REPORT: THE CLIMATE FOOTPRINT OF ENRICHED OAT DRINK AMBIENT

OAT DRINK SWEDEN: OATLY, 1.5%

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The climate footprint of Oatly products

CarbonCloud has calculated the climate footprint of a range of Oatly's products. This document gives a short summary of how the calculations were performed and what is included. It also gives the results for Enriched Oat Drink Ambient 1L, SE.

Life cycle assessment

Life cycle assessment is used to assess environmental footprints of products. This study is focused specifically on the climate footprint. In a life cycle assessment, all activities – as described in the *goal and scope* – are investigated and their environmental impacts quantified. This means that all greenhouse gas emissions that occur along the production chain of the product are taken into consideration and normalized to the functional unit (the product).

An attributional approach to life cycle accounting

We use the so-called *attributional* approach to life cycle accounting. This means that all processes in the production are considered, and their combined climate impact is attributed to the product. The attributional approach only accounts for emissions and removals of greenhouse gasses generated during a product's life cycle and NOT avoided emissions or actions taken to mitigate released emissions. Carbon offsetting is not taken into account. The attributional approach as described here is in line with major standards for carbon footprinting such as ISO 14067 and GHG Protocol.

This contrasts to the *consequential* approach, which is used to assess the climate impact from changing the level of output of a product. The consequential approach focuses on marginal effects linked to the production of a product.

Functional unit

The functional unit is what is investigated and what all resources and emissions are compared against. This study is based on the following functional unit:

- One kg of packaged food product delivered to the store.

Goal and scope

The goal and scope state the purpose of the study and how the system boundaries are drawn, i.e., what is included and what is excluded.

The goal of this study is to investigate the climate footprint of Enriched Oat Drink Ambient in 1L package distributed to the Swedish market.

Note that functional unit is for a specific product for a specific market. There is variation between producers of oat drinks and between markets. This study does not say anything about the climate footprints of other oat drink producers or oat drinks delivered to other markets.

From cradle to store

We assess the climate footprint of the product from *cradle to store*. In this case it means that we consider all steps of the life cycle from the production of agricultural inputs, through agriculture, transports, refinements and distribution up until the product reaches the shelf of the grocery store. Hence, the calculated climate footprints do not consider e.g. lighting and refrigeration at the grocery store, transport from grocery store to home, or cooking of product.

What is included?

The climate footprint includes emissions from:

- **Farm**: The agricultural production of oats, rapeseed and other ingredients.
- **Transport**: The transport chain of inputs from field to factory, between factories, and of the final product from factory to market.
- **Factory**: Electricity and gas consumption in the mill, in the oat base and oat drink production facilities, and in the rapeseed oil production facility.
- **Packaging:** production and transport of packaging material.

What is not included?

Most importantly the calculations omit

- Capital goods (e.g., manufacture of machinery, trucks, infrastructure)
- Corporate activities and services (e.g., research and development, administrative functions, company sales and marketing)
- Transport of employees to and from works

Farm

For most of Oatly's products, the agricultural (farm) step accounts for the largest part of the total emissions, out of the four categories farm, transport, factory and packaging. Emissions from the agricultural step are calculated with an agricultural production system model, that calculates all major greenhouse gas (GHG) emissions related to the production of the functional unit. The agricultural emission calculations are based on the flows of carbon (C) and nitrogen (N) through the crop and livestock systems on a mass and energy balance basis. Further model descriptions can be found in Wirsenius (2000, pp. 13-54), Wirsenius (2003a-b) and Bryngelsson et. al., (2016).

For the production of oats and rapeseed oil the model calculates:

- Emissions of nitrous oxide (N_2O) from mineral soils
- Indirect emissions of nitrous oxide (N_2O) related to ammonia and nitrate emissions from soils
- Emissions of nitrous oxide (N_2O) and carbon dioxide (CO_2) from organic soils
- Carbon dioxide (CO_2) emissions from production and use of fuels (e.g. for tractors and machinery) and electricity
- Emissions of carbon dioxide (CO_2) and nitrous oxide (N_2O) from production of mineral fertilizers and other inputs

Transport

The transport stage includes:

- Transports of oats, from field to mill and from mill to the oatbase production facility (at ambient temperature)
- Transport of rapeseed from field to factory, and rapeseed oil from factory to the oat drink production facility (at ambient temperature)
- Transports between oat base production facility and oat drink production facility (refrigerated)
- Transport from oat drink production facility to warehouse (refrigerated or ambient depending on the product)
- Transport from warehouse to market (refrigerated or ambient depending on the product)

Factory

Oats are delivered to the mill where they undergo a process of cleaning and hulling. The oat kernels are then further processed, which includes steam preparation and drying. The heat consumption in the oat mill is generated from combustion of oat hull residues and is therefore not associated with any additional emissions. The emission intensity of electricity consumed in the oat mill, the oatbase production facility and the oat drink production facilities corresponds to the Nordic power mix. The gas demand at the oatbase production facilities is met with biogas. A fraction of the oat residues from the mill and the oatbase production facility is used for animal feed.

