More lambs from feed and chemical treatments

K.P. Croker
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More lambs from feed and chemical treatments

By K. P. Croker, Research Officer, Sheep and Wool Branch

The ovulation rate, or the number of eggs shed per ovulating ewe, represents the upper limit of the capacity of a flock of ewes to produce lambs. Several methods can be used to increase ovulation rates and lambing percentages of ewes, including selection for better breeding, feeding and the use of chemicals.

The potential for improving the reproductive performance of Western Australia's ewe flocks by the use of different approaches to breeding was discussed by L. G. Butler and R. P. Lewer in the Journal of Agriculture in 1983.

This article mainly discusses the research conducted by the Department of Agriculture's Sheep and Wool Branch on the supplementary feeding of ewes with sweet narrow-leafed lupin seed (Lupinus angustifolius) and the more recent investigations of the technique of immunisation to change the levels of some of the sex hormones in ewes. Both methods can increase ovulation rates and subsequent lambing percentages.

Improved nutrition
Farmers can give ewes more nutritious feed before and at joining to increase ovulation rates.

Flushig
Ewes can be flushed to improve their lambing performances by placing them on a high plane of nutrition before the start of joining. This practice has long been used by farmers.

Many experiments on flushing ewes in this way in Western Australia and elsewhere have shown that both increasing ewe liveweight, as well as the liveweight at mating, influence ovulation rate and lambing performance.

Research at Beverley, Western Australia, as early as 1941 showed that more twin lambs were born to Merino x Border Leicester crossbred ewes grazing a paddock with oaten stubble and unharvested field peas for seven weeks, starting two weeks before the entire rams were joined with them in mid December (Table 1).

Although it appears that flushing flocks produces only small gains when the ewes are in good body condition, there does not seem to be any valid reason for reducing the liveweight and condition of ewes before starting to feed them up again.

The body condition of ewes at joining, which is an assessment of fatness as distinct from liveweight, also influences lambing performances. Ewes gaining in body condition have higher ovulation rates. Therefore, ewes should be managed so that they are in good body condition at the start of joining. Farmers can do this by adjusting stocking rates to increase the amount of paddock feed available to ewes.

In Western Australia's major sheep-grazing areas the quantity as well as quality of paddock feed gradually deteriorates after pastures dry off. Because of these changes to paddock feed, larger increases in lambing percentages would be expected from ewes flushed in January and February. By then, ewes often have lost weight and condition.
The two graphs show the effect of immunising Merino ewes at Wongan Hills Research Station

The graph on the left shows the ovulation rate of Merino ewes immunised with Androstenedione-Oestrone compared to Immunised unimmunised. The graph on the right shows the average number of eggs shed per ewe.

Table 1. Influence of flushing with oaten stubble and unharvested field peas in mid December on the lambing performance of Merino x Border Leicester ewes at Beverley

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Weight start of good feed (kg)</th>
<th>Weight change during flushing (kg)</th>
<th>Ewes lambed (%)</th>
<th>Ewes twinned (%)</th>
<th>Lambs born (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>49.0</td>
<td>-4.5</td>
<td>95</td>
<td>0</td>
<td>95</td>
</tr>
<tr>
<td>Flushed</td>
<td>45.9</td>
<td>+ 10.1</td>
<td>97</td>
<td>20</td>
<td>115</td>
</tr>
</tbody>
</table>

1 Proportion of ewes present
2 Proportion of ewes which lambed with twins.

However, there are no experimental results indicating that this is a better time to flush ewes rather than in November and December.

Feeding sweet lupin seed

In the early 1970s research at the University of Western Australia and the Department of Agriculture showed that feeding ewes sweet narrow-leaved lupin seed at joining could increase ovulation rates and lambing performances. It was suggested that feeding lupin seed, which contains about 30 per cent crude protein, overcame the low levels of protein in dry pastures thought to be responsible for the poor lambing percentages that are common in the agricultural area.

Apart from containing high levels of protein and energy, sweet lupins are a safe supplement to feed to ewes who readily eat the seeds once they are familiar with them.

The degree of response in ovulation rate was related to the amount of lupin seed eaten. More consistent results were obtained with daily supplements of 250 grams per head or more (Table 2).

These early experiments in the 1970s showed that there was a positive relationship between ovulation rate and the number of ewes which lambed when lupins were fed to them during joining. By increasing ovulation rate, more ewes lambed and more twins were born.

