A COMPARISON OF JOINING SYSTEMS FOR PRIME LAMB PRODUCTION

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I. INTRODUCTION

Numerous workers have examined the influence of time of joining on lambing performance in a wide range of localities and a number of sheep breeds (see review by Dun, Ahmed and Morrant 1960).

In determining joining time physiological factors must be considered, in particular the annual oestrus rhythm of peak activity in the autumn (Dun, Ahmed and Morrant 1960) and the peak incidence of multiple ovulations also in the autumn (Radford 1959). The choice of joining time may also depend on the incidence of lamb losses (Morley 1948) as well as economic factors.

While there have been many comparisons of autumn with spring joinings there is no work to demonstrate the influence of joining twice a year, on lamb production. The trial reported here examines three joining systems in which ewes are joined either in the spring or autumn, or twice each year.

II. MATERIALS AND METHODS

(a) Location

The experiments were carried out on the Department of Agriculture's Experiment Farm at Cowra, situated on undulating land typical of the prime lamb raising country of the central western slopes of N.S.W. The average annual rainfall of 25 in. (635 mm.) has no distinct seasonal incidence. The years of the trial, 1958-63, were characterised by average to good seasons. Pastures of subterranean clover (*Trifolium subterraneum* L.), wimmera rye grass (*Lolium rigidum* Gaud.), lucerne (*Medicago sativa* L.) and barley grass (*Hordeum leporinum* Link) were available for grazing.

(b) Sheep

Three hundred Border Leicester x Merino ewes, born in the spring of 1956, were purchased from the Narromine district of N.S.W. The breeding practice of the Narromine breeder is unknown. These ewes were randomly divided into three groups designated as Autumn, Spring or Dual depending on their time of joining.

Dorset horn rams were used.

(c) Joining

The Autumn ewes were first joined in March, 1958; the Spring ewes were first joined in October, 1958. Rams remained with the ewes for six weeks. Dual ewes were joined again each season, i.e. within four weeks of lambing.

(d) General Management

Ewes grazed good quality pasture for three weeks prior to joining, throughout joining and for the last six weeks of pregnancy. The ewes were shorn in July and

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crutched in January or February, rams being shorn twice per year. Ewes were drenched with phenothiazine prior to joining and lambing. Lambs were vaccinated against infectious entero-toxaemia and contagious ecthyma.

(e) Observations

Lambs were identified and weighed within 24 hours of birth. They were weighed again at marking and then at monthly intervals until they reached 32-34 kg (70-75 lb) liveweight. Any animal not reaching 32-34 kg within two months of the first ones doing so was sold. The average age of the lambs reaching 32-34 kg was 120 days. Ewe losses, reproductive records and group average fleece weights were collected.

(f) Analyses

The data were examined by analysis of variance. As litter size is a function of the time of mating it was removed as a variable only in the analysis of birth-weight.

TABLE 1

Fertility and production in groups joined in spring, autumn or at both times.

Year and Group	Lactating Ewes as % Ewes Joined	Multiple Births as % Lactating Ewes	Lambs Reaching Sale Weight as % Ewes Joined	Average Birth Wt. (kg)	Average Daily Gain to Sale Wt. (kg/day)	Liveweight Lamb Produced per 100 Ewes Joined (kg)	Wool Production per Head (kg)
1958							
Autumn†	85·0	17·6	92·0	4·94	0·27	2061	4·08
Spring‡	78·0	7·7	78·0	4·58	0·30	2362	4·54
Dual§	113·0	11·8	115·0	4·67	0·27	2241	4·49
1959							
Autumn	99·0	54·6	135·7	4·54	0·22	3726	3·86
Spring	76·8	36·8	90·9	4·13	0·22	2649	4·17
Dual	118·0	54·1	152·0	4·63	0·23	4533	4·26
1960							
Autumn	92·8	63·7	142·9	4·72	0·29	4364	4·22
Spring	73·2	31·0	89·7	4·63	0·24	2797	4·49
Dual	95·9	61·6	117·3	4·58	0·24	3483	4·26
1961							
Autumn	87·1	61·7	129·0	4·81	0·21	3959	3·76
Spring	51·8	19·0	62·9	4·13	0·22	1670	4·08
Dual	90·5	63·5	118·9	4·76	0·19	3360	4·04
1962							
Autumn	77·9	76·1	118·6	4·72	0·30	3165	3·99
Spring	66·7	28·0	77·3	4·17	0·16	2671	4·04
Dual	87·5	77·6	125·0	4·26	0·16	3525	3·95
Means							
Autumn	88·4	54·7	123·6	4·76	0·25	3255	4·08
Spring	69·3	24·5	79·8	4·31	0·23	2429	4·26
Dual	111·0	53·7	125·6	4·58	0·22	3338	4·22

†Autumn—joined 6 weeks, commencing early March.
‡Spring—joined 6 weeks, commencing early October.
§Dual—joined at both above times.

