REPRODUCTIVE PERFORMANCE, GROWTH AND WOOL PRODUCTION OF EXOTIC SHEEP AND THEIR CROSSES WITH THE ROMNEY

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SUMMARY

Four breeds of sheep, Finnish Landrace (F), East Friesian (E), Oxford Down (O) and German Whiteheaded Mutton (G), were imported from Britain in 1972 on the basis of their favourable fertility or growth attributes. They are being compared with several local breeds, Border Leicester (B), Cheviot (C), Dorset (D) and the imported Booroola Merino (M) when all are crossed with the Romney. The exotic crosses as a group have performed very well, equalling or surpassing the best of the local crosses for lamb survival, weaning weight and reproductive performance, and producing comparable fleece weights. The straightbred Romney by comparison has consistently demonstrated high lamb mortality, low weaning and hogget body weights and poor reproductive performance, while hogget wool production has been comparable to E, O, G and B crosses. In general, F crosses have shown outstanding lamb survival and reproductive performance, E crosses have demonstrated good survival, high growth rate, and good wool production and reproductive performance, and G and O crosses have shown high lamb growth rates and good wool weights. It appears at this early stage that each of the imported breeds has one or more traits in which it can make substantial contribution to the national flock.

INTRODUCTION

The New Zealand sheep industry has traditionally been largely based on one breed, the Romney. This breed has high fleece weights but is only mediocre for fertility, milk production and lamb growth rate. Numerous overseas breeds are known to be far superior to the Romney and other local breeds for fertility or growth rate. The increasing importance of meat relative to wool since the early 1960s has stimulated considerable interest in improving these two attributes. This is reflected in the development and increasing use of Border Leicester-Romney (Coopworth) and Cheviot-Romney (Perendale) sheep, and in the proliferation of group breeding schemes whose aims are directed

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largely toward improved fertility. Breed societies have likewise begun recording type of birth for animals being registered in the flock books.

Research data from overseas have pinpointed prolific breeds such as the Finnish Landrace and East Friesian whose crosses with local stock seem likely to increase lamb production to a level that would take 5 to 10 generations (15 to 30 years) to achieve through within-breed selection. Hence it is apparent that incorporation of genes from certain overseas breeds into the New Zealand national flock could have tremendous potential.

Following considerable discussion, the Maximum Security Quarantine Advisory Committee, appointed in 1968 and representing government, producer boards, farmers' groups and breed societies, recommended several breeds for importation. Animal Health Division considerations of health and disease risks dictated that any importation must be restricted to mature stock from the United Kingdom or Ireland. Working within this framework and the choice of stock available, animals of the Finnish Landrace, East Friesian, German Whiteheaded Mutton and Oxford Down breeds were imported in 1972. Numbers of animals imported and the primary attributes of each breed are shown in Table 1. The animals were held at Somes Island Maximum Security Quarantine Station for six months, then transferred to Mana Island Research Station where multiplication has continued. In 1976, crossbred stock born at Mana Island were transferred to Crater Research Station near Rotorua, a double-fenced quarantine research property, where the bulk of the initial breed evaluation will be carried out.

TABLE 1: EXOTIC BREEDS IMPORTED TO NEW ZEALAND IN 1972

Breed	*Ewes*	*Rams*	*Main Attributes*
Finnish Landrace	46	4	Prolificacy
East Friesian	5	1	Prolificacy, Milk Production
German Whiteheaded Mutton	8	2	Growth, Wool
Oxford Down	40	3	Growth

DESIGN AND AIMS

Litter size of the imported breeds as purebreds is shown in Table 2 as an indication of the genetic potential of these breeds for prolificacy. The decline in litter size of the purebreds is attributable to the addition of two-tooth ewes, advancing age of

imported ewes and harsh environmental conditions at Mana Island. The main expected contribution of the imported breeds is improvement of fertility or growth through crossing with local stock, particularly the Romney. Accordingly, the research programme is aimed at the generation and comparison of crossbreds of the imported and several local breeds with the Romney. The local breeds being included are the local Border Leicester, Cheviot and Dorset breeds and the "Booroola" Merino, a high fertility strain developed in Australia. In addition, quarterbreds (¾ Romney) are being generated for the Finn and East Friesian breeds as well as F_2 interbreds for these two breeds plus the German. The Romney ewe is being used in the production of all crossbreds because of its dominant role in the national flock. The Romney flock from which crossbreds are generated was assembled by wide sampling of the Romney breed with the assistance of the Romney Sheep Breeders' Association.

