Assessment of the Potential Improvement of Cheese Environmental Performance Achievable through the Use of an Innovative Real-time Milk Classification Service

UNIVERSITÀ CATTOLICA del Sacro Cuore

Sara Corrado
Marco Trevisan

INTRODUCTION AND OBJECTIVE

The Milk Classification Service (MCS) is an innovative device designed by Afimilk Ltd which allows to separate milk during milking in two flows according to their coagulation properties. Milk with better coagulation properties has to be sent to cheese making where it allows to reach higher cheese yields compared to the "traditional" one. The other flow, instead, is suited for drinking purposes.
The use of MCS was promoted within the CIP Eco – innovation project MilkyWay – More cheese from less milk: eco-innovative real-time classification technology for optimized milk use, financed by the European Commission within the Eco-innovation project.
Within the MilkyWay project an LCA was carried out with the aim of estimating the potential environmental benefits achievable through the use of the MCS

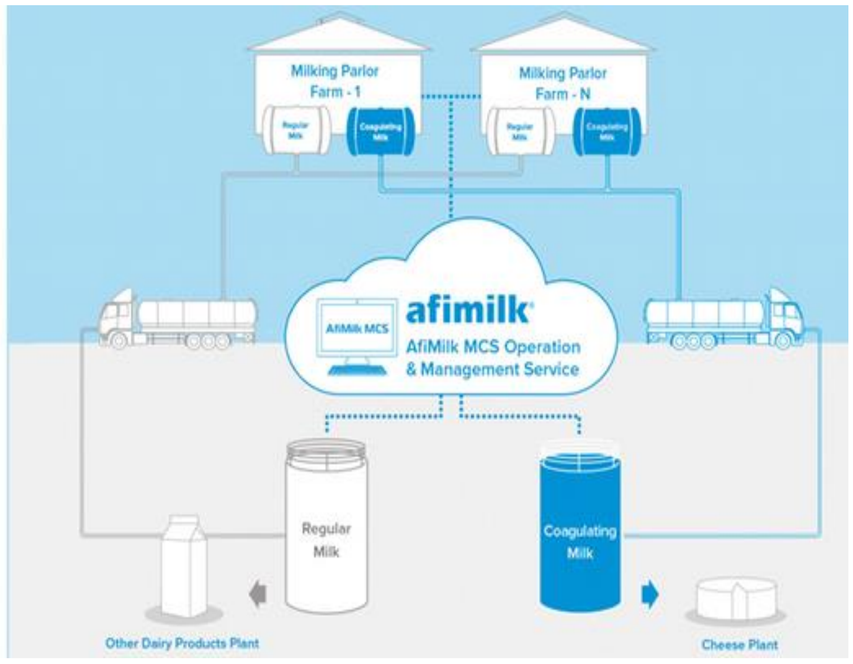

Fig. 1: Schematic representation of the milk separation through the MCS

MATERIALS AND METHODS

- System boundaries: from cradle to farm gate (Fig. 2, Fig. 3)
- Functional unit: 1 kg of cheese with a standard content of fats (31,3 g/100g) and proteins (26,8 g/100g)
- Allocation procedures (IDF, 2015 with adaptations to the specific context)
  - Agricultural residues: economic
  - Farm gate: biophysical for milk, calves and meet (IDF, 2015); physical (dry matter content) among coagulating milk and regular milk
  - Dairy plant: physical (dry matter content)
- Sources of data
  - Activity data collected during experimentations carried out throughout the project
  - Emissions from enteric fermentation and manure management: IPCC, 2006
  - Other field emissions: EEA, 2013
  - Carbon dioxide emissions from direct land use change: Van Zeist, 2016

