eda Fact sheet

March 2018

connect to the world of dairy

Water: a key resource in the dairy sector

Water is a finite and vulnerable vital resource, and an essential element for dairy: **85-90 % of milk is made of water!** Even most importantly, water is key to assure safe high-quality production of dairy products, as it is used in the dairy plants for **heating, cooling, washing, and cleaning**, always prioritising **the highest hygienic standards and maximum safety** in all sectors of production.

The dairy industry is continuously working on greater water sustainability through international and national initiatives.

1. Link to the UN Sustainable Development Goals

The European dairy sector is continuously working on improving not only its economic performance, but also its long-term sustainability, and key to these efforts will be the **achievement of the UN Sustainable Development Goals SDGs**.

Clean water and sanitation: the many recent developments in the dairy sector towards greater circularity and sustainability also result in a more **sustainable management of water and sanitation**. Improvements in water use efficiency and recycling measures have clearly decreased the aquatic impact of dairy. Moreover, the grazing of dairy cows can have a positive effect on water quality by protecting the soil surface from erosion (1).

Industry, innovation and infrastructure: the EU dairy sector has been establishing a **resilient infrastructure**, that promotes **sustainable methods of production** and fosters an environment of **innovation**. As an example, the strive for water reuse may stimulate research leading to the development of innovative technologies and processes that can increase the EU's competitiveness with countries where such projects also take place (2).

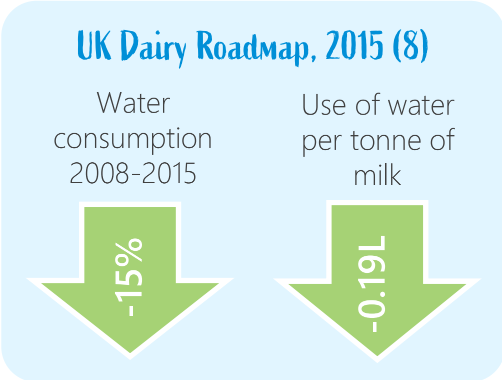
2. Why is water quantity so important?

Without water, there is no food production (farm level) (3): **in fact, agriculture uses 70% of the fresh water worldwide.** Water is used for irrigating crops, animal consumption, animal welfare, moving manure and cleaning the barns via flush systems, cleaning and sanitising equipment, milk cooling, producing value added products (4).

The importance of water

Regarding dairy processing, according to published research results, most dairy plants consume from 1 to 10 m^3 of water per every m^3 of processed milk (5). Water consumption varies enormously according to the type of products and the requirements for the process.

Water supply to dairy processing plants may be from town water, bore wells, wells, river, dams or irrigation channels (6). Water has many uses in dairy processing—heating, cooling, washing, and clean-up (7).



Water scarcity: Europe's freshwater resources are under increasing stress, with a worrying **mismatch between demand for, and availability of, water resources** across both temporal and geographical (spatial) scales (EEA, 2012) (9). Resource availability is further compromised by **poor or unsuitable water quality** which can significantly increase the financial costs of supply (9).

Water savings: water savings on dairy processing sites can go through **more efficient cleaning systems, identifying water 'hotspots' and taking preventive action**, increasing staff awareness and innovative water treatment technologies, like reverse osmosis and recuperation of condensates from milk evaporators, to replace fresh water consumption (9).

Reasons to conserve water:

- Water and sewer charges have more than doubled and will continue to increase
- High water consumption is making availability critical in some cases
- Future regulations may require water conservation and reduction in pollutant discharges

To achieve sustainable water management in a dairy plant, **both the quantity and quality of water need to be considered** (6). Regardless, food safety considerations must always prevail on environmental considerations. The water quality itself can have an influence on how much water is needed for a specific use. The water amount and quality that is used can also have an influence on which cleaning agents and amount of chemicals are needed.

