Innovative and sustainable systems combining automatic milking and precision grazing

Dr. Bernadette O’Brien

Animal and Grassland Research and Innovation Centre, Teagasc, Moorepark, Fermoy, Co. Cork
Background

• Automatic milking systems (AMS)
  • Common across continental Europe – 10,000
  • Indoor feeding systems, high milk production cow, year round calving

• Differences between automatic and conventional milking
  • Cows volunteer themselves for milking based on expectation of feed during or after milking
  • Milking is distributed over a 24 hour period

• Big challenge to integrate fully with grass-based system
  • Grass allocation is key in achieving this
  • Optimizing milk output from AM unit (rather than /cow)
Advantages of AM

- Potential reduction in labour input – 3.8h, 20%, 40%
- Increased milk production :- 6 to +35% (MF, Conc)
- Improvement in cow well-being (stress, lameness)

Advantages of cow grazing systems

- Economic: the cheapest way to feed dairy cows, with lowest input of labour and mechanization (zero grazing farms earn ~0.5 to 2 Euro per 100 kg milk less than farms on full or limited grazing)
- Animal welfare and consumer demands: necessary for cows to be outdoors e.g. Sweden and Denmark
- Positive impact on milk quality and environment
Perceived constraints to grazing with AM

- cows at pasture may not return to the AM voluntarily
- dairy operator may have to collect the cows
- increased labour demand with grass management
- reduction in milking frequency - cow milk yield

BUT AM can be adapted to extensive herd scenarios with technical innovation in grazing management and increased efficiency of grass utilization - NZ
Irish context

• If AM could be combined with cow grazing - could be very relevant to Irish dairy farms

  • (i) Land fragmentation
  • (ii) labour – AM has the potential to reduce labour costs on farms, particularly as they expand
  • (iii) Lifestyle - change in type of labour input
  • (iv) entry level – continue other employment until the farm is viable.
Objective

To integrate an automatic milking system (AMS) into a cow grazing system where both milk output from the AMS unit and the grass proportion of the cow diet are maximized simultaneously

• AMS at Moorepark 8th March 2011
  63 cows of mixed breed (start-up) – 75-80 in 2012
  Mean calving date 15th February
Moorepark trial

- 24 ha milking platform - 63 cows, 2011 – 25, 16, 20, 2
- Land area is divided into 3 grazing sections of 8 ha each (A, B, C) - further divided into 1 ha paddocks
- Water is located at the dairy
- Maximum distance to furthest paddock is ~ 700 m
- Merlin AMS unit installed
- Drafting units: entrance to dairy - pre- or post- milking area, at the dairy exit (holding yard for treatment) or to grazing (Section A, B, C)
- Evaluation of KPIs of the AMS – production, energy and economics
- Evaluation of the AMS in terms of milk quality, labour and cow behaviour
Farm map

Section A

Section B

AMS

Section C
Grassland management

- Grass allocation is critical for optimal cow visits
- Cows graze 1 section of 3 grazing areas in each 24 h
- Cows allocated 5 kg DM in each of the 3 grazing sections (A, B and C) over each 24 h period
- Cows go into grazing areas with grass covers of 1400-1500 kg DM/ha
- Cows move between the grazing Sections A, B and C at 1 am, 11 am and 5 pm, respectively
- Pasture mass estimated twice weekly. Covers greater than 1500 kg DM/ha would discourage cow movement and may reduce milking frequency
- Cows graze to a post-grazing height of 3.5-4.0 cm
- Cows stocked at an average target of 3.5 cows/ha
- All cows received 1 kg concentrate feed per 24 h
Summary

- Cow selection – udder trimming
- Cow training – approx. 4 days/cow
- Daily routine
  - 30 mins morning and 15 mins evening
  - Check cow milking data, udder and cow health
  - Routine maintenance checks
  - Grass allocation
- Liners replaced every 3 weeks
- Good backup service vital
Future Research

• Optimum cow feeding strategy to maximise milk output
• Investigate interaction of milking frequency, cows per unit and stage of lactation
• Identify optimum cow breed/type for the AMS
• Sustainability
  • economics, energy usage, environmental impact, cow well-being and milk quality
List of participants: 14 members comprising 6 SME-AGs from 6 different counties, and 6 RTD Performers and two SMEs

