FLOCK STRUCTURE AND GENETIC GAIN IN A SELF-REPLACING FLOCK

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The rate of genetic gain for a specific trait is determined by the age at which sheep are cast-for-age, heritability and the variability of the trait in the flock. In a self-replacing flock that breeds its own rams, it is managerially more convenient to breed rams from a nucleus or elite group of ewes. This reduces the number of entire males present at classing and lessens the performance-recording required.

There is a lack of extension-level guidelines to rationalise the conflict between increasing selection intensity and reducing generation interval in a breeding flock. There is also a lack of guidelines to determine the optimal nucleus breeding structure.

METHODOLOGY

A program has been written for a microcomputer (BASIC language) which calculates the response to selection for one character and the steady-state flock age structure in the nucleus and flock given the following inputs:

- Number of breeding ewes in the flock.
- Lambing percentage.
- Deaths until classing.
- Deaths in flock ewes.
- Culling rate of older ewes.
- Age at which ewes are cast-for-age.
- Age at which rams are cast-for-age.
- Ram percentage.
- Fraction of flock in the nucleus.
- Fraction of nucleus ewes born in the base.
- Trait heritability.
- Trait variance or range from a subpopulation.
- Trait average.

If required, the program can be used to predict total productivity of a wool-growing flock from these inputs. The pattern of change in reproduction rate with age, the influence on wool production of ewe's age, type of birth, age of dam, pregnancy, and lactation are all taken into consideration as outlined by Turner et al. (1968).

The calculation of genetic gain has been based on the theory outlined by James (1977) for open-nucleus breeding systems. If there is no nucleus the gain is calculated by standard procedures (Turner & Young 1969).

RESULTS AND DISCUSSION

The output from the program gives estimates of:
- Base flock age structure.
- Number of base maidens available for classing.
- Number of cast-for-age base ewes.
- Culling value for the trait.
- Proportion of maidens kept and culled.
- Nucleus flock age structure.
- Number of nucleus maidens transferred to base.
- Number of base maidens transferred to nucleus.
- Number of nucleus maidens retained in nucleus.
- Lag between nucleus and base (production units and time).
- Response/generation and response/year.

The results obtained from the program agree with those of Turner *et al.* (1968) that two age groups of rams and five or six age groups of ewes give the best estimated genetic gain per year and total return. The optimal structure would be to have about 10 per cent of the flock in the nucleus and to obtain half of the nucleus from the base flock (James 1977).

The advantage of the program is that it combines the approach of Turner *et al.* (1968) with that of James (1977), and being written on a microcomputer disk it is accessible to anyone with the appropriate hardware. Alternative management options can be evaluated very quickly.

REFERENCES

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