ActiSaf Sc 47

for low carbon dairy farming

The first yeast probiotic proving environmental efficiency with Life Cycle Assessment from cradle to farm gate.

Farmers are facing many new challenges: headed by the demand to reduce the carbon footprint attached to livestock production, especially greenhouse gas emissions (GHG); the need to use sustainable raw materials, while also improving animal welfare. In the face of such requirements, nutritional solutions, such as Actisaf® Sc 47, offer new opportunities to increase farm profitability, while still reducing the environmental impact of dairy farming.

Phileo by Lesaffre, as a strong supporter of innovation to help the sustainable development of the industry, has worked with Blonk Consultants, international agri-food products life cycle assessment (LCA) specialists, to complete a dairy farm LCA of Actisaf®.

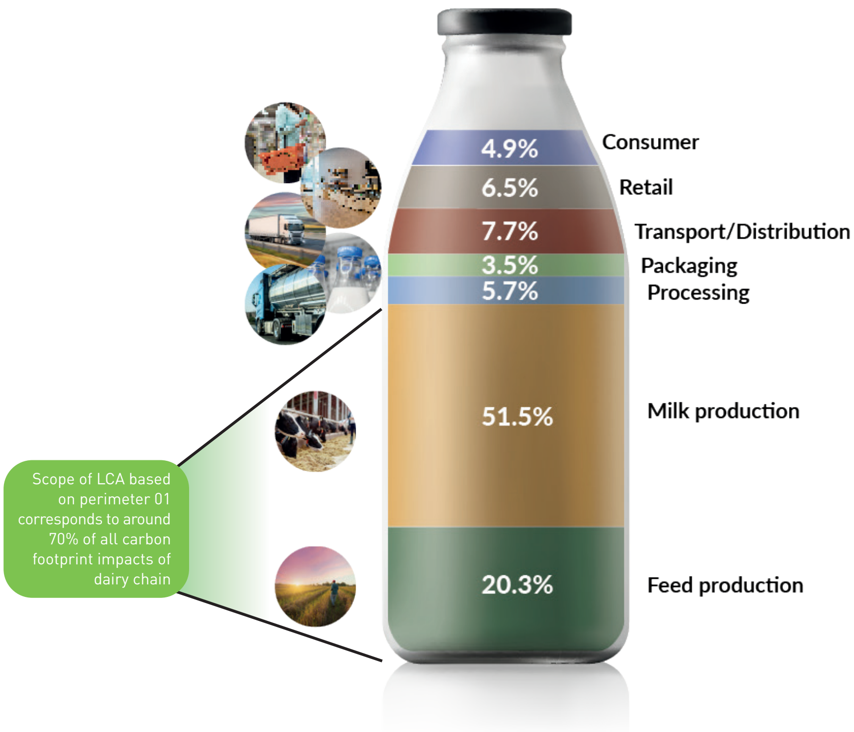
This has enabled Phileo by Lesaffre to focus on reliable information aimed at both the environment and on-farm sustainability, as related to the effect of Actisaf® on animal production.

Life cycle assessment (LCA) - a multicriteria methodology

LCA is a holistic and scientific reference method to evaluate and quantify the environmental impacts of a product throughout its life cycle, while also identifying potential hotspots. An LCA captures the entire supply chain (from cradle to grave) at all individual stages.

An LCA study involves a thorough inventory of energy usage, materials that are required across the product's value chain, and the calculation of corresponding GHG emissions. Recognised procedures for conducting LCAs are covered by the 14000 series of ISO environmental management standards: ISO14040 and ISO 14044 (European Commission, 2018b, 2018a, 2021, and FAO 2019; ISO2006a, ISO2006b). ISO14040 provides the 'principles and framework' of the standard while ISO14044 provides an outline of the 'requirements and guidelines'. While Europe harmonised environmental calculation rules for LCA methodology, we followed the PEFCRs for dairy products and animal feed, alongside the FAO LEAP guideline for feed additives (2019).

