PRELIMINARY STUDIES ON THE EFFICIENCY OF MATING OF EWE HOGGETS

A. J. ALLISON, R. W. KELLY, J. S. LEWIS
Invermay Agricultural Research Centre, Mosgiel
D. B. BINNIE
Ministry of Agriculture and Fisheries, Invercargill

SUMMARY

Four experiments recording mating and fertility of ewe hoggets are described. Failure of insemination in hoggets marked by harnessed rams was shown to be a factor in low fertility. Also fertility in hoggets well marked by the ram crayons was greater than in animals with less distinct marks. In one of two experiments increasing the number of rams increased the number of hoggets mated and conceiving early in the mating period. Liveweight and breed were both important in the expression of oestrus and fertility. Romney hoggets had a lower incidence of oestrus and fertility than Coopworths and Perendales.

INTRODUCTION

Although there are many reports emphasizing the importance of liveweight and breed as factors affecting the percentage of ewe hoggets exhibiting oestrus (reviewed by Dyrmundsson, 1973) there is little available information concerning their mating behaviour and levels of fertility in New Zealand. This paper describes some preliminary observations of mating behaviour and fertility in ewe hoggets at Invermay and on two commercial properties in Southland.

EXPERIMENTAL

Four experiments were conducted in 1974. All of the ewe hoggets used were weighed prior to the start of mating (Experiments 1, 3 and 4) or 16 days after the start of mating (Experiment 2). Southdown rams fitted with "Sire-Sine" harnesses and crayons were used in all experiments. In Experiments 3 and 4 crayon marks were graded "good", "medium" or "poor" according to the intensity and spread of the mark on the rump. Observations of lambing were made twice daily in Experiments 1 and 2. Pregnancy was determined approximately 140 days after the start

of mating in Experiments 3 and 4. Ewes were turned on to their rump and in those not obviously pregnant, as evident from udder development and abdominal distension, an ultrasonic pregnancy detector (Allard, V.601, Sonicaid) was used.

Experiment 1

Seventy-seven Romney and 74 first-cross Cheviot × Romney hoggets were joined with three rams on May 10, each ram having a different coloured crayon in the marking harness. Each day animals with crayon marks were examined to determine the presence or absence of spermatozoa in the anterior vagina. A cotton wool swab attached to a ¼ in. wooden rod was inserted into the anterior vagina for 10 to 15 seconds and returned to a test-tube containing 10 ml 0.9% saline. After vigorous shaking of the severed swab in the stoppered test tube, a few drops of fluid were placed on a microscope slide and examined at 400× for the presence of spermatozoa. Preliminary observations had shown this technique to be a reliable indicator of spermatozoa in the anterior vagina. If spermatozoa were not identified in the washings on the day hoggets were first detected in oestrus, the animals were re-examined the next day.

Two days after marking by harnessed rams, the hoggets were transferred to another paddock and again run with three rams with different colour crayons in the mating harness. Animals returning to service were swabbed as above. Observations continued until 33 days after the start of mating.

Experiment 2

Two groups of 122 ewe hoggets, comprised of approximately equal numbers of Romneys, Coopworths and Perendales, were each joined with three rams on May 6. For the first 30 days rams were fitted with individually coloured crayons (changed on day 15) and from June 5 until June 17 (when rams were removed) all rams had the same coloured crayon.

Experiment 3

Two groups of 200 first-cross Border Leicester × Romney ewe hoggets were joined with eight rams or four rams on May 3. Mating continued for 32 days and recordings of mating were made after 16 days and at the end of mating.

EXPERIMENT 4

Two groups of 220 first-cross Border Leicester × Romney ewe hoggets were joined with four rams or two rams on April 17. Mating continued for 48 days, crayon colours being changed 16 and 32 days after the start of mating when recordings of crayon marks were made. The two groups were combined 32 days after the start of mating and ran together until the end of mating.

RESULTS

The mean liveweight of hoggets which were marked was higher than those which were not marked, with the exception of Romneys in Experiment 1 (Table 1).

