IMPLEMENTATION AND MAINTENANCE OF SELECTION

PROGRAMS FOR WOOL AND MOHAIR

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In implementing a breeding program many practical problems arise which necessitate a departure from procedures designed to maximise rate of genetic progress. Because on-farm situations vary greatly it is not fruitful to make detailed general recommendations on where the compromise should be between current economic considerations and future genetic gains. The wise breeder will make compromises which save him time and money but have relatively little effect on genetic progress. This contribution is aimed at helping breeders identify such compromises.

AGE STRUCTURE

The optimum age structure to maximise rate of improvement may not correspond to the most economic structure from a here and now commercial consideration. This does not present a problem for group breeding schemes or for the large commercial breeders with his own nucleus. As animals in the elite flocks of these schemes reach the optimum culling age for maximum genetic progress, they can be transferred to a commercial flock to complete their economic breeding life.

The small stud breeder who wishes to occupy his entire farm with stud animals may have a problem. The higher the reproduction rate of the flock the earlier the genetically optimum culling age and thus the greater the problem. Departures of only one year from the optimum culling age have a very minor effect but keeping animals on for two ore more seasons beyong the optimum age should be avoided.

If sires are purchased to join to a stud or nucleus flock then the female age structure is of little significance from a genetic view because the only effect of an "old" average age is a slight increase in the genetic lag from the sire purchasing source.

Some breeders may wish to optimise their age structure by having a series of culling ages. In terms of maximising rate of genetic progress a pyramid age structure normally has only a slight advantage over a set culling age. However, where the estimate of breeding value for a character can be more accurately assessed later in life, there is a strong case for a pyramid age structure. For example, the estimate of breeding values for reproduction characters in females can be greatly improved as more lambing or kidding performances are added. If the flock is closed to outside influence one

should avoid allowing one or two outstanding sires to have too much influence through repeated uses.

If not individually recording reproductive performance a sequential culling program would probably only be of justifiable value in does of Angora studs. The projected breeding life of each doe would be based on her ranking on overall merit when assessed at 15 to 18 months. A coloured tag ear-notch system could be used to indicate the destinated culling year.

AGE OF ASSESSMENT

With wool breeds of sheep, and presumably Mohair goats also, the important fleece characters are quite repeatable if measurement is made for a 12 month growing period that excludes fleece grown prior to weaning. It is not in the best interests of the wool industry that many studs fleece measure rams on only six to eight months wool growth. While the importance of shearing lambs is well recognised it seems commercial reality encourages ram breeders to attempt to assess lifetime performance on a relatively short growing period. While it is understandable that most clients like to view rams in the wool it is possible the finer fibre diameter of younger rams also encourages studs to fleece test at an early age. However, the present practice is wasteful and solutions should be sought. A few suggestions follow:-

(1)   Select two-tooth rams for home use on a 12 month wool-growing period that ends two to three months before maiden joining (to allow time for laboratory testing). Offer four-tooth rams for sale in the wool with their two-tooth test results.

(2)   Select two-tooth rams for home use as for "1)" but offer surplus rams as shorn two-tooths. To gain acceptance it would be important to offer test results to clients and be able to assure them that rams that displayed wool faults are not being offered for sale.

(3)   A combination of "1)" and "2)". Young shorn rams are offered for sale with fleece management results as well as four-tooth woolly rams with test results from their two-tooth shearing. This two age groups of sale rams system is genetically better than lambing abnormally early for the district in order to provide rams for clients who wish to purchase several months before joining.

ACCURACY OF RECORDING AND USE OF CORRECTION FACTORS

With regard to accuracy of recording metric data it can be shown that the size of the unit recording is rounded to increases the observed variance by an amount $U^2/12$, where U is the size of the unit. For example, if fleece weight is measured to the nearest 0.1kg then the variance is increased by $(0.1)^2/12 = 0.0008kg^2$ which is an increase of only about 0.2% for hogget rams. Loss of efficiency in

selection will be not more than 1% due to rounding errors, if
fleece weight and birth weight are recorded to the nearest 0.2kg,
liveweight at weaning or later 1.0kg and fibre diameter 0.5 microns.
Since it is convenient to record to at least these levels of
accuracy there is nothing to be gained from paying any special
attention to precisely reading instruments.

