Strategies of Pasture Supplementation on Organic and Grazing Dairies

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The Survey

9 Sections
1) Farm business structure and decision makers
2) People working on the farm
3) Dairy herd and management
4) Feeding management
5) Pasture management
6) Land management and cropping operation
7) Manure and nutrient management
8) Economic information; and
9) Assessment of farm management and satisfaction.
The Survey

- 5 hours on average
- Collected 2011 and 2012
- Monthly data for 2010
- Observations: 131 farms

Face-to-face interviews

- PhD Student
  Marion Dutreuil

- MS Student
  Claudia Hardie
Sample

1. Random sample from list of all dairy producers in Southwest

2. Purposeful sample of grazing dairy producers

3. All certified dairy cattle organic producers
<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Average</th>
<th>Maximum</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years certified organic</td>
<td>0.7</td>
<td>6.7</td>
<td>20</td>
<td>4.7</td>
</tr>
<tr>
<td>Years utilizing grazing</td>
<td>0</td>
<td>14.7</td>
<td>90</td>
<td>13.4</td>
</tr>
<tr>
<td>Total land, ha</td>
<td>17.6</td>
<td>121</td>
<td>766</td>
<td>130</td>
</tr>
<tr>
<td>Total pasture, ha</td>
<td>6</td>
<td>39.4</td>
<td>144</td>
<td>31.2</td>
</tr>
<tr>
<td>Number of cows</td>
<td>12</td>
<td>69.2</td>
<td>650</td>
<td>85.8</td>
</tr>
<tr>
<td>Number of heifers</td>
<td>9</td>
<td>59.3</td>
<td>600</td>
<td>80.5</td>
</tr>
<tr>
<td>Milk production, kg/cow per year</td>
<td>2,360</td>
<td>6,272</td>
<td>10,286</td>
<td>1,805</td>
</tr>
<tr>
<td>Milk fat content, %</td>
<td>3.47</td>
<td>3.98</td>
<td>5.19</td>
<td>0.35</td>
</tr>
<tr>
<td>Milk protein content, %</td>
<td>2.82</td>
<td>3.15</td>
<td>3.67</td>
<td>0.18</td>
</tr>
<tr>
<td>Age of first calving, months</td>
<td>23</td>
<td>26.1</td>
<td>36</td>
<td>2.72</td>
</tr>
<tr>
<td>Calving interval, months</td>
<td>10</td>
<td>13</td>
<td>20.3</td>
<td>1.25</td>
</tr>
<tr>
<td>Number of lactations before culled</td>
<td>2</td>
<td>4.51</td>
<td>7</td>
<td>1.16</td>
</tr>
<tr>
<td>Dry matter intake (DMI), kg/cow/day</td>
<td>11.8</td>
<td>19.8</td>
<td>28.2</td>
<td>3.7</td>
</tr>
<tr>
<td>Peak pasture intake, % of DMI</td>
<td>1</td>
<td>69.3</td>
<td>100</td>
<td>26.1</td>
</tr>
<tr>
<td>Grazing rotation frequency, days</td>
<td>0.21</td>
<td>1.81</td>
<td>14</td>
<td>2.61</td>
</tr>
<tr>
<td>Length of grazing season, days</td>
<td>122</td>
<td>184</td>
<td>244</td>
<td>29</td>
</tr>
</tbody>
</table>
WI Organic Farm (n=70)

- **Supplementation:**
  - 81.8% Grain
  - 12.3% Protein
  - 35.4% Corn silage

- **Pasture:**
  1. Clover (red, white)
  2. Orchardgrass
  3. Kentucky bluegrass
  4. Quackgrass
  5. Timothy
  6. Alfalfa
  7. Smooth bromegrass
  8. Reed canarygrass
An organic WI dairy farm

- 121 ha
- 69 cows
- 17 kg/cow/d
- 19.8 DMI
- 3.98 % butterfat
- 3.15 % protein
- 39 ha
- 1.8 grazing days/rotation
- 69 % peak pasture intake
- 59 heifers
- 184 grazing days/year
- 4.5 lactations
- 121 ha pasture
- 69 % peak pasture intake
Factors Affecting Profitability

