Effect of ewe prolificacy & stocking rate on lamb growth, production efficiency & carcass output

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Introduction

- Industry
  - 35,254 flocks
  - 7.4 ewes/ha
  - 1.3 lambs weaned/ewe
  - 189 kg carcass/ha

- Grass-based lamb production systems

- Grass dry matter (DM) production 8 to 11 t DM/ha
Value of Grass

- 90-95% of annual energy requirements of sheep

- Grazed Grass
  - 18% Crude protein
  - 11 MJ ME/kg DM

- 1 t DM of ryegrass = €76 (£65) (Finneran et al. 2012)

- Competitive advantage
  - Ability to produce lamb from almost entirely grass-based diet

- Key to system→ Sheep grazing ‘high quality’ grass to achieve high levels of performance and output
Factors influencing lamb production

Prolificacy potential (No. lambs born/ewe/year)

Stocking rate (Ewes/ha)

Challenge
Increase lamb output from grass
Objective

- To investigate the effect of Prolificacy potential (PP), stocking rate (SR) & their interaction in a grass-based production system on:
  - Lamb performance
  - Production efficiency
  - Carcass output
Experimental design

- Established in October 2012 (3 production years)
- 2 x 3 factorial design

MP = Medium prolificacy (1.5 lambs/ewe), HP = High prolificacy (1.8 lambs/ewe)
LSR = 10 ewes/ha, MSR = 12 ewes/ha, HSR = 14 ewes/ha
Materials & methods

- Ewes were mated in October/November to lamb early March
- Ewes were housed on average:
  - Early December (HSR), Late December (MSR) & Mid-January (LSR)
- Offered baled grass silage ad libitum
- Concentrate supplementation introduced in late pregnancy
- Post lambing: Ewes & lambs were turned out to pasture
- Grazing decision rules:

<table>
<thead>
<tr>
<th></th>
<th>LSR</th>
<th>MSR</th>
<th>HSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target pre graze herbage mass (kg DM/ha)</td>
<td>1200-1400</td>
<td>1200-1400</td>
<td>1200-1400</td>
</tr>
<tr>
<td>Target post graze sward height (cm) pre-weaning</td>
<td>4.5</td>
<td>4.1</td>
<td>3.7</td>
</tr>
<tr>
<td>Target post graze sward height (cm) post-weaning</td>
<td>5.5 (Lambs)</td>
<td>5.1 (Lambs)</td>
<td>4.7 (Lambs)</td>
</tr>
<tr>
<td></td>
<td>4.5 (Ewes)</td>
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</tr>
</tbody>
</table>
Lamb growth rates were recorded from birth to slaughter

All Lambs weaned on average at 14 weeks of age

Lambs were drafted for slaughter

Data analysed using PROC HPMIXED (SAS, 2012)

- Main effects: PP, SR & their Interaction, Parity, Year
- Ewe ID included as a random effect

<table>
<thead>
<tr>
<th>Month</th>
<th>Live weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>June</td>
<td>42</td>
</tr>
<tr>
<td>August</td>
<td>44</td>
</tr>
<tr>
<td>September</td>
<td>45</td>
</tr>
<tr>
<td>October</td>
<td>46</td>
</tr>
</tbody>
</table>

Target carcass weight 20 kg
Results
Effect of PP on lamb performance

- Average daily gain (g/day)
- Time periods: Pre wean, Post wean, Lifetime
- MP vs. HP
- + 6 g/day
- (P<0.05)
- (P<0.01)
- NS
Effect of PP on lamb performance

Average daily gain (g/day)

Time periods

- Pre wean
- Post wean
- Lifetime

- MP
- HP

(P<0.05)

(P<0.01)

NS

+ 9 g/day
Effect of PP on lamb performance

Average daily gain (g/day)

Time periods

- Pre wean
- Post wean
- Lifetime

MP vs. HP

- Pre wean: (P<0.05)
- Post wean: (P<0.01)
- Lifetime: NS

Avg. 217 g/day
Effect of SR on lamb performance

Average daily gain (g/day)

- 23 g/day

(P<0.001)
Effect of SR on lamb performance

Average daily gain (g/day)

Time period

- Pre wean
- Post wean
- Lifetime

(P<0.001)

