Kulta Katriina Organic Carbon Footprint Calculation (summary)

Products:
Kulta Katriina Organic Light & Dark
Final Report 10.11.2023 / Updated 15.2.2024

The objective of the study was to calculate the carbon footprint of Meira Kulta Katriina organic coffee products during their life cycles. The goal of the results is to provide consumers with reliable and comparable information about the carbon footprint of Meira's products. The results can also be used for internal development purposes.

The study does not support comparative claims for general publication, as the results may not be comparable if they are not prepared according to equivalent standards, or if a different declared unit is used.

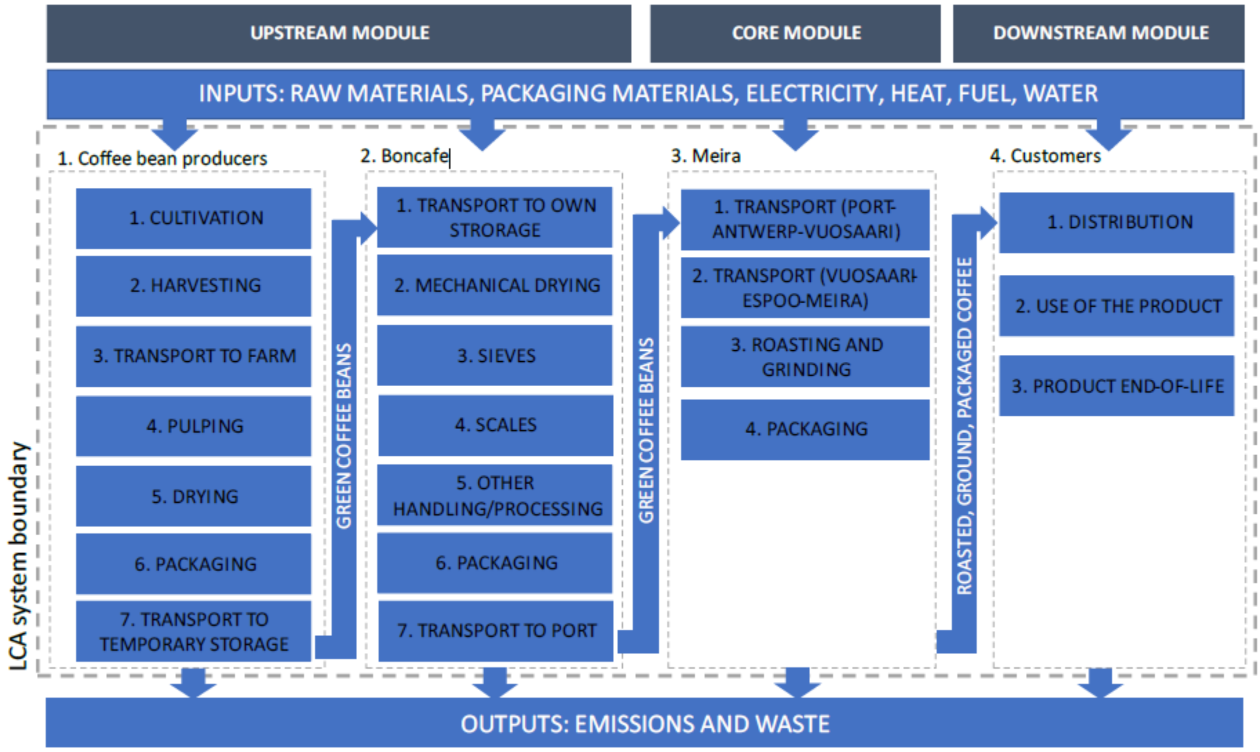
This report covers the carbon footprint calculations for Kulta Katriina organic light and dark roast coffees. The products have different packaging sizes for retail and restaurants/catering (HoReCa).

Product Name	Kulta Katriina Organic Light Roast Kulta Katriina Organic Dark Roast
Declared Unit	1 kg of product
Packaging Sizes	Retail: 450 g Restaurants/catering: 44 x 100 g and 15 x 300 g
Production Location	Helsinki, Finland

The study examines the potential climate impacts of the products using the IPCC Assessment Report (AR6) Global Warming Potential method, over a 100-year time frame, measured in kg CO_2 equivalents.