Water used in food processing must be of a quality that is safe and suitable for human consumption. Consequently, it has to be safe for its intended use, i.e. no contamination of foodstuff with legionella/pathogens and/or other unsuitable substances as a result of using the water in food processing. In the food industry, including dairy plants, **water is used both with and without food contact**, and the water quality criteria differ accordingly.

Make the difference between...

› Water not in contact with raw, intermediate, or final product: water used for cooling purposes and for generation of 'non-food steam, external cleaning' (6).

› Water in contact with the products like water used for equipment cleaning, reconstitution, washing of products, cheese salting and moisture adjustment in products such as butter. (6)

Among these water quality criteria, **a distinction is also to be made between an environmental and a hygiene approach** – it can be the same water, but its assessment criteria may differ. In general, criteria are separated between chemical, physical and microbiological criteria; hygiene-related criteria are mostly focusing on the microbiological and chemical parts, and environmental ones gather all three, with more emphasis on microbiological.

Main water quality criteria (10) with establishment of limits for:

- **chemical** (e.g. BOD, TOC, endocrine disruptors, minimum chlorine residual)
- **microbiological parameter** (e.g. bacteria, protozoa, viruses, helminths)
- **physical** (e.g. pH, turbidity, conductivity)

Chemical oxygen demand (COD) and biochemical oxygen demand (BOD)

analyses the strength of the waste stream by measuring required oxygen to stabilise the wastes (7). In terms of food safety, these parameters are relevant (e.g. assessment of the microbiological stability of water).

3. Different types of water and their relation to our environment

Some authors divide water into three categories: green, blue and grey water. Together, these components provide a comprehensive picture of water use by delineating the source of water consumed, either as rainfall/soil moisture or surface/groundwater, and the volume of fresh water required for assimilation of pollutants (11). In LCA studies, the 'blue water' use is the relevant indicator.

Green water consumption describes the evapotranspiration of rainwater during plant growth, which is especially relevant for agriculture (12).

Blue water consumption is the volume of ground and surface water that is used during production (irrigation, feeding of animals, processing, storage, transport of final products, retail). This is the most relevant value for assessing the dairy industry's water use (12).

Grey water is polluted water which was not in contact with faecal matter (13).

Gran Moravia was the first cheese in the world to calculate its water footprint.

By doing so, it can outstandingly reduce its blue water consumption (by 22%) to less than half of the generic cheese blue water footprint calculated by 'waterfootprint.org' (14). This achievement is made possible by technological progress in the processing phase and the optimal allocation of farms in a region where irrigation is not necessary.

4. What is a Life Cycle Assessment?

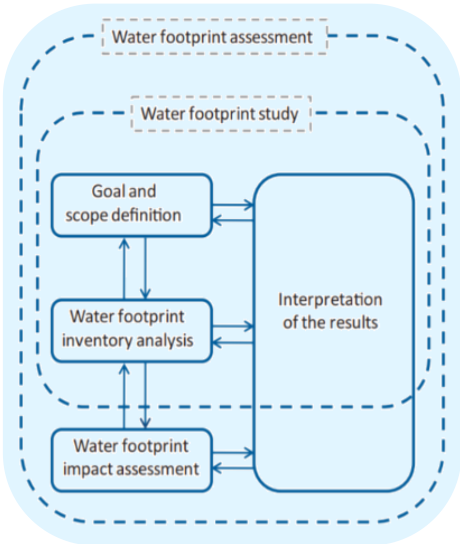
Life Cycle Assessment (LCA) is an internationally standardised methodology (ISO 14040 ff) that helps to quantify the environmental pressures related to goods and services (products), the environmental benefits, the trade-offs and areas for achieving improvements, taking into account the full life-cycle of the product (15).

