Predicted economic and greenhouse gas benefits from using improved maternal genetics in UK beef cattle

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Improving Maternal Beef traits

• Selection focused on beef growth and carcass traits has neglected many maternal traits

• Initiatives to improve maternal beef herds through increased use of improved maternal genotypes and genomic selection
  • UK Scotland Beef Efficiency Scheme (BES)
  • Ireland Beef Data and Genomics Program (BDGP)

➤ Improve herd profitability
➤ Reduce greenhouse gas (GHG) emissions
BES impact prediction: Gene Flow model

Maternal Dual Purpose Index

Maternal Sub-index
- Mature weight (heifer, cow, cull cow)
- Calving interval
- Age at first calving
- Longevity
- Gestation length
- Calving ease

Terminal Sub-index
- Beef value

• Predict effects of farmer sourcing elite maternal genotypes to breed herd replacements
  • Maternal sub-index +£20 to +£40
    (Young sires to Genomic proven sires) above sire population average
### Trait values and expression

<table>
<thead>
<tr>
<th>Maternal Trait</th>
<th>Economic value (Δ£/unit)</th>
<th>GHG value (Δkg CO₂e/unit)</th>
<th>Expressed in herd by</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Calf 0y Heifer 2y Cow 2-11y Cull cow</td>
</tr>
<tr>
<td>Mature weight, cow (kg)</td>
<td>-0.35</td>
<td>0.88</td>
<td></td>
</tr>
<tr>
<td>Mature weight, heifer (kg)</td>
<td>-0.84</td>
<td>1.89</td>
<td>X</td>
</tr>
<tr>
<td>Mature weight, cull cow (kg)</td>
<td>1.52</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Calving interval (d)</td>
<td>-1.29</td>
<td>7.46</td>
<td></td>
</tr>
<tr>
<td>Age at first calving (d)</td>
<td>-348.95</td>
<td>3.85</td>
<td></td>
</tr>
<tr>
<td>Longevity (d)</td>
<td>94.46</td>
<td>-0.63</td>
<td>X X</td>
</tr>
<tr>
<td>Gestation length (d)</td>
<td>-2.05</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Calving ease (% unassist)</td>
<td>5.07</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

- Feed for maintenance
- Feed during empty days
- Feed for replacements
- X
Genetic effect of Elite Maternal sires

Current trend = £-0.722/y

Elite maternal +£30
sires used for 20y

Current trend = £-0.722/y

↑ Mature weight
↑ Calving interval
↓ Calving ease
Expressed GHG: Current trend

Total maternal GHG trend = +3.15 kgCO₂e/y

Breeding cows

Replacement heifers
Expressed GHG with Elite Maternal sires

+£30 Elite maternal sires mated to herd for 20 years

- Current Total maternal GHG trend
- Replacement heifers
- Breeding cows
- Total maternal GHG

GHG emissions (kg CO₂e/cow calving)

year

0 2 4 6 8 10 12 14 16 18 20

-130 -120 -110 -100 -90 -80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70
Key Findings

• Genetic improvement of maternal traits through selection of high maternal-value sires is predicted to have substantial benefits
  • Improved Mature weight, Calving interval, Longevity, Calving ease
    ➢ Increased Profitability
    ➢ Reduced GHG emissions (kg CO$_2$e) and Emissions Intensity (kg CO$_2$e/kg meat)
• Short-term programs also have longer-term benefits