SCOPE OF THE ASSESSMENT

The study comprehensively mapped the carbon footprint, taking into account all key stages of the production chain from coffee cultivation to the consumption of the final product (cradle-to-grave). The necessary equipment and facilities for production were excluded, as were the transportation of employees.



UPSTREAM MODULE

Coffee Bean Producers: Coffee cultivation in Honduras included the following inputs: new coffee plants, fertilizers and lime used in cultivation, as well as electricity, fuels, and water used in primary processing and transportation. Waste management and handling of by-products (such as wastewater treatment or processing side streams) were excluded. In the modeling used to describe Honduras, geographically representative electricity data from the USA was utilized because data specific to Honduras or global datasets for the specified types of electricity (hydropower and geothermal energy) were not available in the Sphera database.

All transportation related to cultivation is included. The mode of transportation (pickup truck or lorry) and actual distances are considered. Electricity is modeled as hydropower or geothermal energy according to the information provided by energy companies.

Boncafe: Boncafe is a Honduran exporter of coffee beans. In this study, its operations include the use of electricity for mechanical drying, weighing, sieving, and other processing, as well as fuel usage for transportation between warehouses and to the port. Electricity is modeled as hydropower based on information provided by energy companies. The modes of transportation (ship or lorry) and actual distances are taken into account.

OWN OPERATIONS

Meira: Meira's operations include the transportation of coffee beans from Honduras and Tanzania, involving specific modes of transportation and distances. The assessment covers the use of natural gas, district heating, electricity, water, and fuels at the roasting plant, as well as the transportation and handling of waste generated during production. The production and transportation of packaging materials are also considered. Electricity (wind power) and district heating (combined production) are modeled site-specifically based on information provided by energy companies.

DOWNSTREAM MODULE

Product Distribution: The emissions from product distribution were obtained directly from the emission reports of two retail chains (SOK and Kesko, including Kespro wholesale), which cover the majority of Kulta Katriina organic product sales. These emission factors were used to cover the entire distribution of Kulta Katriina organic products.

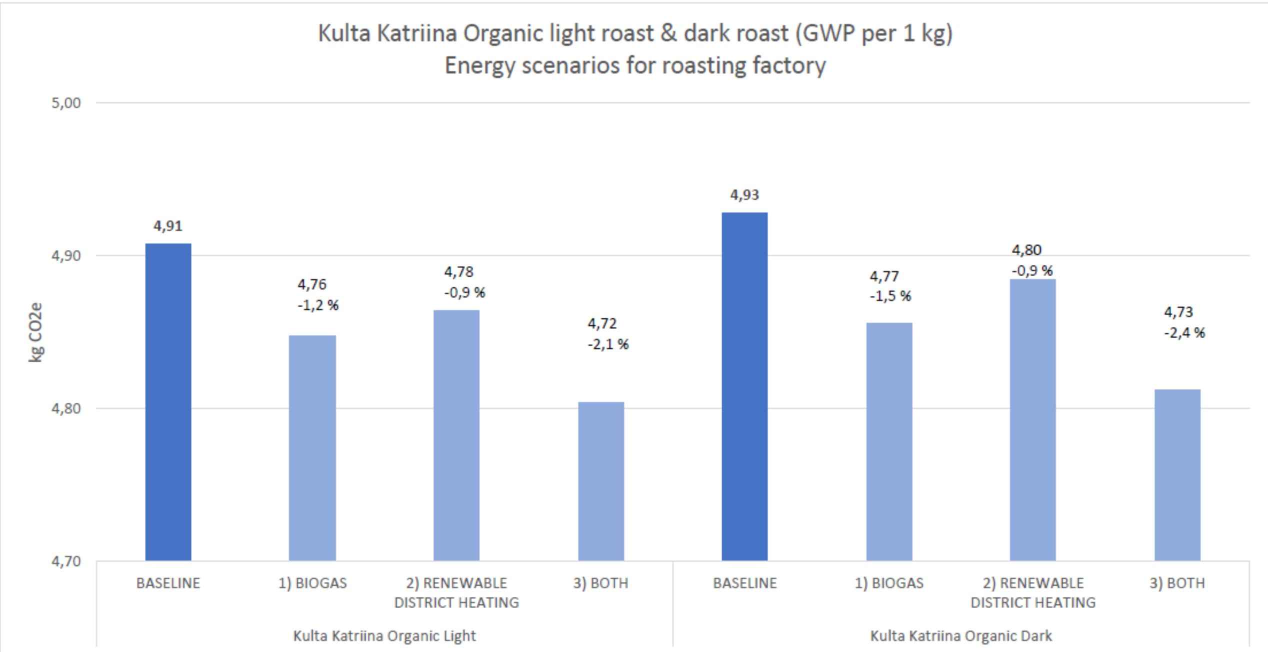
Product Use: The coffee brewing stage in households or restaurants was assessed using a scenario model that took into account the use of electricity, water, filter paper, and ground coffee, as well as the handling of municipal bio-waste and packaging waste. The production of coffee makers was excluded. Electricity consumption was estimated for a traditional drip coffee maker, with an average standby time of 37 minutes assumed (Usva et al. 2020). It was assumed that the filter paper and ground coffee are recycled as bio-waste and packaging waste is utilized in energy production. Electricity was modeled as average Finnish grid electricity.

