increases with age reaching a maximum at 3 to 4 years of age before slowly declining (Sumner, 1985). Fleece weight is a function of fibre diameter, fibre length and the number of active follicles. The age effect is due to fibre diameter increasing with increasing age and staple length and the number of actively producing wool follicles decreasing at an increasing rate after about 3 years of age. There is little effect of age on scoured colour and loose wool bulk (Sumner, unpublished data).

Sex

Sex effects on objective wool characteristics do not appear to be of practical significance after due allowance for body size and differing intake.

Nutrition

When other factors are kept constant wool grows twice as fast in summer as in winter with the absolute response of wool growth to changes in nutrition being also twice as great in summer as in winter (Hawker, 1985). This interaction with season is exacerbated in the grazing situation by changes between seasons in pasture growth and in the breeding status of the sheep. The implication for grazing management is that while above-maintenance feeding during winter is not financially viable, ewes should be as well fed as possible during the other 3 seasons to maximise lamb growth in spring, wool growth in summer and ovulation rates in autumn.

The seasonal cycle in wool growth rate is associated with concomitant changes in fibre length growth rate and fibre diameter. When wool fibres are tensioned during carding, fibre breakage will tend to occur at the weakest point, where the diameter is least - the winter wool growth region. Winter wool growth is thus the primary determinant of staple strength. There is a close relationship between feeding level in mid-pregnancy and staple strength (Fitzgerald *et al.*, 1984) with controlled rather than erratic feeding minimising staple weakness.

Limited trial results suggest that wools from well fed sheep have a poorer scoured colour that wools from poorer fed sheep while loose wool bulk is unaffected by level of feeding (Sumner *et al.*, 1981; Sumner, 1983).

Shearing

Of the easily changed management components, time and frequency of shearing have the greatest impact on subsequent manufacturing performance of wool. Frequency of shearing regulates staple length and hence the likely processing route as well as affecting the