THE ARTIFICIAL REARING OF LAMBS

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The most important factors which determine the size of growing lambs are the litter size and total ewe milk available for the lambs (Mantecon and Bermudez, 1991) (Figure 1).

Sources of variation

- Ram genetic make-up
- Ewe genetic make-up
- Maternal influence
- Age of the ewe
- Litter size
- Sex of the lamb
- Residual

Figure 1. Percentages of the total variation in the size of lambs from birth to 8 months.

Sheep production systems can be classified according with the management during the lactation period into six groups (Flamant and Morand-Fehr, 1982) which are presented in Figure 2.

![Figure 2. Classification of sheep production systems according to the management of the lactation period.](image-url)
Traditionally, the artificial rearing of lambs was used in milk production systems when milk-fed lambs were in competition with potential sold milk. However, the artificial rearing of lambs can be used in sheep production systems in general when they increase the number of lambs per ewe.

The technique of artificial rearing of lambs has the following advantages:

- a regular and homogeneous supply of quantity and quality milk to the lambs.
- individual intake can be controlled, independent of lamb size (single, twins, etc.).
- disease control, eg when Maedi-Visna control programmes are established (González-Angulo and Mantecon, 1995).
- to increase milk sold in milk production systems.

The disadvantages of artificial rearing of lambs are the higher cost of materials (machine, milk substitute, etc.) and the increased labour required compared with natural rearing.

The constraints to the use of artificial rearing of lambs depend on milk and milk substitute prices and the level of milk production, which are shown in Figure 3 (Rodriguez et al., 1994).

From the nutritional point of view, the artificial rearing of lambs is based on the requirement of the lambs and how it is possible to supply them using milk substitutes (Manso et al., 1998a,b).

The energy and nitrogen requirements of milk-fed lambs were studied in the Spanish Churra breed (Mantecon et al., 1987) and the values and equations are:

**Maintenance:**

\[
\text{ME} = 120 \text{ kcal/kg LW 0.75} \\
\text{km} = 0.75 \\
\text{Endogenous faecal nitrogen} = 0.18 \text{ g/100 g DMI} \\
\text{Endogenous urinary nitrogen} = 0.112 \text{ g/kg LW 0.75} \\
\text{Biological value of protein} = 0.70
\]
Growth:

Nitrogen retention (g/day) = 0.38 + 31.42 LWG - 72.12 (LWG/LW) + 559.1 (LWG/LW)^2
Energy retention (kcal/day) = - 0.04 + 3.63 LWG - 3.90 (LWG/LW) - 66.82 (LWG/LW)^2
Nitrogen retention (g/day) = - 0.3455 + 0.2334 M + 0.0033 MEI
Energy retention (kcal/day) = - 66.8884 + 10.0186 NI + 0.5285 MEI

(LWG = live weight gain, g/day; ME = metabolizable energy; LW = Live weight, kg; DMI = Dry Matter Intake; NI = Nitrogen intake (g/day); MEI = Metabolizable energy intake (kcal/day)).

In order to guarantee the correct nutrition of milk-fed lambs, the milk substitutes must be formulated (Mantecon and Pelaez, 1998) according with the following standards

- carbohydrates between 45% and 50% of dry matter
- fat between 25% and 35% of dry matter
- protein between 22% and 30% of dry matter

The use of different sources of nutrients must take into account the digestibility coefficients which are presented in Table 1.

<table>
<thead>
<tr>
<th>Carbohydrates</th>
<th>Protein</th>
<th>Fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lactose</td>
<td>Ewe’s milk</td>
<td>Ewe’s milk</td>
</tr>
<tr>
<td>Maltose</td>
<td>Cow’s milk</td>
<td>Cow’s milk</td>
</tr>
<tr>
<td>Sacharose</td>
<td>Skimmed milk</td>
<td>Pork fat</td>
</tr>
<tr>
<td>Amylose</td>
<td>Casein</td>
<td>Beef fat</td>
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<tr>
<td>Amylopectin</td>
<td>Soya (93% CP)</td>
<td>Cotton</td>
</tr>
<tr>
<td>Starch</td>
<td>Soya (71% CP)</td>
<td>Soya</td>
</tr>
<tr>
<td>Starch (hydrolysé)</td>
<td>Peanut (91% CP)</td>
<td>Peanut</td>
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<tr>
<td></td>
<td>Fish meal (73-90% CP)</td>
<td>Colza</td>
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<tr>
<td></td>
<td>Fish meal (hydrolysé)</td>
<td>Coconut</td>
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<tr>
<td></td>
<td>Yeast</td>
<td>Corn</td>
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<tr>
<td></td>
<td></td>
<td>Palm</td>
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</tbody>
</table>

A summary of the management of the artificially reared lambs is presented in figure 4 (González-Angulo and Mantecon, 1995).

References

Day | Summary
---|---
2 | Colostrum. From cows or commercial 1st - 50ml (minimum) Total: 700-800ml (2-3 times)
30 | Artificial rearing: END Manual: 2 times/day 500ml/time. Machine 2 times/day, 4 min/time
35 | WEANING Manual: 2 times/day, 300ml/time. Machine 2 times/day, 3 min/time WHEN: Age > 4 weeks. Weight > 2.5 times birth weight Solid food intake - forage + concentrate: > 200g/day

Management as ruminant lamb

Figure 4. Summary of the artificial lamb rearing system.


