Reproductive Performance of Australian Dorset Ewes in Canada

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Introduction

The most popular breeds in Eastern Canada, the Border Leicester, North Country Cheviot and Suffolk are characterized by an extremely short breeding season. It starts usually in the autumn (September - October) and lasts for 3 to 4 months (Dufour 1974). To improve sheep production in Eastern Canada a program to develop a new breed was initiated. This program required the formation of a gene pool from 3 breeds each designed to provide the pool with certain characters. The Suffolk was chosen for its fast growth and superior carcass quality, the Leicester for its exceptional milking and mothering abilities. A third breed was needed to provide the pool with genes responsible for long breeding season. The Australian Dorset was chosen for this purpose. The objective of this paper is to report on the reproductive performance of ewes of this breed in Canada and that of ewes obtained by crossing Canadian Dorset with Australian Dorset.

Dorset-crossed ewes.

Materials and methods

Twenty four pregnant Dorset ewes ranging in age between 1 and 4 years (mostly 2 and 3 years old) were imported from two flocks in Australia in October of 1965. The ewes were kept in quarantine in British Columbia for three months where they lambed their first Canadian-born lambs. One ewe died during the quarantine period and two lambs were born dead. The surviving ewes and their lambs were transferred to the Lennoxville Research Station in January of 1966. The ewes were soon rebred using seven Canadian Dorset rams purchased from different flocks in Ontario. The herd was closed thereafter, except in 1971 when the ewes were bred to a ram from a breed native to Newfoundland. In 1972 the flock was moved to another station (Lapocatière 320 km North-east) where they lambed their last lambing in the spring of 1973. After that lambing the flock was disposed of.

At Lennoxville and later at Lapocatière the sheep were kept in a sheep barn with adjacent paddock during winter and on pasture during summer. Sheep on pasture were supplemented in the fall with 225 g of grain. During the winter, they were fed hay given free choice and supplemented with 340 g per day of a concentrate mixture. After lambing the concentrate mixture was increased to 450 g per day. Whenever space permitted, twin-lambing ewes were penned together and given more concentrate. The lambs were weaned at 70 days of age and were fed grain *ad libitum* until they weighed 25 kg. The ewes were deprived of grain for 2 weeks following weaning to reduce milk production, then were fed from 225 to 450 g of grain until they were sent on pasture. The ewes were bred in September of each year; the number of ewes exposed is presented in Table 1. Rams were placed with ewes in pens for about 4 to 6 weeks. The rams chosen for breeding were not related to the ewes alloted for them to keep inbreeding as minimum as possible. In 1967 and 1968 the ewes were exposed to the rams on pasture (late in spring) in an attempt to have two lambing per year. This management was discontinued in 1969 and 1970 because the results were very poor. In 1971 the ewes were mated in June but since few conceived the non-pregnant ewes were rebred again in September. The data on these matings were excluded from the analyses though they will be presented separately with the results. A few ewes were exposed to rams as yearlings, the data obtained from these matings were also excluded from the analyses.

The traits studied were: 1. fertility expressed as 1, gave a litter and 0, non-pregnant; 2. litter size, 1, 2 or 3 depending on the number of lambs born; 3. litter size at weaning (70 days); and 4. lambs weight at birth. The weights of ewes were taken after the spring lambing. These weights were used to represent the yearly changes in the ewes' weight.

Dorset-crossed ewe producing 2 lambings per year.

