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What is a better ram worth?

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ABSTRACT

This paper presents equations that can be used to quantify the differences in value to a commercial farmer among rams available for purchase from a single ram breeder. The same approach can be taken for a group of breeders for which across-flock genetic evaluation results are available. Separate equations are presented in detail for buyers of both dual-purpose and terminal sire rams. A working version of the terminal sire equation incorporates the difference in the terminal sire index value between two rams, the number of years, and the number of ewes per year, to which the ram is to be mated and the tailing percentage in the commercial flock as variables. A working version of the dual-purpose sire equation incorporates the same variables as the terminal sire equation, but with the percentage of the ram's daughters to be kept as replacement ewes also added.

Keywords: economic weights; breeding ram; sheep; genetic improvement.

INTRODUCTION

Sheep farmers in New Zealand are focusing on genetic gain in their flocks in increasing numbers (Geenty, 2001). This has been driven by the importation of new sheep genetics and resulting competition with existing genetics, exploitation of feeding and animal health technologies, and an increasing focus on lamb and meat production.

Since 1996, Sheep Improvement Limited (SIL), funded by sheep farmers from wool and meat levies, has developed and operated a national sheep performance recording and genetic analysis database. This is expected to increase the rate of genetic gain in the national sheep flock (Geenty, 2001).

Effective use of the SIL database and genetic improvement system, and similar systems employed in NZ sheep-breeding, will lead to faster genetic gain by breeders, and, therefore, growers. However, the ultimate rate of genetic gain will depend upon grower utilisation of the information available. While grower belief in the system is ultimately more important than grower understanding of the system, it is important that growers can relate the information provided by a breeder and the SIL database to their own situation.

This paper describes a simple and robust method for breeders and growers to translate the superiority of a ram for its SIL index value into dollars 'on-farm'. This in turn informs the process of deciding whether extra money for higher genetic merit rams is a good investment – in effect it answers the question "What is a better ram worth?"

Sheep improvement limited indexes

Sheep Improvement Limited produces standard indexes (e.g., Amer, 2000) for terminal (Terminal Sire Overall, TSO) and dual-purpose sires (Dual Purpose Overall, DPO). These are summary indexes of key breeding values each multiplied by their economic weighting. Indexes are, therefore, expressed in cents, and are relative to a base year, which is currently 1995.

TERMINAL SIRE OVERALL INDEX

The TSO is expressed in cents per lamb born (before losses) to a sire. For a flock with a base year of 1995, a sire with a TSO index of 300 is therefore expected to return $1.50 (i.e., one half of 300 cents because one half of the lambs genes come from the sire) more per lamb born than the average sire born in 1995. Compared to a ram evaluated as part of the same analysis with an index of 250, this ram is expected to return an average of 25 cents more per lamb born. The extra return from this ram, therefore, is his superiority on his TSO Index multiplied by the number of lambs he sires. This in turn is influenced by the number of years he is used, the number of ewes he mates and their fecundity.

Dual-purpose overall index

The DPO index is based on shifting the average genetic merit of a commercial ewe flock per ewe lambing per year, not on the contribution of the ram to the genetic merit of the ewe flock. As with the TSO, the DPO is expressed in cents. In addition to the factors mentioned above for terminal sires, a dual-purpose sire's worth is also influenced by his contribution to flock replacements, a combination of the proportion of ewe lambs retained and the total number born.

Comparing indexes

Index values are only directly comparable between animals within the same analysis, either within a flock or between flocks if an across-flock analysis has been carried out. Similarly, there is no easy way of knowing the average genetic merit of a commercial grower's ewe flock, or specifically that of the subset of ewes to which a ram will be mated. Any analysis of the value of rams can only compare the additional value expected to be earned from a ram, relative to another ram where both rams have indexes from the same analysis.

VALUE OF TERMINAL SIRES

Equations for estimating the additional value of a terminal sire ram, using its TSO index compared to another ram evaluated in the same analysis are presented in Figure 1. The TSO margin used in Figure 1 corresponds to the index value of a ram of interest relative to another

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FIGURE 1: Equations for calculating the difference in value between two terminal sire (TS) rams

Full version:

Additional TS value = TS overall index margin (TSO margin)
x discount factor
x contribution to offspring's genes (=1/2)
x number of years used
x tailing percentage
x survival correction
x number of ewes mated per year.

Working version:

$$\text{Additional TS value} = \frac{\text{Years mated} \times \text{tailing \%} \times \text{ewes mated/yr}}{210} \times \text{SIL TSO index margin}$$

FIGURE 2: Equations for calculating the difference in value between two dual purpose (DP) rams

Full version:

Additional DP value = DP overall index margin (DPO margin)
x discount factor
x genetic contribution to progeny (=1/2)
x proportion of offspring which are female (=1/2)
x years mated
x tailing percentage/100
x survival factor
x ewes mated per year
x % of ewe lambs retained
x number of times a daughter's genes are expressed.