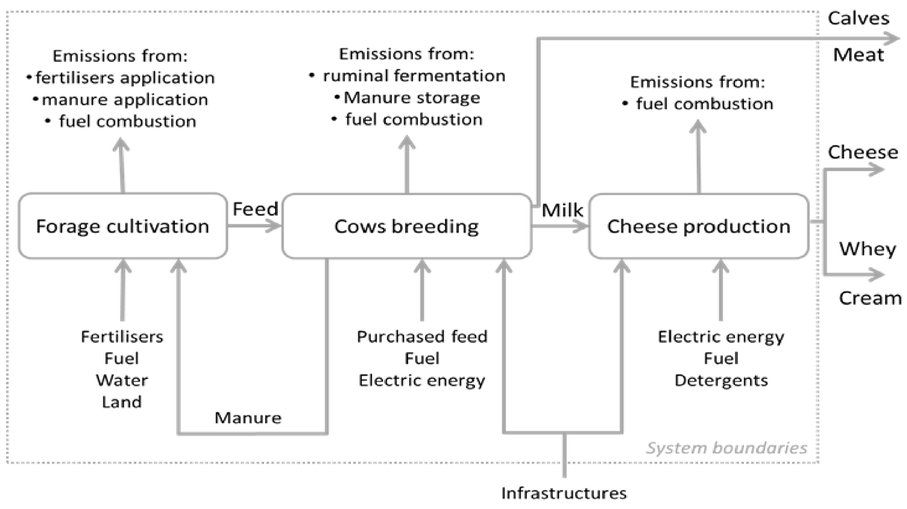

Fig. 2: Diagram of the analysed system without the MCS

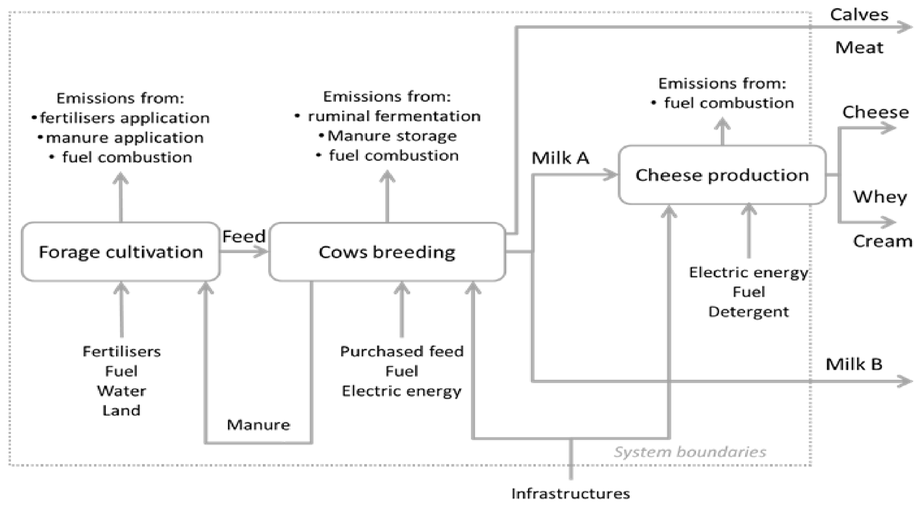

Fig. 3: Diagram of the analysed system with the MCS

RESULTS AND DISCUSSION

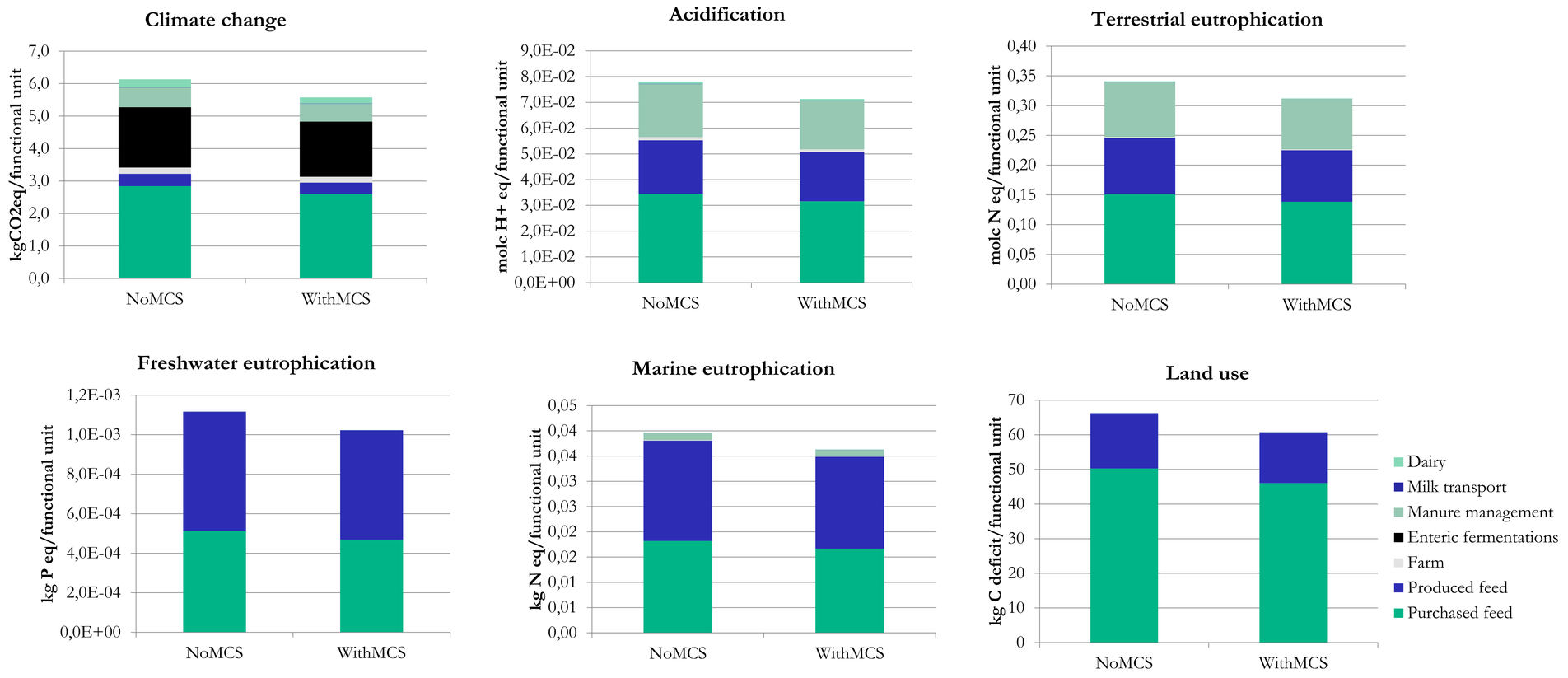

Fig. 3: Results of the study

- Milk production main contribution to all the impact categories
- Use of the MCS implicated a reduction of all the impact categories comprised between 8% and 9%
- Enteric fermentation, purchased and on-farm produced feeds main contributions to almost all the impact categories

Sensitivity analysis

- 1 kilogram of cheese as functional unit, according to the product categories rules for the product environmental footprint of dairy products (Quantis, 2015)
  The use of MCS allowed to reduce the potential impact on all the impact categories by 3% - 4% → lower reduction compared to 1 kilogram of cheese with a standard content of fat and proteins
- Methodology to account for CO_2 emissions from direct land use change
  The potential impacts on climate change and land use can be potentially reduced respectively by 30% and 1%

CONCLUSIONS

- The use of the MCS allowed to reduce the environmental burden od cheese, however the choice of functional unit had an important influence on the extent of the reduction.
- The potential benefits associated with drinking milk production were out of the boundaries of the system analysed.
- Milk production, particularly enteric fermentation, purchased and on-farm produced feeds, are the main environmental hotspots of the system analysed .
- CO_2 emissions from direct land use change represented an important share for the impact categories climate change and land use

References

International Dairy Federation, (IDF) 2015. A common carbon footprint approach for dairy. The IDF guide to standard lifecycle assessment methodology for the dairy sector

IPCC, 2006. IPCC Guidelines for National Greenhouse Gas Inventories – Volume 4: Agriculture, Forestry and Other Land Use

European Environmental Agency (EEA), 2003. EMEP/ technical guidance to prepare national emission inventories. Publications Office, Luxembourg

Van Zeist, 2016. Direct Land Use Change Assessment Tool

Quantis, 2015. Product Environmental Footprint Category Rules for Dairy Products – Draft for public consultation

This work was funded by the European Union Eco-innovation initiative under the MilkyWay Project (ECO/13/630450), and by Università Cattolica del Sacro Cuore