

## BREEDING FOR QUALITY AND PROFIT

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### SUMMARY

After stressing the importance of clearly defined breeding objectives as a prerequisite for selection for higher profitability, this paper describes how the economic environment in South Africa, where in the most profitable flocks the meat component can contribute up to 70% of flock income, has determined the extent to which this factor should be included in breeding objectives. Selection objectives for higher profitability such as Adaptability, Reproduction and Lamb Growth Rates, which have the greatest influence on the profitability of woolled sheep flocks, as well as wool traits of importance are discussed and systems used to enhance these are described.

In discussing Adaptability, the paper suggests that Wool Production Potential (WPP%) may be used to determine the ability of the sheep to survive and reproduce in a variety of environments for optimum overall flock profitability, this should preferably not exceed 7%. Since twinning, lamb survival and growth rates in a commercial environment are the most important factors for improved flock income, the paper concludes by stressing how important it is to preserve the correct balance between wool and meat production, while at the same time concentrating on wool traits that will not inhibit meat production and increase the value of the wool produced i.e. by means of improved quality and lower fibre diameter.

### INTRODUCTION

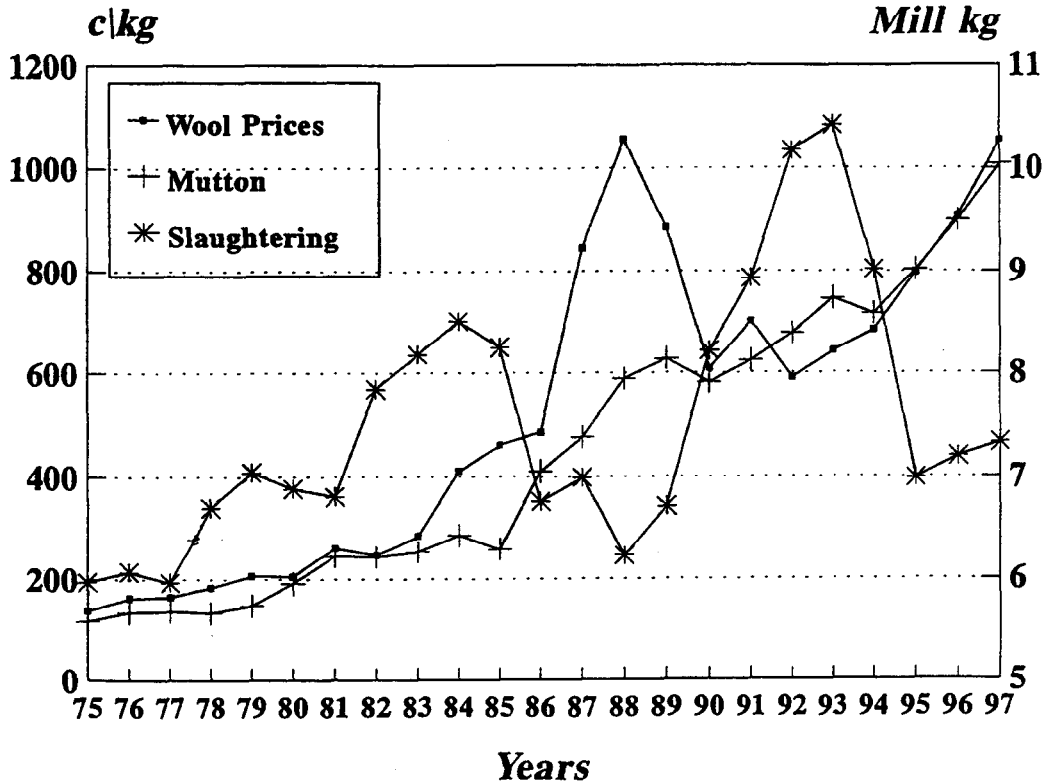
Clear definition of breeding objectives is essential if livestock breeding programmes are to have maximum impact upon the efficiency of animal production. Production efficiency affects everyone who uses such animal products as meat and wool because consumer prices start with production costs. Animal breeders especially need a clear definition of the genetic changes in animal performance which would reduce total production costs per unit of animal product (Dickerson 1982). Great strides have been made in developing and refining methods for maximising the rate of genetic change in any performance trait, or combination of traits, but breeding objectives have not been carefully evaluated in terms of expected net effects on efficiency of livestock production.

