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Abstract:

The number of lambs weaned per ewe is an important factor contributing to both the level of production and producer income. The production and gross margins resulting from varying pregnancy rate, twinning rate, and the use of flushing were compared for a Terminal over Merino ewe enterprise using simulation modelling of a farm at Tarcutta (New South Wales) with 20% of area sown to lucerne. A 20% lower pregnancy rate had a larger impact on gross margins than a 50% reduction in twinning rate. Flushing, on average, increased lamb production and gross margins compared with the standard, but was only possible in 50% of years. On-farm management which avoids reductions in pregnancy rate may be more important for producers than aiming to increase twinning rate, but large gains are possible by flushing ewes to increase twinning rates if this can be achieved frequently and the survival of twins is high.
Modelling the potential for flushing or improved pregnancy rate to increase gross margins for sheep flocks

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Summary

The number of lambs weaned per ewe is an important factor contributing to both the level of production and producer income. The production and gross margins resulting from varying pregnancy rate, twinning rate, and the use of flushing were compared for a Terminal over Merino ewe enterprise using simulation modelling of a farm at Tarcutta (New South Wales) with 20% of area sown to lucerne. A 20% lower pregnancy rate had a larger impact on gross margins than a 50% reduction in twinning rate. Flushing, on average, increased lamb production and gross margins compared with the standard, but was only possible in 50% of years. On-farm management which avoids reductions in pregnancy rate may be more important for producers than aiming to increase twinning rate, but large gains are possible by flushing ewes to increase twinning rates if this can be achieved frequently and the survival of twins is high.

Introduction

The level of reproduction (lambs marked per ewe joined) in sheep flocks directly impacts on gross margins for sheep producers (Warn et al., 2006), and is the net result of number of ewes pregnant, fecundity and lamb survival. Cost-effective improvement in survival can be relatively difficult to achieve unless survival is poor to start, even though there is a large potential for improvement (Trompf et al. 2013). Recent work (Robertson et al., 2015a) has shown short-term flushing (increased nutrition pre-joining) with lucerne can achieve an increase (115% versus 96%) in Merino lambs marked per ewe joined, in a region where survival of twins is typically between 70 and 80%. The financial benefit of flushing can therefore be substantial. However, consumption of high quantities of feed during early pregnancy, as may be done when flushing ewes, can cause embryo mortality, reducing pregnancy rates by 20% (Parr et al., 1987) or reducing the proportion of ewes with multiple foetuses by 50% (Robertson et al., 2015b). These levels of loss are present in commercial flocks, where non-pregnancy rates for ewes mated have been reported to range from 0 to 24%, with partial failure of multiple ovulations ranging from 0 to 40% (Kleemann and Walker, 2005). The level of benefit from changing management to avoid such losses or achieve an increase in lambs marked requires consideration.

The aim of this study was to evaluate the impact on gross margins from flushing ewes on lucerne, and from achieving lower rates of pregnancy or fecundity through increased embryo mortality.

Materials and Methods

Simulation modelling was conducted using AusFarm version 1.4.9, using an updated stock module to allow twin-bearing ewes to be purchased. The simulation was conducted between 1970 and 2011, with data from the first year excluded. A model 1000 ha grazing property located at Tarcutta in southern NSW was used, which had previously been validated against field data. The farm comprised two phalaris based paddocks (each 40% of farm area), and one lucerne paddock (20% of farm area).

Two enterprises were simulated. 1. A Terminal over Merino ewe flock joined in February, with all lambs sold at 55 kg or in December, whichever occurred first. The stocking rate was 5 ewes/ha. 2. A self-replacing Merino flock joined in February, with all wether lambs sold at 55 kg or in December. Ewe lambs were retained as replacements. The stocking rate was 6 ewes+replacements/ha.

To simulate embryo mortality, either the proportion of ewes pregnant, or the proportion of pregnant ewes with twins, was adjusted immediately after the completion of joining. Pregnancy rates were reduced by 20%, and twinning rates were reduced by 50%.

To simulate flushing, the average growth rate of lucerne in the 15 days prior to joining was calculated and used to set the level of increase in twinning rate in each year. If lucerne growth was ≤ 10 kg DM/ha/day, the proportion of pregnant ewes with twins was unchanged; if growth was > 10 and < 20, the proportion twinning was increased by 30%; and if growth was ≥ 20, the proportion twinning was increased by 70%. These response rates have been based on research which indicates that the quantity of live pasture available influences the flushing response (King et al., 2010). Flushing can double the ovulation rate of ewes (Killeen, 1967), while a 36% increase has been reported by grazing stalky lucerne under low growth conditions (King et al., 2010), while a 70% increase in the proportion with multiple foetuses has been recorded for ewes grazing lush pasture (Robertson et al. unpublished).