Generation of the various crossbred types was initiated at Mana Island in 1974 and will continue at Crater through to 1979. The primary aim is to generate about 300 ewes of each crossbred type and evaluate their productive performance over a minimum of four lambings when mated to export lamb sire breeds. In practice evaluation of the crossbreds begins at, or even before, birth in that lamb mortality, growth rate and wool production are being closely measured for all breed types and for male as well as female progeny.

TABLE 2: LITTER SIZE OF EXOTIC BREEDS IN NEW ZEALAND

Breed	*Somes Island* (1972-3)	*Mana Island* (1974-6)
Finnish Landrace	2.7	2.2
East Friesian	2.5	2.1
German Whiteheaded Mutton	1.9	1.5
Oxford Down	1.8	1.5

RESULTS

In 1974, the first year of the programme at Mana Island, the combination of lack of managerial experience in this harsh environment, a heavy stocking rate and incomplete development of the station resulted in reduced lamb production. As experience has been gained and development has proceeded, performance has improved. The intention is, of course, to evaluate the various breed types under realistic practical conditions.

Lamb Survival

Survival to weaning of first-cross versus purebred lambs from Romney dams is shown in Table 3. Despite considerable variation within breeds from year to year most breeds follow the general pattern of declining mortality over the three years. The Finn cross has shown very good survival to weaning despite having the lowest mean birth weight, averaging 0.3 kg lighter than the straightbred Romney at birth. The East Friesian has likewise demonstrated good lamb survival and, in fact, all "exotic" halfbreds have shown mean survival equal to or better than any of the local breed crosses. The Booroola Merino, available for the first time in 1976, demonstrated survival similar to that of the exotic half and quarterbreds. The straightbred Romney has consistently demonstrated high pre-weaning lamb losses.

To more clearly examine the likely causes of these breed differences in mortality, an attempt was made in 1976 to autopsy all lambs dying prior to weaning to determine cause of death. The majority of deaths (82%) were due to dystokia or starvation-exposure. The remainder of deaths were due to a variety of other causes, or could not be accurately diagnosed. With the exception of Finn half- and quarterbreds, which had both lowest mean birth weights and lowest mortality, there was little relationship among breeds between mean birth weight and mortality, or even cause of mortality. Oxford and German crossbred lambs, despite having the heaviest mean birth weights, had no greater incidence of death due to dystokia than breeds with lighter birth weights and had relatively low losses due to starvation-exposure. The straightbred Romney ranked the worst breed for lamb losses both from dystokia (9% of all lambs born) and from starvation-exposure (12% of all born), being 3% higher than the next breeds, Cheviot and Dorset, respectively, for these causes of death.

Lamb Growth

Growth to weaning has been consistently good in the exotic crossbreds and better in the Finn cross than expected from the small mature body size and low birth weights of purebred Finns. Mean average weaning weights (Table 4) show the Oxford, East Friesian and German Whiteheaded Mutton crosses as the heaviest, followed closely by Border Leicester and Dorset crosses. The Finn cross has been consistently equal to the Cheviot cross, followed closely by the Finn and East Friesian quarterbreds (¾ Romney). The Romney has consistently had the lightest weaning

TABLE 3: PREWEANING MORTALITY OF PUREBRED AND CROSSBRED LAMBS FROM ROMNEY DAMS

Breed of Sire	1974 No. Born	1974 % Dead	1975 No. Born	1975 % Dead	1976 No. Born	1976 % Dead	3-year Average (%)
Oxford Down	87	25	104	11	149	9	15
Finnish Landrace	132	16	173	10	181	6	11
German Whiteheaded Mutton	102	23	87	16	146	12	17
East Friesian	88	14	104	16	129	9	13
Finn × Romney	—	—	112	21	155	10	—
East Friesian × Romney	—	—	77	22	108	11	—
Border Leicester	68	25	91	21	238	13	20
Cheviot	59	24	102	13	251	13	17
Dorset	63	14	—	—	244	16	—
Merino	—	—	—	—	237	11	—
Romney	200	32	165	19	341	22	24
Overall	799	22	1015	17	2179	12	17

