COMPARISON OF FINE WOOL MERINO RAMS ACROSS THE TASMAN USING LINKED SIRE EVALUATION SCHEMES

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SUMMARY

The estimated breeding values of 31 fine wool Merino rams bred in New Zealand and Australia were compared using the results generated in sire evaluation schemes in the two countries. The breeding value of each sire was estimated by selection indices calculated from clean fleece weight, fibre diameter and bodyweight data. Country of origin of tested rams was not significant, with equal numbers of the best performers bred in each country. If trade in ram semen between countries is to be conducted on a more informed basis, steps need to be taken to ensure that appropriate link sires are used routinely in SES. If the number of independent SES increases a co-ordinating group is needed to optimise the use of data.

INTRODUCTION

Progeny testing of Merino rams in sire evaluation schemes (SES) to obtain their estimated breeding value (EBV) has occurred in Australia (AUS) and New Zealand (NZ) (Roberts et al. 1990, Cottle and MacDonald 1988,1990). It is cost-effective to measure progeny for clean fleece weight (CFW) and fibre diameter (FD) (Cottle et al. 1991). The overall economic worth of progeny can be calculated using selection indices, in which the choice of relative economic value (REV) of FD can have a large influence on the relative ranking of sheep (Cottle 1990, Russell and Roberts 1991).

When a number of SES are run it is possible to compare sires between sites and years if some common ('link') sires are used. The optimum number of link sire progeny needed to minimise the variance of EBV estimates is about 30% of all progeny (Ashtiani and James 1991). This requires a larger committment of ewes to link sires than has been the case in most SES.

The New England SES has tested fine wool rams since 1990 (Roberts et al. 1991). In 1988 and 1989 fine wool rams were also tested in NZ with one link ram between years (Cottle and MacDonald 1990). Fortunately semen from the ram "Sierra Park Urquart 51", which is sold internationally, was used in both the AUS and 1988 NZ SES. This enabled a comparison to be made between the tested AUS and NZ fine wool sires. No such comparisons have been published previously.

MATERIALS AND METHODS

The conduct and collection of data from these SES is detailed in previous papers (Roberts et al. 1991, Cottle and MacDonald 1988,1990). The EBV of fine wool rams was calculated by using a selection index approach based on the values used by WOOLPLAN (Ponzoni 1988). First the EBV of individual traits were calculated using single trait BLUP (Harvey 1990). These estimates were corrected for non-genetic effects, heritability of the trait and number of progeny per sire. The breeding value estimates for each trait were then multiplied by the appropriate REV's. The three indices used to evaluate the sheep were Options 1 (5% FD premium), 3 (10%) and 4 (20%) from WOOLPLAN (Ponzoni 1992). The REV's for CFW and BWT are the same for each index, being $49.67 and $0.72 respectively. Only the REV for fibre diameter is altered, being -$9.12, -$18.24 and -$36.49 for Options 1, 3 and 4 respectively. This approach of first estimating the breeding value of the sire and then applying the REV's for each trait does not take into account the genetic correlations between the traits, but does make optimal use of information from relatives (half sibs) of the progeny of the rams.

The results were also analysed by calculating the index value (using genetic and phenotypic parameters and REV's) for each individual progeny and calculating a single trait BLUP of this value. This approach does take into account the correlations between traits but does not make optimal use of information from half sibs for all of the traits (only the trait of 'index score'). Both approaches produced similar EBV estimates so only results using the first method are reported.

The 20% index was used to rank the rams as the REV's reflect the relative premium for fineness for wools produced from these fine wool rams. The current prices for 19 μm and 18 μm wools are 1030 and 801 c/kg clean respectively, i.e. 28% fibre diameter premium. This could be viewed as a fine wool index if one views an index as being driven by assumed REV's. If one holds the view that desired direction of gain should determine the index it could be viewed as an index for reducing fibre diameter. The ranks based on the 10% and 5% indices were also calculated to study the effect of changing the REV of fibre diameter.

The effect of country of origin was determined by a t-test of EBV for rams bred in AUS versus NZ.

RESULTS

The estimated breeding values of each trait and the three index scores or ranks for rams above average for 20% index value are given in Table 1.