TABLE 1: MEAN LIVEWEIGHTS

Experiment	*Date of Weighing*	*Breed*	*Liveweight (kg)*	*Difference Marked minus Unmarked*
1	10/5	Romney	28.6	−0.3
		Cheviot × Romney	28.5	2.5
2	20/5	Romney	28.1	3.8
		Coopworth	31.9	1.3
		Perendale	30.6	2.6
3	3/5	B.L. × Romney	38.5	1.3
4	3/5	B.L. × Romney	30.0	4.7

EXPERIMENT 1

Thirty-two of 77 Romney and 41 of 74 Cheviot × Romney hoggets were recorded as being marked. Data for mating and fertility are in Table 2. There were no differences in fertility between the Romney and the Cheviot × Romney hoggets and the data have been combined. More than half of the animals were marked by one ram only but in only 7 cases (8%) were ewes marked by all three rams. Spermatozoa were recovered from the anterior vagina of all of these 7 ewes but from a lower percentage of the animals marked by one or two rams. In 52 ewes which were marked by one ram, 16 had no spermatozoa recovered from the anterior vagina. The fertility of the 36 ewes from which spermatozoa were recovered was very low: only 6 lambed in comparison with 18 of 28 in ewes marked by two or three rams from which spermatozoa were recovered ($P < 0.01$).

TABLE 2: THE RELATIONSHIP BETWEEN THE NUMBER OF RAMS MARKING EACH EWE, THE NUMBER ACTUALLY MATED AND THE NUMBER LAMBING TO THAT MATING (Experiment 1)

Marked by	*No. of Records*[1]	*No. with Spermatozoa Present*	*No. Lambing to that Mating*	*% of those with Spermatozoa*
One ram	52	36 (69.2%)	6	16.7
Two rams	28	21 (75.0%)	13	61.9
Three rams	7	7 (100.0%)	5	71.4

[1] Includes returns to service.

EXPERIMENT 2

Thirty-five of 80 Romney ewe hoggets were marked by rams and of these only 17 lambed (Table 3). These values are low in comparison with the Perendales where 70 of 84 were marked by rams and 56 actually lambed ($P < 0.01$). Levels recorded in the Coopworth ewe hoggets were intermediate.

TABLE 3: MATING AND LAMBING PERFORMANCE OF THREE BREEDS OF EWE HOGGETS (Experiment 2)

Breed	*No. of Ewes*	*No. Marked*	*No. Lambing*	*% of those Marked*
Romney	80	35 (43.8%) a	17	48.6 a
Coopworth	80	56 (70.0%) b	37	66.0 ab
Perendale	84	70 (83.3%) b	56	80.0 b

Means within columns not having a common letter are significantly different $P < 0.01$.

There was no difference between the three breeds in the proportion that were marked by one or two rams in the first 30 days of mating (Table 4). Only in 5 of a total of 167 observations were animals mated by each of the three available rams. With the excep-

TABLE 4: LAMBING PERFORMANCE IN EWE HOGGETS MARKED BY ONE OR TWO RAMS (INCLUDES RETURNS TO SERVICE) (Experiment 2)

Marked by	*Romney*		*Coopworth*		*Perendale*	
	No. Marked	*No. Lambing*	*No. Marked*	*No. Lambing*	*No. Marked*	*No. Lambing*
One ram	21	6 (28.6%)	29	18 (62.1%)	40	30 (75.0%)
Two rams	15	9 (60.0%)	27	15 (55.6%)	30	22 (73.3%)

tion of the Romney hoggets there was no suggestion of any difference in fertility between hoggets marked by one or two rams.

EXPERIMENTS 3 AND 4

Mating and fertility data for Experiments 3 and 4 are in Tables 5 and 6, respectively, and also in Fig. 1.

In Experiment 3 there was little difference between the two groups in the number of hoggets marked during the first 16 days of joining, although the number marked in the second 16 days was

TABLE 5: MATING AND LAMBING PERFORMANCE
(Experiment 3)

Rams/ Ewe Hoggets	*No. Marked Days 1-16*	*No. Pregnant*	*No.*[1] *Marked Days 17-32*	*No. Pregnant*	*Total Marked*	*Total Pregnant*
4/200	108	80	79	50	160	130
8/200	115	68	106	64	181	132

[1] Includes returns to service.

