WHICH IS THE SUPERIOR RAM?

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INTRODUCTION

An estimated breeding value (EBV) for an animal is the estimate of that animal's genetic worth for a particular trait or index of traits. EBVs can be expressed in physical units (for example, kilograms of greasy fleece weight) or as deviations from a flock mean (for example, - 2 microns fibre diameter).

NSW Merino studs offering sale rams with objective measurement data in their sale catalogues provide a mixture of information. The figures on rams that are most often given are GWP (greasy fleece weight expressed as a percentage, with the stud's measured average given the value of 100%), FD (fibre diameter expressed as a deviation from the stud's measured average micron) and BWP (hogget bodyweight expressed as a percentage, with the stud's measured average given the value of 100%).

While there has been much written on the use of selection indices (Turner and Young, 1969; Ponzoni, 1979), there are no extension guidelines on how to combine GWP, FD and BWP into an index to rank rams. The usual approach of ram buyers appears to be to select the micron range of ram required and then choose the best GWP rams to bid on. This approach can be classified as using independent culling levels and is theoretically inferior to a selection index approach (Turner and Young, 1969).

METHODS

Assuming a net value for wool of \$2/kg greasy and a price premium for fineness of 16c/kg clean, the relative economic values for greasy fleece weight (GFW), hogget bodyweight (HBW) and fibre diameter (FD) were calculated by the methods of Ponzoni (1979, 1982) to be \$8.71, \$0.50 and -\$2.40 respectively. These values are based on returns from livetime production discounted to occur at 1½ years of age, using a 10% discount rate. The heritabilities of GFW, HBW and FD were assumed

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to be 0.35, 0.4 and 0.5 respectively, and the phenotypic standard deviations of GFW, HBW and FD were assumed to be 0.53kg, 4.5kg and 2.2um respectively. The phenotypic correlations assumed were GFW, HBW (0.3), HBW, FD (0.13) and GFW, FD (0.13). The genetic correlations assumed were GFW, HBW (0.2), HBW, FD (0.1) and GFW, FD (0.16).

Three selection indices or EBVs were calculated, with all correlated responses taken into account, using matrix algebra.

(1) $I_{11} = (GFW \times 2.24) + (HBW \times 0.25) - (FD \times 0.98)$
$= [(GFW \times 8.96) + (HBW) - (FD \times 3.92)] \times 0.25$

(2) $I_{21} = (GFW \times 1.79) + (HBW \times 0.25)$
$= [(GFW \times 7.16) + (HBW)] \times 0.25$

(3) $I_{31} = (GFW \times 1.64) - (FD \times 0.98)$
$[(GFW \times 1.67) - FD] \times 0.98$

These indices are only valid when all values are expressed either in the physical units or as deviations from the mean. It is possible to convert GFW, FD and HBW to a common basis (deviations from the mean), for comparison of rams using the appropriate selection index from above.

Let A = Average measured value

d = deviation from the average

GWP, BWP = catalogue values (Percentages)

$$GWP = \frac{(A + d)}{A} \times 100$$

$$\therefore \quad d = \frac{(GWP - 100)}{100} \times A$$

The selection indices can now be rewritten as:

(1) $$I_{12} = \left\{ \frac{(GWP - 100)}{100} \times \overline{GFW} \times 8.96 + \frac{(BWP - 100)}{100} \times \overline{HBW} - FD \times 3.92) \right\} \times 0.25$$

(2) $$I_{22} = \left\{ \frac{(GWP - 100)}{100} \times \overline{GFW} \times 7.16 + \frac{(BWP - 100)}{100} \times \overline{HWB} \right\} \times 0.25$$

(3) $$I_{32} = \left\{ \frac{(GWP - 100)}{100} \times \overline{GFW} \times 1.67 - FD \right\} \times 0.98$$

These equations look untidy, but if one assumes an average greasy fleece weight of 6kg and an average bodyweight of 50kg the indices reduce to:

(1) $$I_{13} = \left\{ \frac{(GWP - 100)}{100} \times 53.8 + \frac{(BWP - 100)}{100} \times 50 \quad - (FD \times 3.9) \right\} \times 0.25$$

$$= \left\{ \frac{(GWP - 100)}{100} \times 13.7 + \frac{(BWP - 100)}{100} \times 12.8 - FD) \right\} \times 0.98$$

(2) $$I_{23} = \left\{ \frac{(GWP - 100)}{100} \times 43.0 + \frac{(BWP - 100)}{100} \times 50 \right\} \times 0.25$$

$$= \left\{ \frac{(GWP - 100)}{100} \quad + \frac{(BWP - 100)}{100} \times 1.16 \right\} \times 10.75$$

(3) $$I_{33} = \left\{ \frac{(GWP - 100)}{100} \times 10.0 - FD \right\} \times 0.98$$

RESULTS

These equations can be used to provide extension guidelines for ranking rams. If the ram purchaser wishes to assess rams using data on all three characters, $Index_{13}$ suggests a 1 micron reduction is equalled by a 7.3% increase in GWP or a 7.8% increase in BWP. If only GWP and BWP measurements are available a 1% increase in GWP approximates a 1% increase in BWP. If only GWP and FD figures are known then a 1 micron reduction is equalled by a 10% increase in GWP.

These figures change with different assumptions however as a general guideline the ranking of rams can be done on the following basis:

1 micron finer = 7% higher GWP = 8% higher BWP

DISCUSSION

An example of how these guidelines can be used to choose the best rams from a sale catalogue follows:

Consider	Ram 1	104%	GWP	-1	FD	111%	BWP
	Ram 2	117%	GWP	-2	FD	109%	BWP
	Ram 3	112%	GWP	+1	FD	127%	BWP

Using I_{13},

EBV Ram 1 = [.04 x 13.7 + .11 x 12.8 + 1] x 0.98

= 2.96 x 0.98 = 2.90

EBV Ram 2 = [.17 x 13.7 + .09 x 12.8 + 2] x 0.98

= 5.48 x 0.98 = 5.37

EBV Ram 3 = [.12 x 13.7 + .27 x 12.8 - 1] x 0.98

= 4.1 x 0.98 = 4.02

Therefore Ram 2 has the best figures.

These comparisons could have been made very quickly by using the general guideline. Ram 2 is obviously superior on figures to Ram 1. Ram 3 is 2 microns stronger than Ram 1(= 7% GWP and 8% BWP). He is higher by 8% GWP and 16% BWP so he has better figures. Ram 3 is 18% higher than Ram 2 in BWP (= 2 microns). He is 3 microns stronger so he is inferior to Ram 2. Using this approach the figures on any two rams can be quickly compared by determining the micron difference and equating it to relative differences in GWP and BWP.

Having ranked rams on the basis of their measured characteristics, the ram buyer can then proceed to assess the ram on the basis of length, density, condition, colour and any other wool characteristics considered important in his environment.

The calculation of economic values for GWP, BWP and FD is more complex. Flock and stud ram prices can be compared to the price of rams with average figures. For example, using similar assumptions to those given in this paper, Cottle (1987) calculated that flock rams used for three years are worth an extra *$60/micron finer, $9/percentage increase in* GWP and $8/percentage increase in BWP.

REFERENCES

Cottle, D.J. (1987) Wool Tech. Sheep Breed. Submitted
Ponzoni, R. (1979) Proc. Aust. Assoc. Animal Breeding and Genetics 1:320.
Ponzoni, R. (1982) Wool Tech. Sheep Breed. XXX:44.
Turner, H.N. and Young, S.S.Y/ (1969) Quantitative Genetics in Sheep Breeding. Cornell University Press, Ithaca, NY.