U.S. Fluid Milk Carbon Footprint



1Thoma et. al, *Greenhouse Gas Emissions of Fluid Milk in the U.S.*, University of Arkansas, 2010. Based on environmental and consumption data from 2007-2008. Carbon footprint of 1 gallon of fluid milk consumed is 17.6 lbs. CO2e.

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To start an LCA, one of the first steps is to define the goal and scope of the study. The scope explains the analysed product system and its boundaries (e.g., cradle-to-grave or cradle-to-gate). Another important aspect to define is the functional unit, which amounts to a quantified description of the product's function.

Second, starting the inventory process involves the compilation and quantification of the product's inputs and outputs throughout its life cycle. Primary data is obtained and a database for missing data is used to complete the inventory.

The third step of the process involves an impact assessment of the selected impact categories, using a specific method.

The fourth and final step consists of interpreting all gathered information and results (ISO, 2006).

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Category impacts

According to Product Environmental Footprint (PEF) methodology, 16 categories of environmental impact exist. The **Actisaf®** LCA covered six different environmental impact categories, mainly focused on carbon footprint or climate change impact, land use, water scarcity, acidification, eutrophication, and resource use – energy.

In the LCA, the impact on climate change was expressed in CO_2 equivalent (CO_2-eq). CO_2-eq is a metric which compares emissions from different GHGs, all of which have an impact on climate change. The GHGs are compared according to their Global Warming Potential (GWP) and expressed in equivalents with the same impact as 1 kg CO_2 over a period of 100 years.

Land Use Change (LUC) emissions, such as deforestation, also have an impact on climate change. LUC impact should be interpreted in a different way to other global warming impact emissions, such as CO_2, methane, and laughing gas. LUC emissions are based on country average statistics. In general, only a small part of agricultural land is deforested but this can have a high impact on the country average.

System tools

On-farm emission calculations were performed within the dairy module of the Animal Production Systems (APS) tool, provided by Blonk Sustainability Tools (Blonk Consultants, 2020). The system boundaries were from cradle-to-farmgate, with **Actisaf®** production (performed by EVEA) taken account of throughout the LCA. The APS-footprint framework enabled environmental footprint calculations to be conducted according to background datasets, with parameters defined by the user and the modelling of emissions, carried out according to specified standards and guidelines (FAO – LEAP).

Dairy systems may vary in design and environmental performance due to differences in herd composition, grazing periods, housing types, feeding regimes and manure management systems. The dairy APS module enables a user to model these different characteristics and investigate how they influence environmental impacts.

FAO – LEAP is a technical document that provides detailed guidelines on how to measure environmental performance in relation to the production of feed additives, and, on the other hand, how to measure the effects of feed additives on the environmental performance of livestock products. The product's environment footprint is based on precise terminology to indicate the requirements, recommendations, and options that might be chosen during the study.

The methodological framework regarding allocation, functional units, boundary definitions and emission modelling is based on published and recognised international guidelines (European Commission, 2018; European Environment Agency, 2016; IPCC, 2006b).

The allocation

Outputs from a typical dairy farm are raw milk, live animals leaving the farm (dairy cows and calves), and manure. Milk is usually connected to a processing stage and a subsequent distribution channel.

Allocation is used to distribute the overall environmental impact according to the different outputs: milk and animal liveweight (aggregate of replaced dairy cows and sold calves). The dairy module of the APS-footprint uses biophysical allocation to calculate the environmental impact of the two co-products. This type of allocation is extensively used in the dairy sector. It was developed by the International Dairy Association (IDF, 2010) and was suggested to be used for both documents as a base to LCA-analyse dairy PEFCR (European Commission, 2018) and FAO – LEAP.

Trials data

The primary data for this study was drawn from trials carried out by renowned institutions in different regions of Europe. They provided the relevant data required for an LCA of dairy production, such as milk yield, feed intake, and rations. Other data points, such as energy consumption, manure management, and herd composition, were taken from Blonk's dairy reference systems database. For each country, a reference system was available that could be considered as representing an average farm. The dairy trials did not cover a full lactation period. In fact, the **Actisaf®** trial covered from calving to 201 days in milk, with a supplementation period up to 120 days and a period of no supplementation. This may result in an underestimate of the benefits of supplementing **Actisaf®** during the entire LCA period of 305 days, which assumed milk production equal to the reference system for the UK, FR and DE, for both groups.