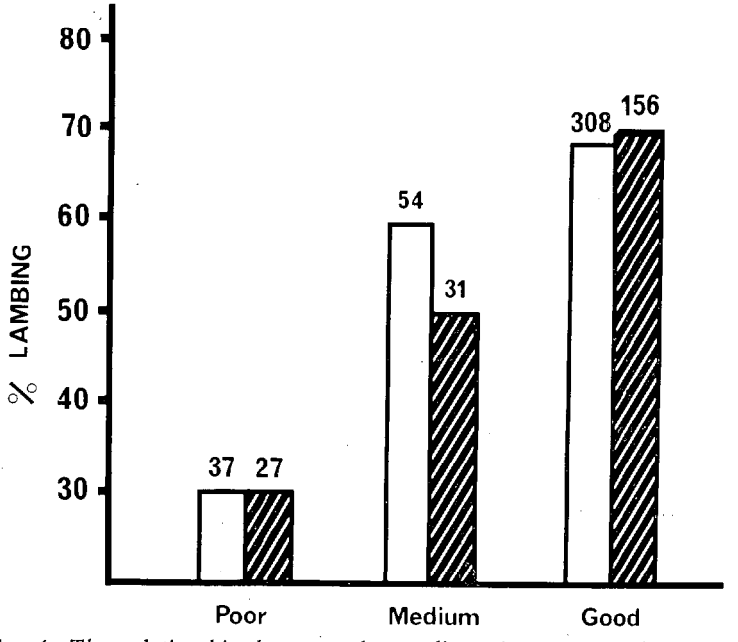

FIG. 1: *The relationship between the grading of crayon marks and the fertility of ewe hoggets. Experiment 3, open bars; Experiment 4, cross-hatched bars. (Number of records at the top of the bars.)*

TABLE 6: MATING AND LAMBING PERFORMANCE
(Experiment 4)

Rams/ Ewe Hoggets	*No. Marked Days 1-32*	*No. Pregnant*	*No.*[1] *Marked Days 33-48*	*No. Pregnant*	*Total Marked*	*Total Pregnant*
2/220	68	37	40	22	92	59
4/220	98	65	14	9	102	74

[1] Includes returns to service. Both groups were combined for Cycle 3 (May 3-19).

greater in the 8/200 group ($P < 0.01$). This, however, was primarily due to a greater number of animals returning to service ($P < 0.05$). Consequently the total numbers pregnant were similar in the two groups.

In Experiment 4 only six hoggets were marked in the first 16 days of mating (April 17-May 3). These data have been combined with those for the second cycle 16 days of mating in Table 6. The number of hoggets marked and lambing to service during the period April 17 to May 19, when the mating groups were running separately, was higher in the 4/220 group ($P < 0.01$). When the two groups were combined for the last 16 days of mating, more hoggets from the 2/220 group were marked ($P < 0.01$). Fifty-nine (26.8%) and 74 (33.6%) of the hoggets in the two flocks were pregnant at the time of pregnancy diagnosis. This difference was not statistically significant.

The intensity and spread of crayon marks gave some indication of subsequent fertility. The difference between animals with good or medium marks did not achieve statistical significance ($0.05 > P < 0.10$) but only 29.7% of those recorded with poor marks actually were pregnant ($P < 0.01$, Fig. 1).

DISCUSSION

Although the number of rams per number of ewe hoggets recorded in oestrus was well in excess of requirements for mature ewes (Allison, 1975) more than half of the animals in Experiments 1 and 2 were marked by only one ram and very few were marked by all of the three available rams. Presumably this is due to shorter durations of oestrus and to a lack of migratory behaviour (Dyrmundsson, 1973). It is well known that most rams will mount an oestrous ewe several times before achieving a successful service. Other things being equal, a ewe which is marked by more than one ram should have a better chance of being successfully mated than

a ewe mounted by one ram only. The data in Table 2 and Fig. 1 support this concept.

While there is a possibility that some of the "good" crayon marks could have been due to poor mating dexterity from some rams, resulting in a high number of mounts per service, a definite relationship between the crayon grading and fertility existed. These data are at variance with Cahill *et al.* (1974) who reported no relationship between "crayon score" and failure of fertilization. In Experiments 3 and 4 it is probable that many of the animals with "poor" crayon marks had not had any semen deposited in the anterior vagina. This may also apply to some of the animals with "medium" marks. There was no advantage in increasing the number of rams in Experiment 3 although with Border Leicester × Romney hoggets of high liveweight a ratio of 4/200 was probably adequate. Also in Experiment 2 there were no significant differences in fertility between hoggets mated by one or two rams. However, in Experiment 4 additional rams were an advantage in that more hoggets were mated at an earlier stage of the joining period. This would mean earlier lambing and subsequent weaning, thus allowing a longer period of time before the two-tooth mating in which any liveweight disadvantage, in comparison with unlambed animals, could be made up.