Ewes seem to respond to lupin supplements soon after feeding starts. In an experiment at Merredin ovulation rate increased eight days after feeding lupins (Table 3). Independent research at the University of Western Australia showed that ovulation could be increased after only six days of feeding. Therefore, it would appear that ovulation rate can be increased without measurable changes in liveweight because these feeding periods are too short for significant changes in weight.

The results from the initial experiments also indicated that 2.5-year-old ewes were not as responsive to lupin supplements as were older ewes. It was subsequently shown that ovulation in 1.5-year-old ewes was not increased after feeding either 250 or 500 g of lupins per head per day. Ovulation rates of 2.5-year-old ewes increased only when 500 g of lupins per head per day were fed, whereas older ewes showed increases in ovulation at both feeding rates (Table 4).

Other research by the University of Western Australia at Northam during the spring, summer and autumn of 1975-76 showed that when ewes were fed 750 g of lupins per head per day ovulation rates increased in October, January and February, but not in December. In contrast, observations by the Department at Beverley on ewes which received 250 or 500 g of lupins per head per day over similar periods in 1975-76 and 1976-77 showed no consistent effect of season on ovulation rates, although there were slight, but not statistically significant, increases in the ewes fed the bigger amount. These ewes produced more twins. Perhaps more lupin seed is...
necessary to obtain consistently large ovulation responses at the various times of joining. Results from the Department's experiments between 1972 to 1977 were examined. They indicated that ovulation rates and lambing performances of ewes 3.5 years and older could be economically increased by feeding the equivalent of 250 g of lupins per head per day to 'teased' ewes for 14 days before the entire rams were joined with them and until day 17 of joining.

**On-farm trials**

The potential application of this method was examined on 50 farms and with 22,800 mature ewes in the agricultural area between 1977 and 1982. Three series of trials compared the lambing performances of unsupplemented flocks with those fed lupins.

In the first series, the supplemented ewes received 250 g of lupins per head per day. Because these trials showed a large variation in responses to lupin supplements, a second series was conducted in which nearly all trials had an additional group which received a daily supplement of 500 g of lupins per head. In the last series of trials, ewes on properties which had marked 60 per cent or fewer lambs during the preceding five years were fed lupins at 250 g per head per day to determine whether worthwhile increases in lambing percentages were obtained.

The overall results from these on-farms studies did not show any significant increase in the lambing performances of the supplemented ewes. As was found at Beverley, there was no difference in response between the various times of joining. However, there was a large variation between farms in the differences between the unsupplemented and supplemented ewes in the percentage of lambs born, ranging from 14 per cent fewer lambs born to the supplemented ewes in one trial to 21 per cent more lambs born to these ewes.

Increasing the supplementary feeding rate to 500 g per head per day did not overcome the variability in the lambing response.

In the third series of trials where the properties were selected on the basis of previous poor lambing performances, the unsupplemented ewes had good lambing figures (93 per cent lambs born). Perhaps, as a result, this is the reason that supplementation did not significantly increase the percentage of lambs born.

The results from the on-farm trials may be associated with a potential clover disease problem. In series 1 and 2 trials, the best results were obtained from the Bunbury area where it had been previously shown that sub-clinical clover disease depressed lambing performances of ewes. The results obtained from this area and, for comparison, those from Merredin, a non-clover pasture area, are shown in Table 5.

On the properties in the Bunbury area less than 80 per cent of ewes lambed whereas in the Merredin area between 88 and 94 per cent of ewes lambed. However, the apparent association of large responses to lupin supplements where subterranean clover pastures may depress lambing percentages has not been examined experimentally, so that confirmation is still required.

**A place for lupins?**

Although the Department of Agriculture has conducted many experiments between 1972 and 1982 on feeding sweet lupin seed to ewes to increase ovulation rates and lambing percentages, it is still not possible to recommend that lupins be used to improve lambing performances on all farms. The major problem is determining which ewe flocks can be supplemented successfully and what causes the tremendous variability in the lambing performances of flocks after supplementation. This is the basis of our search for the components of lupins which affect ovulation rates, as discussed in 'Ovulation rate of ewes—role of energy and protein' on page 36.
Chemicals
A range of pharmaceutical products is available which can influence the reproductive efficiency of sheep. Of relevance here are those which can increase ovulation rates and so provide an opportunity to improve the lambing percentages of flocks.

