CONTROLLED INTENSIVE BREEDING OF SHEEP IN EUROPE

T. J. ROBINSON**

Controlled sheep breeding for lamb production, based largely upon Australian experimental work, is in commercial use in France and Eire, and at an advanced stage of experimental development in Scotland.

Economic incentive

There are good economic reasons for the interest abroad in such application. In France, for example, a lamb born out of season is worth, to the farmer, 15F or A$2.50 per kilo, dressed weight. A lamb born in season in 1972/73 was worth 12F or A$2.00 per kilo to the farmer. A male lamb born as a single in season is worth approximately A$38 at 100 days as compared with $47.50 if born out of season. Hence the incentive to produce lambs out of season is very great. If two lambings per year can be obtained the gross return per ewe can exceed $100 per annum.

Such economic incentives have led to the development of three programmes each different and each using some of the modern technology available but none using it all. These are dealt with in an ascending order of complexity.

Breeding of early lambs - Eire

The simplest programme is that of Dr. Ian Gordon in Eire (Gordon 1973). He has used the Cronolone impregnated intravaginal sponge/PMS technique (Robinson and Smith 1967) for the advancement of the breeding season and has applied it on an increasing scale and with consistently improving results on several hundred private farms over the past 8 years (Table 1). Extension of the programme has now passed into the hands of the Department of Agriculture and it is an accepted practice. In 1971/72 some 10,000 ewes were treated.

| TABLE 1 |
| Results of early breeding trials in Eire (Gordon 1973) |

<table>
<thead>
<tr>
<th></th>
<th>1965/67</th>
<th></th>
<th>1968/69</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1900 ewes in 60 groups</td>
<td>759 ewes in 56 groups</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1st heat</td>
<td>2nd heat*</td>
<td>1st heat</td>
</tr>
<tr>
<td>Percentage bred</td>
<td>77%</td>
<td>78%</td>
<td>98%</td>
</tr>
<tr>
<td>Conception rate</td>
<td>40%</td>
<td>70%</td>
<td>62%</td>
</tr>
<tr>
<td>Lambs/conception</td>
<td>1.6</td>
<td>1.4</td>
<td>1.7</td>
</tr>
<tr>
<td>Lambs born/100 ewes treated</td>
<td>47</td>
<td>53</td>
<td>100</td>
</tr>
</tbody>
</table>

* Ewes not pregnant after first heats which returned one cycle later.

The techniques are simple, namely

1. Cronolone sponge/PMS treatment terminating 6 to 8 weeks before the normal onset of the breeding season.
2. Joining the ewes to 10% of rams, 48 hours after sponge removal and PMS treatment.

The improvement in results shown in Table 1 has been confirmed in subsequent years and, with the price incentives already cited, the induced breeding of early lambs is on the increase and resulted in the production of some 20,000 extra lambs for the 1972 Easter market.

** Department of Animal Husbandry, University of Sydney, Sydney, NSW 2006.
Intensive production using light control - Scotland

The Scottish scheme has been running for some 3 years at the Rowett Research Institute (Ørskov and Robinson 1972). The system is highly intensive and involves year round housing on zero grazing in a light controlled environment. Breeding activity is regulated using the principles demonstrated by Yeates (1949). The light year is reduced from 365 to 205 days so that the ewes exhibit a short breeding season every 7 months. Superimposed upon this is the synchronization of oestrus using Cronolone impregnated intravaginal sponges in order to produce uniformity of lambs and to use the short breeding season to maximum advantage. Genetic parameters are introduced also in that highly fecund Finnish Landrace x Poll Dorset Horn ewes are bred to Suffolk rams to give high prolificacy plus maximum hybrid vigour.

Techniques used are as follows -
1. Control of the breeding season by a 205 day light year.
2. Control of the time of oestrus by the use of intravaginal sponges.
3. Hand service 48 hours after withdrawal of sponges.
4. Complete year round housing of ewes and lambs.
5. Determination of number of lambs by X-ray in mid pregnancy and adjustment of ewes' rations according to the number of foetuses.
6. Weaning at 1 month and artificial rearing of lambs thereafter.
7. Use of highly fecund cross bred ewes to ensure high twinning rates.
8. Outcross to local breed of ram for hybrid vigour and growth rate.

