BIOECONOMIC MODELLING OF ALTERNATIVE BEEF FINISHING SYSTEMS IN SCOTLAND

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Background

Scottish beef production sector involves approx. 9,000 beef producers and a number of ancillary businesses in the supply chain.

Sources of uncertainty and potential risk factors:

1. Variation in carcass quality
2. Price fluctuation in inputs
3. Latest political developments
4. Continuous regulatory reforms
Livestock Simulation Modelling

Models identify examples to follow and provide information for farmers, policy-makers and stakeholders.

Bioeconomic farm-level modelling: supports decision making by evaluating the effects of different management and breeding strategies on economic efficiency.
Grange Scottish Beef Model

- Grange Dairy Beef Systems model modified and recalibrated
- SRUC field experiments
- Historic Scottish data
- SRUC “Growth Path” beef study
- Produce physical, financial and environmental outputs
Application of the Model

Main Assumptions:

Nitrogen application rate: 175 kg/ha
Utilizable farm area: 120 ha
Concentrate price: 150 £/tonne

Breed: Limousin crossbreds
Gender: Steers & Heifers
Starting Age: 12 months

Slaughter ages/systems examined by the model:

- Short: 16-17 months
- Medium: 18-24 months
- Long: 25-35 months
Finishing Timescales

**Short duration**
- 2nd summer
- Housed: Silage + Concentrates

**Medium duration**
- 2nd summer
- 2nd winter
- On Pasture: Grazing Grass
- Housed: Silage + Concentrates

**Long duration**
- 2nd summer
- 2nd winter
- 3rd summer
- 3rd winter
- On Pasture: Grazing Grass
- Housed: Silage + Concentrates

Finishing age (months)
- 12
- 17
- 22
- 27
- 32
- 37

SRUC
Baseline Results

Steer Net Margin

Heifer Net Margin

£ per animal

[Bar chart showing the net margins for steers and heifers across different months from September to April. The chart indicates varying net margins with some months showing a loss and others showing profit.]
Baseline Results (2)

GSBM Results (£ per animal)

<table>
<thead>
<tr>
<th>Slaughter age</th>
<th>17</th>
<th>18</th>
<th>21</th>
<th>24</th>
<th>25</th>
<th>30</th>
<th>35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Months</td>
<td>October</td>
<td>November</td>
<td>February</td>
<td>May</td>
<td>June</td>
<td>November</td>
<td>April</td>
</tr>
<tr>
<td>Steers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Costs</td>
<td>165</td>
<td>121</td>
<td>193</td>
<td>270</td>
<td>227</td>
<td>281</td>
<td>436</td>
</tr>
<tr>
<td>Variable Costs</td>
<td>397</td>
<td>173</td>
<td>345</td>
<td>517</td>
<td>354</td>
<td>464</td>
<td>720</td>
</tr>
<tr>
<td>Net margin</td>
<td>196</td>
<td>222</td>
<td>172</td>
<td>-12</td>
<td>-214</td>
<td>-89</td>
<td>-431</td>
</tr>
<tr>
<td>Heifers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Costs</td>
<td>168</td>
<td>110</td>
<td>184</td>
<td>266</td>
<td>222</td>
<td>276</td>
<td>428</td>
</tr>
<tr>
<td>Variable Costs</td>
<td>347</td>
<td>149</td>
<td>274</td>
<td>363</td>
<td>292</td>
<td>373</td>
<td>606</td>
</tr>
<tr>
<td>Net margin</td>
<td>111</td>
<td>120</td>
<td>81</td>
<td>-28</td>
<td>-306</td>
<td>-116</td>
<td>-430</td>
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</table>
Scenarios

**Scenario A**: Study the effect of genetically selecting cattle for feed efficiency.

**Scenario B**: Investigate the influence of intra-population genetic variation in performance.

**Scenario C**: Assess the impact of currently available subsidies (Basic Payment Scheme and the Greening Payment).
Simulation Outcomes

Steer Systems

- Baseline
- High Growth
- Feed Efficiency
- Subsidies

£ per animal

-500 -400 -300 -200 -100 0 100 200 300 400 500

September October November December January February March April May

June July August September October November December January February March April
# Financial Results

## Scenario A:

<table>
<thead>
<tr>
<th>£ per animal</th>
<th>Steers</th>
<th>Heifers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profitable systems</td>
<td>24, 29 months</td>
<td>23, 24 months</td>
</tr>
<tr>
<td>Largest Effect</td>
<td>+ £157 (35 month)</td>
<td>+ £80 (24 month)</td>
</tr>
</tbody>
</table>

## Scenario B:

<table>
<thead>
<tr>
<th>£ per animal</th>
<th>Steers</th>
<th>Heifers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profitable systems</td>
<td>24, 26, 27, 28, 29, 30 months</td>
<td>23, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34 months</td>
</tr>
<tr>
<td>Largest Effect</td>
<td>+ £208 (27 month)</td>
<td>+ £415 (32 month)</td>
</tr>
</tbody>
</table>

## Scenario C:

<table>
<thead>
<tr>
<th>£ per animal</th>
<th>Steers</th>
<th>Heifers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profitable systems</td>
<td>24, 29 months</td>
<td>23, 24, 29 months</td>
</tr>
<tr>
<td>Largest Effect</td>
<td>+ £147 (35 month)</td>
<td>+ £138 (35 month)</td>
</tr>
</tbody>
</table>
Concluding Remarks

- Farm physical and financial results largely followed expected trends.

- Opportunities exist for profitable beef production in Scotland, particularly for finishing steers at a younger age profile at slaughtering.

- Model revealed which of the interventions simulated were better fit for each beef finishing system examined.

Future work

- Measure environmental impact
- Optimize outcomes using Linear Programming
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Thank you for your Attention!