PMSG
Pregnant mare serum gonadotrophin (PMSG) can be used to stimulate an ewe's ovaries directly. According to the dosage given, it can produce moderate or very high ovulation rates.

There are several problems with the use of PMSG. It must be used either in conjunction with techniques which synchronise oestrous or with the careful monitoring of natural oestrus. It must be injected on the 12th to 14th day of the oestrous cycle. The hormone is expensive and adds considerably to the cost of production. Also the response to it are highly variable, both within and between ewes.

PMSG can only be obtained on a veterinarian's prescription.

Immunisation against ovarian hormones
After the discovery in the early 1970s that ovulation rates of ewes were increased when they were immunised against the sex hormones oestrone (a female hormone) and androstenedione (a male hormone), CSIRO developed a new method of producing more twins from ewes. The ewes are injected with a hormone-protein compound that will stimulate antibody production. The antibodies neutralise some of the naturally circulating sex hormones, which results in the release of two eggs instead of one in some ewes.

An important part of the development of this technique has been to find what level of antibody production is needed to stimulate above-normal lambing performances without the harmful side-effect of having triplets or quadruplets.

The first experiments with the immunising compounds were conducted by CSIRO at Armidale, New South Wales, in 1977-78 and led to significant increases in ovulation.

Evaluation of the compounds started in Western Australia in 1980 because the strain of Merino and the field environment here differ from those examined by CSIRO.

The initial experiments were conducted on the Department's Wongan Hills Research Station with Merino ewes which were 2.5-years-old when first immunised. The results are shown in the figures. During these investigations, CSIRO's scientists were 'tailoring' the compounds (immunogens) and procedures to give the right biological response. Hence, there were slight differences between experiments. However, in this State injections of the immunogens increased ovulation rates and resulted in more lambs being born.

In late 1983 an anti-androstenedione compound which had been developed under an agreement between CSIRO and Glaxo Australia Pty Ltd was released commercially as Fecundin®. Subsequently, the Department began to evaluate the responses to immunisation with Fecundin® of Merino and crossbred ewes on commercial properties.

On-farm trials
In 1984 crossbred ewes on properties at Moora and Rosa Glen and Merino ewes on properties at Darkan, Jingalup and Chowerup were treated.

At Moora the ovulation rate of the untreated ewes was 1.31 whereas it was increased to 1.77 in the immunised ewes, but only 9 per cent more lambs were marked in the immunised ewes. At Rosa Glen there was no difference between the two groups at marking.

The ovulation rate of maiden ewes immunised at Chowerup increased from 1.02 in the untreated ewes to 1.24, but there was no difference between the two groups at marking. At Darkan and Jingalup between 13 and 27 per cent more lambs were born to older immunised ewes, but at Jingalup more lambs in the treated groups died, so that there were no gains from immunisation. However, a 23 per cent increase in marking percentage at Darkan demonstrated that reasonable increases in lambing performances from immunised mature Merino ewes were possible in some situations.

Treatments were repeated on the properties at Moora, Rosa Glen, Darkan and Jingalup in 1985 to determine the variation in ovulation that could arise between years. The similar results recorded (Table 6) suggest that variation in response to immunisation between properties is more of a problem than the variation between years.

The lack of a significant response at marking in most of these experiments may be associated with a high death rate amongst the...
twin-born lambs. In nearly every flock examined, immunisation has produced many more twins. Therefore, if immunisation to produce more lambs is to be useful, farmers must manage their ewes more intensively to improve the chances of the lambs surviving. On some properties the percentage of barren ewes amongst the immunised flocks increased, which also may have contributed to the lack of a response. However, this should not be a major problem in the future because a four-week interval between the last booster injection and the start of joining will minimise the difference in pregnancy rate between untreated and immunised ewes. Immunised ewes should be fed adequately at all times to obtain the best response to the treatment.

Use of Fecundin®
The use of Fecundin® will probably be limited in Western Australian flocks with prime lamb producers or stud breeders being the most likely users.

In the first year of treatment ewes require two injections of two millilitres given at eight and four week intervals before the start of joining. In subsequent years ewes only need a booster injection four weeks before joining starts.