The number of hoggets lambing following marking by two or three rams was comparable in Experiments 1 and 2 but there was no apparent explanation for the extremely low fertility in animals marked by one ram only in Experiment 1. Some of the discrepancy may be accounted for by the fact that conception rates in ewes marked by one ram only are normally some 7 to 10% lower than in ewes marked by two or three rams (Allison, 1975). It also is possible that the swabbing for spermatozoa may have caused stress which upset sperm transport and survival (Thibault, 1973), thus affecting fertilization. This technique was used to enable the same animals to be used to detect vaginal spermatozoa as well as for fertility data. The use of intravaginal sponges to differentiate between mated and unmated ewes (Cahill *et al.*, 1974; Killeen 1974) does not allow any fertility information on the same sheep.

The data reported here are in accord with other observations in that the heavier ewe hoggets had a superior reprodutive performance (Dyrmundsson, 1973) and also that crossbred hoggets are more likely to exhibit oestrus than are Romney (Hight *et al.*, 1973). In Experiment 2 the mean liveweight of Coopworth and Perendale hoggets were 3.8 kg and 2.5 kg greater than Romneys. This difference would contribute to the difference in incidence of

oestrus. The very low fertility in Romney hoggets which were marked (Experiment 2) in comparison with Perendales (17/35 versus 56/70, $P < 0.01$, Experiment 2) was unexpected. Whether these differences are the result of some animals being mounted but not mated or due to differences in inherent fertility remains to be resolved.

Overseas reports are in general agreement that the practice of mating ewe hoggets has no detrimental effects on subsequent reproductive efficiency provided nutrition is adequate (Drymundsson, 1973). In New Zealand these observations have been confirmed by K. H. C. Lewis (unpublished data) who has shown a small depression in twinning at the 2-tooth lambing in hoggets which lambed (Lewis, 1959), but no differences thereafter in comparison with animals which did not lamb. Presumably hogget mating is not popular in New Zealand because of a depression of two-tooth lambing performance and also the nutritional problem that many hoggets are small, poorly developed and considered too small to mate. Certainly in hoggets of low liveweight the incidence of oestrus will be depressed but the levels of fertility achieved in Experiments 2 and 4 still suggest a considerable and unexploited potential for lamb production. The incidence of oestrus is higher in crossbred ewe hoggets and will probably also be higher in crosses involving imported exotic breeds (Land *et al.*, 1974).

More information is necessary on the importance of mating behaviour and the stresses of pregnancy and lactation in hoggets of lower liveweight. If hogget mating can be shown to be a bonus in terms of lamb production with a minimum of additional labour and without affecting subsequent productivity, then the practice should become more widely accepted.

ACKNOWLEDGEMENTS

We thank D. Millar and M. Chirnside for provision of stock and facilities and also I. D. Corson, R. W. Trotter and G. Cooney for experimental assistance.

REFERENCES

Allison, A. J., 1975: *N.Z. Jl agric. Res., 18:* 1.
Cahill, L. P.; Kearins, M. A.; Blockey, M. A.; Restall, B. J., 1974: *Aust. J. exp. Agric. Anim. Husb., 14:* 723.
Dyrmundsson, O. R., 1973: *Anim. Breed. Abstr., 41:* 273.
Hight, G. K.; Lang, D. R.; Jury, K. E., 1973: *N.Z. Jl agric. Res., 16:* 509.
Killeen, I. D., 1974: *J. Reprod. Fert., 36:* 464.
Land, R. B.; Russell, W. S.; Donald, H. P., 1974: *Anim. Prod., 18:* 265.
Lewis, K. H. C., 1959: *Proc. N.Z. Soc. Anim. Prod., 19:* 111.
Thibault, C., 1973: *J. Reprod. Fert., Suppl., 18:* 39.