Evaluation of dam breeds and crosses for export lamb production

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ABSTRACT

Results from recent diallel crossbreeding experiments are used to illustrate the range in average genetic merit for meat and wool production available for utilisation in our present breed resources by crossbreeding. Performance of reciprocal first crosses suggests in addition considerable opportunity for exploitation of hybrid vigour. Breed differences are considerably reduced when production is expressed relative to ewe body size, although first-generation crosses remain superior to purebreds on this basis.

INTRODUCTION

The breed composition of N.Z.'s sheep industry has altered markedly during its short history in response to grassland development and changing market demands for meat *v* wool (Carter and Cox, 1982). Crossbreeding provides the way in which the latent flexibility offered by breed resources can be utilised rapidly. It has been mainly applied in the use of special purpose terminal sire breeds and in the development of new synthetic breeds such as the Corriedale, Perendale, Coopworth and Borderdale.

Recent comparisons of purebreds and contemporary first-crosses at the Templeton and Woodlands Research Stations have explored some of the production opportunities offered by other combinations of our major dual-purpose breeds in addition to estimating the potential from hybrid vigour in first generation crosses. Preliminary results are briefly presented to illustrate the variation available among dam breeds and crosses for export lamb production.

MATERIAL AND METHODS

At Woodlands 4089 ewe records at joining have been analysed for some 1200 purebred and reciprocal first-cross ewes derived from the Romney, Border Leicester, Cheviot and Merino breeds. At Templeton 3370 joinings represented more than 900 ewes of the Romney, Dorset (horn and polled) and Corriedale breeds and all reciprocal first-crosses. The animals were generated from 15 to 25 rams of each breed in 1970/3. Each crop of ewes was evaluated for meat and wool production over 4 consecutive years as 2- to 5-year-olds. Within each trial each crop of hoggets was reared together and all ewes (50 to 100 per purebred or reciprocal cross) were run together at all times following single-sire joinings to meat-breed rams. The data presented came from preliminary analyses of unweighted means in an attempt to allow for the effects of birth year and age of ewe.

RESULTS

Woodlands

Breed means by sire of ewe obtained by averaging genotypes across all 4 dam breeds (Table 1) indicated that on average a 50% substitution of Romney for Border Leicester genes increased ewe live weight at mating by 7%, weaning rate by 8%, weight of lamb weaned by 11% but reduced ewe fleece weight by 5%. Overall productivity, calculated on the assumption that 1 kg of wool is worth 4 times as much as 1 kg of lamb live weight at weaning, was increased by 5%, although productivity relative to ewe body weight declined by 2%. Another noteworthy feature of the sire breed means is the 18% inferiority of Cheviots relative to Romneys for fleece weight, Merinos and Border Leicesters being similar in this regard, and the superiority of Merinos over other breeds of sire for overall productivity per unit of body weight.

Average purebred and crossbred performance (reciprocals averaged) for meat and wool production is summarised in Fig. 1 which further highlights the superiority of Romneys and Romney crossbreds for wool production and of Border Leicester and Cheviot crossbreds for lamb production. The negative sloping line represents a constant overall productivity, assuming a ratio of wool to lamb prices of 4:1. Thus, genotypes which are equidistant at right angles to and on the same side of this line are of equal productivity; those which are further above it are more productive than those which are closer.

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TABLE 1 Sire breed means across pure and first-cross ewes (2 to 4 year olds 1973/8)

		Mating wt. (kg)	No. lambs weaned	Wt. lamb weaned (kg)	Fleece wt. (kg)	Productivity*	Product./ ewe wt.
Woodlands							
Romney	(R)	52.1 (100)	1.11 (100)	24.2 (100)	3.87 (100)	39.7 (100)	(100)
Border L.	(B)	55.7 (107)	1.20 (108)	26.8 (111)	3.68 (95)	41.6 (105)	(98)
Cheviot	(Ch)	51.9 (100)	1.17 (105)	25.0 (103)	3.16 (82)	37.6 (95)	(95)
Merino	(M)	46.0 (88)	0.99 (89)	21.0 (87)	3.70 (96)	35.8 (90)	(102)
Templeton							
Romney	(R)	58.6 (100)	1.06 (100)	26.5 (100)	3.69 (100)	41.2 (100)	(100)
Corriedale	(Co)	60.4 (103)	1.05 (100)	26.4 (100)	3.70 (100)	41.2 (100)	(97)
Dorset	(D)	62.8 (107)	1.12 (106)	29.2 (110)	2.89 (78)	40.8 (99)	(92)

* Productivity = Wt. weaned + (4 × fleece wt)

Romney-Border Leicester crossbreds were about 10% more productive than Romney-Cheviot crosses.