If not always clearly defined, the improvement of the economic performance of a particular breed is, by implication, the most important function of a Breed Society. Because of over-emphasis in most countries in the past on visual standards of excellence - re-inforced by a long tradition of showing - as well as the preservation of breed purity by an elaborate system of pedigree recording, the of improving performance has often been overlooked (McMaster 1982).

**ECONOMIC ENVIRONMENT**

Pure woolled breeds such as the Merino, Dohne Merino, Letelle and South African Mutton Merino make up 60% of the sheep population of South Africa. Meat production is the only alternative to wool production in the most important wool producing regions of the Republic. Because the two products are complementary there is a close inter-relationship between them. There is an inverse relationship between wool and sheep meat production - declining wool prices being associated with increased sheep slaughtering and meat production (Figure 1 Aucamp 1994).

Figure 1 Wool and mutton prices and slaughtering 1975-1997



However, a growing human population in South Africa, coupled with declining sheep numbers, has resulted in a serious under-supply of sheep meat, as a consequence of which up to 50% of domestic consumption has to be imported. The price ratio between meat and wool, previously 1:3 has, as a result of higher meat prices, now declined to 1:2. The effect of this is that throughout the whole spectrum of woolled sheep strains, the emphasis has shifted towards characteristics that will enhance meat production and lower production costs. Meat income now far exceeds wool income in most production units. The impact of market forces has been so powerful that even the conventional Merino has undergone radical change in attempts to adapt to these economic trends (McMaster 1994).

The significance of the meat component is highlighted by an analysis of the factors that contribute to profitability in woolled and dual-purpose sheep enterprises which achieved the highest gross margins (Londt 1994). It was revealed that in flocks achieving the best results:-

- Meat contributes 70% of total flock income and wool's share is only 30% (here we refer to fine wool of high quality).
- Ewes in full production constitute at least 60% of the flock.
- 90% of all lambs are marketed before 12 months of age.
- Only replacement ewe hoggets are not in full production - approximately 15% of the flock.
- No wethers or dry sheep are kept.
- High reproduction, weaning and growth rates are achieved.
- Unit costs are relatively low.

Present economic considerations in South Africa call for a "low input" animal capable of generating maximum income under extensive pastoral conditions at minimum cost. Maximum income does not imply maximum production, but rather the optimum levels possible within environmental constraints, with the production components that contribute to cash income being in the optimum relationship with each other (McMaster 1994). To achieve this, both clearly defined goals and a relevant selection strategy are called for.

## SELECTION OBJECTIVES

### Adaptability

Sheep breeders in South Africa aim for maximum economic return per unit of input in terms of feed, labour, veterinary costs and other overheads. To achieve this the animal must be sufficiently hardy to be able to thrive and produce and rear lambs in different environments and seasons - even those previously considered to be unsuitable for lamb production. Schoeman (1990) showed that over a two year period a total of 1.13 lambings per annum could be achieved with Dohne Merinos with a survival rate to 100 days of age of 0.86. Karberg et al. (1985) recorded a figure of 1.23 - evidence of the efficiency of the breed in terms of lamb production in a variety of environments.

The ratio between clean fleece weight (CFW) and body weight (BW) for any group or population of sheep can be defined by expressing CFW as a percentage of BW at a particular age - termed the **Wool Production Potential (WPP%)**. Research with sheep under sub-optimum conditions in South Africa has indicated that sheep with a very high WPP% are less adapted, have lower fertility and growth rates and a later sexual maturity (Herselman et al. 1993). The average WPP% for all Dohne Merino rams tested at twelve months of age is 7%. The comparative figure for Merino rams is approximately 9% (McMaster 1994).

