Flora Professional Ice Cream Mix vs. dairy ice cream in Europe.

Life Cycle Assessment
Technical Summary

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FLORA PROFERSSIONAL ICE CREAM Mix VS. DAIRY ICE CREAM LCA TECHNICAL SUMMARY

Upfield, a leading food company, believes developing sustainable plant-based food alternatives to dairy is an important factor in tackling the impacts of our food system on our natural environment. Upfield has commissioned Quantis to perform a life cycle assessment of their 2 plant-based ice creams compared to dairy equivalents in the European market to understand the environmental impacts. This summary deals with the plant-based ice creams.

LIFE CYCLE ASSESSMENT

Life cycle assessment (LCA) is a metric-based methodology used to assess environmental impacts resulting from a product or service, for example, greenhouse gas emissions, waste production, water, land, and energy use. Environmental impacts are calculated over the life cycle of a product, from extraction of raw materials to the end-of-life.

METHOD

This study followed the regionalized LCA methodology described by Liao et al. (2020) to compare the environmental impacts of 1 kg of Upfield Products to the same amount of dairy equivalents sold in Europe. Data was collected with a cradle-to-grave approach for the product recipe, key ingredients sourcing countries, production factory, energy mixes, packaging designs, transportation, and end-of-life scenarios. Spatially differentiated agricultural life cycle inventory data were generated (archetypes), as well as land use change (LUC) emissions for Upfield Products to dairy equivalents using an attributional approach as per PAS 2050 (BSI, 2012), aligned with the latest international standards for dairy products, published by the International Dairy Federation (IDF, 2015) and the European Dairy Association (EDA, 2016).

CRITICAL REVIEW

The LCA respects ISO 14040 and 14044 standards for public disclosure of results. The study has been peer reviewed by a panel of three independent experts on topics such as LCA, agronomy and dairy production.

FUNCTIONAL UNIT

The functional unit (FU) is a reference unit for which all results are calculated and presented. For Upfield Products and dairy equivalents, the functional unit (FU) was to provide the function of 1 kg of ice cream consumed.

To fulfil the functional unit, the specific quantities and types of material required must be expressed. These are known as reference flows. The main reference flows for the systems under study are the following.

Plant-based or dairy Ice cream

- 1 kg of Flora Professional Ice Cream Mix or dairy ice cream, packaged in 10 L bag in box, in hotel, restaurant or catering, on the EU market
- 1 kg of Flora Professional Ice Cream Mix, packaged in 1 L liquid packing board, in hotel, restaurant or catering, on the EU market

ENVIRONMENTAL IMPACT INDICATORS CONSIDERED

The assessment includes a total of 16 indicators: 14 environmental impact indicators from the European Commission Environmental Footprint (EF) 3.0 method and two additional indicators: land occupation (m^2.y), which reflects the total area of land used over one year and is a proxy for biodiversity and ecosystem services (Nemecek et al. 2011, Milà i Canals et al. 2012), and water consumption (m^3), the total amount of fresh water consumed (ISO 14046), which includes, for example, evapotranspiration of irrigation water.

FROM CRADLE-TO-GRAVE

The LCA considers all identifiable activities across the product life cycle (cradle-to-grave) for the selected Upfield Products in Europe (see Figure 1).

The study includes impacts from:

- Farming (crop production or milk production)

- Product manufacturing of Upfield Products or dairy equivalents
- Packaging manufacturing of Upfield Products or dairy equivalents
- Distribution
- Retail
- Consumer use
- Packaging end-of-life