<table>
<thead>
<tr>
<th></th>
<th>Coordinator/RTD</th>
<th>SME-AG</th>
<th>RTD</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(Coordinator)</td>
<td>Teagasc - Agriculture and Food Development Authority</td>
<td>TEAGASC</td>
<td>Ireland</td>
</tr>
<tr>
<td>2</td>
<td>SME-AG</td>
<td>Irish Grassland Association</td>
<td>IGA</td>
<td>Ireland</td>
</tr>
<tr>
<td>3</td>
<td>RTD</td>
<td>Stichting Dienst Landbouwkundig Onderzoek</td>
<td>WLR</td>
<td>The Netherlands</td>
</tr>
<tr>
<td>4</td>
<td>SME-AG</td>
<td>LTO Noord</td>
<td>LTO</td>
<td>The Netherlands</td>
</tr>
<tr>
<td>5</td>
<td>RTD</td>
<td>Aarhus Universitet</td>
<td>AU</td>
<td>Denmark</td>
</tr>
<tr>
<td>6</td>
<td>SME-AG</td>
<td>Videncentret For Landbrug</td>
<td>VFL</td>
<td>Denmark</td>
</tr>
<tr>
<td>7</td>
<td>RTD</td>
<td>Institut de l'Elevage</td>
<td>IDELE</td>
<td>France</td>
</tr>
<tr>
<td>8</td>
<td>SME-AG</td>
<td>Centre National Interprofessionnel de l'Economie Laitiere</td>
<td>CNIEL</td>
<td>France</td>
</tr>
<tr>
<td>9</td>
<td>RTD</td>
<td>Sveriges LantbruksUniversitet</td>
<td>SLU</td>
<td>Sweden</td>
</tr>
<tr>
<td>10</td>
<td>SME-AG</td>
<td>Svensk mjölk ab</td>
<td>SDA</td>
<td>Sweden</td>
</tr>
<tr>
<td>11</td>
<td>RTD</td>
<td>Universite de Liege</td>
<td>ULg</td>
<td>Belgium</td>
</tr>
<tr>
<td>12</td>
<td>SME-AG</td>
<td>Filiere Lait et Produits Laitiers Wallonne</td>
<td>FLPLW</td>
<td>Belgium</td>
</tr>
<tr>
<td>13</td>
<td>SME end user</td>
<td>Aidan+Anne Power, Farmer</td>
<td>SME FARM IE</td>
<td>Ireland</td>
</tr>
<tr>
<td>14</td>
<td>SME end user</td>
<td>Thure Worm, Farmer</td>
<td>SME FARM DK</td>
<td>Denmark</td>
</tr>
</tbody>
</table>
The objective

to develop and implement innovative and sustainable systems that combine Automatic Milking and Precision Grazing for dairy cows which are appropriate to the different approaches to dairy farming to be found in the different regions in Europe
Concepts and main focal points

• AM operated mainly with cows indoors on diets high in conserved forage and concentrate feed, e.g. Denmark
• Alternatively, e.g. Ireland, have well developed cow grazing systems but are not familiar with AM
• This project brings the two concepts together.
• Will focus on: farm labour demand, farm fragmentation where land is a constraint to herd expansion at one location, legislative requirements for cow grazing times, reduction in feed costs, consumer preference for milk from grazed grass.
Outputs of AUTOGRASSMILK

• Protocols for optimum feeding strategies for dairy cows incorporating grazing and AM for different grass supply and quality, farm infrastructure and cow breed scenarios in the six partner countries
• Pasture management tools that will facilitate AM dairy farmers to implement excellent grazing management practices
• A tried and tested sustainability assessment tool for farmers to evaluate their own AM /cow grazing system
• Web based decision support tool that will facilitate dairy farmers to optimise economic efficiency when combining grazing with AM
• Guidelines for optimized operation of both mobile and carousel AM units in grazing scenarios

The Irish Agriculture and Food Development Authority
Dissemination

- Protocols for optimum feeding strategy for dairy cows incorporating grazing with AM technology for various production systems in Europe as influenced by grass supply and quality, farm infrastructure and cow type
- Pasture management tools that will facilitate AM dairy farmers to implement excellent grazing management practices

WEBSITE
- Consumer interaction
- Technical communication
- Scientific papers
- Popular communication
- Factsheets

A tried and tested (on the SME end user farms) sustainability assessment tool for farmers to evaluate their own AM/cow grazing system
- Web based decision support tool that will facilitate dairy farmers to optimise economic efficiency when combining grazing with AM technology
- Guidelines for optimized operation of both mobile and carousel AM units in grazing scenarios

INTERACTIVE (face-to-face) COMMUNICATION

The Irish Agriculture and Food Development Authority
Potential impact of project

- European competitiveness in dairying
- Conforming to animal welfare EU legislation
- Herd expansion
- Profitability
- Labour costs and efficiency
- Sustainability
- Farmers well-being
- Milking equipment industry
- Collaboration within the EU
Discussion

• Feedback - relevance of this project to your country
• Other issues that we should focus on
• Ideas on dissemination methods – key element of this project – methodologies used for grazing technology – may be appropriate for this project
Thank you for your attention