TABLE 4: MEAN WEANING AND EWE HOGGET BODY WEIGHT (kg) OF LAMBS FROM ROMNEY DAMS

	Born 1974 Weaning	Born 1974 Hogget	Born 1975 Weaning	Born 1975 Hogget	Born 1976 Weaning	Mean Weaning Weight*
Oxford Down	—	—	21	48	23	(21)
Finnish Landrace	19	32	19	41	20	19
German Whiteheaded Mutton	20	32	20	45	21	21
East Friesian	20	33	21	47	21	21
Finn × Romney	—	—	19	39	19	(19)
East Friesian × Romney	—	—	19	41	20	(19)
Border Leicester	19	33	20	45	22	20
Cheviot	19	30	19	44	20	19
Dorset	20	35	—	—	21	(20)
Booroola Merino	—	—	—	—	18	—
Romney	17	26	18	38	19	18

*Means in parentheses are adjusted for years in which data were missing.

weights with the exception of 1976 when the Booroola Merino cross, in its first year of inclusion in the trial, was about 1 kg lighter at weaning.

Patterns of preweaning growth among breeds have continued beyond weaning with the result that breed differences in body weight at weaning tend to have increased by the hogget stage (Table 4). The Romney, lightest at weaning, has demonstrated the lowest post-weaning gain, followed closely by the two quarter-bred (¾ Romney) groups.

Ewe hogget fleece weights and quality number (count) are shown in Table 5. The considerable differences in fleece weight between years once again reflect the large seasonal effect previously seen in hogget body weights. Fleece weights of exotic half-breds were comparable to the straightbred Romneys and local crosses, with the exception of Cheviot and Finn crosses which had lighter fleeces. The quality number of German cross wool was similar to Romneys, with wool from the other exotic crosses appearing finer and comparable to Cheviot and Dorset crosses.

TABLE 5: ROMNEY AND CROSSBRED EWE HOGGET WOOL PRODUCTION

Breed of Sire	*Fleece Weight (kg)* *Born 1974*	*Born 1975*	*Average Count*
Oxford Down	—	3.5	50
Finnish Landrace	1.7	2.9	48
German Whiteheaded Mutton	2.0	3.6	46/48
East Friesian	2.0	3.5	50
Finn × Romney	—	3.0	48
East Friesian × Romney	—	3.2	48/50
Border Leicester	.3	3.9	46
Cheviot	1.9	3.3	50
Dorset	2.0	—	50
Romney	1.7	3.6	46/48

Finnish Landrace purebreds have shown considerable incidence of break in the wool in some years. This has been passed on in part to crossbreds, with the Finn cross showing a significantly higher incidence of wool break than the other crosses. The economic importance of this fault is, however, questionable. Finnish Landrace crossbred wool has returned essentially the same amount per kilogram as Romney wool when sold as a separate lot in the same consignment. Indeed, no significant differences in return per kilogram of wool were noted for any

TABLE 6: REPRODUCTIVE PERFORMANCE OF ROMNEY AND CROSSBRED TWO-TOOTH EWES BORN 1974

Ewe Breed	*Lamb Sire Breed*	*No. Mated*	*% Dry*	*Litter Size*	*Pre-docking Mortality (%)*	*Lambs Born* / *Ewes Mated*	*Lambs Docked* / *Ewes Mated*
Finn × Romney	F × R	55	2	1.61	14	1.58	1.36
East Friesian × Romney	E × R	42	2	1.41	7	1.38	1.29
German Mutton × Romney	G × R	41	15	1.09	11	0.93	0.83
Border Leicester × Romney	Oxford	23	17	1.21	13	1.00	0.87
Cheviot × Romney	Oxford	21	10	1.16	36	1.05	0.67
Dorset × Romney	Oxford	33	6	1.26	13	1.18	1.03
Romney	Oxford	60	25	1.04	32	0.78	0.53

of the breeds when all types were sold separately. Nevertheless, in view of the high selection intensity possible in a breed as prolific as the Finn, it may be possible to produce purebred rams whose crossbred progeny exhibit a minimal level of wool break while at the same time increasing fleece weights.

