Thrace Greenhouses
FRESH HYDROPONIC VEGETABLES

EPD®
THE INTERNATIONAL EPD® SYSTEM

EPD - Environmental Product Declaration Of Cluster tomato

In accordance with ISO 14025 and PCR 2020:07 “Arable and Vegetables Crops” of The International EPD® System.

General information

Owner of the EPD:	Thrace Greenhouses S.A.
Location of production site:	Neo Erasmio, Xanthi
Programme:	The international EPD® system www.environdec.com
Programme operator:	EPD international AB
EPD registration number:	S-P-05113
Publication date:	2022-02-24
Validity date:	2027-01-16
Geographical scope:	Global

Programme information

Programme

The International EPD® System

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EPDs within the same product category but from different programmes may not be comparable.

Product category rules (PCR): 2020:07 "Arable and Vegetables Crops" of The International EPD® System.

PCR review was conducted by: The Technical Committee of the International EPD® System; Chair of the PCR review: Maurizio Fieschi, info@environdec.com

Independent third-party verification of the declaration and data, according to ISO 14025:2006:

☐ EPD process certification
☑ EPD verification

Procedure for follow-up of data during EPD validity involves third party verifier:

☐ Yes
☑ No

Third party verifier: Koci Vladimir (Individual verifier) "Approved by the International EPD® System"
Contact: vlad.koci@vscht.cz

LCA Developer: www.environmetrics.gr

ENVIROMETRICS
Business Consultants & Engineers

Sustainable Growth

A green revolution.

Committed to Innovation & Sustainability

Thrace Greenhouses were established in 2013 in Neo Erasmio, Xanthi, by two Greek groups with dynamic presence in the global market, Thrace Group and Elastron, that made the strategic decision to invest in innovation and sustainable agriculture.

From their founders to builders and producers, Thrace Greenhouses are directly related to Xanthi, in Thrace municipality, NE Greece. Thus, they invest **in the local community** and agricultural tradition, and particularly in the know-how and passion of their people.

By utilizing the hydroponic cultivation method and benefiting from the rich Geothermal energy sources in the greater area, Thrace Greenhouses can guarantee the supply of high quality, low carbon footprint vegetables all year round. By operating in their state-of-the-art facilities that currently occupy 14Ha plot of land, Thrace Greenhouses are the largest geothermal greenhouses in Europe.

Hydroponics is the cultivation of plants without soil. Their roots come into direct contact with nutrient solutions from which they extract the minerals they need for proper development, such as potassium, nitrogen and calcium. Some of the advantages of hydroponics:

- **Controlled growth conditions**
- **Stable, quality crops all year round**
- **No chemical residues**
- **Minimum requirements in plant protection**
- **Conservation of water and essential nutrients**
- **No soil and groundwater pollution**

The company is certified for its Good Agricultural Practices by the GLOBALG.A.P. (GGN 4052852805575). The main markets of Thrace Greenhouses are currently Greece and SE Europe.

