

dairy_{4.0}

Advanced, trustworthy AI and data solutions for individualised automated milking & feeding of dairy cows



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About the Project

The dairy industry, vital to the EU economy, faces challenges with rising global demand and CO₂ emissions. Automated Milking Systems (AMS) and Automated Voluntary Milking Systems (AVMS) are vital. AI-driven advancements are needed to enhance efficiency, animal health, milk quality, and feeding strategies.

The International Farm Comparison Network (IFCN) reports that despite fewer dairy farms, those remaining will grow larger to meet rising global demand. Technological advancements aim to reduce emissions per kilogram of milk by 28% by 2050.



dAlry 4.0 integrates AI, Data, and Robotics to optimise AVMS, reducing environmental impact. It focuses on individual cow health via AVMS and introduces a laser sensor for real-time milk quality analysis. These innovations allow personalised milking, tailored feeding, and milk partitioning by quality, demonstrated in real-world cases.

Objectives



Objective 1

Development of an improved AI-based module using multi-source information for classifying the cows at individual animal level.



Objective 2

Upgraded modules for individualised milking, feeding and partitioning of milk for further optimisation of the Voluntary Automated Milking System (AVMS).



Objective 3

A novel DSS to be developed for enabling stakeholders to track, monitor and control parameters for high level farm goals.



Objective 4

Initial tests within R&D facilities and Complete system validations within six farms to test the system in real-world scenarios.



Objective 5

Wide-scale and audience-specific communications to demonstrate the value of project outcomes.

Expected outcomes

1.

Development of hardware modules including the novel milk analyser based on mid-IR spectroscopy, new modules for visual inspection and updated modules for individualised milking, feeding and milk partitioning. All to be integrated together for an upgraded AVMS.

2.

Extend current capabilities of existing data management platform with the development of a novel DSS based on new simulation models, where a digital twin of a farm will provide individualised decision support for stakeholders.



Initial testing phase

For the initial testing period, the new hardware and software modules will be tested within R&D facilities of project partner LELY to ensure successful integration of all components and required data analysis is achieved.

Actual validation phase

In total 6 farms located in the Netherlands will be used for the validations. These farms, already collaborating in R&D activities relevant to AMS robots, will be included to demonstrate the overall solution under varying conditions such as different cow breeds, farm sizes, feed ratios and other differing factors.

Result 1

Development and 1st integration of the Animal Status Classifier

- Vision submodules were developed and tested
 - Preliminary classification rules were established, categorising cows
 - Initial internal experiments showed promising accuracy (~95%) in vision submodules
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Result 2

Progress on the novel Milk Quality Analysis Module

- A new homogenisation and filtration system was acquired and validated
 - First lab tests confirmed feasibility of reaching analysis time target (<3minutes)
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Result 3

Deployment of the Data Infrastructure & Decision Support System (DSS)

- The cloud-based data platform is operational, handling real-time and historical data streams with an API getaway
 - Synthetic data validation demonstrated reliable risk detection and recommendations within <5 minutes
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Result 4

Integration of robotic modules and actuation progress

- Individualised milking, feeding, gating control, and milk partitioning modules were delivered in their first versions
- Milking parameters were optimised, and feed efficiency calculations were demonstrated

Project Facts

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Industrial & SME partners



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