### Reproduction

The reproductive performance of a flock influences not only the cash income but also the intensity of selection. De Klerk et al. (1983) estimated the percentage of lambs born to ewes mated for all woolled sheep in South Africa to be 74% and for Merinos 71% which is decreased further by pre-weaning mortality, indicating that high

levels of reproductive failure occur in local sheep flocks. Weaning percentage (lambs born/ewes joined) is the single most important factor contributing to higher reproduction and therefore to flock profitability. This trait can be divided into the following components, (Coetzee 1991):

- Fertility (ewes lambbed/ewes joined)
- Fecundity (lambs born/ewes lambbed)
- Survival (lambs weaned/lambs born)

Lamb survival has a profound influence on flock profitability. It was previously believed that, even taking pre-weaning mortality into consideration, selection for multiple births was an efficient method of improving reproduction. Cloete (1992) found that mortality at birth (36.4%) and the desertion/starvation/exposure complex (49.6%) were responsible for the majority of lamb deaths. Cloete (1992) found that 28.8% of ewes whose lambs died before weaning, had a repeat of reproductive failure the following year, compared with only 11.3% in the case of the ewes whose lambs survived to weaning. Selection against ewes which fail to wean a lamb is therefore more appropriate. The ability to rear lambs is now regarded as the most important factor for higher reproduction. Fourie and Cloete (1993) reported that the mean number of lambs marked, expressed as a percentage of ewes joined in a study in the South Western Cape, was 87.7% for Merinos (23189 ewes), 92.6% for Dohne Merinos (7692 ewes) and 112.7% for South African Mutton Merinos (2399 ewes). Mean fecundity, expressed as the percentage of lambs born to ewes lambbed, was 121.6% for Merinos, 122.7% for Dohne Merinos and 140.2% for Mutton Merinos. Coetzee (1991), reporting on results achieved in the Stellenbosch University stud flocks, listed the number of lambs weaned as a percentage of ewes joined over a period of five years for Merinos, Dohne Merinos and Mutton Merinos as 121%, 145% and 144%, respectively. Fourie and Cloete (1993) concluded that selection against reproductive failure by using the simple wet and dry technique to be a low input method for improvement of reproductive performance in sheep flocks. Measures to improve reproductive performance must be included in the selection process.

The lifetime reproductive performance of stud ewes should be carefully recorded and breeders must be encouraged to apply direct selection for reproduction. The reproductive performance of their dams is an important criterion which should be used to select sires. The factors to be taken into account are:

- Age at first conception
- Regularity of conception
- Fecundity
- Survivability of lambs (McMaster 1990)

Breed Societies should be encouraged to publish in sale catalogues the mean reproduction record of the dam of each stud ram offered for sale and testes size, measured by scrotum circumference, should also be listed.

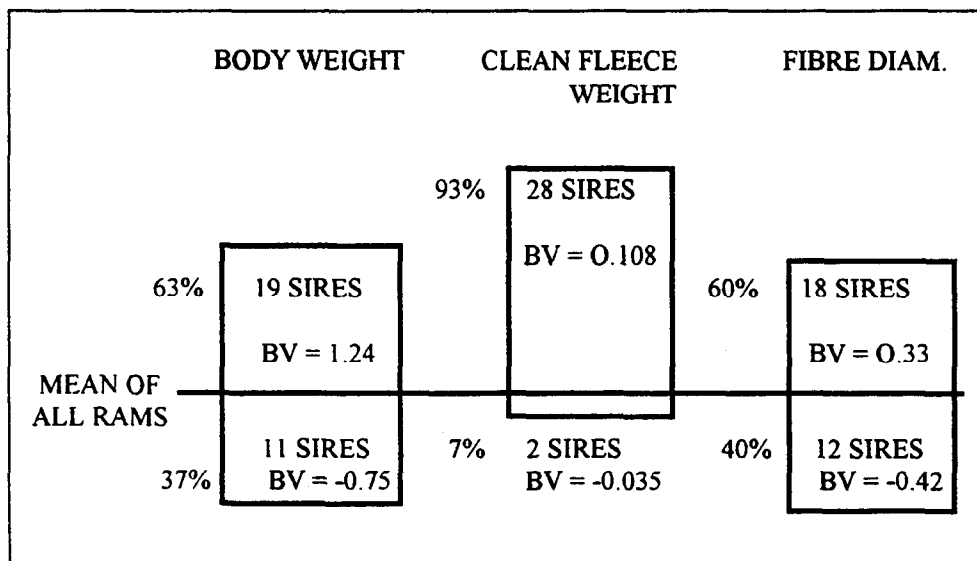
#### Body Weight, Wool Production and Fibre Diameter

