Brief communication

CROSSBREEDING, INTERBREEDING AND ESTABLISHING A NEW BREED OF SHEEP

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Formation of new breeds involves combining the virtues of two or more existing breeds by crossing and then interbreeding, with usually the parent ewes being from a breed numerically very strong and the parent rams from a breed numerically weak. The new breed therefore expands from the base ewe breed.

The F_1 or first-cross sheep almost invariably gives a performance superior to that of the base ewe breed because of hybrid vigour and the particular choice of the sire breed. When the F_1 generation and then the F_2 are interbred hybrid vigour is lost and there is a regression of performance, theoretically to the mean of the parent breeds. Many trials have shown the superiority of the F_1 generation; very few have recorded the changes which take place during interbreeding. A few that have, for example, the Romney × Rambouillet in Canada (Peters *et al.*, 1961), Border × Merino in Australia (McGuirk, 1967), and Border × Romney at Whatawhata, New Zealand, (Hight and Jury, 1970) have confirmed a high performance for the F_1 and regression during interbreeding. For example, in the Whatawhata experiments, in a hill country environment where the Romney control flock gave 80 to 85% lambing percentage, the F_1 ewes gave a 20 to 25% higher performance but the F_3 had dropped back to only an 8% superiority. Interbreeding experiments with grazing animals must be interpreted with care. First, selection during interbreeding is usually random as it should be in an experiment, whereas in breed formation it is not; and, secondly, the two parent breeds, the F_1 with hybrid vigour, and the interbred generations without hybrid vigour, are unlikely to be equally adaptable to the environment where the experiment is conducted.

The present paper is concerned with interbreeding and formation of a Coopworth flock at Lincoln in an environment where the Romney would be expected to have a lambing percentage of about 110%. Interpretation is made difficult because no control flock was kept.

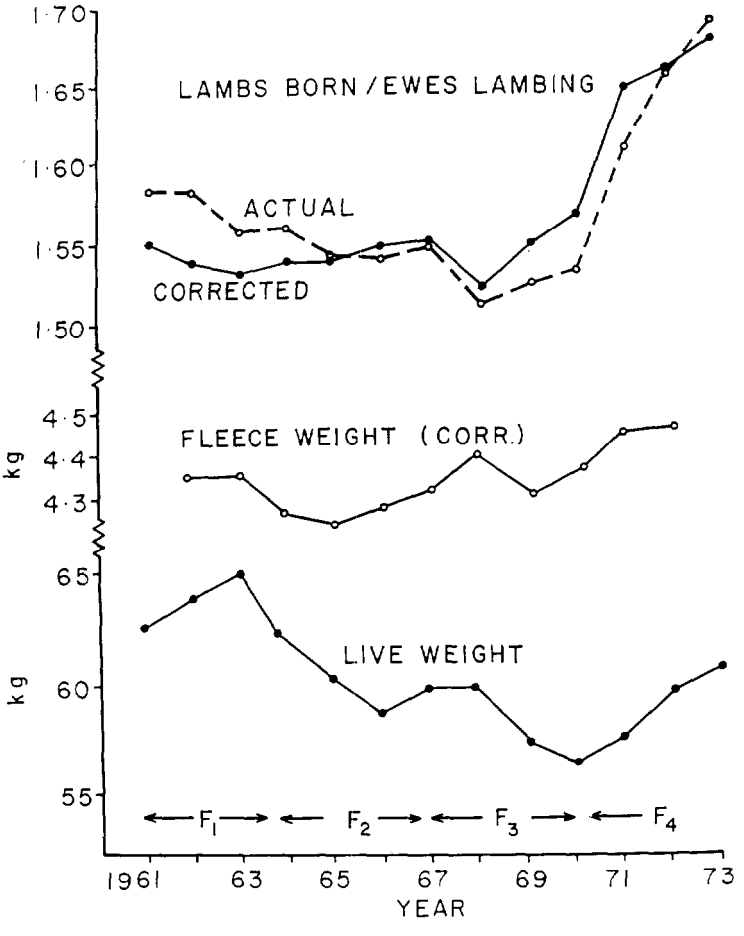

FIG 1: *Mean flock performance in the F_1 to F_4 generations.*

Romney ewes were crossed with Border Leicester rams in 1958-60. The crossbreds were then interbred F_1 to F_1, F_2 to F_2. In Fig. 1 the F_1 to F_4 sequence represents the years during which the ewe flock was predominantly F_1 to F_4. The flock has increased in size from 200 to 300 ewes during the F_1 and F_2 stages to 600 to 700 at present. Fertility or litter size (lambs born/ewes lambing), fleece weight and liveweight at mating are given as the mean of the 2-, 4-, 6- and 8-tooth performance with each age given equal weighting, and are presented as a 3-year sliding average.

During interbreeding, selection has been based on fertility and wool characters. Rams have been selected on the basis of their dams' lambing performance, and the rams themselves have to be above average for fleece weight and grade. After an initial culling of 2-tooth ewes for wool, subsequent ewe culling is solely on reproductive performance.

It is not valid to compare, without qualification, the present F_4 performance with the F_1 performance of 1960-4. The stocking rate, the seasons and management have changed. The nearest approach to valid comparison is to compare performance in relation to liveweight at mating. Liveweight is the main environmental determinant of ovulation rate and reproductive performance and is the most logical parameter integrating nutritional conditions. Accordingly actual fertility and liveweight are recorded in Fig. 1, together with fertility and fleece weight corrected to a 60 kg liveweight on the basis of 1.3% more twins (Coop 1962) and 1.3% more wool for each additional kg liveweight.

The results show that in spite of selection there has been a slight loss in fertility as one proceeded from F_1 to F_2 and F_3, and a very slight gain if corrected for liveweight. However, from F_2/F_3 to F_4 there has been a very considerable improvement, so that the current performance of the F_4, both actual and weight-corrected, is considerably higher than the original F_1. Loss of hybrid vigour in F_1 to F_3 has been offset by selection and now that most or all of the hybrid vigour has been lost there is a substantial, and one hopes continuing, gain.

In fairness it must be said that had there been a control flock of Romney ewes also subjected to selection it too would have improved.

While fertility has been the main objective in selection in the College flock, fleece weight and grade have also been included. Figure 1 shows that fleece weight corrected for ewe liveweight has been maintained and is now showing a slight increase.

It is concluded that loss of hybrid vigour during interbreeding can be offset by selection so that the interbred generations need not necessarily have a lower performance than the F_1 and may in fact have a superior performance if selection is efficiently applied.

REFERENCES

Coop, I. E., 1962: *N.Z. Jl agric. Res., 5*: 249.
Hight, G. K.; Jury, K. E., 1970: *N.Z. Jl agric. Res., 13*: 641.
McGuirk, B. J., 1967: *Wool Technol. Sheep Br., 14* (2): 73.
Peters, H. F.; Slen, S. B.; Hargreave, H. J., 1961: *Can. J. Anim. Sci., 41*: 126.