Proc. AAABG 5th Conf., Sydney 1985

TECHNICAL DEVELOPMENTS IN TYPE 2 SHEEP RECORDING

R.P. Lewer*, R.W. Ponzoni, P.D. Morgan† and D.S. Vanrenen‡**

* Animal Breeding and Research Institute, Katanning, WA
** Department of Agriculture, SA
† Australian Wool Testing Authority, WA
‡ 'Avoca Forest', Logan, Vic

INTRODUCTION

In November 1983 the Working Party report on Sheep Performance Testing and Recording was presented to Animal Production Committee. The Sheep Performance Recording Co-ordinating Committee was subsequently charged with, amongst other things, development of Type 2 performance recording.

Type 2 recording is designed for non-pedigree sheep of general purpose breeds where fleeces are tested at a laboratory. It is therefore relevant to the majority of Australian sheep, comprising most Merinos and breeds derived from the Merino.

This paper describes the work of the Type 2 development Sub-committee and discusses some of the technical aspects of the preferred scheme.

BREEDING OBJECTIVES

The breeding objective comprises those traits which influence returns to the producer, and hence genetic improvement in the traits in the objective will increase incomes. The traits are each weighted by their relative (net) economic value, which expresses their comparative importance. Table 1 lists components of the breeding objective defined for general purpose sheep.

Table 1: Traits and relative economic values used in the Type 2 Sheep Recording Service.

Trait	Relative economic value
Clean fleece weight (CFW)	14.5
Fibre Diameter (FD)	-2.03
Reproduction Rate (RR)	30.95
Sale weight of surplus offspring (SW)	0.5
Weight of cast-for-age animals (MW)	0.12

The relative economic values are from Ponzoni (1982) and take account of the increased costs associated with genetic improvement in live-weight and reproduction rate. The values chosen are considered appropriate

for Merino sheep. If different relativities are proved necessary for the other breeds, these could be calculated taking account of production and marketing systems under which genetic improvement is required.

An important aspect of any National recording scheme is the maintenance of flexibility in the breeding objective, to allow pursuance of specific breeding goals. The options which are available (Table 2) encompass a broad range of situations encountered in ram breeding flocks and could be expanded if there was sufficient demand. Further flexibility can be introduced into the system in future by allowing breeders to nominate their own economic values.

SELECTION INDICES

The selection criteria are the variates which are measured or observed by the breeder and used as predictors of the breeding objective. A selection index combining the variates will rank individuals according to their estimated overall scores of merit, or aggregate genotypes.

For Type 2 recording, where fleece testing data is always available, the minimum and mandatory criteria will consist of CFW and FD. Where birth/rearing ranks are recorded, dam's number of lambs weaned (dNLW) can be included in the selection criteria. In addition, correction factors can be applied to the data so that twin born (or reared) animals are not penalised during selection. The advent of cheap, accurate pregnancy diagnosis apparatus will undoubtably increase the frequency with which this information will be provided.

Table 2: Breeding objective and index options for Type 2 sheep recording, the standard deviations of the indices (Si) and the correlations between the indices and the objectives (R).

Breeding objective			Variates in the indices		
Option No.	Option		Index 1 CFW,FD	Index 2 CFW,FD,HW	Index 3 CFW,FD,HW,dNLW
1	No restrictions	Si	3.14	3.58	3.63
		R	0.43	0.49	0.50
2	FD restricted	Si	2.75	3.20	3.25
		R	0.40	0.46	0.47
3	RR restricted	Si	3.13	3.28	3.28
		R	0.59	0.61	0.61
4	FD & RR restricted	Si		3.07	3.07
		R		0.60	0.59

The characters included in the selection indices corresponding to the various objectives are shown in table 2. Eleven combinations (4 objectives and 3 indices) will initially be offered. The combination corresponding to breeding objective number 4 and selection index number 1 is excluded because the index does not contain enough information to select for that objective. Demand for additional index variates such as wrinkle score and face cover score will be continuously monitored and included as warranted.

Table 2 also contains the standard deviation of the index and the correlation between the breeding objective and the selection index for the

combinations described. The standard derivation of the index is defined as the gain in economic units achieved by one standard derivation of selection on the index. Breeders should be encouraged to add SW to an index which contains CFW and FD, as the standard deviation of the index then increases up to 16%. In most cases the correlation between the index and the breeding objective also increases as more information is added.