A procedure for the selection of Merino sheep in South Africa by means of a selection index (SI), was proposed by Poggenpoel & van der Merwe (1975). The aim was to increase total income per sheep by recording body weight (BW), clean fleece weight (CFW), fibre diameter (FD) and wrinkle score, combining these in a single index according to their relative economic importance and selecting sires on their ranking order. Dohne Merino breeders followed suit and up to 1990 used the index  $1BW+15CFW-2FD$  to rank their animals. As a result of increasing premiums for fine wool, the index was changed in 1990 to  $1BW+15CFW-3FD$ . In addition, minimum standards for production traits and the SI are set for rams that qualify as stud sires. Up to the end of 1994 these were  $BW>95$ ,  $CFW>95$ ,  $FD<110$  and  $SI>105$  (100 being the group mean in each case).

However, a sire referencing scheme using the BLUP animal model, has provided a means to evaluate the effectiveness of the index. The information from this data indicates that the SI promotes an imbalance between CFW and BW, which, in the light of evidence emerging from recent research results (Herselman et al. 1993), may impair fitness traits. Breeding values for each of the components of the SI were calculated in respect of 60 sires used in the 1992 mating (Londt 1994). The relative number of positive and negative breeding values for BW, CFW and FD of the top 30 sires ranked according to the SI are set out in Figure 2. The bias in respect of CFW reflected here, is a matter of concern, especially since the positive correlation between CFW and FD has clearly resulted in an increase in Fibre Diameter.

It is alarming that the highest ranking rams selected according to this SI cause FD to increase. The breeding of animals with an imbalance between CFW and BW is a matter of concern. If this tendency persists, animals with high wool production potential (WPP%) will be less adapted to a wide range of environments, and reproduction and growth rates will be negatively affected. As a result of the selection pressure applied for higher wool production, the Dohne Merino already has a potential higher than most environments can sustain (McMaster 1994). It is therefore pointless to continue to exert pressure on high fleece weight. To increase overall flock income, attention is now given to aspects that will add value to the wool component (lower FD and quality traits), and improve the efficiency of lamb and meat production - traits that make the major contribution to cash income. To achieve this new objective, the ram Selection Index was changed at the beginning of 1995 to  $1BW+8CFW-5FD$ . Minimum standards for stud rams are now  $BW>95$ ,  $CFW>90$ ,  $FD<110$  and  $SI>105$ . Because of the negative effect of wrinkles on fitness and reproduction, selection against wrinkles is very strictly carried out.

Figure 2 Relative breeding values (BV) for body weight, clean fleece weight and fibre diameter of the top 30 sires ranked according to the selection index in the North East Cape Dohne Merino Sire Referencing Scheme (data used - 1992 lamb crop) Londt 1994



## CONCLUSION

While selecting for cash value characteristics, woolled sheep breeders should be ever mindful of the relationship between the various production traits and the effect that this will have on the physiological functions of the animal. There is a need to continually evaluate the results being achieved by the selection strategy applied, and a need to modify and adapt according to changing economic and environmental circumstances. Only then will the productivity and profitability of woolled sheep flocks be improved.

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