Average milk yield per feeding day during extended lactations

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With help from Ermias Kebreab and Jim Fadel, UC Davis, California
Outline of presentation

• Why extended lactations?
• Private herds with extended lactations
• Fitting sparse milk recordings
• Extended lactation curves
• Results
• Key points
The logic behind extended lactation

- Extended lactations → Fewer calvings / annual cow → Fewer dry days / annual cow
- Fewer heifers → Less herd feed use → Improved profitability
- IF Milk yield / feeding day is unchanged → Fewer heifers
- Fewer heifers → Less GHG / kg milk
Lactation curves

Traditional lactations - app. 12-month calving interval

Extended lactations - app. 18-month calving interval
### Private herds with extended lactations

<table>
<thead>
<tr>
<th>Herd characteristic</th>
<th>Herd 1</th>
<th>Herd 2</th>
<th>Herd 3</th>
<th>Herd 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of cows</td>
<td>162</td>
<td>93</td>
<td>158</td>
<td>112</td>
</tr>
<tr>
<td>Breed</td>
<td>Holstein</td>
<td>Holstein</td>
<td>Cross</td>
<td>Jersey</td>
</tr>
<tr>
<td>ECM / cow / year</td>
<td>11,274</td>
<td>10,099</td>
<td>7,669</td>
<td>7,090</td>
</tr>
<tr>
<td>Replacement, %</td>
<td>40</td>
<td>25</td>
<td>42</td>
<td>23</td>
</tr>
<tr>
<td>Milking system</td>
<td>Parlour - 3x</td>
<td>Robot</td>
<td>Parlour - 2x</td>
<td>Robot</td>
</tr>
<tr>
<td>Grazing</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

- ECM recordings: Jan 2007 - May 2013
- 1,320 completed lactations
Days to first insemination

![Graph showing days to first insemination for different calving intervals. The graph includes data for five herds: Herd 1, Herd 2, Herd 3, and Herd 4. The x-axis represents calving interval in days, ranging from 350 to 675. The y-axis represents DIM at first insemination, ranging from 75 to 325. Each herd is represented by different symbols: Herd 1 (filled circles), Herd 2 (filled squares), Herd 3 (upward-pointing triangles), and Herd 4 (downward-pointing triangles).]
Fitting sparse milk recordings

Considerations

- Aim - total yield, peak
- Distance between record
- Management variation
- Calving interval
- Disease effect
- Incomplete lactations
- Drying off
- Milk yield at day one

<table>
<thead>
<tr>
<th>Type</th>
<th># par</th>
<th>Reference</th>
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<tbody>
<tr>
<td>Logarithmic</td>
<td>2</td>
<td>Brody, 1923</td>
</tr>
<tr>
<td>Exp. + linear</td>
<td>4</td>
<td>Wilmink, 1987</td>
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<tr>
<td>Mech. diff. eq.</td>
<td>5</td>
<td>Dijkstra, 1997</td>
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<td>Legendre Polyn</td>
<td>-</td>
<td>Schaeffer, 1990</td>
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<tr>
<td>...</td>
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<td>...</td>
</tr>
</tbody>
</table>

09/25-2014
First parity lactation curves - Herd 1

<table>
<thead>
<tr>
<th>Cow</th>
<th>Lactating days</th>
<th>Feeding days</th>
<th>ECM / day (305 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow 1 (Black)</td>
<td>465</td>
<td>521</td>
<td>36.5</td>
</tr>
<tr>
<td>Cow 2 (Red)</td>
<td>465</td>
<td>575</td>
<td>33.6</td>
</tr>
</tbody>
</table>
Third parity lactation curves - Herd 1

<table>
<thead>
<tr>
<th>Cow</th>
<th>Lactating days</th>
<th>Feeding days</th>
<th>ECM / day (305 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow 1 (Black)</td>
<td>437</td>
<td>522</td>
<td>41.9</td>
</tr>
<tr>
<td>Cow 2 (Red)</td>
<td>487</td>
<td>540</td>
<td>45.8</td>
</tr>
</tbody>
</table>

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Mean kg ECM per feeding day

Herd 1
- CI = 1
- CI = 2
- CI = 3
- CI = 4
- CI = 5

Herd 2
- CI = 1
- CI = 2
- CI = 3
- CI = 4
- CI = 5

Herd 3
- CI = 1
- CI = 2
- CI = 3
- CI = 4
- CI = 5

Herd 4
- CI = 1
- CI = 2
- CI = 3
- CI = 4
- CI = 5

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Kg ECM per feeding day, mean ± sd

<table>
<thead>
<tr>
<th></th>
<th>Parity 1</th>
<th></th>
<th>Parity 3+</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 13</td>
<td>13 &lt; 15</td>
<td>15 &lt; 17</td>
</tr>
<tr>
<td>CI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Herd 1</td>
<td>26.8 ± 2.5 (n = 124)</td>
<td>27.1 ± 2.9 (n = 75)</td>
<td>26.9 ± 2.5 (n = 21)</td>
</tr>
<tr>
<td>Herd 3</td>
<td>NA ± NA (n = 0)</td>
<td>18.7 ± 1.7 (n = 105)</td>
<td>18.5 ± 1.6 (n = 82)</td>
</tr>
</tbody>
</table>
Key points

• Extended lactations may reduce herd feed use without reducing herd milk production

• Results from four Danish dairy farms suggest that milk yield per feeding can be maintained

• Future work will attempt to characterize cows capable of maintaining milk yield

• Future work will estimate overall farm effect on GHG emission and farm economy

Reference: Lehmann et al. Organic Agriculture. Available online: July 16\textsuperscript{th} 2014