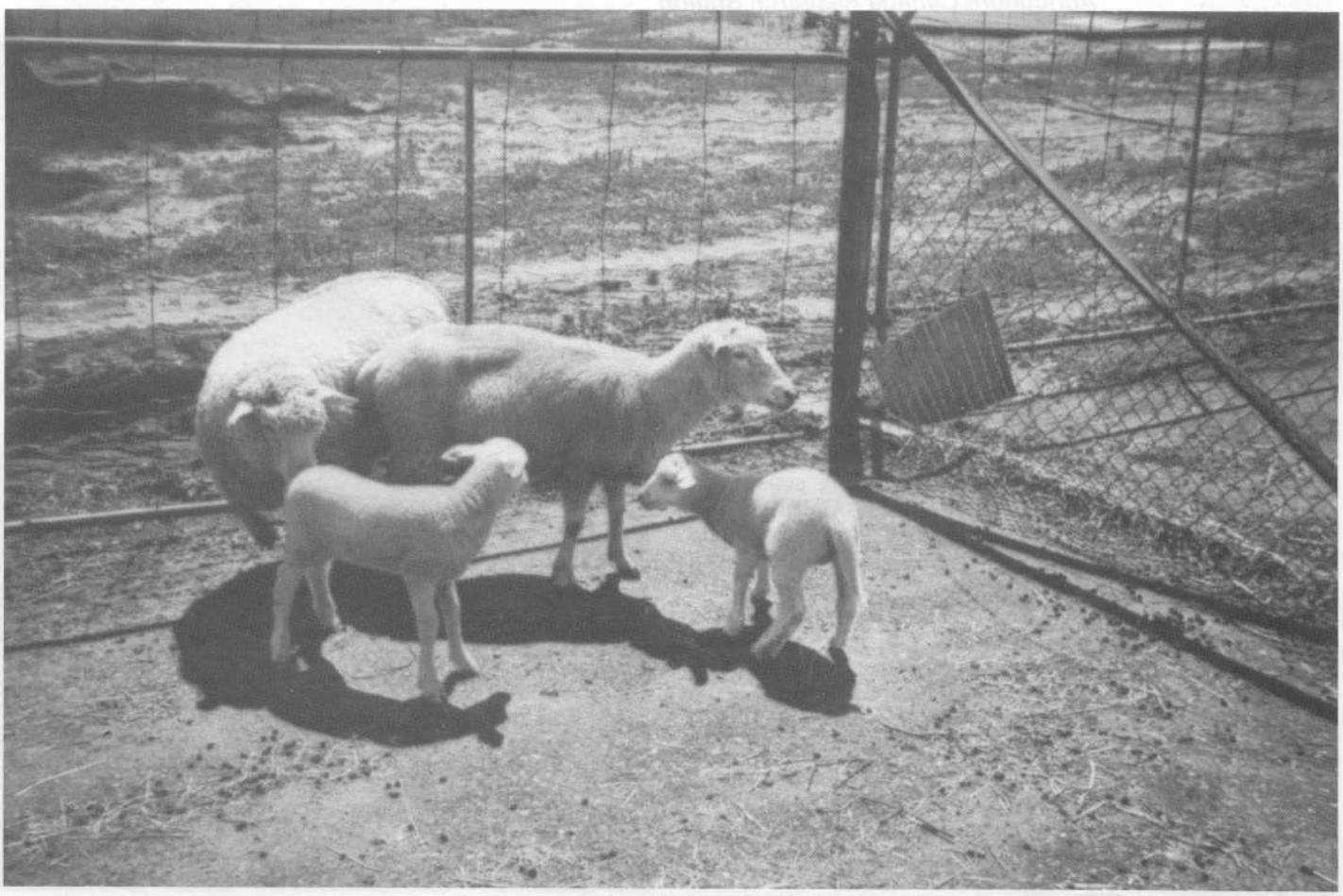
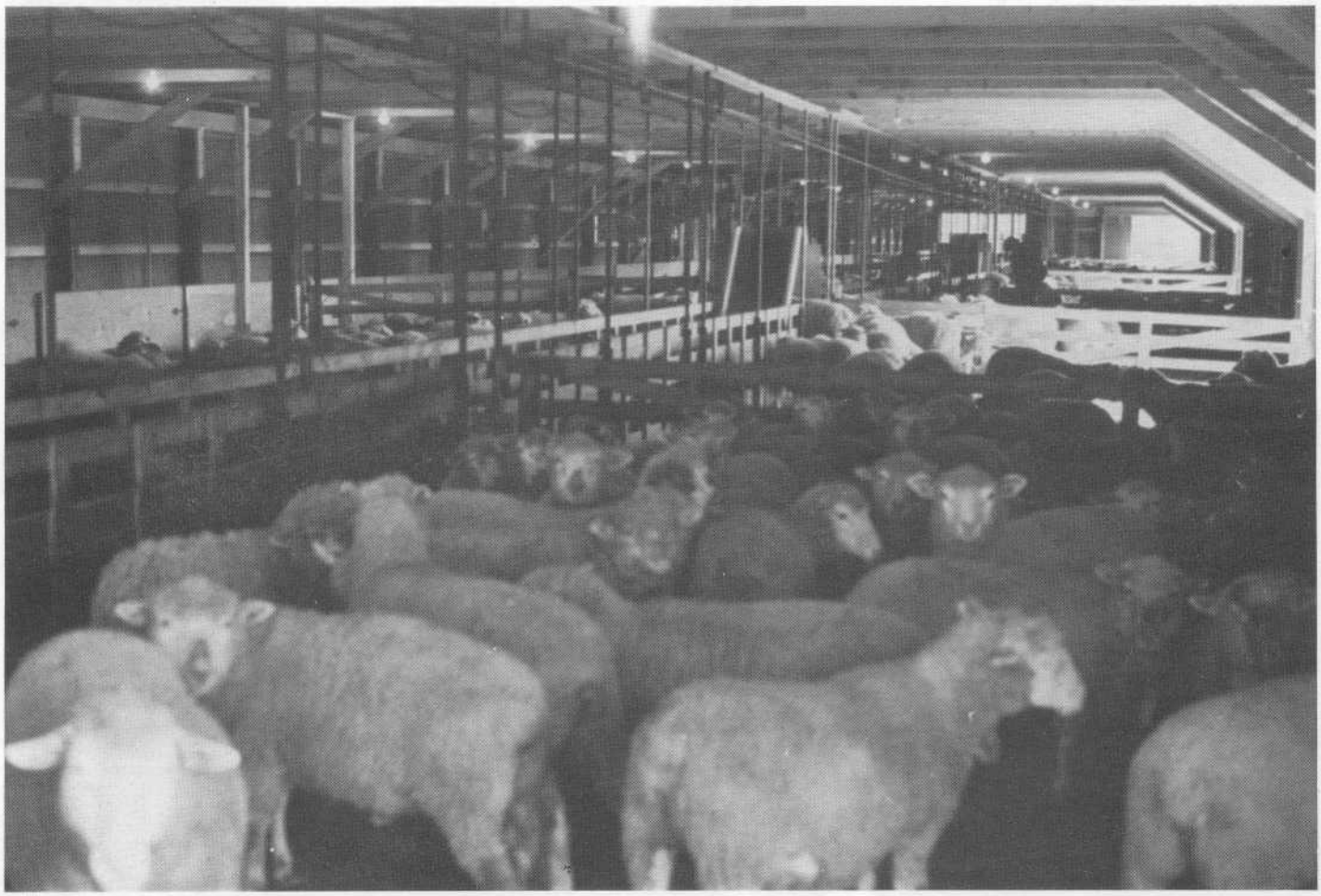