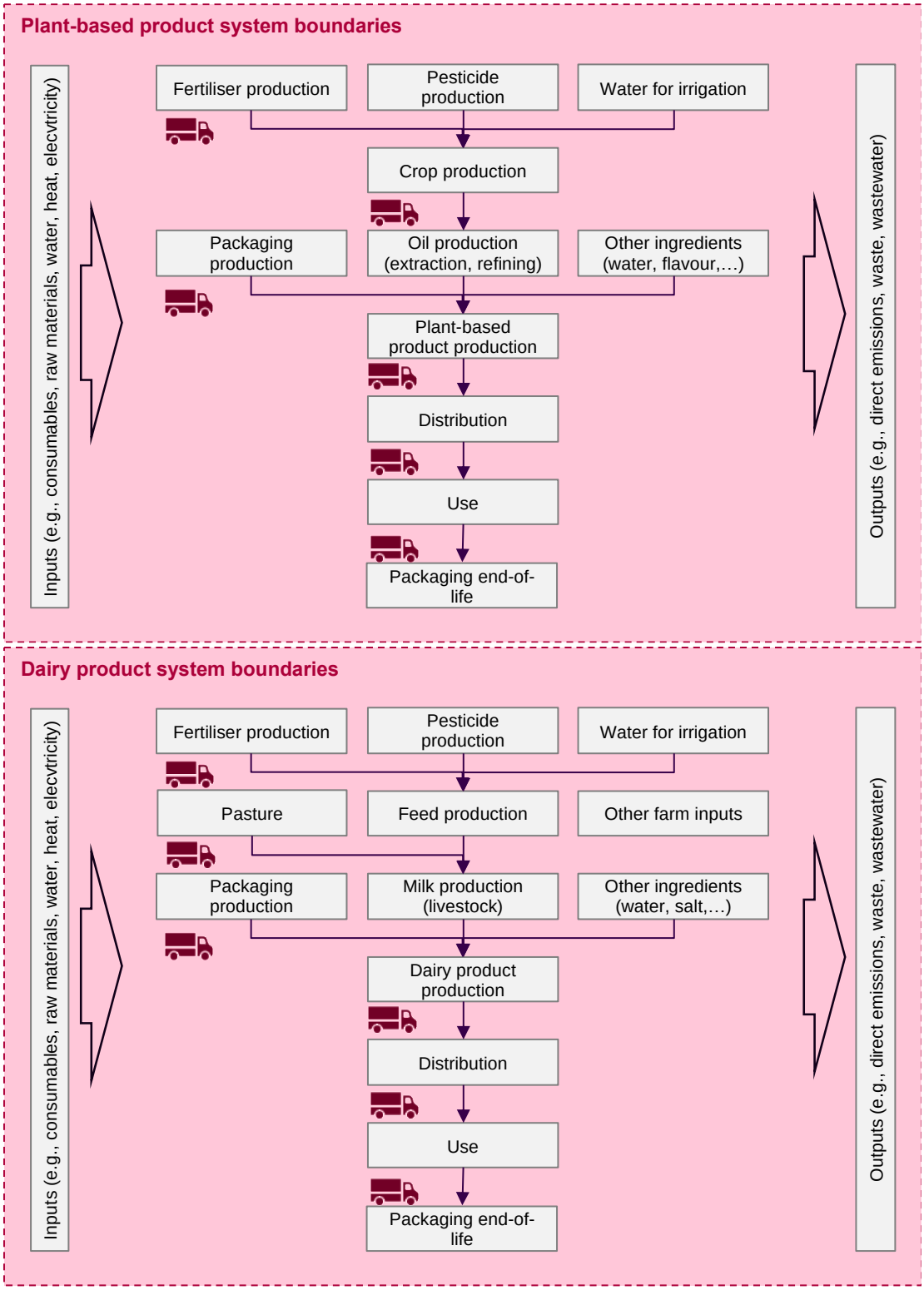

Figure 1. Schematic of the systems evaluated

The study does not include impacts from:

- Capital goods at the distribution centre and at the point of retail.
- Labour, commuting of workers, administrative work, cattle insemination, and disease control processes.
- Food loss and food waste during distribution, at retail point and at the consumer's home.