- Profitability = Milk income - Feed costs = Income over Feed Cost

- n = 20 (preliminary)
  4 organic (O)
  4 grazing (G)
  12 non organic, non grazing (C)

- Cluster analysis by complete linkage
Factors Affecting Profitability

Cluster 1
Cluster 3
Cluster 2

0:1:4 3:1:2 1:2:6
## Factors Affecting Profitability  
*(n=20 preliminary)*

<table>
<thead>
<tr>
<th></th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>O:G:C</td>
<td>0:1:4</td>
<td>3:1:2</td>
<td>1:2:6</td>
</tr>
<tr>
<td>Total ha</td>
<td>114</td>
<td>94</td>
<td>53.2</td>
</tr>
<tr>
<td>Number of cows</td>
<td>72</td>
<td>71</td>
<td>48</td>
</tr>
<tr>
<td>Milk production, kg/cow/year</td>
<td>7,083</td>
<td>10,787</td>
<td>4,155</td>
</tr>
<tr>
<td>Fat content (%)</td>
<td>3.78</td>
<td>3.55</td>
<td>4.36</td>
</tr>
<tr>
<td>Protein content (%)</td>
<td>2.99</td>
<td>3.03</td>
<td>3.25</td>
</tr>
<tr>
<td>SCC (x1,000 cells/ml)</td>
<td>287</td>
<td>204</td>
<td>317</td>
</tr>
<tr>
<td>Milk price, $/kg</td>
<td>0.37</td>
<td>0.35</td>
<td>0.48</td>
</tr>
<tr>
<td>Total DMI in winter, kg/cow/day</td>
<td>23.6</td>
<td>20.4</td>
<td>17.7</td>
</tr>
<tr>
<td>% hay in winter</td>
<td>32</td>
<td>0.9</td>
<td>54</td>
</tr>
<tr>
<td>% concentrates in winter</td>
<td>36</td>
<td>46</td>
<td>16.2</td>
</tr>
<tr>
<td>% vitamins and minerals in winter</td>
<td>0.9</td>
<td>0.7</td>
<td>2.4</td>
</tr>
<tr>
<td>IOFC in winter ($/cow/day)</td>
<td>5.97</td>
<td>8.09</td>
<td>5.22</td>
</tr>
</tbody>
</table>
Factors Affecting Profitability (n=20 preliminary)

Cluster 2
Productive efficient, $8.09 IOFC 0:1:4
- Intermediate land and herd size
- Highest milk productivity
- Highest concentrate in diet
- Poorest milk composition
- Lowest milk price

Cluster 1
Intermediate, $5.97 IOFC 3:1:2
- Largest land base
- Intermediate milk productivity, composition and price,
- highest DMI
- Intermediate levels of feed ingredients

Cluster 3
Low input, $5.22 IOFC 1:2:6
- Smallest land and herd size
- Lowest milk productivity
- Lowest DMI
- Best milk composition
- Best milk price
Factors Affecting Profitability (n=20 preliminary)

- Farm system might not be a good indicator of farm profitability
- Scope and inference is restricted to the preliminary analysis
- Complete survey database are being analyzed
## Predicted Greenhouse Gas Emissions (n=3 selected farms)