Based on the experience in Western Australia, it would appear that it is not worth treating maiden ewes and that immunised ewes should weigh at least 45 kilograms.

Treatment with Fecundin® will not correct existing fertility problems. It should not be used on ewe flocks with low lambing percentages.

Table 5. Changes in the reproductive performances of ewes supplemented with lupin seed in subterranean clover (Bunbury) and non subterranean clover (Merredin) pasture areas.

<table>
<thead>
<tr>
<th>Property</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date rams joined</td>
<td>5.12.77</td>
<td>11.1.78</td>
<td>12.7.78</td>
<td>27.12.78</td>
</tr>
<tr>
<td>% of unsupplemented ewes which lambed</td>
<td>79</td>
<td>61</td>
<td>79</td>
<td>72</td>
</tr>
<tr>
<td>Deviation from unsupplemented ewe performances (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ewes lambed</td>
<td>+6</td>
<td>+10</td>
<td>+3</td>
<td>+14</td>
</tr>
<tr>
<td>Ewes twinned</td>
<td>+3</td>
<td>+12</td>
<td>+12</td>
<td>+5</td>
</tr>
<tr>
<td>Lambs born</td>
<td>+10</td>
<td>+19</td>
<td>+13</td>
<td>+19</td>
</tr>
<tr>
<td>Merredin</td>
<td>6.12.77</td>
<td>4.1.78</td>
<td>31.1.78</td>
<td>6.2.79</td>
</tr>
<tr>
<td>% of unsupplemented ewes which lambed</td>
<td>90</td>
<td>94</td>
<td>88</td>
<td>92</td>
</tr>
<tr>
<td>Deviation from unsupplemented ewe performances (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ewes lambed</td>
<td>0</td>
<td>+3</td>
<td>+4</td>
<td>+1</td>
</tr>
<tr>
<td>Ewes twinned</td>
<td>-1</td>
<td>+10</td>
<td>-10</td>
<td>+1</td>
</tr>
<tr>
<td>Lambs born</td>
<td>-1</td>
<td>+13</td>
<td>-4</td>
<td>+2</td>
</tr>
</tbody>
</table>

Note: Ewes on properties 1 to 3 were supplemented with 250 g per head per day, whereas on property 4 ewes received 500 g per head per day.

Table 6. Differences in the performances of ewes treated with Fecundin® compared with those of untreated ewes, 1984-1985.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Average weight 1 (kg)</td>
<td>0</td>
<td>-2</td>
<td>-1</td>
<td>-1</td>
<td>-2</td>
<td>+2</td>
</tr>
<tr>
<td>Ovulation rate 2</td>
<td>+0.46</td>
<td>+0.29</td>
<td>n.a.</td>
<td>n.a.</td>
<td>+0.47</td>
<td>+0.56</td>
</tr>
<tr>
<td>Ewes lambed 3 (%)</td>
<td>-3</td>
<td>0</td>
<td>-1</td>
<td>-1</td>
<td>-3</td>
<td>-5</td>
</tr>
<tr>
<td>Ewes twinned 4 (%)</td>
<td>n.a.</td>
<td>n.a.</td>
<td>+7</td>
<td>+17</td>
<td>+32</td>
<td>+5</td>
</tr>
<tr>
<td>Lambs born 5 (%)</td>
<td>n.a.</td>
<td>n.a.</td>
<td>+7</td>
<td>+15</td>
<td>+26</td>
<td>-1</td>
</tr>
<tr>
<td>Lambs marked 6 (%)</td>
<td>+9</td>
<td>+14</td>
<td>-1</td>
<td>+13</td>
<td>-20</td>
<td>-11</td>
</tr>
</tbody>
</table>

1 Weight at start of joining.
2 Ovulation rate of ewes ovulating.
3 Proportion to ewes present at end of lambing.
4 Proportion of ewes which lambed with twins.
5 L n.a. Data not available.

Acknowledgements
Many officers from the Department's Sheep and Wool Branch and District Offices have contributed to these experiments.

The co-operation of numerous farmers between Esperance and Geraldton who participated in the on-farm research is acknowledged.

The research with lupins was partially funded by a grant from the Australian Wool Corporation. Dr R. I. Cox, Division of Animal Production, CSIRO, Prospect, N.S.W., collaborated with our early immunisation studies. Glaxo (Australia) Pty Ltd also provided assistance.

Further reading