The simulations were run using historical and current meat prices. A wool price grid used 2003 to 2011 average prices (ABARES, 2011) (19.1 to 20.0 micron 927 c/kg). A price grid (carcase weight) of > 22 kg 354c/kg, 18-22 kg 361 c/kg (55th percentile for national saleyard lamb price) (ABARES, 2011), 16-18 kg 343 c/kg and < 16 kg 312 c/kg for crossbred lambs used higher values than the Merino lamb price grid of > 22 kg 283c/kg, 18-22 kg 289 c/kg, 16-18 kg 275 c/kg and < 16 kg 250 c/kg for historical values. Current lamb prices used 588, 600,
570, 519 for the crossbred grid and 470, 480, 457, and 416 for the Merino lamb grid. Cast for age ewe prices were $47 historical, and $100 current, while replacement ewes and excess ewe hoggets were valued at $71 historical, and $150 current.

Results

The percentage change in gross margin due to changing reproductive performance was similar under historical and current meat values, but the change in gross margin was larger at current higher meat values (Table 1). The relative change in gross margins from different rates of reproduction was similar in a self-replacing Merino flock (data not shown) to the crossbreeding enterprise.

Reducing the pregnancy rate by 20% reduced gross margins by 20%, while a 50% reduction in the proportion of pregnant ewes with twins reduced gross margins by 4%, compared with the standard rate of reproduction in the Terminal over Merino flock. This was due to a larger reduction in the number of lambs sold where the rate of pregnancy was reduced. Flushing increased mean gross margins by 5% over the standard by increasing the number of lambs sold, although the weight of lambs sold was reduced. However, the cumulative gross margin after 40 years for flushing was $550/ha ($549,864/farm) higher than for the standard reproductive rate, using current meat values. Flushing was possible in 50% of years, with an average 24% increase (range 11 to 34%) in the proportion of ewes bearing twins in the years when they were flushed.

Discussion

This study indicates that management to avoid large reductions in pregnancy rate would have a larger benefit to producer gross margins than increasing twinning rates. The relative difference can be expected to vary depending on the proportion of ewes which normally carry twins. The standard twinning rate in the simulated flock was relatively high compared with industry averages, meaning that there may be a larger potential benefit of flushing in flocks than that shown here.

The benefit of flushing was dependant on the proportion of years when summer/autumn rainfall allowed sufficient pasture growth, and may have been underestimated in this analysis due to the high rate of twinning in the standard flock. The proportion of years in which ewes can be flushed will vary between locations and differing pasture types.

Table 1. Mean reproductive performance and gross margins for a terminal over Merino ewe enterprise at 5 ewes/ha

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>Reduced Pregnancy rate</th>
<th>Reduced Twinning rate</th>
<th>Flushing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross margin ($/ha) (historical meat values)</td>
<td>200</td>
<td>164</td>
<td>192</td>
<td>210</td>
</tr>
<tr>
<td>Gross margin ($/ha) (current meat values)</td>
<td>317</td>
<td>250</td>
<td>304</td>
<td>330</td>
</tr>
<tr>
<td>No. lambs sold/ha</td>
<td>4.6</td>
<td>3.8</td>
<td>4.2</td>
<td>5.0</td>
</tr>
<tr>
<td>Weight wether lambs sold (kg)</td>
<td>42.7</td>
<td>44.8</td>
<td>44.2</td>
<td>42.1</td>
</tr>
<tr>
<td>Lambs born/ewe (%)</td>
<td>129</td>
<td>106</td>
<td>109</td>
<td>139</td>
</tr>
<tr>
<td>Lamb survival to marking (%)</td>
<td>74</td>
<td>73</td>
<td>79</td>
<td>73</td>
</tr>
<tr>
<td>Lambs marked/ewe (%)</td>
<td>95</td>
<td>77</td>
<td>86</td>
<td>100</td>
</tr>
<tr>
<td>Pregnant ewes (%)</td>
<td>91</td>
<td>71</td>
<td>91</td>
<td>91</td>
</tr>
<tr>
<td>Twin bearing ewes of pregnant ewes (%)</td>
<td>45</td>
<td>45</td>
<td>23</td>
<td>56</td>
</tr>
</tbody>
</table>

While altering components of the reproductive rate may only result in modest changes in long-term average gross margin, the cumulative effect can be large, meaning management to avoid reductions in pregnancy rates and improve twinning can have a positive effect on cash flow and financial performance.

References