Superimposed upon this general scheme are nutritional regimes designed to determine the capacity of the ewe to withstand the pressures of continual pregnancy and lactation. Only after 3 years have the ewes on the lowest plane of nutrition shown signs of reduced reproductive efficiency, and the lambing efficiency of this flock is extraordinary, as shown in Table 2.

TABLE 2
Conception rates and litter sizes in ewes with a lambing interval of 205 days
(from Ørskov and Robinson 1972)

<table>
<thead>
<tr>
<th>Group</th>
<th>No. of ewes</th>
<th>Previous date of lambing</th>
<th>Date of induced oestrus</th>
<th>% Conception at induced oestrus and 1st return</th>
<th>Mean litter size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>48</td>
<td>18 March - 12 April</td>
<td>21 May</td>
<td>93.7</td>
<td>2.3</td>
</tr>
<tr>
<td>2</td>
<td>48</td>
<td>24 June - 18 July</td>
<td>29 Aug.</td>
<td>97.9</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Despite the high inputs associated with this scheme, the Rowett workers believe that this type of production is economically feasible within the framework of European lamb prices.

Intensive production using exogenous hormones - France

The French system, which has been under development since 1966, is much further advanced commercially than is either of the others described. It is estimated that in 1973 some 300,000 ewes will have been artificially inseminated following controlled breeding.

Two systems are in commercial operation: (a) simple advancement of the breeding season, as in Eire, and (b) shortening of the post partum interval to provide a second conception some 7 weeks after parturition. The most advanced and sophisticated programme (b) is that at the Station for Research in Animal Physiology at Nouzilly and it is from here that the techniques flow out to the producers. A general description of the programme appears in the 1972 Annual Report of the Station (INRA 1972).

Breeding activity is not controlled by light. Cronolone impregnated
Sponges plus PMS are used. The system (in use until 1972) is as follows.

1. In early October (Autumn), all adult ewes are treated with sponges/PMS and are artificially inseminated twice 48 and 60 hours after withdrawal of sponges and injection of PMS - Wave 1.
2. Sixteen days later teasing commences and oestrous ewes are inseminated - Wave 2.
3. In early November (Autumn) all "agnelles" (6-7 month old ewe lambs) of 30 kg live weight (60% adult) are similarly treated - Wave 3.
4. Sixteen days later, teasing and second insemination - Wave 4.
5. In Spring, all ewes and "agnelles" in each of the 4 waves are injected with dexamethazone on the 143rd day of gestation (Bosc 1972). Lambing is completed by the 145th day. Lambs are left on the ewe for 100 days.
6. Thirty days after parturition, sponges are inserted and left in place for 10 days. On withdrawal PMS is injected and ewes are inseminated twice, 48 and 60 hours later. They are not teased 16 days later as this is the anoestrous period.

The following autumn the same treatments are applied and the cycle of operations repeated.

In all, some 3,000 ewes are involved in the Nouzilly flock, mainly Ile de France and Pre-alpes breeds. In the Ile de France breed, some 200 lambs per 100 ewes of all ages from 6 months up were produced annually during the years 1969 to 1972.

Losses are very low - only some 3% - as a consequence of induced parturition and close surveillance, and the overall figure of 200 lambs produced per 100 ewes is close to the numbers reared. There are breed differences and Table 3 summarizes the results obtained between 1969 and 1972.

### TABLE 3
Summary of lambing results - Nouzilly, 1969-72

<table>
<thead>
<tr>
<th>Breed</th>
<th>Percentage of even lambing/year</th>
<th>Number of lambs born/100 ewes and agnelles</th>
<th>Number of lambs sold/100 ewes and agnelles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ile de France</td>
<td>135%</td>
<td>200</td>
<td>190</td>
</tr>
<tr>
<td>Pre-alpes</td>
<td>150%</td>
<td>240</td>
<td>220</td>
</tr>
</tbody>
</table>

The French workers are now incorporating the Russian Romanov breed - a close cousin of the Finnish Landrace - into their programme. They have also used frozen ram semen but its use has been too unreliable to be used on a widespread commercial scale.

