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HOW MUCH IS A SUPERIOR RAM WORTH?

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SUMMARY

The comparative economic value of flock and stud rams can be calculated using selection index theory in combination with other algebraic techniques.

*If **flock rams** are used for three years, then compared to the price of a ram with average figures, a general guideline is:*

1 micron finer = $64; 10% GWP = $88; 10% BWP = $82

For ***stud rams*** *the relative value of each ram sired by the purchased ram is:*

1 micron finer = $24; 10% GWP = $33; 10% BWP = $31

where GWP = greasy wool percentage
BWP = body weight percentage

For example, a flock ram with figures of 104% GWP, 111% BWP and -1 micron would be worth about $190 more than the price of an average ram from the stud.

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%).

Cottle (1987) has shown that the EBV of a ram can be calculated as:

(1) EBV = (13.4 × (GWP - 100)/100) + (12.5 × (BWP - 100)/100) - (1.0 x FD) (1)

(2) EBV = ($8.71 x ^{G}GFW) + ($0.50 x ^{G}HBW) - ($2.40 x ^{G}FD) (2)

where ^{G}GFW, ^{G}HBW and ^{G}FD are the estimated genetic values of the ram for greasy fleece weight, hogget bodyweight and fibre diameter respectively.

Thus an animal with one extra unit of the index or EBV will return $1 extra revenue from its lifetime performance. The economic values (lifetime returns) are based on a flock with four age groups, which results in 5.85 shearings per animal lifetime (Ponzoni, 1979), with wool returns discounted relative to the time the animal is 1½ years of age.

METHODS

Direct Returns

The use of a ram with an EBV of +1 will result in progeny with an EBV of +0.5, if he is mated to a random sample of ewes from the flock. Thus every sheep sired by the ram would be expected to return an extra 50¢ which is received when the animal is 1½ years of age but is accrued during its lifetime. Table 1 shows the present value of 50¢ earned in 2 to 8 years time and is the increased value of each additional sheep sired by a ram with an EBV of +1, compared to progeny from a ram with the flock's average figures.

If the producer mates the ram to 50 ewes each year for four years and gets a 78% marking (39 lambs) then the value of the 1 unit in the ram's EBV is 39 x (41.3 + 37.6 + 34.2 + 31.0) = $56.20. Table 2 shows the value of this premium if the ram is used for one to four years.

Flock Rams — Indirect Returns

The values shown in Table 2 only show the increased returns from sheep sired by the ram. They do not take into account the fact that progeny from the progeny the ram has sired will be superior. If these progeny are retained for breeding purposes there will be further indirect effects, which will be

Table 1. Present value of a future cash flow of 50¢ discounted at 10% per annum.

	Years From Now						
Present Value of Future 50¢	2	3	4	5	6	7	8
	41.3	37.6	34.2	31.0	28.2	25.7	23.3

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further diluted, i.e. a 'line' of progeny is produced.

If it is assumed that the ram bought is a flock ram and only female progeny are used as breeders then it is possible to calculate the discounted economic value of these accumulated indirect effects, as well as the direct returns for offspring.

James (1980) developed an expression for the value of a purchased sire using matrix algebra.

If returns are realised at an age Y in both sexes, each unit of breeding value in the sire is worth:

$$(r^{Y+1}JP/2)(1-r^tW^t)/(1-rW) \quad (3)$$

where t = time from the sire's initial use (years)
W = survival rate of rams (fraction per year)
r = 1/(1+d); d = discount rate (fraction)
P = No. of progeny produced by each ram
J = genetic contribution of the sire (total/direct — refer James, (1980)).

If it is assumed that P = 39, d = 0.1, Y = 1, W = 0.95 and ewes are bred from four years, then (3) has the values shown in Table 3.

Stud Rams

The values in Table 3 only show the increased returns from sheep bred from ewes related to the ram or directly from the ram. If the ram is a stud ram then future returns may also be gained from rams bred from this ram. Rams bred immediately from the purchased ram receive half of their genes from the ram and start producing their returns two years later. Therefore each unit of breeding value of the purchased sire realised from his sons born in the first year of his use is worth:

$$(r^{Y+3}JP/4)(1-r^tW^t)/(1/-rW) \quad (4)$$

A similar approach could be used to evaluate rams bred in the future, more distantly related to the purchased ram. For example rams born 2½ years in the future from the purchased ram's ewe offspring would increase the breeding value of the purchase sire by $(r^{Y+5}JP/8)(1-r^tW^t)/(1-rW)$. All possible combinations cannot be considered here.