TABLE 1 - Number of ewes exposed yearly to rams according to year of birth and genetic group.

Group	Year of birth	Year of lambing									Number of ewes
		1965	1966	1967	1968	1969	1970	1971	1972	1973	
Imported Australian	1961	1	1	1	1	1	1	1			
	1962	4	4	4	3	2	1	—			
	1963	16	16	15	14	13	11	5			
	1964	2*	2	2	1	1	1	1			
Australian born in Canada	1965			7	6	6	5	5	3	2	
Canadian x Australian F_1 & F_2	1966				7	7	7	6		4	
	1967					16	16	16	7	5	
	1968						12	11	4	4	
	1969						12*	12	8	3	
	1970								18	7	
	1971								5*	5	
	1972									2*	
Australian		23	23	29	25	23	19	12	3	2	30
F_1 & F_2		—	—	—	7	23	47	45	42	30	70
Total		23	23	29	32	46	66	57	45	32	100

* Ewes exposed as yearlings.

Dorset crossed ewes.



Statistical Analysis

The data were analyzed statistically using the least squares method of fitting constants (Harvey, 1960). The model used was:

$$Y_{ijklm} = u + g_{i)} + d_{ij} + a_k + r_l + e_{ijklm}$$

where u refers to overall mean; g to the effect of the i^{th} breed group, original Australian ewes imported, Australian born in Canada, F_1 and F_2 (first and second generations, Canadian x Australian); d, to the effect of the j^{th} ewe nested within the i^{th} group; a, to the effect of the k^{th} age of ewe; r, to the effect of the 1^{th} year of lambing and, e to a random element associated with each observation. The effects of group year and age were assumed to be fixed whereas those of ewe and e to be random. The model used to analyze birth weight of lambs also included the effects of type of birth and sex. Significant differences among subclasses were detected using t test.

Results

Out of season breeding

The original 24 ewes imported from Australia were bred in June and July in Australia i.e. in midwinter. After they had lambed in October to December and weaned their lambs in Canada they commenced cycling and it was possible to rebreed them to lamb again in the summer of 1966. Theses were the circumstances under which the ewes gave two lambings in one year. Breeding in the summer (June) of 1967 and 1968 was not successful; of 21 ewes exposed in 1967 and 26 exposed in 1968 only one, the same ewe lambed. When summer mating was repeated in 1971, only eight ewes out of 29 (28%) lambed. The results of Dufour (1974) showed that the Dorset ewes experience a period of anoestrus during the summer months.

