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Level of nutrition of the ewe and lamb survival

D. L. JOHNSON, J. N. CLARKE, K. S. MACLEAN, E. H. COX and N. C. AMYES

Ruakura Agricultural Research Centre, Hamilton

P. V. RATTRAY

Whatawhata Hill Country Research Station, Hamilton

ABSTRACT

The survival of lambs of 4 breeds of sheep managed at 3 stocking rates was analysed. There was no apparent effect of stocking rate on lamb survival. The mortality among multiple-born lambs was 20% compared with 15% among singles and this difference was associated with birth weight. Year of birth and breed also had important effects on survival. There was no evidence to support the suggestion that increasing the average birth weight of twin-born lambs would increase their probability of survival.

INTRODUCTION

The identification of pregnancy (ewe) and birth rank (lamb) status could facilitate differential pre-natal and early post-natal management of single- and multiple-bearing ewes, one of the possible objectives being improved survival of twin-born lambs, although it is not clear what this management should involve. Hight and Jury (1970) and Dalton *et al.* (1980), in their analyses of lamb survival among 18 000 lambs over 17 years at the Whatawhata Hill Country Research Station, showed that twin-born lambs had higher mortality than single-born lambs (21% v 16% and 27% v 17% respectively). Both studies indicate that single- and twin-born lambs of the same birth weight have a similar chance of survival, a finding also supported by Purser and Young (1964). If the relationship between birth weight and survival is causative, then any management technique aimed at increasing the birth weight of multiples might increase their probability of survival towards the level for singles.

In this paper the source of data is the Ruakura 'Breed by Stocking Rate' trial from which the effect of different levels of ewe stocking rate on lamb birth weight and the subsequent effect on survival can be studied.

MATERIALS AND METHODS

Four breeds (high fertility Romney, control Romney, Coopworth and Perendale) were run at 3 stocking rates (26, 21 and 16 ewes/ha) referred to subsequently as high, medium and low respectively. For detailed information on the trial design see Joyce *et al.* (1967a, b) or Rattray *et al.* (1978). A total of 6180 lambs born during 1973/7 are included in this study. The effects on lamb survival (lambs weaned per 100 lambs born) of stocking rate, year born, breed, age of dam, sex, birth rank and birth weight

were analysed by logit transformation as described by Dalton *et al.* (1980). In determining the relative influence of different effects included in a model, the entropy measure of residual variation for binomial data has been used (Efron, 1978).

RESULTS

Estimates for lamb survival, derived from the logit model are presented in Table 1. The 2 Romney strains had a lower survival rate than either the Perendale or Coopworth breeds particularly among the multiple-born lambs. Coopworths tended to have the lowest mortality. Female survival was higher than

TABLE 1 Lamb survival (lambs weaned per 100 lambs born).

		Single	Multiple
Mean		84.3	79.3
Stocking Rate (ewe/ha)	26	84.5	79.7
	21	83.4 NS	81.0 NS
	16	84.8	77.2
Breed	High fert. Rom.	82.5	76.0
	Cont. Rom.	83.5 NS	76.4***
	Coopworth	86.7	83.6
	Perendale	84.1	80.7
Sex	Male	81.7 **	78.2 NS
	Female	86.6	80.5
Age of dam	2 year	83.8	77.8
	3 year	82.8	80.9
	4 year	85.8 NS	82.2 *
	5 year +	84.5	76.4
Year of birth	1973	84.0	81.2
	1974	82.4	76.6
	1975	88.4 *	84.5***
	1976	80.5	75.1
	1977	85.0	78.2

male, this difference being more marked among singles. The effect of stocking rate on survival was not significant for singles or multiples. Year of birth had a significant effect on lamb survival, the range being approximately 8% over the 5 years for both singles and multiples.

After allowing for the effects of breed, sex and age of dam which in total accounted for 5% of the variation, an additional 5% of the variation in survival was attributable to environmental influences associated with differences among years and stocking rates. Most of this 'residual' environmental variation was associated with differences among years. All 2-factor interactions among year born, stocking rate and breed were also tested but none was significant.

Multiple-born lambs had 5% lower survival than single-born lambs ($P < 0.001$) this effect accounting for a further 2.5% of the variation in survival. Alternatively, the linear and quadratic effects of birth weight accounted for an additional 4% of the variation in survival but had no appreciable effect on the variability in survival due to stocking rate or year. The average effects on birth weight of decreasing stocking rate adjusted for birth rank (singles were 1 kg heavier than multiples) and relative to high stocking were 0.06 kg and 0.15 kg for the medium and low stocking rates, respectively. The corresponding stocking rate increases in winter live weights for ewes were approximately 2 kg and 5 kg, respectively.

DISCUSSION

The effect of differing stocking rates during pregnancy was to change the birth weight of multiple-born lambs by 0.15 kg on average without any corresponding change in lamb mortality. Coop (1950) fed ewes either to gain (10 to 16 kg) or to maintain live weight. Twin lambs from the higher plane ewes weighed approximately 0.14 kg more at birth than those from the lower plane ewes but there was no difference in lamb mortality between the groups.

A large part of the variation in lamb birth weight within a flock may be explained by variation in the extent of placental development, which is normally completed by day 100 of pregnancy (Davis *et al.*,

1981). Manipulation of feed intake in late pregnancy may therefore be of limited value particularly under pasture feeding. Under pen-feeding conditions, Rattray and Trigg (1979) have indicated that an increase in the birth weight of twin-born lambs of 0.5 kg is about the maximum that can be achieved through a high level of nutrition for twin-bearing ewes during the last 5 to 6 weeks of pregnancy.

The seasonal effect on survival, which is not associated to any great extent with birth weight differences between years, is an important source of variability. Factors such as cold stress are probably important here. Shelter for lambing ewes might assist in reducing such mortality (Alexander *et al.*, 1980), but is usually limited and accordingly may be most beneficial for smaller multiple-born lambs.

Relationships between survival and birth weight on a within-management group basis need not translate directly to the between-management group situation. These results provide no support to the hypothesis that increasing the average birth weight of twin-born lambs would increase their probability of survival.

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