Table 2. Relative value of one unit of EBV of a ram used for one to four years. Direct returns on offspring.

	Years of Use of Ram			
	1	2	3	4
Relative Present Value (=$)	16.11	30.77	44.11	56.20

Table 3. Relative value of one unit of EBV of a ram — returns from all future offspring related to the ram.

	Years of Use of Ram			
	1	2	3	4
Relative Present Value (=$)	25.14	46.84	65.59	81.77

Table 4. Relative value of one unit of EBV of a stud ram — returns from each son of the ram.

Year of Use of the Purchased Ram	First				Second				Third				Fourth			
Years of Use of His Sons	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Relative Present Value ($)	10.38	19.34	27.09	33.77	9.44	17.58	24.62	30.70	8.58	15.99	22.39	27.92	7.80	14.53	20.35	25.37

Table 5. Relative value of each ram bred from stud rams with one unit of EBV

	Years of Use of all Rams			
	1	2	3	4
Relative Present Value (=$)	10.38	18.46	24.70	29.44

If the previous assumptions are used then (4) has the values shown in Table 4.

If the ram is used to breed some rams for the flock the value of an EBV of +1, if all rams are used for a set number of years, is approximated by averaging the appropriate values in Table 4. The value of each bred ram is shown in Table 5.

The figures shown in Tables 3 and 5 relate to the predicted increased returns from using superior rams. They obviously cannot take into account the sociology and publicity purposes of ram purchases. If the rams are used in an A.I. programme then P increases dramatically and hence the relative values also increase.

For the commercial ram purchaser, however, the values in Tables 3 and 5 provide an interesting yardstick in determining the price or auction value of rams.

Assume the value of a ram that has average figures (i.e. 100% GWP, 100% BWP 0 micron) is given as $150. What are the predicted extra returns to be gained, and hence, theoretical price premium for the following three rams (1984 'Avenel' ram sale).

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 (1)

EBV (Ram 1) = (13.4 x .04 + .11 x 12.5 + 1 x 1) = 2.9
EBV (Ram 2) = (13.4 x .17 + .09 x 12.5 + 2 x 1) = 5.4
EBV (Ram 2) = (13.4 x .12 + .27 x 12.5 -1 x 1) = 4.0

Assume that all rams are kept for 3 years. If the three rams are flock rams the predicted extra returns from the rams are:

Ram 1 = 2.9 x 65.59 = $190
Ram 2 = 5.4 x 65.59 = $354
Ram 3 = 4.0 x 65.69 = $262

Thus the rams should be valued at $340, $504 and $412 respectively. They were actually sold for $375, $350 and $850 respectively, which suggests a poor relationship between objectively measured figures and price. If these rams were used to breed rams, each ram offspring would increase returns due to their genetic relationship with the purchased ram by $72, $133 and $99 for Rams 1, 2 and 3 respectively.

The above calculations show a specific example of how the value of rams could be assessed. As an extension guideline, using the assumptions given in this paper, the value of rams can be summarised as follows:

If flock rams are used for:

3 years then:

10% GWP	= $88
10% BWP	= $82
1 micron finer	= $64

or

4 years then:

10% GWP	= $110
10% BWP	= $102
1 micron finer	= $80

Some of the more important assumptions made by Cottle (1987) are that the net return from wool is $2/kg greasy wool, the clean price differential for fibre diameter is 16¢/micron category and the average GFW is 6kg and average HBW is 50kg.

If stud rams and flock rams are used for 3 years then the value of each ram sired by the purchased ram is:

10% GWP	= $33
10% BWP	= $31
1 micron finer	= $24

At the 1984 'Avenel' auction the top-priced ram was bought for $2,200. This ram had figures of 125% GWP, -2 FD, 120% BWP. By the above calculations the ram's EBV was 7.85, thus his flock ram value was approximately $150 + $515 = $665. The ram would need to sire 8 rams kept for breeding to pay his way. This is possible and hence his price was not necessarily extravagant.

For a ram to be worth $10,000 the average wool cut of the stud would need to be extremely high and/or a large number of rams would need to be bred from the sire. For example if the top-priced ram mentioned above came from a stud with an average GFW of 7kg, the ram's EBV would be 8.4, his flock ram value would be approximately $200 + (8.4 x 65.5) = $752, and he would need to sire 45 rams (i.e. 12 every year) that were used for breeding. This assumes the bred rams are not sold but used to increase production.

The guidelines presented in this paper allow any ram breeders, e.g. studs and group breeding schemes, to place an economic value on any ram based on his objective measurements. This should promote a more financially equitable distribution of genetic material.

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