DATA COLLECTION AND MODELLING

- Upfield Products: primary data for the recipes and ingredient sourcing for Upfield Products, as well as their product and packaging manufacturing and distribution, were provided by Upfield.
- Dairy equivalents for Europe: Default data representative of European averages and published by the European Dairy Association and the European Commission were used to model dairy processing and distribution.

All data has been assessed to ensure that it meets the quality standards required to make comparative assertions. Data was compiled for different product recipes, key ingredient sourcing countries, production factory locations, energy mixes, packaging designs, transportation, and end-of-life scenarios. Spatially differentiated agricultural life cycle inventory data were generated (archetypes), as well as LUC emissions for agricultural ingredients in all markets relevant to each system's supply chain. The LCA modelling tool SimaPro version 9.3 was used to model individual datasets (such as oilseeds and packaging) required for 100% plant-based products and for the life cycle of dairy products.

RESULTS AND DISCUSSION

CLIMATE CHANGE IMPACTS

Table 1 shows that all Upfield Products assessed have lower climate impacts than dairy equivalents. The climate impacts of 1 kg Flora Professional Ice Cream Mix vary between 1.28 and 1.30 kg CO_2-eq per kg of product depending on recipe and market, whereas the impacts vary between 2.33 and 2.55 kg CO_2-eq per kg dairy ice cream.

	Climate impacts (kg CO_2eq/kg product)		Calculated savings	
PRODUCTS COMPARED (Upfield / dairy equivalents)	Upfield	Dairy	kg CO_2eq/kg	%
EUROPE				
Flora Professional Ice Cream Mix, 10 L BiB	1.28	2.33	1.05	-45%
Flora Professional Ice Cream Mix, 1 L LPB	1.30	2.35	1.05	-45%

Table 1. Climate change impacts for Flora Professional Ice Cream Mix in Europe and dairy equivalents in the same markets. Results are expressed in kg CO_2-eq per kg of product

Figure 2 shows that the main drivers of climate impacts for Upfield Products are the raw material stage (coconut farming and associated LUC emissions), as well as the distribution stage, which can vary significantly depending on distances travelled to consumer markets.

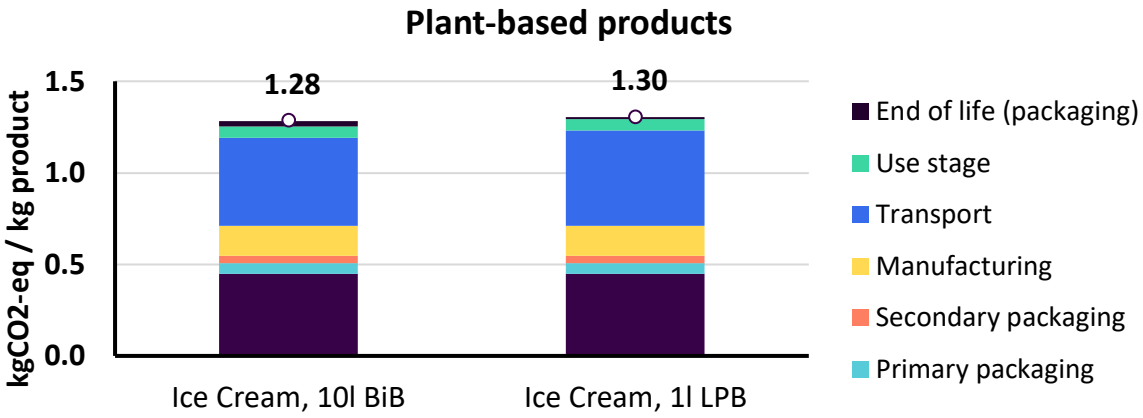

Figure 2. Average climate change results per life cycle stage for 1 kg of product in Europe.

LAND OCCUPATION

In terms of land occupation, all Upfield Products have lower results compared to dairy equivalents (Table 2). The land occupation of 1 kg Flora Professional Ice Cream Mix products varies between 0.94 and 0.96 m^2.y per kg of product depending on recipe and market, whereas that of dairy equivalents varies between 1.87 and 1.89 m^2.y per kg of dairy equivalents.