The 'life-cycle' impacts include:

- the extraction of raw materials
- the processing, and fabrication of the product
- the transportation or distribution of the product to the consumer
- the use of the product by the consumer
- and the disposal or recovery of the product (16)

Phases of LCA:

- compiling an inventory of relevant inputs and outputs
- evaluating the potential environmental impacts associated with those inputs and outputs
- interpreting the results of the inventory and impact phases in relation to the objectives of the study (16)



The IDF Guide to Water Footprint Methodology for the Dairy (17)

5. What is a water footprint?

The water footprint measures the amount of water used to produce each of the goods and services we use. It looks at both direct and indirect water use of a process, product, company or sector and includes water consumption and pollution throughout the full production cycle from the supply chain to the end-user (11).

A water footprint may be presented as **the result of a stand-alone assessment or as a sub-set of results of a larger environmental assessment**, such as a Life Cycle Assessment.

A water footprint aims at **quantifying potential environmental impacts related to water**, including impacts associated with water use, and the subsequent effect on water availability for humans and ecosystems, as well as direct impacts on the water resource and its users from emissions to air, soil and water. These may later be quantified using the traditional LCA impact categories (e.g. freshwater eutrophication, freshwater acidification, human toxicity, eco-toxicity) (18).

European Dairy Association

eda@euromilk.org

@EDA_Dairy

References and further reading:

1. FAO-AGAL, Livestock and the SDGs. Available from: http://bit.ly/2fgklSd

2. Inception Impact Assessment Minimum quality requirements for reused water in the EU (new EU legislation), Roadmap 07/04/2016. Available from: http://bit.ly/2aiBQg1

3. IDF, Water footprint. Available from: http://bit.ly/2FtrLOr

4. Cullens, F., Water use on dairy farms, Michigan State University Extension, 18 October 2011. Available from: http://bit.ly/1LyhDAv

5. Wojdalski, J., Dróżdż, B., Piechocki, J., Gaworski, M., Zander, Z., Marjanowsk, J., Polish Journal of Chemical Technology 2013 15 issue 2, P. 61-72. Available from: http://bit.ly/2FkeTKW

6. National Dairy Development Board, Dairy Knowledge Portal. Management of water in dairy plants. Available from: http://bit.ly/2FibEDY

7. Rausch, K.D., Powell, G.M., Dairy Processing Methods to Reduce Water Use and Liquid Waste Load, Cooperative Extension Service, Kansas State University March 1997. Available from: http://bit.ly/2tjbZ3u

8. Dairy Roadmap 2015. Available from: http://bit.ly/1QLnDYA

9. EC, Optimising water reuse in the EU. Final report – Part I, Publications Office of the European Union, 2015. Available from: http://bit.ly/2yvqhfg

10. Alcalde Sanz, L., Gawlik, B., Water Reuse in Europe - Relevant guidelines, needs for and barriers to innovation, JRC92582, 2014. Available from: http://bit.ly/2oWlv7t.

11. Water footprint network, What is a water footprint?. Available from: http://bit.ly/1NuRVyo

12. Berger, M. and Finkbeiner, M., Water Footprinting: How to Address Water Use in Life Cycle Assessment? MDPI AG 2010, 2(4) P. 919-944. Available from: http://bit.ly/2IbMp3M

13. The Water Network, What is blue, green and grey water?. Available from: http://bit.ly/2Ab4QBg

14. Brazzale, Gran Moravia Water Footprint. Available from: http://bit.ly/2HgE8KD

15. EC, European Platform on Life Cycle Assessment (LCA). Available from: http://bit.ly/2G0Du4A

16. The Global Development Research Center, Defining Life Cycle Assessment. Available from: http://bit.ly/2FgtSWt

17. IDF, The IDF Guide to Water Footprint Methodology for the Dairy, Bulletin of the International Federation 486/2017, 2017. Available from: http://bit.ly/2oPUa7B

18. WULCA, Water footprinting in LCA. Available from: http://bit.ly/2Fx3JSt

EDA (European Dairy Association)
Av. d'Auderghem 22-28
1040 Brussels
Belgium

+32 2 549 50 40
www.euromilk.org/eda
eda@euromilk.org
@EDA_Dairy