In 1973 a new scheme was introduced, the so-called 49 day system. The ewe flock is divided into 8 equal groups and every 49 days treatment commences of one of these groups with sponges and PMS. Built into this scheme is a pregnancy diagnosis at day 18 using a competitive protein binding assay for progesterone. The general treatments are as described above, and the object is to provide all year round production of lambs. It is totally scheduled with every operation timetabled so as to avoid weekend and holiday work.

Techniques involved are as follows:

1. Control of breeding activity and time of oestrus by Cronolone impregnated sponges and PMS.
2. Induction of a degree of superovulation by the use of PMS.
3. Artificial insemination on a fixed time basis.
4. In limited circumstances, the use of frozen semen.
5. Pregnancy diagnosis at 18 days after insemination.
6. Complete year round housing of ewes and lambs.
7. Induction of lambing with dexamethazone.
8. Natural rearing of the majority of lambs, associated with artificial rearing.
9. Comparison of breeds and introduction of new breeds and crosses of high
fecundity,
10. Induction of breeding activity in lactation using sponges and PMS.
12. Timetabling to give freedom from weekend and holiday work.

Programmes such as this, in one form or another, are being used on an
increasing scale so that, today, some 4% of all ewes in France are involved and
the percentage has doubled annually over the past 3 years.

The largest commercial operation is in the Marne region and Table 4
presents key data.

### TABLE 4

<table>
<thead>
<tr>
<th>Summary of production data in large scale lamb production operation - Marne region, France</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total ewes</td>
</tr>
<tr>
<td>Conception rates</td>
</tr>
<tr>
<td>Agnelles (% of 3 years)</td>
</tr>
<tr>
<td>Ewes dry - Breeding season (age)</td>
</tr>
<tr>
<td>- Non-breeding season (live weight)</td>
</tr>
<tr>
<td>Ewes wet - Breeding season (price)</td>
</tr>
<tr>
<td>- Non-breeding season (gross production)</td>
</tr>
<tr>
<td>Lambs born/100 ewes/year</td>
</tr>
<tr>
<td>- All ages</td>
</tr>
<tr>
<td>Losses of lambs</td>
</tr>
<tr>
<td>Lambs sold/100 ewes/year</td>
</tr>
<tr>
<td>Age at sale (days)</td>
</tr>
<tr>
<td>Live weight at sale (kg)</td>
</tr>
<tr>
<td>Price paid/lamb ($/A)</td>
</tr>
<tr>
<td>Gross production/ewe/year ($/A)</td>
</tr>
<tr>
<td>Labour force (men)</td>
</tr>
<tr>
<td>Gross return/annum ($/A)</td>
</tr>
</tbody>
</table>

A flock of 2,200 Ile de France ewes is housed permanently in 2 barns and
the programme is generally similar to that at Nouzilly. Breeding is controlled
by intravaginal sponge/PMS treatment and all ewes are artificially inseminated.

The opinion of the management is that this level of operation, conducted
on high quality land in competition with sugar beet, maize, etc., just breaks
even at 2.1 lambs sold per ewe. Controlled parturition is not yet used and its
introduction and consequent saving in lambs lost would put this enterprise
economically ahead of cash crop production on present prices and demand.

**CONCLUSION**

In conclusion, I wish to commend the entrepreneurs, scientific and commer-
cial, who have taken modern advances in reproduction, nutrition, behaviour,
management, genetics and disease control and who have melded together these
advances to provide these viable working models. Slight improvements in existing
techniques, the introduction of new techniques such as controlled parturition,
and the use of new genetic material have resulted in a steady increase in perfor-
mance over a period of 7 or 8 years since the first of these programmes commenced.

We have a great deal to learn from these enterprises in that they demonstrate the
value of taking existing knowledge and techniques derived from a range of
disciplines and of persevering in putting them together in order to provide whole
working systems of value to animal industry.

**REFERENCES**

tion (Ministere de l'Agriculture: France).
ROBINSON, T.J. and SMITH, J.F. (1967). In "The Control of the Ovarian Cycle in