	Land occupation (m^2.y /kg product)		Calculated savings	
PRODUCTS COMPARED (Upfield / dairy equivalents)	Dairy	m^2.y /kg	m^2.y /kg	%
EUROPE				
Flora Professional Ice Cream Mix, 10 L BiB	0.96	1.89	0.93	-49%
Flora Professional Ice Cream Mix, 1 L LPB	0.94	1.87	0.93	-50%

Table 2. Land occupation for Upfield Products in Europe, and dairy equivalents in the same market. Results are expressed in m^2·year per kg of product.

WATER CONSUMPTION

Table 3 show that for Flora Professional Ice Cream Mix, water consumption is slightly worse than its dairy equivalents. The quality of water consumption data in LCA databases is not robust enough to support external communications and comparative claims.

	Water consumption (m^3 /kg product)		Calculated savings	
PRODUCTS COMPARED (Upfield / dairy equivalents)	Upfield	Dairy	m^3 /kg	%
EUROPE				
Flora Professional Ice Cream Mix, 10 L BiB	0.04	0.04	-0.001	+2%
Flora Professional Ice Cream Mix, 1 L LPB	0.04	0.04	-0.001	+2%

Table 3. Water consumption for Upfield Products in Europe and dairy equivalents in the same market. Results are expressed in m^3 per kg of product

CONCLUSIONS AND OUTLOOK

The plant-based ingredients, particularly the sourcing of vegetable oils (land use change impacts from deforestation), were highlighted as critical factors influencing the environmental performance of plant-based alternatives. The distribution phase was further identified as a significant contributor to the overall environmental impact, particularly for climate change. This insight provides a tangible opportunity for optimizing logistics to further reduce the carbon footprint.

EXTERNAL COMMUNICATIONS

For this study, 2 representative products in the EU markets were selected. For external communications and claims a conservative approach was used since Upfield's entire product portfolio was not assessed.

Due to the limitations of the climate change impact method and updates to the WFLDB database, it is recommended to adopt a more conservative approach when communicating the environmental benefits of plant-based cream compared to dairy ice cream. Following this more conservative approach, this study shows that Flora Professional Ice Cream Mix has 25% lower climate impacts than dairy equivalents.

Reduction percentages are rounded conservatively so that they are easy to understand by the general public and to avoid overclaiming (e.g., 58% savings is rounded to 55% savings), therefore claims percentages may be different than the calculated percentages in Table 1. A conservative approach avoids misleading communication and greenwashing.

SOURCES USED FOR EQUIVALENCIES

Equivalency type	Source	Additional information and assumptions
Using a combination oven	https://academic.oup.com/ijlct/article/11/1/66/2363520	Based on an energy consumption of 35 kWh/day
Using a commercial fridge	https://www.energy.gov/eere/articles/6-energy-saving-tips-commercial-refrigerators-and-freezers	Based on energy consumption up to 17000 kWh/y
Using an industrial dishwasher	https://www.energy.gov/femp/purchasing-energy-efficient-commercial-dishwashers	Based on energy consumption up to 4368 kWh/year Based on EU energy mix used
Using a kitchen aid appliance	https://www.datart.cz/#kasa-go-to-datart	Based on the power of 0.5 kW for an hour of use (0.5 kWh)

ABOUT QUANTIS

Quantis, a BCG company, is a leading sustainability consultancy pioneering approaches to solve critical environmental challenges. We partner with leading consumer goods and financial services organizations who are serious about reducing their environmental impacts to future-proof their businesses and prosper in a new planetary economy. Our unique approach combines deep environmental expertise, strategic business knowledge, and enterprise transformation skills to help organizations shape policies, practices and business models that align with the planet's capacity while building resilience, unlocking innovation, and optimizing performance.
Our dynamic and visionary team of environmental, business and communications experts will guide you on the journey from business as usual to business at its best.

Discover Quantis at www.quantis.com

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