ENERGY SCENARIOS FOR OWN OPERATIONS

In addition to the described scope, three energy scenarios for Meira's own operations were outlined:

1. The roasting plant switches from natural gas used in the roasting process to biogas.
2. The roasting plant switches from average district heating to 100% renewable district heating.
3. Both of the above changes occur.

Meira has adopted energy scenario 3 for the energy sources of the roasting plant in early 2024. This change corresponds to approximately a -2.1% reduction in the carbon footprint for light roast and a -2.4% reduction for dark roast.



BOUNDARY CRITERIA

In this assessment, no life cycle stages or individual material/energy flows were excluded.

INVENTORY ANALYSIS (LCI)

DATA COLLECTION

Primary data for coffee cultivation was collected directly from fifteen coffee farms in Honduras and from Boncafe. The data represents coffee cultivation from May 2022 to April 2023, which was the most recent full growing season. The study assumed that these fifteen farms represent all coffee bean production in Honduras from which Kulta Katriina organic products are produced. For Tanzania, primary data on coffee cultivation was not available, so the most representative general data set was selected for the study.

Primary data for the production of Kulta Katriina organic coffee was collected directly from Meira. For Meira's operations, the data represents the year 2021, which was the last normal year of coffee roasting operations before the factory fire.

General data used for modeling upstream and downstream processes were collected from the Sphera and Ecoinvent 3.9.1 databases. If supplier-specific data were not available, data sources were chosen based on their technical and geographical representativeness. Global data were used only when country-specific or European data were not available.

CALCULATION PROCEDURES

Modeling was performed using the LCA for Experts software (formerly GaBi software) and the life cycle assessment data provided by Sphera and Ecoinvent.

ALLOCATION PRINCIPLES

Allocation rules were followed in accordance with the ISO 14044:2006 standard. Allocation is avoided where possible, and when necessary, allocation is performed according to physical proportions (e.g., mass in kilograms). Allocation is necessary when more than one product is produced in the production process, and material, energy, and waste flows cannot be measured separately for the studied product.

Allocation could not be avoided for the following flows, as data were measured only at the country/company/factory level. Allocation for the following three units and their production inputs was performed separately:

- Coffee cultivation: consumption of electricity, water, and fuel
- Boncafe: electricity consumption
- Meira's roasting plant (also produces other coffee products and spices**):** consumption of electricity, district heating, natural gas, water, and fuel

Allocation of these production inputs was based on their total consumption during the study period and total production amounts. Production inputs were allocated to each studied product according to their production amount (mass in kilograms).