TABLE 2

Summary of *analyses*

Source of Variance	Multiple Births	% Ewes Lactating	% Lambs Reaching Sale Wt.	Av. Birth Weight	Av. Daily Gain to Sale Wt.	Liveweight Lamb Produced per 100 Ewes Joined	Average Wool Production per Head
Between groups	***	***	***	*	N.S.	*	*
Between years	**	*	N.S.	N.S.	N.S.	*	**

*P<0·05 **P<0·01 ***P<0·005 N.S.—Not Significant

The results of five joinings in the Autumn and Spring groups and of ten joinings in the Dual group have been analysed.

III. RESULTS

Table 1 presents the mean fertility and production figures in years and groups. Results of the associated analyses are presented in Table 2.

(a) Lambing Performance .

The percentage of both "wet" ewes (ewes detected as having a lamb) and multiple births in Autumn and Dual ewes was greater (P<0.001) than in the Spring ewes but differences between Autumn and Dual ewes were not significantly different from one another.

(b) Lamb Growth

The birth weight of lambs conceived in the Autumn was greater (P<0·05) than that of lambs conceived in the Spring.

There was no difference between mating groups or years in the daily gain to sale weight.

(c) Production Per Flock

The percentage of lambs reaching sale weight was greater (P<0.001) in the Autumn and Dual groups than in the Spring group. Autumn and Dual groups also produced a greater (P<0·05) total liveweight of lambs per 100 ewes joined. Because of the yearly variations in fecundity there was a significant year effect (P<0·05) on the total Iiveweight of lamb reaching 32-34 kg.

The Spring and Dual groups produced more wool per head (P<0·05) than the Autumn groups while years also had an effect on wool production (P<0·005).

(d) Lactation Anoestrum

Figure 1 shows the percentage of Dual ewes that failed to lamb after joining during lactation, e.g. at joining in spring 1958, 76% of those ewes which had just lambed, failed to lamb in autumn 1959.

During the first two years of dual mating, autumn joining of lactating ewes was considerably more *successful than spring joining (Figure 1); both differences were significant. The difference approached significance in the third year, but thereafter was small and not significant. In effect the flock had divided itself into autumn and spring mating groups. At some time during the trial all ewes mated in both the autumn and spring.

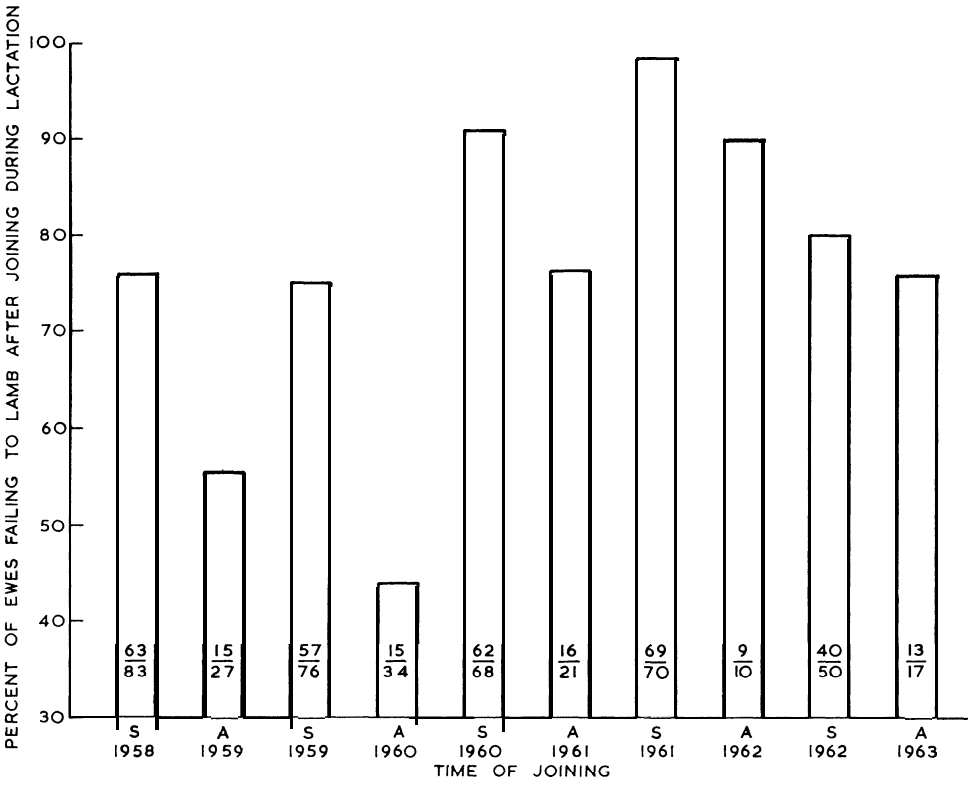

Fig. 1.- The percentage of ewes which have just lambed that fail to lamb again from an immediate joining. The numbers in the columns represent the actual number of ewes involved.
S-Spring, A-Autumn.

