COMBINING ROBOTIC MILKING AND GRAZING

4 years of experiments in Derval experimental farm

- T. HUNEAU
- V. BROCARD
One goal

Assure decent:

- Traffic
- Production
- Feed intake

with a

- 100% grass diet
- Saturated robot
- Reasonnable workload

Combining robotic milking and grazing at Derval farm
How to combine grazing and a robot?

- Saturation of the robot
  - 741,000 liters delivered each year
  - 72 Holstein in lactation all year long
  - 9,000 kg of milk as a herd average
  - AMS: Reversed circulation with pre-screening

Combining robotic milking and grazing at Derval farm
Choices made at Derval farm

- Simplified rotational grazing
  - 0.40 hectare per cow
  - Perennial Ryegrass + white clover
  - 400 meters to access the furthest paddock
  - Three paddocks
  - No water outside
Choices made at Derval farm

- Buffer feed: maize silage, according to sward volume outside
  - platemeter
  - density

- Target to keep 10 days of grass ahead

- Regular timetable with one fetching of the cows by herdsman
One idea:

• Ideally,

  - One cow at the robot
  - The rest of the herd grazing

• But difficulties
  - Ensure milkings at night
  - Compose with cows’ gregarious instinct
  - Act individually or collectively
From 100% maïs silage down to 8 kg DM:

One situation, one organisation

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>8am</td>
<td>Cows go out after milking (one after the other)</td>
</tr>
<tr>
<td>12am</td>
<td>Pasture Free access Paddock – cowshed Going out one by one after milking</td>
</tr>
<tr>
<td>6pm</td>
<td>Cows shed</td>
</tr>
</tbody>
</table>

- Cows milked since midnight are sorted out and allowed OUT (10 min)
- All cows fetched back inside shed

- 2 daily compulsory working periods: 8am and 6pm
- Sure to have milkings till 12am
- Returns from 12am and 6pm according to weather

Combining robotic milking and grazing at Derval farm
100 % grazing

One situation, one organisation

<table>
<thead>
<tr>
<th>Time</th>
<th>Pasture</th>
<th>Pasture</th>
<th>Cowshed</th>
<th>Pasture</th>
</tr>
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<tr>
<td>8am</td>
<td>Pasture</td>
<td>Pasture</td>
<td>Cowshed</td>
<td>Pasture</td>
</tr>
<tr>
<td></td>
<td>Going out one by one after milking</td>
<td>Free access Paddock – cowshed</td>
<td>Open</td>
<td>Going out one by one after milking</td>
</tr>
</tbody>
</table>

- 1 daily compulsory working period at 5:30pm - 6pm
- 30 milkings performed between 00am and 6am
- Cows come back between 8am and 6pm according to weather

Combining robotic milking and grazing at Derval farm
Many questions

• Is it possible to close the maize clamp?

• Which factors do affect the milking frequency?

• What is the impact of grazing on feeding cost with robotic milking system?
Data registered and analysed

- **Technical criteria:**
  - All forage delivered and concentrate are weighed
  - Measures of grass height and density; estimation of grazed grass intake \(^{(\text{Inra, 2007 : intake capacity})}\)
  - Dairy production (cow and tank levels)
  - Milking frequency

- **Economic criteria**
  - Feeding cost
  - Margin over feeding cost
Statistical Analyses

- Test of effects of feeding periods (P) on production criteria and frequency over 3 years:
  - P1: 100% maize silage
  - P2: transition period
  - P3: 100% grazing

- No significant differences of lactation stages and parity between years and feeding periods
Grass intake

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2012</th>
<th>2013 Jan-Jul</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grazing days</td>
<td>220</td>
<td>145</td>
<td>129</td>
</tr>
<tr>
<td>100 % grazing</td>
<td>11</td>
<td>32</td>
<td>56</td>
</tr>
<tr>
<td>(d)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grazed grass</td>
<td>1,200</td>
<td>1,500</td>
<td>1,100</td>
</tr>
<tr>
<td>(kgDMc⁻¹ d⁻¹)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Milk production and milking frequency from February to July 2012

Milk production per cow (kg)

Milk production and milking frequency from February to July 2012

P2

P3 100% grazing

Milk production per cow (kg)

Milking frequency

1/2 1/3 1/4 1/5 1/6
Effect of period on milk production

- **Milk production**
  - Significant difference between periods
  - P1 > P2 > P3 (<0.0001)

- **Effect partial grazing P2-P1**: +1.4 kg of milk.c⁻¹.d⁻¹
  - Decrease by -1.7 kg concentrate.c⁻¹.d⁻¹

- **Effect 100% grazing P3-P1**: -1.7 kg of milk.c⁻¹.d⁻¹
  - Decrease by -2 kg concentrate.c⁻¹.d⁻¹

- **Estimate production**:
  - P1: 28.9 kg of milk.c⁻¹.d⁻¹
  - P2: 30.3 kg of milk.c⁻¹.d⁻¹
  - P3: 27.5 kg of milk.c⁻¹.d⁻¹
Effect of period on milking frequency

- Milking frequency
  - Significant difference between periods
  - P1 > P3 > P2 (<0,0001)

- Effect partial grazing P2-P1 : -0,15 milking.c⁻¹.d⁻¹

- Effect 100% grazing P3-P1 : -0,12 milking.c⁻¹.d⁻¹

- Estimate production :
  - P1 : 2,11 milking.c⁻¹.d⁻¹
  - P2 : 1,96 milking.c⁻¹.d⁻¹
  - P3 : 1,99 milking.c⁻¹.d⁻¹
Performance of AMS in 2012

<table>
<thead>
<tr>
<th></th>
<th>P1(60j)</th>
<th>P2(74d)</th>
<th>P3(32d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headcount</td>
<td>73</td>
<td>74</td>
<td>74</td>
</tr>
<tr>
<td>Number of milkings per d</td>
<td>149</td>
<td>141</td>
<td>138</td>
</tr>
<tr>
<td>AMS Production (kg per d)</td>
<td>2130</td>
<td>2323</td>
<td>2044</td>
</tr>
</tbody>
</table>
Reduction of feeding costs

-30% feeding cost with 100% grazing compared to 100% indoor

- Margin on feeding cost between 200 and 300 € per 1000 liters
Combining robotic milking and grazing is possible!

• 1,200 kg of grazed grass per cow in 2012
And already...1,100 kg in 2013!

• Maize clamp closed during 7 weeks in 2013

• Efficient cow traffic in 100% grazing
  – Frequency : 1,99 milking.c\(^{-1}\)d\(^{-1}\)
  – Production : 27,5 kg of milk.c\(^{-1}\)d\(^{-1}\)
Combining robotic milking and grazing is possible!

- Limited work load
  - Once per day fetching of the cows by herdsman
  - No silage distribution
  - Less cubicle cleaning
Thank you for your attention

You can visit Derval experimental farm this Friday to discover the equipment

thomas.huneau@loire-atlantique.chambagri.fr