Templeton

Sire breed means (Table 1) showed close genetic similarity of Romneys and Corriedales apart from the slightly greater body weight of Corriedales. Dorsets displayed similar productivity, their superior weaning rate and lamb growth rate being compensated by inferior wool production which was similar to that displayed by Cheviots relative to Romneys at Woodlands. Higher body weights of Dorset-sired ewes reduced productivity per unit of live weight compared with those by Romney and Corriedale sires. Not all aspects of relative performance are embraced by these results. For example, the high milk production and leanness advantages of the Dorset are not fully reflected in the weaning weights presented in Table 1 (Geenty and Jagusch, 1974; Geenty *et al.*, 1979).

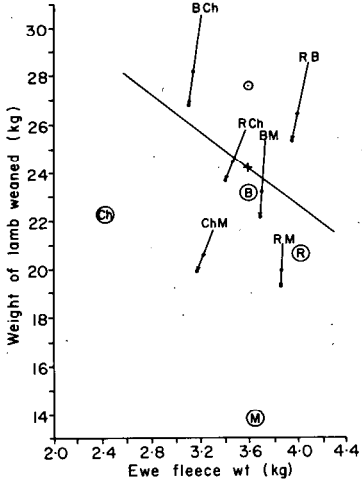

FIG. 1 Meat and wool production of purebred and first-cross ewes— Woodlands. (See Table 1 for symbols.)

DISCUSSION

The experiments have quantified the considerable opportunity for different quantitative combinations of meat and wool producing genes offered by the dual-purpose breeds available for crossbreeding in N.Z. Taking account of meat, wool and body size considerably reduced breed differences, although crossbreds generaly retained a useful advantage over purebreds.

The average superiority of first-crosses over purebreds at Woodlands for lamb production, wool production, productivity and ewe body weight was 28%, 7%, 20% and 8%, respectively. At Templeton, Romney-Corriedale crosses displayed relatively little hybrid vigour, the average superiority of first-crosses involving the Dorset over the corresponding parental breeds averaging 13%, 6%, 10% and 3%, respectively.

Actual levels of hybrid vigour in lamb and wool production for each of the crosses are illustrated in Figs. 1 and 2 by the positive sloping lines joining each first-cross mean to a point mid-way between the crossbred and purebred means. The lower end of the line thus indicates the expected performance, under a genetic model in which heterosis is proportional to heterozygosity, of two breed synthetics derived by interbreeding without selection from each of the crosses. The expected performance of an established 2-breed rotation is shown by the dot on this line. The

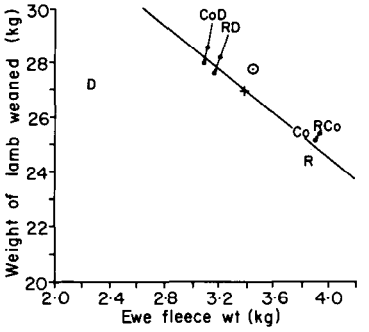

FIG. 2 Meat and wool production of purebred and first-cross ewes—Templeton. (See Table 1 for symbols.)

expected performance of a 3 breed rotation (ignoring Merinos) under the same simple genetic model which ignores many epistatic possibilities (Sheridan 1981), is shown by the circled dot.

If this genetic model is proved to be meaningful by future research, these results suggest that rotational crossbreds and first-crosses could well have a future role in sheep production in N.Z. Further aspects of these possible future roles of crossbreeding are discussed by Clarke and Meyer (1981) and Clarke (1982).

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REFERENCES

Carter, A. H.; Cox. E. H., 1982. In *'Sheep in N.Z.—Production, Processing and Marketing'*, N.Z. Inst. Agric. Sci. Publ. (in press).

Clarke, J. N., 1982. *Proc. World Congr. Sheep and Beef Cattle Breeding, 1980,* (in press).

Clarke, J. N.; Meyer, H. H., 1982. *Proc. World Congr. Sheep and Beef Cattle Breeding, 1980,* (in press).

Geenty, K. G.; Clarke, J. N.; Jury, K. E., 1979. *N.Z. Jl agric. Res., 22:* 23.

Geenty, K. G.; Jagusch, K. T., 1974. *Proc. N.Z. Soc. Anim. Prod., 34:* 14.

Sheridan, A. K., 1981. *Anim. Breed. Abstr., 49:* 131.