The appendix contains estimated genetic and economic gains from each standard deviation of selection on the index.

SELECTION LISTS

New outputs contain breeding value estimates for all of the traits in the breeding objective as well as a breeding value estimate for aggregate genotype. These selection lists are in tag order and index order.

PARAMETER ESTIMATES

The parameter estimates used in computation of the index weights were mainly those presented in the review of Ponzoni (1979). A genetic correlation of -0.1 between RR and CFW was used instead of his zero value.

DATA HANDLING

All records are transformed in the following manner, prior to the calculation of index scores and breeding values.

$$\text{Transformed record} = \frac{X-\bar{X}}{s}$$

where X is the actual record, $\bar{X}$ is the average value calculated from the data and s is the standard deviation estimated from the data. The equivalence between the index coefficients for transformed and untransformed data is:

$$B = b\ sx$$

where B is the index coefficient for transformed data, b is the index coefficient for untransformed data, and sx is the standard deviation that was assumed for that character in the derivation of the indices. This system will have the effect of standardising the standard deviation between flocks, and also treating as average any animal for which data is missing.

DATA CORRECTION

Environmental factors influence productive traits in sheep. For example, the fleece weight of a young ram may be affected by its age at measurement, type of birth or rearing, and the age of its dam. Correcting or adjusting the data will remove the differences due to these environmental effects, increase heritability, and lead to more accurate breeding value estimates. Breeders should be encouraged to obtain the information required for the application of correction factors because this will improve the effectiveness of their breeding programmes.

Environmental factors for which the data could be corrected are:

(i) Date of birth
(ii) Maternal handicap (type of birth and age of dam)

(iii) Management groups.

The following procedures will be reviewed periodically, and altered if necessary as new information becomes available.

(i) Date of Birth

The record on the individual will be adjusted to the average day of birth using regression. The two characters to be adjusted in this manner are clean fleece weight and live weight. Initial values to be used are:

Clean fleece weight	b = -0.005 kg/day
Live weight	b = -0.05 kg/day

Where the exact day of birth is not known, weekly intervals may be recorded.

(ii) Maternal Handicap

On average twins produce less wool and are smaller than singles. Also, offspring of 2-year-old ewes develop less rapidly than their counterparts from adult ewes.

If the records are not corrected for maternal handicap, selection may discriminate against twins and offspring of 2-year-old ewes. Selection against twins could reduce the reproductive rate of the flock, whereas selection against the offspring of 2-year-old ewes would increase the generation interval, both leading to lower genetic gains per year.

Four subclasses of individuals will be identified:

a. Singles of adult ewes
b. Singles of 2-year-old ewes
c. Twins of adult ewes
d. Twins of 2-year-old ewes.

Provided the number of animals in the subclass is greater than 35 the records will be transformed within the above groups as described previously.

When the number of animals in a subclass is less than 35 the records will be adjusted to the "single of adult ewe" equivalent by using standard additive correction factors and the animals in that subclass would be adjusted to the subclass "singles of adult ewes". Then transformation of the records would proceed as shown before.

Clean fleece weight and live weight will be adjusted for maternal handicap. The standard adjustment factors to be used are:

	Twins	Offspring of 2-yr-old
Clean fleece weight (kg)	+0.25	+0.2
Live weight (kg)	+2.5	+2.0

(iii) Management Groups

Flocks are often subdivided into management groups. Assignment to the various management groups should be at random with as few groups as possible. Formation of groups of very small size should be avoided.

Type 2 Performance Recording will take into account management groups by carrying out other environmental adjustments within each group. Management groups can be ignored thereafter.

IMPLEMENTATION

Type 2 recording will be implemented through the Australian Wool Testing Authority. With the software technology which will be available on new large, computers, modifications to the data base structure will be relatively easy. Hence the number of variates recorded can be modified at short notice providing considerable ongoing flexibility.

Where a flock owner has a preference for some other testing laboratory, the AWTA will provide a bureau service to produce standard outputs if required. A system of standard format inputs will have to be developed for this purpose. Where the AWTA conducts the fleece testing, no charge will be made for the computer processing and provision of selection lists.

REFERENCES

PONZONI, R.W. (1982). Wool Tech. Sheep Brdg. 30: 44.