Reproductive Performance

The first group of crossbred ewes (born 1974) were mated at Mana Island in 1976 and lambed at Crater. All mating was in pens with teaser-marked ewes going to the ram to which they had previously been allocated. Local breed cross and Romney control ewes were mated to Oxford rams, while the exotic crosses were all mated to rams of their own genotype to produce F_2 interbreds. The reproductive performance given in Table 6 for the various breeds is thus partially confounded with sire breed and, in view of the small numbers of ewes present for each crossbred type, *must be considered very preliminary.* Considerable differences existed among breeds for % dry ewes, litter size and lamb mortality. Finn and East Friesian crosses had extremely low incidence of barrenness, high litter size and good lamb survival, despite the high frequency of multiple births. The combination of these factors resulted in lambs docked/ewe mated of 1.36 and 1.29, respectively, for these two breeds.

In comparison, local crosses ranged from 0.67 lamb docked/ewe mated for Cheviot crosses to 1.03 for the Dorset cross. The German cross was intermediate to this range at 0.83 and straightbred Romneys averaged only 0.53 owing to a combination of a large proportion of dry ewes, small litter size, and poor lamb survival.

Despite the high incidence of muiltiple births for Finn and East Friesian crossbred ewes (59 and 41%, respectively), only one set of triplets was born. Thus the fear which has been expressed that the first cross with these breeds would be too prolific, producing and losing a large proportion of triplets, may be unfounded, although it remains to be seen how these ewes perform with increasing age.

DISCUSSION

Generation of the different breed types from similar Romney ewes and uniform management of the various groups throughout their lifetime should ensure valid progeny comparisons. Crossbred types would, however, be expected to derive advantage from

heterosis relative to the straightbred Romney controls. These initial matings are not designed to estimate the magnitude of heterosis which might be present, since priority is being given to the production of half- and quarterbred exotic crosses from Romney ewes. As pointed out by Carter (1976), the improvement potential of new breeds can be assessed from performance comparison of derived first crosses. If these prove substantially superior to local stock, the contribution of hybrid vigour merely influences the way in which the new breeds may best be exploited in national flock improvement.

The large effect of environmental variation on various measures of production is obvious for the first 3 years of results from this trial. The better season of 1975 relative to 1974 was reflected not only in lower lamb mortality and higher weaning weights, but also carried through to higher hogget body and fleece weights as well. The poor relative reproductive performance of the 1974-born Romney ewes as two-tooths (Table 6) might perhaps be ascribed to their poor growth as lambs and hoggets. This is supported by the much higher incidence of dystokia among these ewes (17% of all lambs born) than among brought-in Romney two-tooth ewes pen-mated to the same Oxford rams (6% of all lambs born). The latter ewes averaged 3 kg heavier at lambing. The observation was made by staff at Mana Island that the straightbred Romney lambs failed to adapt to feeding of hay and concentrates over the dry 1974 summer and autumn period as well as did the exotic and local breed crosses. Nevertheless, the breed rankings for weaning and hogget body weights were similar in 1975 when conditions were markedly better. That being the case, unless genotype-environment interactions are important, one must assume that reproductive performance of the other breed types in 1976 (Table 6) was depressed similarly to that of the Romney.

The high performance of exotic breed crosses to date makes them look very useful for potential incorporation into the national flock. The optimal breeding system for their incorporation remains to be determined, but certainly each breed has one or more traits in which it can make substantial contribution.

It is noted with regret that scrapie, a neurological disorder with a long incubation period and apparent hereditary influence, was diagnosed in an East Friesian ewe dying of other causes. As a result, all East Friesian and derived crossbred stock were destroyed as part of the continuing quarantine safeguards to the

national flock. It is hoped that more animals of this very promising breed can be imported in the near future.

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