Sustainable dairy production with large amounts of home-grown feeds
A case study within SOLID (EU-project)

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SOLID - Sustainable Organic and Low Input in Dairying

• EU FP7 project  [www.solidairy.eu](http://www.solidairy.eu)

• 25 partners from 10 different countries
  – Coordinator Prof. Nigel Scollan University of Aberystwyth, Wales, UK
  – Universities, Research Institutes, Knowledge Centres and 10 SME’s

• Total budget 2011-2016
  – 7.75 M€,
  – whereof EU contribution 5.96 M€
SOLID – Sustainable Organic and Low-Input Dairying

– Use the latest scientific techniques to help cows and goats to adapt to organic and low-input systems, with few or no chemicals and artificial feedstuffs.

– Develop new and sustainable foodstuffs and improve the quality, yield and management of forage crops.

– Assess and improve grassland dairy systems, including home-grown forage supplies.

– Develop new methods and strategies and improve collaboration along the supply chain, from farm to fork.

– Share the knowledge with groups of farmers and the dairy industry in order to make the most of the project’s successes at all levels.
Definition of Low Input

Includes total farm expenditure of

- Purchased feed (for grazing livestock)
- Fertiliser
- Crop protection
- Energy

-> expressed as € per Grazing Livestock Unit (€/GLU)

Classes were defined:

- Low Input (LI) (419 €/GLU)
- Medium Input (MI)
- High Input (HI)
## Data for conventional, Low Input and Organic dairy farms (EU 27 data)

<table>
<thead>
<tr>
<th></th>
<th>Conventional</th>
<th>Low Input</th>
<th>Organic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forage area, ha</td>
<td>28</td>
<td>20</td>
<td>41</td>
</tr>
<tr>
<td>Dairy cows / farm</td>
<td>30</td>
<td>17</td>
<td>26</td>
</tr>
<tr>
<td>Own land, %</td>
<td>66</td>
<td>75</td>
<td>70</td>
</tr>
<tr>
<td>Total Labour, AWU</td>
<td>1.97</td>
<td>1.62</td>
<td>1.87</td>
</tr>
<tr>
<td>Family Labour, %</td>
<td>93</td>
<td>96</td>
<td>92</td>
</tr>
<tr>
<td>Milk yield, kg/cow/year</td>
<td>5 400</td>
<td>3 950</td>
<td>5 120</td>
</tr>
<tr>
<td>Milk Production, tons/farm</td>
<td>205</td>
<td>85</td>
<td>160</td>
</tr>
</tbody>
</table>
8 work packages make up the project

1. Innovation through stakeholder engagement and participatory research
2. Adapted breeds
3. Novel feeds and decision support models
4. Develop a knowledge platform to assess environmental sustainability
5. Supply chain and consumer analysis
6. Socio-economic evaluation
7. Knowledge exchange, training and innovation
8. Management
WP2: Performance of different breeds and cross-breeds in low input systems.
Genetic and metabolic measures

- **Northern Ireland**
  Crossbred Jersey – HF - Swedish Red

- **Austria** - Holstein (bred for lifetime performance not high lactation yield) vs Brown Swiss

- **Finland** - Finnish Ayrshire selected for index including fertility and health traits vs Holstein
  - Productivity, animal health, milk quality
WP3: Forages for productivity, quality, animal health and welfare in organic and low input dairy systems

Exploring novel forages including by-products:

- Eg Agroforestry by-products (willow)
- By-products of olive oil and tomato production
- Full-fat or locally extracted rapeseed cakes
  - Two publications

- Analysis to identify potential feeds
- Feeding experiments in Romania
Feeds included in the Literature review

Camelina, Crambe and Safflower meals
Lupin by-products
Olive leaves, Olive cake, Tomato pomace

On-farm produced rapeseeds
Buckwheat, mustard and Canary seed
Wood by-products, Agro-forestry

Reduced fat and high protein distillers grains, pea, bean, chickpea and lentils
WP4: Environmental assessment For improvements and communication in organic and low input dairy systems

Objectives:

• To develop and apply Life Cycle Assessment (LCA) based tools for producing indicators for environmental sustainability assessment of diverse multi-functional dairy systems (process approach)
• To identify the sustainability hot spots in important low input and organic dairy chains (system approach)
• To integrate the LCA approach to other sustainability indicators used in chain approaches
• To analyse the eco-efficiency and sustainability gains from innovations at the farm and chain level (policy approach).
WP5: Competitiveness of organic and low input dairy sector: Supply chain and consumer analyses

Objectives:

• To identify expectations for innovation in management practices and adapted breeds along the whole supply chain (fork to farm)

• To assess the acceptability of novel strategies (developed in WP1, 2 and 3) along the whole supply chain, with special consideration to consumer acceptance and preferences, and the sustainability of supply chain management practices

• To identify optimal strategies to enhance collaborative behaviours in supply chains in order to introduce acceptable innovations enhancing competitiveness and sustainability along the whole supply chain.
WP6: Socio-economic evaluation of novel strategies in organic and low-input dairy farming

Objectives:

• To develop a methodology for classifying low input dairy farms and to provide baseline data to identify factors that have led to the profitability of high performing dairy farms

• Assess the effect of novel strategies on EU dairy typical farm types through farm scale and sector scale modelling of proposed novel strategies

• To determine the policy implications of more widespread adoption of novel strategies developed within the SOLID project in contrast to further intensification of milk production within the EU.
WP7: Knowledge exchange, training and dissemination

Task:

- Analyse the outputs from WP1 to 6 in order to
  - identify the stakeholders for each deliverable
  - use innovative and participatory methods in dissemination

Stakeholder groups:

- dairy farmers
- milk processing/animal industry
- consumers
- NGOs
- scientist
- policy makers
WP1: Innovation through stakeholder engagement and participatory research

Aims:

• to actively involve farming stakeholders (dairy farmers, farmer groups, farm advisors) and stakeholder partners in a co-ordinated participatory approach
• to identify research needs
• to engage producer innovation in the development and implementation of research projects
• to assess stakeholder-led novel strategies at the farm level
How are farmers involved?

10 per country have undertaken whole farm sustainability assessments (Rapid Assessment Tool - RAT)

• Helping to identify research needs
• Suggesting novel ideas to test or monitor
• Providing data for analysis
• Hosting on-farm research
Rapid Assessment Tool Exercise for Sustainability

Aim:
• to describe innovative production systems with strengths and weaknesses (productivity & sustainability)
• inform research needs
• Half a day on a farm
RAT results, Finland

- 7 organic dairy farms
- 19 years in organic production (15-24)
- Mean size 139 ha (18-414)
- 20-170 ay/farm
Topics for on-farm research in Finland

**Aim:** Increase home-grown protein production (forage and concentrate) in organic dairy farming

- How to increase the **clover content of the first cut** of red clover grass silage by increasing the clover content of the yield -> pinch cut in May
- How to increase the **protein content of the grass** in the first cut of clover/grass silage -> slurry in the autumn
- What are the best techniques to **establish a winter turnip rape** crop
- How does the protein produced by faba bean and **blue lupin** compare to **peas**?
Pinch cut of red clover-grass ley in May to increase the protein content of the ley in the first cut in June.
Winter turnip rape
Blue lupin + spring wheat

Blue lupin
• 5% of the total yield
• Analyses of lupin:
  protein 336 g/kg,
  raw fiber 144 g/kg,
  raw fat 88 g/kg

Faba bean + spring oats

Faba bean
• 28% of the total yield
• Analyses of faba bean:
  protein 318 g/kg,
  raw fiber 88 g/kg,
  raw fat 21 g/kg
Pea-oats-wheat vs. Faba bean-oats-wheat for whole-crop silage

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<tr>
<th></th>
<th>DM</th>
<th>Protein</th>
<th>D-value</th>
<th>NDF</th>
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<tbody>
<tr>
<td>Pea</td>
<td>185</td>
<td>165</td>
<td>639</td>
<td>413</td>
</tr>
<tr>
<td>Faba bean</td>
<td>136</td>
<td>175</td>
<td>672</td>
<td>496</td>
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