Self-sufficiency with vitamins and minerals on organic dairy farms

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Hypothesis of the project

Self-sufficiency with vitamins and minerals can be obtained at farm level through optimization of factors such as

– Type of forage crop
– Conservation method
– Season at harvest
– Plant development at harvest
– Silage quality
– Duration of storage
Model: Vitamin and mineral supply

Input:
- Type of forage crop
- Conservation method
- Season at harvest
- Plant development at harvest
- Silage quality
- Duration of storage

Model:
- Vitamin A
- Vitamin E
- Zn
- Cu
- Se

Output:
- Vitamin and mineral/ha
- Vitamin and mineral/animal/day during the year

5 case study farms

Present situation:
- 100% organically grown feed
- All farms import mineral and vitamin mixture

Strategy for increased vitamin and mineral supply:
- Including herbs with high content of vitamins/minerals
Supply from mineral and vitamin mixture

All farms:
Same level and type all year round

Per lactating cow per day:
750 mg vitamin E = 94% of requirement (800 mg)
110 mg Cu = 63% of requirement (10 mg/kg DM)
560 mg Zn = 63% of requirement (50 mg/kg DM)
4.7 mg Se >100% of requirement (0.1 mg/kg DM)

Feed ration for cows
Farm A

<table>
<thead>
<tr>
<th>Kg DM/cow/day</th>
<th>Summer = grazing</th>
<th>Winter = indoor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>May-Jun</td>
<td>Jul-Aug</td>
</tr>
<tr>
<td>Grazing</td>
<td>11.5</td>
<td>9.0</td>
</tr>
<tr>
<td>Silage</td>
<td>2.1</td>
<td>6.4</td>
</tr>
<tr>
<td>Concentrated feed</td>
<td>3.9</td>
<td>2.2</td>
</tr>
<tr>
<td>Total kg DM</td>
<td>17.5</td>
<td>17.6</td>
</tr>
</tbody>
</table>

60 cows: 8000 kg ECM
74 ha: grass-clover and cereals
Vitamin E supply from feed (green) and mixture (blue), mg/day

- Requirement: 800 mg/day

Cu supply, mg/kg DM from feed (green) and mixture (blue)

- Requirement: 10 mg/kg DM
Se supply
from feed (green) and mixture (blue), mg/kg DM

Requirement: 0.1 mg/kg DM

Results from plots with herbs in the grass-clover fields
Strategy for increased mineral supply

Including 30% (of DM yield) of herbs with high mineral content

Herbs can increase Se in feed

<table>
<thead>
<tr>
<th>Month</th>
<th>Basic</th>
<th>With herbs (30%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>May-Jun</td>
<td></td>
<td></td>
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<tr>
<td>Jul-Aug</td>
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<td></td>
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<tr>
<td>Sep-Oct</td>
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<tr>
<td>Jan-Feb</td>
<td></td>
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<tr>
<td>Mar-Apr</td>
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</tbody>
</table>

![Graph showing Se content in feed with and without herbs](graph.png)
Herbs can increase Cu in feed

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<thead>
<tr>
<th>Month</th>
<th>Basic</th>
<th>With herbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>May-Jun</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Jul-Aug</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>Sep-Oct</td>
<td>9</td>
<td>11</td>
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Conclusion

The final version of this model can
- evaluate the present practice of mineral and vitamin supply
- demonstrate relevant alternatives for increased mineral and vitamin supply