With regard to correction factors the increase in variance
due to not correcting for a factor is approximately $p (1-p)d^2$
where p is the proportion of animals the correction applied to
and d is the mean difference between the groups. For example, if
25% of weaners were twins and they averaged 2kg lighter at weaning
the increase in variance from disregarding whether an animal was
a twin or not would be:

$$(.25) (.75)2^2 = 0.75kg^2.$$

Since the within birth-type variance of weaning weight is typically
only about six k, not correcting weaning weight for twins would
reduce rate of genetic progress from selection on weaning weight
to 6/6.75 or 89% of the rate obtained with correction. The effect
of not correcting for birth type may be more significant for the
bias it introduces against twins than for its effect on progress
in growth rate. Failure to correct liveweight for age of dam
has a larger influence on rate of genetic progress that its effect
on variance because there is the additional effect of an increase
in generation interval due to progeny from mature dams being
favoured. For further insight into use of correction factors in
general see papers by James and Roberts (1979) and Jones (1979).

If weaning weight is a selection character, correction for
age of dam, type of birth and rearing rank is very worthwhile. For
fleece characters measured on a growing period after removal of
lambs fleece corrections are not important. Likewise, correction
of yearling weight for maternal factors only leads to minor improve-
ment in efficiency of selection. However, if identifying lambs
to their dams and computerising the data, corrections for maternal
factors and birth date can be incorporated in the program to give
some improvement in efficiency of selection at negligible cost.

The large influence of nutrition on fleece value and growth
rate dictates that only animals that have been run together as a
mob throughout the period measurement applies to can be compared.

Accuracy of weighing can be improved by ensuring that the
scales are kept properly zeroed. A good idea is to have a test
weight and periodically use it during weighing to adjust the scales.
The test weight should be in the range of the weights being recorded.

Variation due to gut-fill can be simply reduced by allowing
a common fasting period of say 24 hours. This would be expected to
lead to an increase in efficiency of the order of 5%.

Weighing the belly with the fleece improves accuracy of
fleece weight ranking a little but except where shearers vary in the

area shorn for the belly, it is of doubtful benefit. If two sheep have the same total fleece weight but differ in weight of belly wool the fleece with the least belly wool would be more valuable.

When sampling for the determination of fibre diameter and yield the mid-side of each animal should be marked prior to shearing. Parting the fleece at the mid-side position and spraying a little dye from a pressure pack into the parted wool prevents sheep smudging each other with dye.

HOW MANY CHARACTERS SHOULD BE SELECTED?

Every breeder knows there are many factors to be considered in selection for there are many characters that influence the value of an animal as an economic unit of production. Decisions need to be made about what characters to measure and the relative emphasis to be placed on all characters considered.

Fortunately, the most important character in selection of wool and Mohair goats, fleece value, can be estimated reasonably accurately with the help of simple measurements. In females greasy fleece weight coupled with visual appraisal is all that can normally be justified to rank animals on fleece value. In sire selection the extra precision obtained from measuring percent yield and fibre diameter is warranted even in selection of flock rams. However, if sires are only being bred for home use there is little point in going to the expense of laboratory testing them all. Testing two times the number required for replacements is adequate but all should be fleece weighed to help decide which to sample.

If objective information is available on two or more characters an efficient way to use the information if via an appropriate selection index. For example, if it is desired to reduce body wrinkle and face cover as well as increasing fleece value and fertility then combining measurements or estimates of these characters in an index makes selection decisions simple and is genetically very efficient.

While all breeders have many characters they subjectively consider in selection it is a sound policy to formally measure and combine information from major characters that can be cheaply measured.

RECORDING REPRODUCTIVE DATA

Pistols which fire pellets of dye can be purchased and should prove useful where identification to dams is not required. If only single born lambs are marked with dye there will be a minimum of disturbance to the flock and especially to the twins. By lambing ewes in separate age groups and changing the colour of the dye every week all the information required for correction factors is obtained. It would be necessary to permanently identify lambs with respect to type of birth and week of lambing with ear tags at marking time.

Recording lambs to their dams is worthwhile if major emphasis is to be placed on raising fertility. When this is done the initial selection of replacement males and females can take fertility rating of dam into account and the number of breeding seasons females are kept for can vary from two to about six,

according to fertility rating which, in turn, is updated each year.

Some breeders identify lambs to their mothers via a mothering-up exercise at about marking time. However, accuracy is obtained if identification is done at lambing. Ewes can be numbered for this purpose by using large permanent ear tags, temporary neck tags or by side-branding just prior to lambing. The latter method can be quickly done with either stencils or branding fluid in pressure packs.

REFERENCES

JAMES, J.W. and ROBERTS, E.M. (1979). *Proc. Aust. Assoc. Anim. Breed. Genet.* 1: 359-63

JONES, L.P. (1979) *Proc. Aust. Assoc. Anim Breed. Genet.* 1: 387-88