Table 1. Estimated Breeding values and Index scores and ranks for Australian and New Zealand fine wool Merino rams above average for 20% index value

			Estimated Breeding Values			Index		
SIRE	Ctry	No	CFW(kg)	BWT(kg)	FD(μm)	20%score	10%rank	5%rank
Black Forest Noah	NZ	18	-0.13	-2.75	-1.76	56.0	2	10
Nerstane 697	AUS	22	0.37	-0.72	-0.96	52.7	1	1
Black Forest 74/85	NZ	56	-0.29	-0.10	-1.68	47.1	7	14
Mirani 214.5	AUS	24	-0.01	-1.04	-1.29	45.9	3	7
Forest Range 497	NZ	25	0.06	0.22	-0.76	30.5	6	8
Auchen Dhu Red 13	AUS	19	0.12	1.86	-0.52	26.5	5	6
Te Awa 11	NZ	28	-0.21	-2.89	-1.01	24.3	12	20
Petali 556	AUS	29	-0.32	-1.93	-1.13	23.8	14	22
Cleardale Y986	NZ	39	0.35	1.00	-0.11	21.9	4	2
Ruby Hills 225	AUS	22	0.20	0.71	-0.20	17.7	8	5
Roseville Pk 69	AUS	22	0.09	0.38	-0.31	15.9	11	11
Moutere 547	NZ	7	-0.07	-1.00	-0.54	15.3	13	15
Salt Creek 19	NZ	18	0.25	2.30	0.03	13.3	9	4
Lorelmo 108	AUS	26	-0.17	-0.99	-0.47	7.9	17	21
Collinsville 37	AUS	21	0.42	2.08	0.47	5.1	10	3
Woolaroo 203	AUS	28	0.01	0.70	-0.09	4.4	15	13
Sierra Pk Urquart	AUS	56	-0.10	-0.20	-0.21	2.3	19	19
Mirani 95.2	AUS	26	-0.38	-0.18	-0.54	0.5	22	28
Mean			2.6	33.2	18.1			

The mean EBV of 20% Index values for AUS and NZ rams were $2.57 and -$2.74 respectively. This difference was small and non-significant (t=0.42, P>0.05). The choice of index changed the relative ranking of some rams considerably depending on the balance of CFW and FD in progeny. For example the Black Forest rams were the finest and ranked 1 and 3 on 20% index. If the 5% index was used they dropped to 10 and 14 (out of 31). The Collinsville-based rams (Collinsville 37 and Cleardale Y986) had the highest CFW and improved from Rank 9 and 15 on 20% Index to rank 2 and 3 on 5% Index. Rams above average for performance in both CFW and FD did not change so much in rank when using different indices, eg. Nerstane 697 and Mirani 214.5 and could be safer choices in breeding programs as their superiority is not so influenced by changing market premiums for FD.

DISCUSSION

If the approach of Ashtiani and James (1992) is used the optimum number of link progeny from 31 rams with 865 progeny in total is 234 (0.27). Ashtiani and James (1992) used the ratio between the prediction error variance (PEV) of the estimated breeding values and the residual component of variance as a measure of the efficiency of the linking between the schemes. With the optimum number of link progeny, $PEV/V_E = 0.0372$. However in this case, where only 56 progeny (0.065) were from link sires $PEV/V_E = 0.0452$. This indicates that the variance of the breeding value estimates as a proportion of the residual variance is 22% higher in this program than if the optimal design had been applied. If the results from SES are to be used by ram breeders to help decide whether to use imported semen, the number of link sire progeny in SES needs to be increased by taking positive action to include semen on test at other sites.

Another potential problem in an analysis such as this is use of inappropriate BLUP models. The current model assumes all sheep are from a common base population, and thus regresses the breeding value estimates back to a common mean. If the sheep come from a number of genetically diverse populations this approach will lead to biassed estimates. This problem is unlikely to be too great in this case as the sheep are all finewools, and differences in the base populations may not be large. It is nonetheless a problem that requires attention in sire evaluation programs generally.

Choice of index has a large effect on the relative ranking of rams so it needs careful consideration. Some traits not included in the index can become very important in particular environments. For example fleece rot resistance in fine wools in high rainfall areas is important and is subjectively scored in most SES. Some sheep may perform well on index but have an unacceptable number of 'cull' progeny, eg. Collinsville 37. It is difficult incorporating disease resistant traits into selection indices.

The results suggest that neither country has a monopoly on superior fine wool Merino genestock. The NZ industry is based on earlier and current imports from AUS so, if efficient selection programs have been in place, this should not be surprising. A much larger selection of rams would be needed before any claim could be made about the superiority of any one country. The results presented in Table 1 provide a better basis for deciding which semen to purchase than any of the information currently presented in semen catalogues. Paying high prices for semen is less risky if the ram has been proved superior in performance compared to other potential sires.

The sheep industry is about to follow the lead of the cattle and pig industries in other countries and develop a national database of progeny tested sires. The co-ordinating body for the database (CSIRO, Univ of NSW, NSW Agriculture) needs to ensure sites are linked as efficiently as possible to maximise the amount of useful comparative data available to ram breeders. This body will also need to consider the appropriateness of using BLUP models in progeny tests where sires are drawn from a range of genetic populations.

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