<table>
<thead>
<tr>
<th>Farm system type</th>
<th>Non organic or grazing</th>
<th></th>
<th>Organic</th>
<th></th>
<th>Grazing</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current</td>
<td>Double</td>
<td>Current</td>
<td>Double</td>
<td>Current</td>
<td>Double</td>
</tr>
<tr>
<td><strong>Number of cows</strong></td>
<td>75</td>
<td>150</td>
<td>80</td>
<td>160</td>
<td>80</td>
<td>160</td>
</tr>
<tr>
<td><strong>Stocking, cow/ha</strong></td>
<td>0.46</td>
<td>0.92</td>
<td>0.49</td>
<td>0.99</td>
<td>0.59</td>
<td>1.18</td>
</tr>
<tr>
<td><strong>Milk, kg/cow/year</strong></td>
<td>25,725</td>
<td>25,544</td>
<td>10,480</td>
<td>10,480</td>
<td>11,002</td>
<td>11,002</td>
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<tr>
<td><strong>Forages, ha</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>162.3</td>
<td></td>
<td>132.3</td>
<td></td>
<td>135.2</td>
<td></td>
</tr>
<tr>
<td><strong>Alfalfa, ha</strong></td>
<td>57.1</td>
<td></td>
<td>69.6</td>
<td></td>
<td>135.2</td>
<td></td>
</tr>
<tr>
<td><strong>Grass, ha</strong></td>
<td>28.3</td>
<td></td>
<td>62.7</td>
<td></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Corn, ha</strong></td>
<td>76.9</td>
<td></td>
<td>0</td>
<td></td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
Integrated Farm System Model

**Start**

- Read input
- Initialization
- Setup machinery

**Farm Parameters**

- Crop
- Till
- Soil
- Grazing
- Manure

- Harvest
- Storage
- Feed
- Cows

**Machinery File**

- Spring operations
  - Crop growth
  - Crop harvest
  - Storage
  - Cow feeding
  - Cow management
  - Manure handling
  - Fall operations
  - Economic analysis

**Output Files**

- Results
- Another year? (Yes/No)

- Weather data
- Machinery file
- Farm parameters
- Output files
## Predicted Greenhouse Gas Emissions (n=3 selected farms)

<table>
<thead>
<tr>
<th>Farm system type</th>
<th>Non organic or grazing</th>
<th>Organic</th>
<th>Grazing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current</td>
<td>Double</td>
<td>Current</td>
</tr>
<tr>
<td>Stocking (cows/ha)</td>
<td>0.46</td>
<td>0.92</td>
<td>0.49</td>
</tr>
<tr>
<td>PGHGE (kg CO₂eq /kg milk)</td>
<td>0.53</td>
<td>0.66</td>
<td>0.70</td>
</tr>
</tbody>
</table>

(%) total PGHGE

<table>
<thead>
<tr>
<th>Housing</th>
<th>46.6</th>
<th>42.8</th>
<th>39.0</th>
<th>37.1</th>
<th>30.7</th>
<th>33.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manure</td>
<td>4.0</td>
<td>39.0</td>
<td>5.6</td>
<td>5.2</td>
<td>15.6</td>
<td>9.3</td>
</tr>
<tr>
<td>Feed</td>
<td>19.4</td>
<td>37.1</td>
<td>6.3</td>
<td>8.4</td>
<td>7.8</td>
<td>7.3</td>
</tr>
<tr>
<td>Grazing</td>
<td>4.9</td>
<td>30.7</td>
<td>34.7</td>
<td>31.8</td>
<td>13.6</td>
<td>15.4</td>
</tr>
<tr>
<td>CO₂</td>
<td>-34.4</td>
<td>-33.0</td>
<td>-31.5</td>
<td>-30.0</td>
<td>-25.0</td>
<td>-25.9</td>
</tr>
<tr>
<td>Fuel</td>
<td>4.1</td>
<td>3.6</td>
<td>2.4</td>
<td>2.7</td>
<td>2.6</td>
<td>2.1</td>
</tr>
<tr>
<td>Secondary sources</td>
<td>21.1</td>
<td>5.6</td>
<td>11.9</td>
<td>14.8</td>
<td>29.7</td>
<td>32.8</td>
</tr>
</tbody>
</table>
Predicted Greenhouse Gas Emissions

kg CO2 eq / kg milk

0.4
0.5
0.6
0.7
0.8
0.9

1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
Predicted Greenhouse Gas Emissions (n=3 selected farms)

- Effect of animal density on PGHGE depends on farm system/management
- Farm data + model predictions = powerful for devising best management practices
- Scope limited to 3 selected farms
Acknowledgment

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