FLORA PLANT (plant-based spread) vs. dairy butter

Life Cycle Assessment, Climate Footprint and Equivalencies Calculation Technical Summary

March 2020
Version 1

FLORA PLANT VS. DAIRY BUTTER. LCA TECHNICAL SUMMARY

In 2020 Quantis was commissioned to conduct a Life Cycle Assessment (LCA) of Upfield's FLORA PLANT plant-based spread, a new product for European markets, compared to dairy butter sold in the same respective markets. This document provides a short summary of the scope of the study, functional unit and system boundaries, method and data sources, and results, as well as the climate footprint and equivalencies used for comparative climate claims.

LIFE CYCLE ASSESSMENT

LCA is a metric-based methodology used to assess environmental impacts resulting from, 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 follows the regionalised LCA methodology described by Liao et al. (2020) to compare the environmental impacts of FLORA PLANT compared with dairy butter sold in 18 countries in Europe on the basis of 1 kg of product. Data was collected with a cradle-to-grave approach for the different product recipes, key ingredients sourcing countries, production factory locations, energy mixes, packaging designs, transportation and end-of-life scenarios. Spatially (archetype) differentiated agricultural life cycle inventory data were generated, as well as land use change (LUC) emissions for agricultural ingredients. A total of 18 environmental indicators were assessed. The LCA compares environmental impacts of Upfield's plant-based products and dairy butter and creams using an attributional approach as per PAS 2050 (BSI, 2012), aligning 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 the ISO 14040 and 14044 standards for public disclosure of results. The LCA is currently under peer review 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 dairy butter vs FLORA PLANT, the functional unit (FU) was 1 kg of product (fresh matter) for spreading, baking or shallow frying, at the consumer's home.

ENVIRONMENTAL IMPACT INDICATORS CONSIDERED

The assessment includes 15 environmental impact indicators from the European ILCD 2011 Midpoint+ v1.08 impact assessment method (JRC-IES 2011). Three additional indicators were included: 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), water consumption (m^3), the total amount of fresh water consumed (ISO 14046), which includes, for example, evapotranspiration from irrigation water, and water scarcity footprint (m^3 water equivalent (eq)) based on the AWARE approach that assesses the water deprivation potential considering spatial water scarcity differences (Boulay et al. 2017).

FROM FARM-TO-PLATE

The LCA considers all identifiable activities across the product life cycle (cradle-to-grave) for all products in the 18 markets. (see Figure 1).

The study includes the impacts from:

- farming (crop production or milk production)
- production of plant-based margarines and spreads or dairy butter
- packaging
- distribution
- retail