IV. DISCUSSION

This experiment shows that crossbred sheep are more fecund when mated in the autumn than when mated in the spring. The Autumn and Dual groups produced a greater weight of saleable lamb due to a higher proportion of ewes lambing, to more multiple births and to greater birthweights of individual lambs. However, the Spring group averaged 88 % lambs born alive, which supports the findings of Cannon and McConchie (1963) that Border Leicester x Merino ewes will mate successfully in October, under certain conditions.

The 10% difference between the Autumn and Spring groups in wool production per head supports the evidence of Seebeck and Tribe (1963) that lactation and the production of twins depress wool production. In this present experiment the Autumn group produced a greater number of ewes with lambs, more multiple births and less wool than the Spring group. There is no obvious explanation for the high wool production of the Dual group.

A possible confounding influence on the results of this trial was that shearing was carried out at a set time each year and thus occurred at different times in each group's breeding cycle. However, this effect is unlikely to account for the large differences observed here.

In a double mating system, the effects of ***post partum*** or lactational anoestrum must be considered. Asdell (1946) and Laing (1957) both state that complete anoestrum occurs for varying lengths of time in lactating ewes. Hammond (1944), Phillips, Schott and Simmons (1947) and Hafez (1952) noted that ewes which lambed during or just after the peak of annual sexual activity, experienced a shorter ***post partum*** anoestrum than ewes which lambed earlier or later. The results of the present experiment are in agreement with these findings. In addition there is a tendency for ewes which mate in the autumn to fail to mate in the following spring. The tendency in the later years for most ewes to fail to lamb from an immediate ***post partum*** joining, either in autumn or spring (Figure 1) may be due to the effects of age or the effects of poorer seasons (1960-62).

If the number of lambs produced per year was the only important factor, then the autumn joining which produces no less lambs than the double joining, would be the ideal system. However, seasonal price fluctuations also effect the return from lamb. Fluctuations of monthly lamb prices at Homebush (New South Wales) for the last five years (1958-1963) have been of about $\pm$ 5% of the annual mean (Anon. 1963). Although this variation is relatively small it may be sufficient to make spring joining a financially sound enterprise.

A dual mating system, despite the extra work involved, may be advantageous for two reasons. Firstly, to give a spread of lambing and hence of returns, and, secondly, the extra joining may be used to get those ewes in lamb which miss service or fail to conceive to the first joining. If these ewes conceived to the second joining then it is possible that the Dual system may produce more lambs than the Autumn system.

A further system and one which is already being used, is to join the ewes three times every two years. This system aims at avoiding ***post partum*** oestrus; however, it raises complicated management problems such as the fixing of shearing time.

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VI. REFERENCES

ANON. (1963). 28th Annual Report of the Australian Meat Board. Commonwealth of Australia, p. 84.

ASDELL, S. A. (1946). "Patterns of Mammalian Reproduction." (Cornstock Publishing Co. Inc.: New York.) p. 361.

CANNON, D. J., and MCCONCHIE, B. J. (1963). Reproductive performance of Border Leicester x Merino ewes in Northern Victoria when joined in the spring. ***Australian Journal of Experimental Agriculture and Animal Husbandry 3: 332.***

DUN, R. B., AHMED W., and MORRANT, A. J. (1960). Annual reproductive rhythm in Merino sheep related to the choice of mating time at Trangie, central western New South Wales. ***Australian Journal of Agricultural Research*** 11: 805.

HAFEZ, E. S. E. (1952). Studies on the breeding season of the ewe. Part IV. ***Journal of Agricultural Science 42:*** 189.

HAMMOND, J., Jnr. (1944). On the breeding season in the sheep. ***Journal*** of ***Agricultural Science 34: 97.***

LAING, J. A. (1957). Female fertility. "Progress in the Physiology of Farm Animals." ed. J. Hammond. (Butterworth Scientific Publications, London.) p. 773.

MORLEY, F. H. W. (1948). Some seasonal factors affecting fertility among Merino ewes in the Trangie district of New South Wales. ***Australian Veterinary Journal 24:*** 106.

PHILLIPS, R. W., SCHOTT, R. G., and SIMMONS, V. L. (1947). Seasonal variation in the occurrence of conceptions in Karakul sheep. ***Journal of Animal Science 6:*** 123.

RADFORD, H. M. (1959). Variation in the incidence of twin ovulation in Merino ewes on a constant plane of nutrition. ***Australian Journal of Agricultural Research*** 10: 377.

SEEBECK, R. M., and TRIBE, D. E. (1963). The relation between the lamb production and the wool production of the ***ewe. Australian Journal*** of ***Experimental Agriculture and Animal Husbandry 3:*** 149.