DATA QUALITY ASSESSMENT AND HANDLING OF MISSING DATA

The quality requirements for life cycle assessment (LCA) were set according to the EN ISO 14044 standard (4.2.3.6.). The primary data calculated from Meira's own production and the distribution chain of the studied products is notably valuable, which is why similar data were used in the studies whenever possible. In cases where separate data were not available, the most representative general data from Sphera or Ecoinvent was utilized.

IMPACT ASSESSMENT (LCIA)

The impact assessment (LCIA) was conducted based on the data collection described in the previous section. Separate life cycle models were created for Kulta Katriina organic light and dark roast coffees. Quantitative data on production inputs and outputs, transportation modes, and distances collected for the carbon footprint assessment of the products were input into the software.

The impact assessment method used was the GWP100 method based on the IPCC AR6, where the characteristics of different greenhouse gases are in accordance with the latest IPCC assessment report (AR6), and the results are expressed as global warming potential over a hundred-year time frame, measured in kg CO2 equivalent.

The required greenhouse gas emissions and removals were set according to the ISO 14067 standard.

KULTA KATRIINA ORGANIC LIGHT, 1 KG (GWP 100)	UNIT	UPSTREAM MODULE (Coffee farming + Boncafe)	CORE MODULE (Meira)	DOWNSTREAM MODULE (Coffee consumption)	TOTAL
Fossil GHG emissions	kg CO2e	2,16	0,51	2,00	4,67
Biogenic GHG emissions	kg CO2e	0,38	0,05	2,16	2,59
Biogenic GHG removal	kg CO2e	-0,53	-0,07	-1,85	-2,45
Emissions from land use change (dLUC)	kg CO2e	0,10	0,00	0,00	0,10
Aircraft emissions	kg CO2e	0,00	0,00	0,00	0,00
Total GHG emissions	kg CO2e	2,10	0,49	2,32	4,91

KULTA KATRIINA ORGANIC DARK, 1 KG (GWP 100)	UNIT	UPSTREAM MODULE (Coffee farming + Boncafe)	CORE MODULE (Meira)	DOWNSTREAM MODULE (Coffee consumption)	TOTAL
Fossil GHG emissions	kg CO2e	2,16	0,53	2,00	4,69
Biogenic GHG emissions	kg CO2e	0,38	0,05	2,16	2,59
Biogenic GHG removal	kg CO2e	-0,53	-0,07	-1,85	-2,45
Emissions from land use change (dLUC)	kg CO2e	0,10	0,00	0,00	0,10
Aircraft emissions	kg CO2e	0,00	0,00	0,00	0,00
Total GHG emissions	kg CO2e	2,10	0,51	2,32	4,93