- consumption
- waste management of packaging

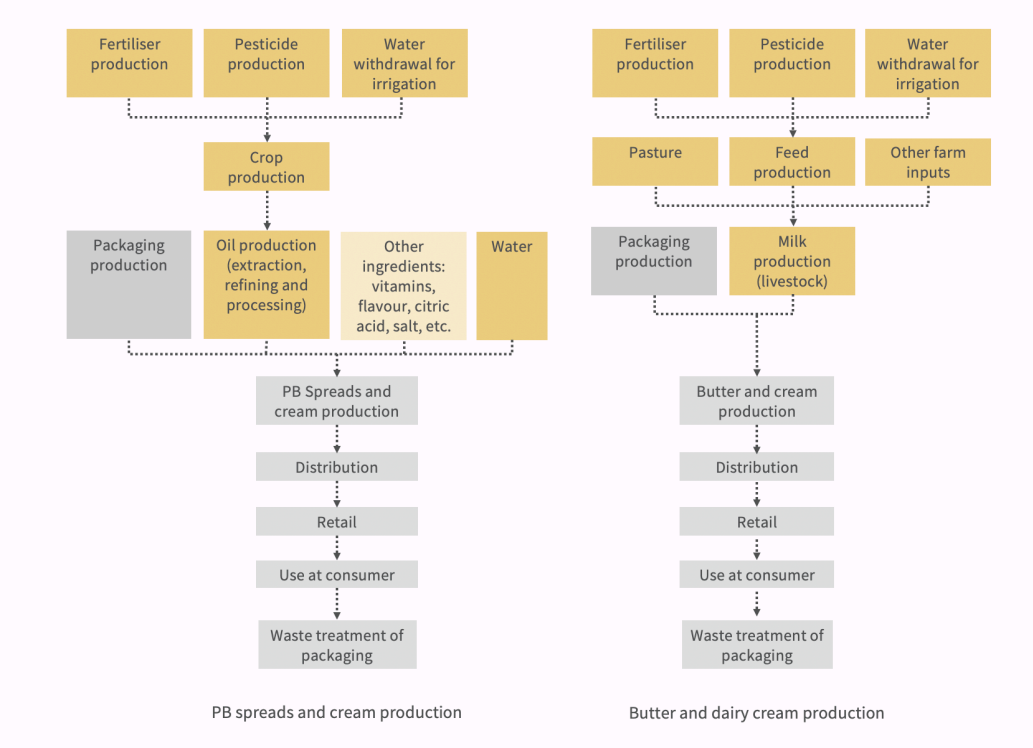

Figure 1. Schematic of the systems evaluated

The study does not include the 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

- Plant-based margarines and spreads: Primary data for the recipes and ingredient sources for FLORA PLANT were provided by Upfield.
- Dairy butter: Default data representative of European averages and published by the European Dairy Association and the European Commission were used to model dairy processing, packaging and distribution. 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 (archetype) differentiated agricultural life cycle inventory data were generated, as well as LUC emissions for agricultural ingredients in all markets relevant to each system's supply chain. All data has been assessed to ensure that it meets the quality standards required to make comparative assertions. The LCA modelling tool SimaPro version 9.0 was used to model individual datasets (such as oilseeds and packaging) required for plant-based products and for the life cycle of dairy products.

RESULTS AND DISCUSSION

Table 1 shows that FLORA PLANT has a significantly lower climate impact than dairy butter. The climate change impact for FLORA PLANT plant-based spreads in the European markets considers a single FLORA PLANT recipe, multiple European factories, and conservative transportation across all countries. The climate change impact is 4.88 rounded up to 5 kg CO2-eq considering uncertainties when used on communications about the differences between FLORA PLANT and dairy butter, whereas the average impact for dairy butter is 12 kg CO2-eq, with variabilities from 9.4 to 14.5 in the 18 European countries under study. Figure 2 shows that the main drivers of GHG emissions for FLORA PLANT are oilseed farming and the associated LUC emissions, which can vary significantly depending on the type of oilseed, its quantity and sourcing countries.

	FLORA PLANT spread	Dairy butter	GWP difference	
Country	GWP (kg CO_2-eq/kg)	GWP (kg CO2-eq/kg)	kg CO_2-eq/kg	%
Germany	5	12.7	7.7	-61%
Netherlands	5	12.2	7.2	-59%
UK	5	12.4	7.4	-60%
Denmark	5	9.9	4.9	-49%
Switzerland	5	12.4	7.4	-60%
Austria	5	13.6	8.6	-63%
Italy[1]	5	12.4	7.4	-60%
Czech Republic	5	12.0	7.0	-58%
Ireland	5	11.8	6.8	-58%
Spain	5	14.5	9.5	-65%
Sweden	5	10.1	5.1	-50%
Finland	5	9.4	4.4	-47%
Greece	5	14.2	9.2	-65%
Hungary	5	10.4	5.4	-52%
Portugal	5	14.5	9.5	-65%
Romania	5	10.9	5.9	-54%
Slovakia	5	12.1	7.1	-59%
Slovenia[2]	5	12.1	7.1	-59%
18 European Markets*	5	12.2	7.0	-59%

Table 1. Carbon footprint for FLORA PLANT and dairy butter in the 18 European markets (kg CO_2eq per kg of product)

*The "18 market" weighted dairy butter is calculated by multiplying the country average carbon footprint by the market share derived from the 2018 dairy butter production data (Eurostat https://ec.europa.eu/eurostat/databrowser/view/tag00038/default/table?lang=en (accessed on 01/31/2020)

[1] Italy use Switzerland as a proxy [2] Slovenia uses Slovakia as a proxy.