Electricity use

For electricity we apply an emission intensity factor representing the Nordic power mix that accounts for upstream emissions and power losses.

Time horizon

Harvest yield data represent the average of the period 2013-2017. Data from Oatly's production facilities represent year 2017.

The weighting of greenhouse gases

The total climate impact is given in CO_2 equivalents. All greenhouses gases are weighted with the latest values of GWP100 given by IPCC. For methane and nitrous oxide we use a GWP of 34 and 298, respectively.

Allocation

When a process generates more than one product, the climate impact from the process needs to be allocated between the products. Most important for the Oatly calculations is that rapeseed oil and rapeseed cake are produced in the same process. Here we use economic allocation. This means that the climate impact from a process is allocated between the products in proportion to their economic value.

Key parameters

Key parameter values are:

- Share of cropland that is located on organic soil: 3.8% for cereals
- Oat yield: 3.99 tonne DM/ha/yr
- Rape seed yield: 3.25 tonne DM/ha/yr

Results

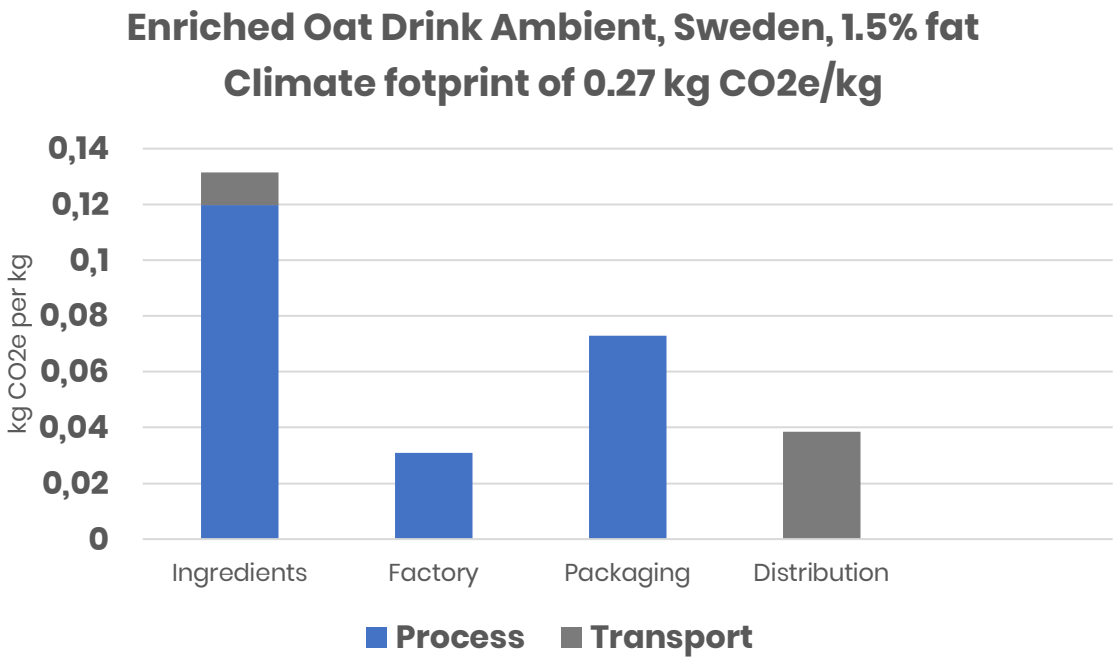

Table 1 Greenhouse gas emissions (climate footprint) per major process for Oatly Enriched Oat Drink Ambient, SE. All emissions are expressed in the unit kg CO_2e per kg product

	Total	Process	Transport
Ingredients	0.13	0.12	0.012
Factory	0.03	0.03	
Packaging	0.07	0.07	
Distribution	0.04		0.04
Total CO_2e	**0.27**		

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Production system and logistics data were provided by Oatly