Fertility

The cross between Canadian and Australian Dorset had a higher percentage of ewes lambing per ewes joined,

Australian Dorset horn ewe at Lennoxville, Quebec.

(Table 2) compared to that of the ewes imported from Australia. The low fertility of the group of ewes imported from Australia (77.8%) resulted mainly from their low fertility at 2 and 3 years of age (70 and 71% respectively). The differences between the 4 groups were however non-significant. Fertility was highest (85 and 86%) in 2- and 3- year - old ewes (Table 3) then dropped at older ages. The effect of age of ewe on fertility was non-significant.

Prolificacy

The number of lambs born was slightly higher though nonsignificantly in the F_1 and F_2 Canadian x Australian Dorset (Table 2) than in the two Australian groups. Preweaning lamb survival averaged 78.6% for the four groups, it was highest in the group imported (84.2%), followed by the F_1 (81.7%). Survival was highest in lambs born to 4-6-year-old ewes, it dropped in younger and older ewes.

Lamb birth weight

The heaviest lambs (4.08 kg) were born to the imported ewes, those born to Australian Dorset born in Canada were about 0.5 kg lighter (Table 2). Four to six-year-old ewes had the heaviest lambs whereas 2-year-old ewes lambed the lightest lambs. Single lambs averaged 3.98 kg, 33% heavier than twin-born lambs. Male lambs averaged 3.63 kg, 8% heavier than females.

Discussion

The change in environment from Australian to Canadian conditions was so drastic that the imported ewes needed a few years to adapt. This was observed from the low fertility of the ewes in the first years, then from the continuous loss of weight and condition. At importation the ewes averaged 69 kg live weight, three years later, when the majority of the ewes attained 6 years of age the average weight had declined by 9 kg (Fig. 1). All efforts made to maintain the weights of these ewes failed. The seven pure Australian ewes born in Canada were generally lighter in weight than their dams at the various given ages, taking into consideration that direct comparisons were not possible because of the differences in years. The ewes of the cross between Canadian and Australian Dorset were intermediate in weight between those imported and those born in Canada. The loss of condition may explain the relatively poor fertility of the imported group as compared to the ewes born in Canada. On the other hand the imported ewes had the highest lamb survival rate and the heaviest lamb weight at birth, probably as a result of their heavier weights.

The failure of the Dorset ewes to breed in summer in the present study indicated that they pass throught a period of reduced fertility during the summer months which was also observed by Dufour (1974). Zollinger, *et al.* (1969) reported that 37% of the ewes bred in the spring lambed compared to 74% for those bred in the fall. The