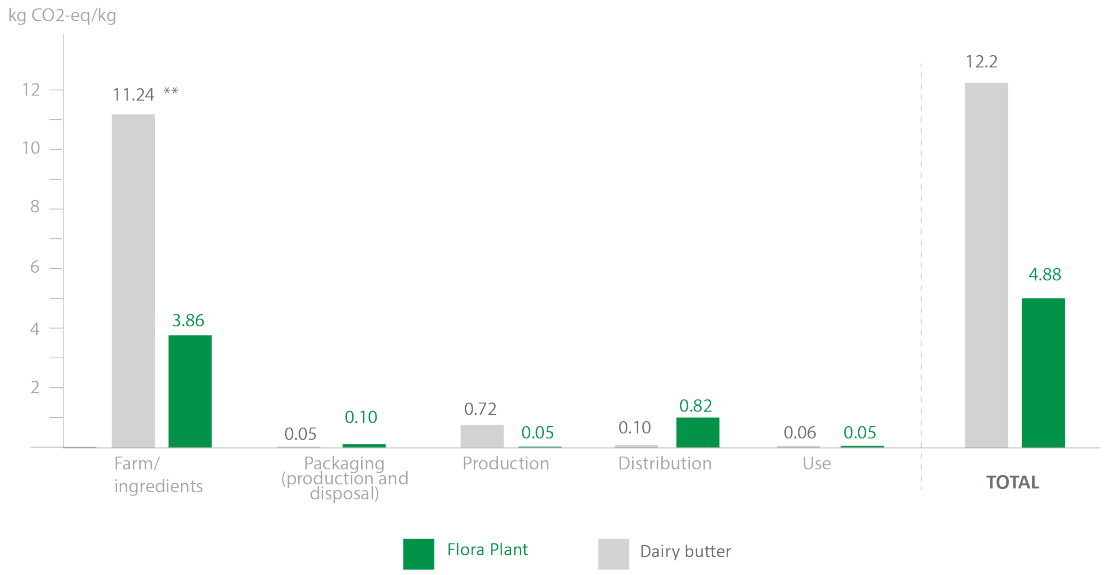

Figure 2. Climate change results per stage of life cycle per 1 kg of product

** CO2-eq emission per kg of dairy butter by farm activity (18 markets): Enteric emissions: 4.53 kg; Manure management: 1.50 kg; Pasture feed: 0.47 kg2; Pasture peat degradation: 0.38 kg; Feed fodder: 2.13 kg; Fodder land use change: 1.47 kg; other farm activities: 0.77 kg. The weighted average enteric emissions account for 40% for the dairy butter carbon footprint of the 18 markets, with variabilities of 35-53% for different countries.

CONCLUSIONS AND OUTLOOK

This study shows that FLORA PLANT has a much lower climate impact than dairy butter. The climate change impact for FLORA PLANT is dominated by vegetable oil ingredients' production. When moving towards transparency of sustainable supply chains and developing potential mitigation strategies, producers can only understand the impacts of their products and look for opportunities to reduce these impacts if they fully and accurately assess their product supply chains. Towards more sustainable plant-based margarines and spreads, a key factor would be to reduce embodied environmental impacts from oilseed ingredients through better understanding and improvements in supply chain sourcing, farm level agricultural practice, and product recipe design. The key challenges of performing regionalised LCA lies in the collection and organization of all relevant data and models, performing gap assessment and prioritization, developing missing data or improving data quality, and linking inventory data with impact assessment, to draw robust conclusions and meet requirements for data quality.

CLIMATE FOOTPRINT

The climate footprint of a kilogram of FLORA PLANT is 5kg CO_2-eq, for a 250g pack wrapped in 100% paper parchment it would be 1.25kg CO_2-eq, for 100g it would be 0.25kg CO_2-eq and for a single serving of 10g it would be 0.025kg CO_2-eq.