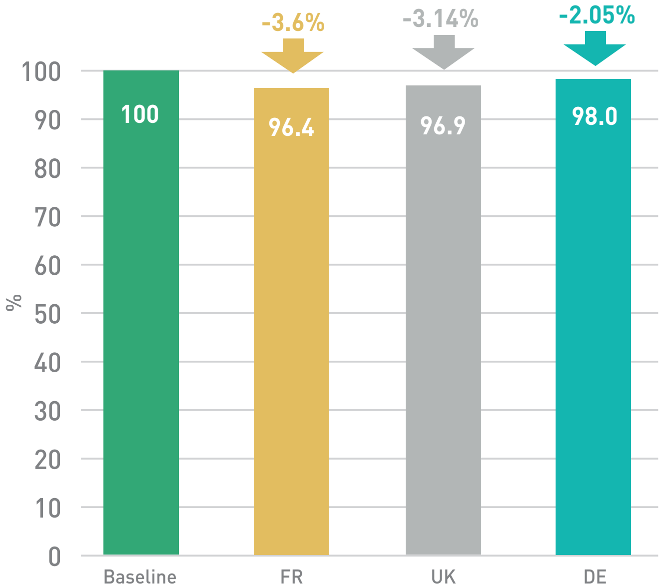
Assumptions

During the research important data were collected and these data were used as an important source for the LCA analysis, even in this situation some assumptions were needed to complete the assessment.

The extrapolation of trial data to annual farm data means that the effect of **Actisaf®** was only included during the trial period. The days of lactation outside trial scope were assumed equal to the control.

This diluted the reduction from approximately 5% to 3%

Relative carbon footprint results for the three trials in scope



Source: ISO REPORT 14040/44 - 2023 – Relative carbon footprint results for the 3 trials in scope.

Results

Extrapolation of trial data in all three trials to annual farm level shows reductions in the carbon footprint (in CO_2eq per kg of FPCM) from - 2,05% and 3,6% + other similar range of reductions in other category of impacts. Similar reduction was observed on the categories evaluated as land use, eutrophication and others.

This range of reduction refers to the whole milk production in a lactation cycle including calving (305 days) + the dry period (60 days) and other non-milk producing animals on the farm. As Phileo advises to supplement during full lactation period, current reductions are underestimated.

Shown below are the results from three different trials. This LCA analysis demonstrates a reduction of CO_2eq per kg of FPCM of between 2,05% and 3,6%.

Actisaf® delivered reductions across several impact categories on annual data estimation

Environmental impact category	Average reduction control vs Actisaf®
Climate change	-2.9%
Climate change, LUC	-1.85%
Climate change, biogenic	-2.76%
Acidification	-1.99%
Freshwater eutrophication	-2.12%
Marine eutrophication	-2.16%
Terrestrial eutrophication	-2.33%
Land use	-2.15%
Water scarcity	-2.19%
Resource use, fossils	-1.85%

Source: ISO REPORT 14040/44 - 2023 – average reduction control vs Actisaf® on different categories of impact – based on one year estimation at farm.

Key Words: Actisaf®, life cycle assessment, CO_2eq, carbon footprint, feed efficiency, sustainable dairy farming

Reference: Life cycle assessment report by Blonk Consultants, the international leader in environmental and sustainability research in the agri-food sector – LCA compliant with the requirements of the ISO standards ISO 14040/44 and critically reviewed.

Conclusion

Actisaf® is a good practice for sustainable dairy transition:

Based on the submitted trials and LCA analysis we can conclude that Actisaf® is the first yeast probiotic proving environmental efficiency with Life Cycle Assessment from cradle to farm gate.

Subject to the supplementation period Actisaf® reduces the carbon footprint of 1 kg of milk up to 5% and delivered also reductions across several environmental impact categories.

*This study is based on an LCA that is under ISO 14040/14044 critical review - 2023

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More information on Actisaf® ?

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