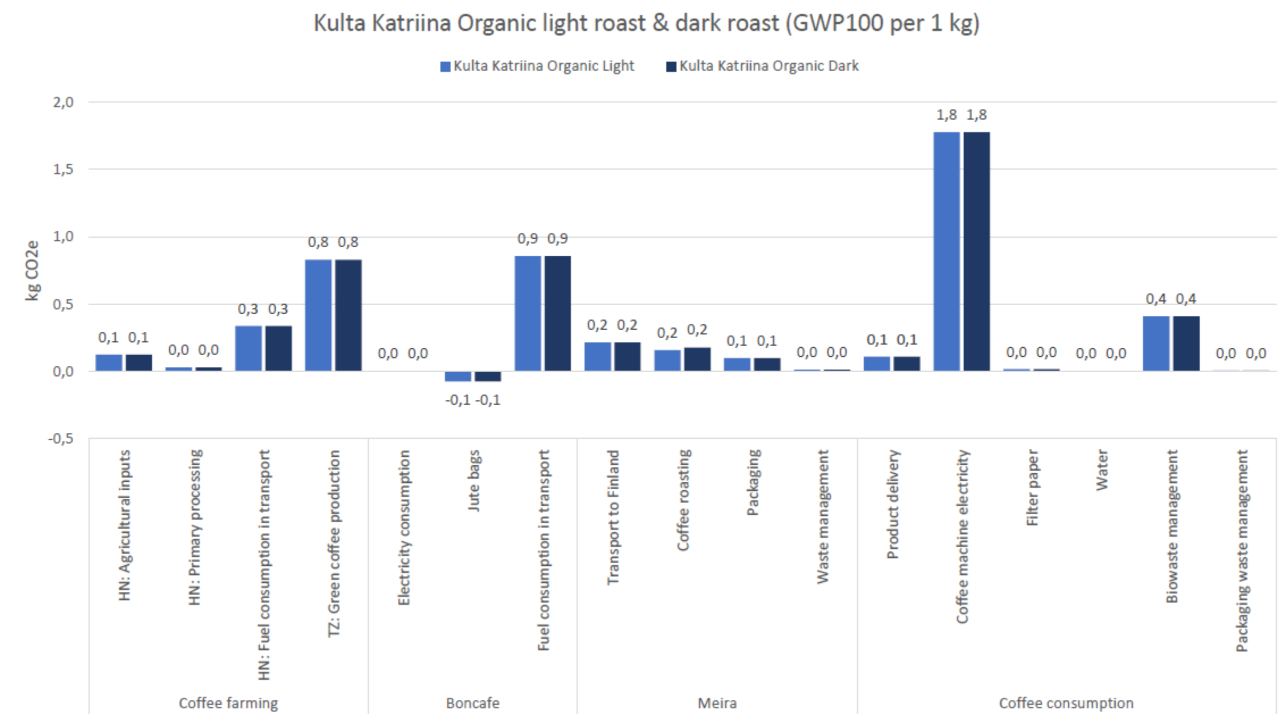
RESULTS OF THE CARBON FOOTPRINT CALCULATION

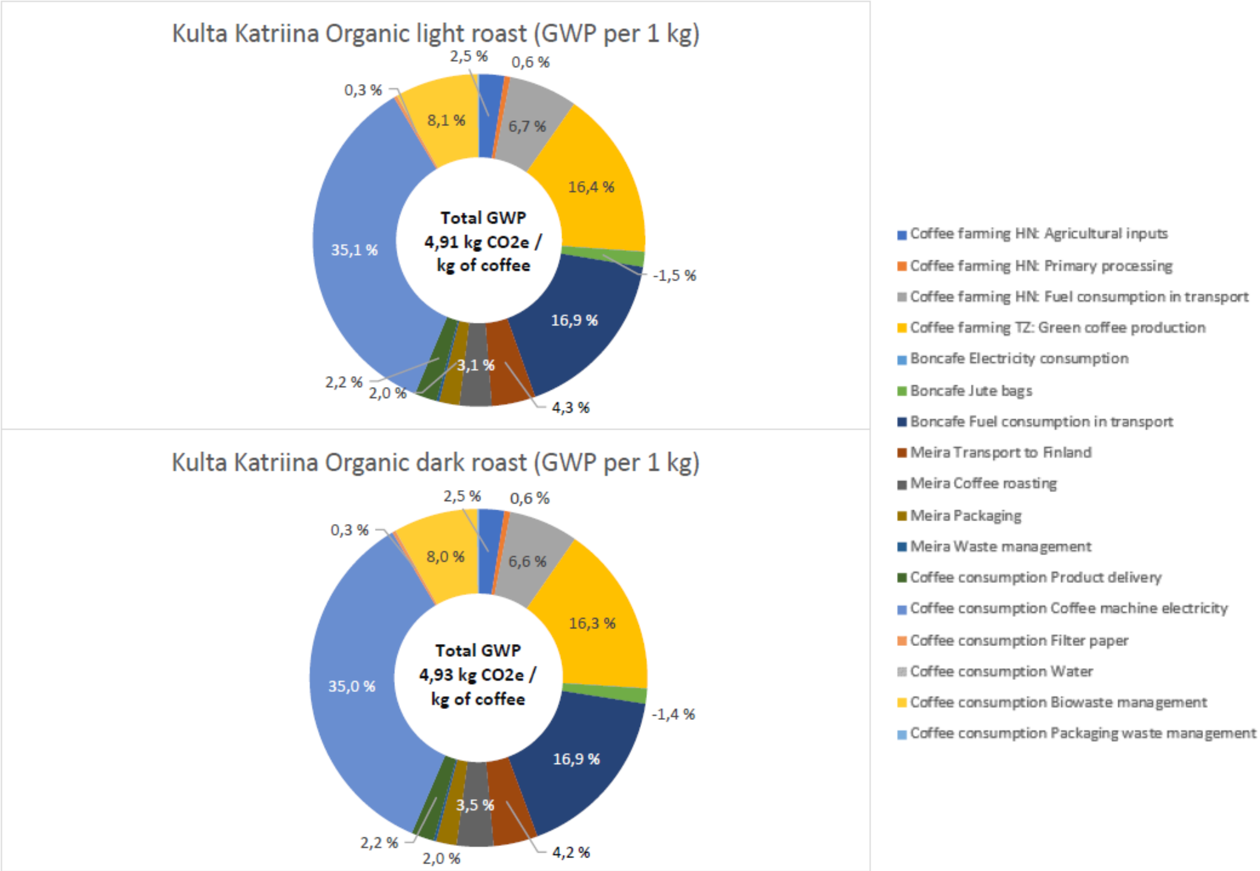
The total global warming potential (GWP) for Kulta Katriina Organic light roast coffee is 4.91 kg CO2e per kilogram, and for dark roast coffee, it is 4.93 kg CO2e per kilogram over their life cycles. The only difference in the production process, and thus in the emissions between Kulta Katriina Organic light and dark roast, is the 20% longer roasting time for dark roast, which consumes 20% more natural gas.