CALCULATION OF EQUIVALENCIES

Equivalencies are used to put into perspective the results of the greenhouse gas emissions of FLORA PLANT and dairy butter to render the information more meaningful and understandable for a larger audience. The equivalencies were assessed by calculating the CO_2-eq saving between FLORA PLANT and dairy butter and converting the savings amount into equivalencies of different daily activities like CO_2-eq emissions of kilometres driven by car, charging smartphones over nights or plastic bottles. Table 3. on page 7 shows the data sources and units used for equivalencies calculated.

The following charts show examples of equivalencies for the Netherlands.

GENERAL CLAIMS ON GHG SAVINGS

FLORA PLANT carbon footprint (per Kg)	5kg CO2eq
Average butter carbon footprint in the Netherlands (per Kg)	12.2 kg CO2eq
Kg of CO2eq saved per Kg of product when switching from butter to FLORA PLANT	7.2 kg CO2eq
Potential saving per FLORA PLANT pack of 250g (Kg CO2eq)	1.8 kg CO2eq
Potential saving per 1'000 people switching (considering 4kg/yr.) (Kg CO2eq) in the Netherlands	28,800 kg CO2eq
Potential saving per household (4 pp) in the Netherlands switching (considering 4kg/pp/yr.) (Kg CO2eq)	115 CO2eq

- FLORA PLANT has a 50% lower climate impact than the same amount of dairy butter.
- FLORA PLANT has half the climate impact of dairy butter.
- Compared to dairy butter, FLORA PLANT has half the greenhouse gas emissions.
- 1 kg of FLORA PLANT saves 7 Kg of CO2eq emissions compared to dairy butter.
- The same amount of FLORA PLANT saves half the greenhouse gas emissions compared to dairy butter.
- Switching 250g of dairy butter for a 250g pack of FLORA PLANT saves 1.8 kg of greenhouse gas emissions.

CLAIMS FOR 250g PACK ON GHG SAVINGS

Charging a smart phone overnight X times	225
driving a car X Km	7
Producing X PET bottles	18

Switching from one 250g pack of dairy butter to a 250g pack of FLORA PLANT in the Netherlands could save the equivalent greenhouse gas emissions as …

- charging a smartphone over 220 nights (that´s every night for over half a year!)
- driving a petrol car 7 kilometres.
- 18 plastic bottles.

EQUIVALENCIES DATA SOURCE

Equivalency	Equivalency Unit	Explanation	Source
Dairy butter consumption per person	-	Average dairy butter consumption in kg per capita	https://www.statista.com/statistics/415277/butter-consumption-per-capita-by-country-europe/
Smartphone charging	0.008 Kg CO_2-eq	Charging an average smartphone overnight	https://www.zdnet.com/article/heres-how-much-it-costs-to-charge-a-smartphone-for-a-year/ https://slate.com/technology/2012/03/is-charging-your-cell-phone-overnight-a-major-waste-of-energy.html
Plastic bottles saved	0.1 Kg CO_2-eq	500 ml PET bottle (full life cycle, from production to end of life)	ecoinvent v3.4
Km driven in a petrol car	0.25 Kg CO_2-eq	Emissions from driving an average internal combustion engine gas-powered car (tailpipe)	ecoinvent v3.4
Annual Carbon footprint of a person	Kg CO_2 per capital carbon	Average per capita carbon footprint by country. It includes both territorial accounting and consumption-based accounting.	Cite as: Updated from Peters et al. (2012) and Peters et al. (2011) Published by the GCP (global carbon project) team.
Cup of coffee	0.1 Kg CO_2-eq	Full life cycle assessment of 1 Lungo cup of portioned coffee made with a capsule	WFLDB + Ecoinvent
Flight	0.275 Kg CO_2-eq	Air travel, per passenger, life cycle footprint	ecoinvent & IPCC2013
Grilled beef burger patty	2.5 Kg CO_2-eq	Full LCA of a ready-to-eat grilled beef burger patty	RegletteFood_2019-09-19

Table 3. Equivalencies units and data sources

DO YOU WANT TO KNOW MORE ABOUT THE STUDY?

Read the complete study published in The International Journal of Life Cycle Assessment and get more detailed information at: https://link.springer.com/article/10.1007/s11367-019-01703-w

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