REPRODUCTIVE PERFORMANCE OF BORDER LEICESTER EWES

N. M. FOGARTY*, B. J. McGUIRK+ AND P. J. NICHOLLS++

Summary

The reproductive performance and mortality of 624 Border Leicester ewes from 1963 to 1974 at Cowra Agricultural Research Station is reported. Although 49% of lambing ewes produced twins or triplets, 44% of the ewes failed to lamb. Age of ewe effects were significant for litter size and lambs born per ewe joined (\(L_{BJ}\)). Ewe mortality was higher among older ewes.

For \(L_{BJ}\) the intraclass correlation estimate of repeatability was 0.13 with a pooled regression estimate of 0.12. Ewes failing to lamb produced 0.22 fewer lambs at their following lambing than ewes initially producing one lamb. However there was no additional advantage in subsequent performance for ewes initially producing twin lambs.

Extreme culling of dry maiden ewes in such a flock of six age groups was estimated to raise \(L_{BJ}\) from 78.8% to only 82.7%.

I. INTRODUCTION

In Australia the Border Leicester breed is maintained almost exclusively to provide rams for crossing with Merino ewes. The first cross ewe progeny have proved highly successful for lamb production due to their high level of reproductive performance, wool production and ease of management.

The Border Leicester has generally been considered a highly prolific breed, and lambings of 18% have been attributed to it under U.K. conditions (Yeates 1965). However a recent survey of the Flock Book for British Breeds of Sheep in Australia indicated a much lower level of performance (Trounson and Roberts 1970). In another study, McGuirk (1967) found a high proportion of dry ewes and high lamb losses in a small Border Leicester flock, although fecundity was high.

This study reports on the survival and reproductive performance of Border Leicester ewes at Cowra Agricultural Research Station.

II. MATERIALS AND METHODS

(a) Sheep and Management

Observations were made on the performance of 624 ewes in three experimental flocks at Cowra Agricultural Research Station from 1963 to 1974.

One flock (A) consisted of the base Border Leicester ewes in a hybrid vigour experiment, mated to either Merino or Border Leicester rams, in the years 1963 to 1967. Another flock (B) comprised the purebred progeny of flock A, and was joined to Dorset Horn rams in the years 1965 to 1973. The performance of these flocks was presented in part by McGuirk (1967).

New South Wales Department of Agriculture,
* Agricultural Research Station, Cowra,
+ C/- C.S.I.R.O., Division of Animal Genetics, Epping.
++ Biometrical Branch, Sydney.

117
Flock C was established in 1969 by the purchase of 100 young ewes from a commercial stud. A further 145 young ewes from three different studs were added in 1970. Rams were obtained from all four studs. Since these initial introductions, ram and ewe replacements have been bred within the flock.

No culling was practised in flock B and ewes were kept for five joinings. In flocks A and C, a small number of ewes were culled prior to joining in two years.

All flocks were joined in the autumn each year for five to six weeks, with ewes first joined at 1½ years of age. Flocks A and B were paddock joined to a group of rams. Flock C was paddock joined in single ram groups from 1969 to 1971 and artificial insemination with backstop paddock joining was used from 1972 to 1974.

(b) Records and analysis

Ewe mortality records were obtained between successive joinings. For each ewe joined and alive at lambing, joining and lambing records were obtained. Only purebred lambs were considered for survival to weaning. The measures of reproductive performance at individual joinings or lambings were: ewes raddled per ewe joined (EPJ), ewes lambing per ewe joined (EPJ), litter size (LBp), lambs born per ewe joined (LBp), and lambs weaned per ewe lambing (Lwp).

Least squares analysis was used to assess the factors; age of ewe at lambing (2 to 7 years), ewe birth type (single or multiple), year of lambing, and the age of ewe x ewe birth type interaction for each measure of reproductive performance. Although the method is not exact for discrete data, a significant factor under the usual test was accepted as a real effect and the derived standard errors were taken as rough estimates of the expected sampling variation. Lambs weaned per ewe joined (Lwp) was calculated as the product of EPJ and LBp.

The repeatabilities for EPJ, LBp and Lwp were estimated as the intraclass correlation from a hierarchical analysis carried out within drops. The repeatability of Lwp was also estimated by regression (Lush 1956; Young, Turner and Dolling 1963). Records at either first or second lambing (Lwp) were examined as predictors of performance at either second and third lambings or third lambing respectively.

III. RESULTS

Estimates of ewe mortality (Table 1) indicate a trend towards higher losses among older ewes.

**TABLE 1**

Age specific ewe mortality

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>1½--2½</th>
<th>2½--3½</th>
<th>3½--4½</th>
<th>4½--5½</th>
<th>5½--6½</th>
<th>6½--7½</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ewes initially</td>
<td>513</td>
<td>424</td>
<td>389</td>
<td>285</td>
<td>143</td>
<td>35</td>
</tr>
<tr>
<td>Mortality (%)</td>
<td>10.9</td>
<td>10.4</td>
<td>18.3</td>
<td>23.5</td>
<td>18.9</td>
<td>31.4</td>
</tr>
</tbody>
</table>

Age of ewe had a significant effect on both LBp and Lwp (Table 2, P < 0.05). Both traits increased with age of ewes from two to five years and Lwp then declined. A similar pattern of change in performance
with age occurred for $E_{RJ}$ and $E_{LJ}$, but age of ewe effects were not significant. Ewe birth type and the age of ewe x birth type interaction were not significant for any measure of performance.