For both light and dark roast coffee, the upstream module of the production chain (coffee cultivation and export) is the most significant source of emissions, covering 42.9% and 42.7% of the products' total GWP, respectively. The most significant impacts come from fuel consumption for transportation in the cultivation activities and especially from Boncafe's logistics, as its distances are longer and volumes larger. Tanzanian coffee is modeled with a data set representing non-organic coffee, as general data for organic coffee were not available. This data set includes some use of non-organic NPK fertilizers, which affects the results. It is noteworthy, however, that most of the coffee for Kulta Katriina Organic comes from Honduras.

In Meira's own operations, the largest impacts result from the transportation of coffee to Finland, followed by the use of natural gas in coffee roasting. Meira's own operations account for 9.9% and 10.3% of the product's total GWP, making them significantly lower than the upstream and downstream modules.

The downstream module (coffee consumption) is the most significant in the coffee life cycle, as the electricity usage of coffee makers covers 47.2% and 47.0% of the total GWP per kilogram of coffee, respectively. The electricity consumption for brewing coffee alone accounts for 36% of the heating potential per kilogram. The water and filter paper used in brewing coffee form only a small part of the total GWP.




Kulta Katriina Organic light roast (GWP per 1 kg)
Total GWP
4,91 kg CO2e /
kg of coffee
2,5 %
0,6 %
6,7 %
16,4 %
-1,5 %
16,9 %
4,3 %
3,1 %
2,0 %
2,2 %
35,1 %
0,3 %
8,1 %
Kulta Katriina Organic dark roast (GWP per 1 kg)
Total GWP
4,93 kg CO2e /
kg of coffee
2,5 %
0,6 %
6,6 %
16,3 %
-1,4 %
16,9 %
4,2 %
3,5 %
2,0 %
2,2 %
35,0 %
0,3 %
8,0 %
Coffee farming HN: Agricultural inputs
Coffee farming HN: Primary processing
Coffee farming HN: Fuel consumption in transport
Coffee farming TZ: Green coffee production
Boncafe Electricity consumption
Boncafe Jute bags
Boncafe Fuel consumption in transport
Meira Transport to Finland
Meira Coffee roasting
Meira Packaging
Meira Waste management
Coffee consumption Product delivery
Coffee consumption Coffee machine electricity
Coffee consumption Filter paper
Coffee consumption Water
Coffee consumption Biowaste management
Coffee consumption Packaging waste management