LSR  MSR  HSR

- 15 g/day
- 11 g/day

a a b a b c a b c
Effect of SR on lamb performance

Average daily gain (g/day)

Time period

Pre wean
Post wean
Lifetime

LR
MSR
HSR

(P<0.001)

-12 g/day
-19 g/day
## Effect of PP & SR on carcass traits

<table>
<thead>
<tr>
<th>Parameter</th>
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<tbody>
<tr>
<td></td>
<td>MP</td>
<td>HP</td>
<td>S.E.M</td>
</tr>
<tr>
<td>Carcass wt. (kg)</td>
<td>19.6</td>
<td>20.0</td>
<td>0.06</td>
</tr>
<tr>
<td>Carcass grade</td>
<td>3.0</td>
<td>3.0</td>
<td>0.02</td>
</tr>
<tr>
<td>Carcass fat</td>
<td>2.8</td>
<td>2.9</td>
<td>0.02</td>
</tr>
<tr>
<td>Kill out prop.</td>
<td>0.43</td>
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<td>0.02</td>
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<td>0.005</td>
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Notes:
- *P*-values less than 0.05 are considered statistically significant.
- Superscript letters indicate significant differences between treatments.
- *** indicates **P** < 0.001.
- ** indicates 0.001 < **P** < 0.01.
- NS indicates **P** > 0.05.

The Irish Agriculture and Food Development Authority
Measures of production efficiency

- **Effect of PP:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>MP</th>
<th>HP</th>
<th>Difference %</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. lambs born/ewe</td>
<td>1.87</td>
<td>2.07</td>
<td>+11</td>
<td>***</td>
</tr>
<tr>
<td>No. lambs weaned/ewe</td>
<td>1.50</td>
<td>1.68</td>
<td>+12</td>
<td>**</td>
</tr>
<tr>
<td>Production efficiency‡/ewe</td>
<td>0.65</td>
<td>0.70</td>
<td>+5</td>
<td>*</td>
</tr>
<tr>
<td>Production efficiency‡/ha</td>
<td>0.76</td>
<td>0.86</td>
<td>+10</td>
<td>*</td>
</tr>
</tbody>
</table>

‡ = ratio of lamb live weight (kg) weaned to ewe live weight (kg) mated

- **No effect of SR**
Effect of PP on carcass output

Carcass output (kg/ha)

Carcass output (kg/ewe)

Prolificacy

MP

HP

+ 51 kg/ha

+ 4.2 kg/ewe

(P<0.01)

(P<0.001)
Effect of SR on carcass output

Stocking rate

Carcass output (kg/ha)

LSR  MSR  HSR

+ 102 kg/ha

+ 55 kg/ha

+ 47 kg/ha

(P<0.001)
# Effect of PP and SR on grass utilisation

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<tr>
<td>Kilograms of grass DM utilised</td>
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<tr>
<td>Hectare</td>
<td>MP</td>
<td>HP</td>
<td>S.E.M</td>
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<td></td>
<td>10 449</td>
<td>10 347</td>
<td>247.0</td>
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<td>LSR  MSR  HSR  S.E.M</td>
<td>PP  SR  Inter.</td>
</tr>
<tr>
<td><strong>HECTARE</strong></td>
<td>10 449 10 347 247.0</td>
<td>8 306a 10 038b 12 849c 302.1</td>
<td>NS  *** NS</td>
</tr>
<tr>
<td>Ewe and lamb unit</td>
<td>865 860 18.6</td>
<td>831a 836a 921b 22.8</td>
<td>NS  * NS</td>
</tr>
<tr>
<td>Kilogram of carcass produced</td>
<td>27.9 27.7 0.60</td>
<td>25.8a 27.3a 30.3b 0.75</td>
<td>NS  * NS</td>
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<td>LSR: 306&lt;sup&gt;a&lt;/sup&gt;</td>
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Conclusion

- Increasing ewe PP increased production efficiency and carcass output without any negative effect on lifetime lamb performance
- Increasing SR increased carcass output despite reductions in lamb growth
- No effect of PP on the quantity of grass DM utilised
- The highest SR system required a greater quantity of grass DM
Thank you for your attention
Any Questions?

Special thanks to:
Staff at the Teagasc, Sheep Research Demonstration Farm,
Tara Meeke and Cecile Valadier

Email: elizabeth.earle@teagasc.ie