TABLE 2
Least squares means and standard errors of components of reproductive performance for age of ewe

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>$E_{RJ}$</td>
<td>0.878</td>
<td>0.902</td>
<td>0.930</td>
<td>0.931</td>
<td>0.931</td>
<td>0.920</td>
<td>0.915</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.016)</td>
<td>(0.017)</td>
<td>(0.018)</td>
<td>(0.023)</td>
<td>(0.040)</td>
<td>(0.010)</td>
</tr>
<tr>
<td>$E_{LJ}$</td>
<td>0.538</td>
<td>0.586</td>
<td>0.622</td>
<td>0.601</td>
<td>0.527</td>
<td>0.501</td>
<td>0.562</td>
</tr>
<tr>
<td></td>
<td>(0.024)</td>
<td>(0.025)</td>
<td>(0.026)</td>
<td>(0.031)</td>
<td>(0.038)</td>
<td>(0.059)</td>
<td>(0.015)</td>
</tr>
<tr>
<td>$L_{EP}$</td>
<td>1.38</td>
<td>1.49</td>
<td>1.54</td>
<td>1.60</td>
<td>1.54</td>
<td>1.56</td>
<td>1.52</td>
</tr>
<tr>
<td></td>
<td>(0.037)</td>
<td>(0.038)</td>
<td>(0.038)</td>
<td>(0.046)</td>
<td>(0.061)</td>
<td>(0.096)</td>
<td>(0.023)</td>
</tr>
<tr>
<td>$L_{BJ}$</td>
<td>0.741</td>
<td>0.877</td>
<td>0.957</td>
<td>0.961</td>
<td>0.817</td>
<td>0.778</td>
<td>0.855</td>
</tr>
<tr>
<td></td>
<td>(0.042)</td>
<td>(0.044)</td>
<td>(0.046)</td>
<td>(0.054)</td>
<td>(0.066)</td>
<td>(0.101)</td>
<td>(0.025)</td>
</tr>
<tr>
<td>$W_{EP}$</td>
<td>0.637</td>
<td>0.690</td>
<td>0.787</td>
<td>0.744</td>
<td>0.607</td>
<td>0.582</td>
<td>0.672</td>
</tr>
<tr>
<td></td>
<td>(0.047)</td>
<td>(0.054)</td>
<td>(0.059)</td>
<td>(0.060)</td>
<td>(0.059)</td>
<td>(0.065)</td>
<td>(0.037)</td>
</tr>
</tbody>
</table>

No. records 498 443 398 269 164 79 1891

* Age of ewe effects significant, $P < 0.05$
+ A total of 1526 ewe records available
++ $L_{EP} \times E_{PJ}$ with a total of 640 ewe records for $L_{EP}$

The intraclass correlation estimates of repeatability, with their standard errors, were 0.14 (0.02) for $E_{RJ}$, 0.02 (0.04) for $L_{BP}$, and 0.13 (0.02) for $L_{BJ}$. The pooled regression estimate of the repeatability of $L_{BJ}$ (Table 3), was similar to the intraclass correlation estimate. Ewes producing no lambs in their first or second year in the breeding flock produced on average 0.22 fewer lambs at subsequent lambings than ewes initially producing one lamb (Table 3). However there was no additional advantage in subsequent performance for ewes initially producing twin lambs.

TABLE 3
Regression coefficients and standard errors of subsequent on early reproductive performance ($E_{RJ}$)

<table>
<thead>
<tr>
<th>Initial lambing</th>
<th>Lambings considered</th>
<th>Weighted average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 and 2</td>
<td>1 and 3</td>
</tr>
<tr>
<td>Repeatability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(pooled regression)</td>
<td>0.16 (0.06)</td>
<td>0.10 (0.09)</td>
</tr>
<tr>
<td>0 x 1 lamb</td>
<td>0.22 (0.10)</td>
<td>0.22 (0.16)</td>
</tr>
<tr>
<td>1 x 2 lambs</td>
<td>0.08 (0.08)</td>
<td>-0.11 (0.12)</td>
</tr>
</tbody>
</table>
IV. DISCUSSION

The level of reproductive performance of these ewes is similar to that reported in the survey of Trounson and Roberts (1970). In the records examined, 44% of ewes failed to lamb, although 49% of lambing ewes produced twins or triplets.

Net reproductive rates (Turner and Young 1969) were used to assess the joint effects of ewe mortality and reproductive performance on flock productivity and the scope for selection. In these calculations ewe mortality was assumed to be 10% between each of the first two pairs of joinings, and 2% between later successive pairs of joinings. Mortality between weaning and first joining was taken as 6% (McGuirk and Manwaring, unpublished data).

Based on these calculations, a flock such as the one described here would need at least four age groups of ewes (two to five years at lambing) to be self-replacing. With this age structure 4% of hogget ewes could be culled. Flocks of five and six age groups of ewes would permit the culling of 14% and 21% respectively of hogget ewes.

The difference between dry and lambing ewes in their subsequent reproductive performance (0.22) is higher than previously reported (Young, Turner and Dolling 1963). This suggests that culling dry ewes might result in worthwhile improvement in current flock performance. However, to carry out such a culling programme more hogget ewes have to be taken into the flock, and the size of other age groups reduced, if the flock size and number of age groups are to be maintained. This will lower the reproductive performance of the flock. Further, the high incidence of dry ewes will not allow all dry maiden ewes to be culled. For example, in a flock of six age groups of ewes, only 69% of dry maiden ewes could be culled even with the retention of all hogget ewes for joining. With such a culling regime, and assuming a difference of 0.22 in $L_{15}$ at all subsequent lambings between dry and lambing maiden ewes, $L_{15}$ for the flock would only be raised from 78.8% to 82.7%.

V. ACKNOWLEDGEMENTS

We wish to thank the Manager and staff of Cowra Agricultural Research Station for the care and management of the flocks and collection of many of the records.

VI. REFERENCES