Preliminary calculation:

$$\text{\% ewe lambs retained} = \frac{\text{Replacement \%}}{(\text{Lambing \%} \times \text{\% ewes to replacement sire} \times \text{50\% progeny female})}$$

Working version:

$$\text{Additional DP value} = \frac{\text{Years ram mated} \times \text{tailing\%} \times \text{ewes mated/yr} \times \text{\% ewe lambs retained.}}{10{,}000} \times \text{DPO Margin}$$

ram evaluated in the same SIL analysis. The discount factor is required because a ram is used over several years and is based on a discount rate of 7% from a farm mortgage rate of 9% (less inflation at 2%). A useful working value for the discount factor is 0.8.

SIL's indexes are based on number of lambs born, not the number of lambs surviving to sale or winter. Therefore tailing percentage needs to be corrected for lamb losses between birth and tailing. At an assumed industry average survival from birth to tailing of 84% the correction factor for survival is 1/0.84 or 1.19.

Figure 1 also shows a working version of the equation to estimate the relative value of a dual-purpose ram. In this version, the standard values for proportion of genes contributed, discount rate and survival listed above have been inserted to replace some of the variables.

As an example, consider two terminal sire breed rams, from the same breeder (and, hence, the same analysis). Ram A has a TSO index of 233, Ram B a TSO index of 181. We assume that the grower will use the ram for three years and that his flock has an industry average 124% tailing. Rams will be mated to 120 ewes. The additional value of ram A relative to ram B is the 52 cents margin between index values multiplied by (3 x 124 x 120)/210= $110.54.

Therefore, Ram A is worth a maximum of $110 more to the buyer than Ram B under these conditions.

VALUE OF DUAL-PURPOSE SIRES

Equations for dual-purpose sires are significantly different, as we are not only interested in the immediate performance of offspring (such as growth rate and lamb fleece weight) but also future performance, such as the fecundity and milk production of the female progeny over their lifetime.

Equations for estimating the additional value of a dual-purpose ram, using its DPO index compared to another ram evaluated in the same analysis, are presented in Figure 2 along with a simpler working version with standard values where practical. It is necessary to take account of the fact that, on average, only one half of a ram's offspring is female. In addition, account is taken of the proportion of the ram's daughters which are expected, on average, to become ewe flock replacements. Figure 2 shows how this proportion can be calculated from standard flock performance statistics. The expression of the sire's genes in terminal lambs relative to expressions of the sire's genes in replacement daughters is accounted for in the formulation of the DPO index value.

The ram's daughters express their genes at each lambing. In addition, the ram's granddaughters also express one half of the daughters' genes at each lambing. Summation of these values followed by discounting leads to a typical working value of a daughter's maternal genes being expressed 4.2 times.

For example, with 70% of ewes mated to a replacement sire, 30% mated to a terminal sire, 124% lambing and a 25% replacement rate (i.e., 25% of ewes are lambing for the first time in any year), the proportion of ewe lambs retained can be calculated as 25%/(124% x 70% x 50%) =58%.

The additional return from Ram A is therefore 55 cents multiplied by (3 x 124 x 120 x 58)/10,000 =$142.40.

APPLICATION

Current pricing systems by ram breeders using SIL are typically step-wise in nature, with pricing bands set by the ranking of rams on index. For example, the highest price may be set for the top 5% of rams offered, with progressive reductions for every 10% group thereafter.

This has tended to drive economic analysis of rams by prospective purchasers. Buyers tend to identify a price range they are comfortable with and an assumption is frequently made that rams within that 'band' are of similar potential value to the buyer. However, given normal distribution of indexes, and depending on the scale of the price bracket, this may not be so. This scheme tends to favour breeders for rams just above the demarcation, and growers for rams just below the demarcation.

A better system would be linked more directly to the overall index, and therefore the expected return to the grower. Such a system needs to be relatively simple, yet at the same time quite robust. 'Ram Focus' (Jopson & Amer, 2003) offers one such option. Another utilizes the calculations outlined in this paper.

Rams should be priced according to the benefit they offer a commercial grower, with a proportion of the benefit shared with the ram breeder. This could be, for example, 25% of the benefit to the breeder, 75% to the grower, in addition to a base price. An example utilizing this apportionment and a base price of $300 is set out in Table 1.

Linking ram price directly to ram value clarifies issues for the purchaser, and in our opinion, would likely encourage buyers to purchase higher index rams than they may have previously. This will lead to a faster rate of genetic gain in the sheep industry.

TABLE 1: An example of ram pricing linked directly to Terminal Sire Overall (TSO) Index[1]

Ram ID	TSO index cents	Estimated additional value $	Breeder's share $	Total price $	Benefits to grower $
1	292	656	164	464	492
4	181	334	83	383	250
7	145	229	57	357	172
10	127	177	44	344	133
13	108	122	30	330	91
16	86	58	15	315	44
19	70	12	3	303	9

[1]Assuming a base price of $300, the purchased ram will be mated for 4 years to 120 ewes per year, tailing percentage in the ram buyers flock is 127% and ram pricing based on the breeders share being 25% of the extra value of superior rams.

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