What sensors can do for grazing

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Outline of presentation

- Examples automatically collected information AM systems
  - Milking robot
    - RFID
    - Milk meter
    - Conductivity
    - Blood
    - HerdNavigator
  - Activity sensors
    - Leg
    - Neck
Information from milking robot

- As example – VMS from DeLaval
### Information from milking robot

<table>
<thead>
<tr>
<th>Device</th>
<th>Variable</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFID</td>
<td>Visiting time</td>
<td>Visiting frequency</td>
</tr>
<tr>
<td></td>
<td>Milking time</td>
<td>Milking frequency</td>
</tr>
<tr>
<td>Milk meter</td>
<td>Milk yield</td>
<td>Production level</td>
</tr>
<tr>
<td>Conductivity sensor</td>
<td>Conductivity</td>
<td>Udder health</td>
</tr>
<tr>
<td>Blood sensor</td>
<td>Blood in milk</td>
<td>Udder health / Colostrum</td>
</tr>
<tr>
<td>HerdNavigator</td>
<td>Progesterone</td>
<td>Heat / pregnant</td>
</tr>
<tr>
<td></td>
<td>Urea</td>
<td>Ration</td>
</tr>
<tr>
<td></td>
<td>BHB</td>
<td>Ketosis</td>
</tr>
<tr>
<td></td>
<td>LDH</td>
<td>Udder health</td>
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<tr>
<td>and others ...</td>
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</tbody>
</table>
Information from milking robot

Daily milk yield for cow 607

Date (dd-mm-yyyy)

kg.d^{-1}
Information from milking robot

Daily milk yield for herd (40 cows)

kg.d$^{-1}$

date (dd-mm-yyyy)

31-05-2013 30-06-2013 30-07-2013 29-08-2013 28-09-2013
Information from activity sensors

- **Leg mounted**
  - Walking (Steps)
  - Lying
  - Standing

- **Neck mounted**
  - Activity
  - Feeding/grazing time
Activity sensor data (leg)

Activity cow 607 during August 13 and 14

Activity (steps per 15 min)
Activity sensor data (leg)

Average daily activity during experiment

steps night  steps day

activity (steps per cow per day)

0 800 1600 2400 3200 4000

31-7-2013 14-8-2013 28-8-2013 11-9-2013 25-9-2013
Activity sensor data (leg)

Average daily lying time during experiment

- **lying night (min)**
- **lying day (min)**

Graph showing daily lying time from 31-7-2013 to 25-9-2013.
Neck sensor data

- In 15 min windows
  - Feeding / grazing time = angle of neck
  - Activity level = movements of head
Neck sensor data – feeding time

- Per individual cow: eating pattern over the day
Neck sensor data – feeding time

- Eating time of herd

**Eating time per day (min)**

- average herd (58 cows) barn feeding time
- average herd (58 cows) pasture feeding time

<table>
<thead>
<tr>
<th>Date (dd-mm)</th>
<th>Barn Feeding Time (min)</th>
<th>Pasture Feeding Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-8</td>
<td>120</td>
<td>180</td>
</tr>
<tr>
<td>6-8</td>
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<td>7-8</td>
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</tbody>
</table>
Neck sensor data – activity

activity from neck sensor

activity level

date (dd-m-yyyy)

in heat

Neck sensor data from 1-8-2014 to 4-8-2014 shows increased activity levels on 3-8-2014, indicating that the animals were in heat during this period.
Information from different sensors

**Feeding time from neck sensor**

- Date (dd-m-yyyy)
- h.d⁻¹
- 3.0
- 6.0

- Decreased feeding time

**Beta hydroxy butyric acid information from HerdNavigator**

- BHB
- Date (dd-m-yyyy)
- 30-7-2014
- 9-8-2014
- 19-8-2014
- 29-8-2014
Discussion

How can collected sensor data be cooperated in grassland management (individual based or herd based)