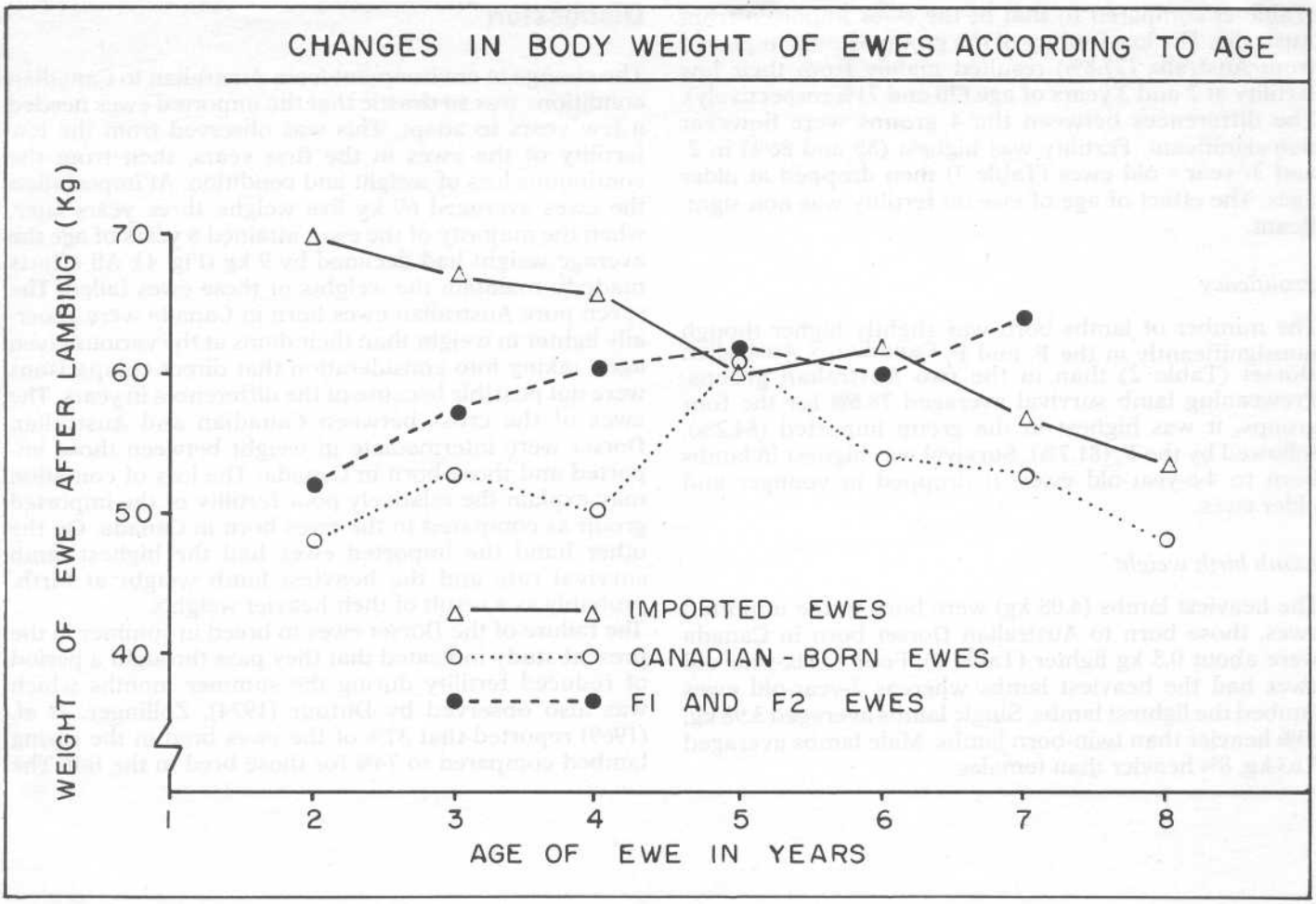
TABLE 2 - Reproductive performance of the various breeding groups.

	No of ewes	No of Expo-sures	Fertility %	No of Lambings	Lambs born/ ewe Lambing	Lambs weaned/ ewe Lambing	Survival rate %	No of Lambs	Lamb birth weight kg
u± S.E.	100	341	82.2 ±.040	280	1.40 ±.057	1.10 ±.070	78.6	350	3.49 ±.09
Imported ewes	23	123	77.8	95	1.39	1.17	84.2	96	4.08 a
Canadian-born ewes	7	36	82.8	31	1.36	1.03	75.7	43	3.49 b
F_1 Canadian x Australian	36	126	83.7	107	1.42	1.16	81.7	149	3.21 c
F_2 Canadian x Australian	34	56	84.6	47	1.42	1.03	72.5	62	3.16 c

a -c means followed by different letters are significantly different ($P < 0.05$)

TABLE 3 - Effect of age of ewe on reproductive performance.

Age of ewe	No of Exposures	Fertility %	No of Lambings	Lamb born/ ewe Lambing	Lambs weaned/ ewe Lambing	Survival %	No of Lambs	Lamb birth weight
2 years	90	85.3	76	1.43	0.87	61.0	70	3.24
3 years	80	86.2	69	1.52	1.25	82.2	82	3.45
4-6 years	139	77.6	110	1.40	1.25	89.3	160	3.77
7 years and older	32	80.0	25	1.24	1.01	81.5	38	3.48



latter percentage is very close to that found for the imported Dorset ewes in the present study.

The average lambing rate of 1.40 found in the present study for the Australian Dorset and its cross with the Canadian Dorset is close to the 1.66 estimate reported by Zollinger *et al.* (1969). Survival rate of the lambs was relatively low in the present study, with most of the deaths occuring at birth or soon after. This agrees with the findings of Fogarty (1971) who reported that the survival rate in an Australian flock was 71% in autumn lambing but only 55% in spring lambing. He showed that about 80% of the loss resulted from dystocia. Low survival rates were also reported by Zollinger *et al.* (1969) at 69% in autumn lambing and 88% in spring lambing.

It can be concluded from this study that an imported stock may sometimes find it difficult to adapt easily to a different environment. Their progeny however, being adapted to the new environment might be expected to be more productive than the original stock.

Acknowledgements

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