EPD

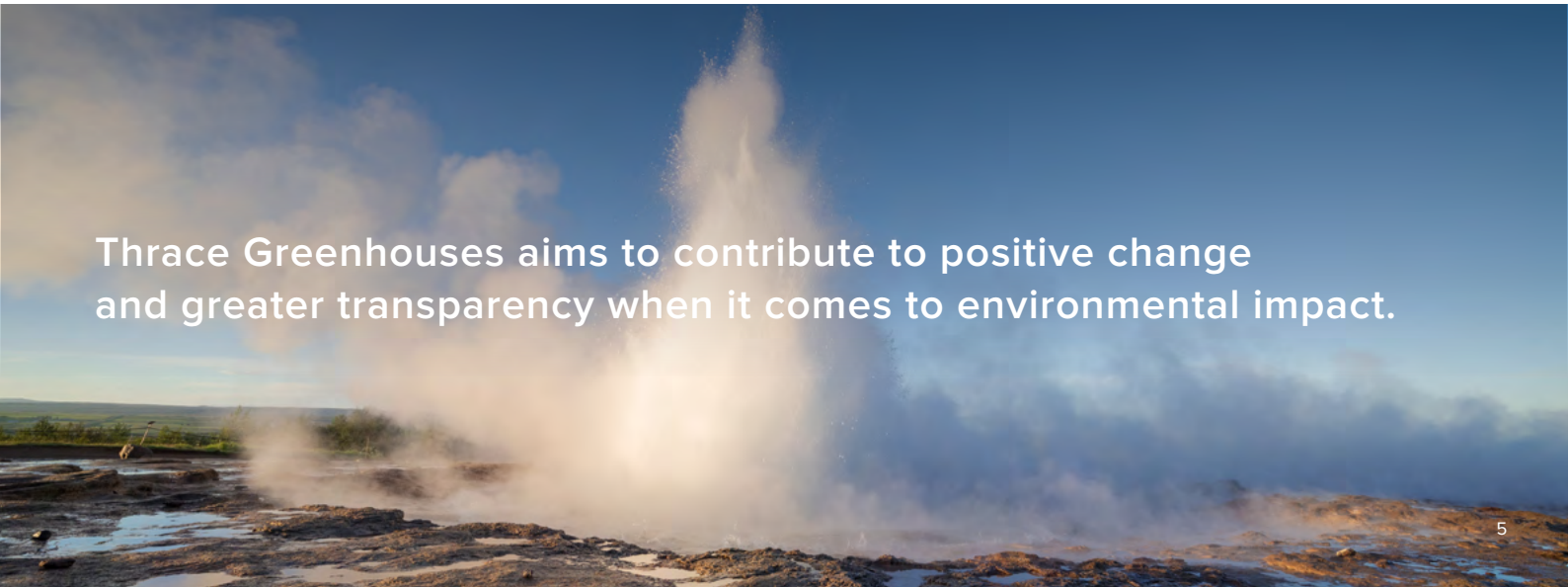
Environmental Product Declaration

"A long-term, sustainable and transparent measuring tool for environmental impact".

Clean Energy sourced through Greek soil, Flavor sourced through Greek sun

- **Geothermal energy*** is used to meet all the Thrace Greenhouses' heating needs. As a major asset of northern Greece, Geothermal energy could significantly enhance agricultural activity. With its scattered geothermal fields, the wider region of Thrace - and Xanthi in particular - shows tremendous geothermal potential.
- Solely **natural solar radiation** is used for the growth of Thrace Greenhouses' produce. The required energy for chemical activities within growing plants, as well as the evaporation from the foliage, is achieved though sunshine. The sun in Greece, offers the needed quality and quantity of sunlight all year round.
  No artificial light is used at Thrace Greenhouses.

*Geothermal energy is the natural thermal energy generated from the earth's core to its surface. It is a renewable energy source, which can fully **replace the use of petrol** and other conventional heating and cooling methods.



"The path to growth leads back to nature"

"The environment is a key-element of Thrace Greenhouses' value system.
By protecting it, we ensure superior quality of the produce we offer our consumers.
This is the rewarding feeling that keeps us going."

- **Good Agricultural Practices**. Hydroponics is one of the most advanced & environmentally friendly cultivation methods in practice, while the renewable geothermal energy meets 100% of the heating requirements. Good agricultural practices aren't just about products; they are also about people. TG ensures all workers' health, safety and welfare, while being an active member of the local community.
- **Integrated Management System**. By applying sustainable management methods of natural resources, TG achieve certified quality of vegetables at every stage.
- **Almost Zero Carbon Footprint.** Thanks to geothermal energy which requires no fuel, TG not only emit no CO_2, but actively generate oxygen due to the photosynthetic process of plants.
- **Management of water resources**. Hydroponics allows TG to conserve up to 60% more water than traditional farming methods. The recirculation of both water and mineral nutrient solution also helps reduce production costs and environmental impact.
- **Natural Pollination**. The use of insect pollinators ensures premium quality and hormone free produce.
- **Plant waste management**. Rather than burning plant debris from our greenhouses or disposing it into the environment, TG make it available to local farmers as supplementary feed for their livestock.

Product information

Tomato is the base of Mediterranean nutrition and a nutrient-dense superfood that offers benefit to a range of bodily systems. Its nutritional content supports healthful skin, weight loss, and heart health.

Thrace's Greenhouses cluster tomato is vine-ripened and harvested in clusters, thus keeping its freshness, nutritional value and juices for a prolonged time.

Cluster tomato is classified under code 01234 "Tomatoes" in the United Nations Central Product Classification (CPC) System.

SUPPORT BLOOD CLOTTING AND WOUND HEALING

GREAT SOURCE OF VITAMINS

HEALTHY SKIN

BOOST DIGESTIVE HEALTH

IMPROVE YOUR VISION

Energy Value	Fruit size	**ELEMENTS** (per 100g)	**MINERALS** (per 100g)	**VITAMINS** (per 100g)
Energy - 18 kcal	58 - 85 mm	Water - 95%	Calcium - 10 mg	Vitamin K - 7,2 mcg
		Carbohydrates - 3,9 g	Sodium - 11 mg	Vitamin B6 - 0,1 mg
		Protein - 0,9 g	Potassium - 237 mg	Vitamin C - 13,7 mg
		Fat - 0,2 g	Copper - 0,3 mg	

LCA information - Life Cycle assessment

Life Cycle Assessment is a method for analysing the environmental impact of a product throughout its life-cycle, from the extraction of raw materials (the cradle) to handling the waste (the grave).

Goal of the study
An LCA study has been conducted in accordance with ISO 14025 and the requirements stated in the General Programme Instructions by The International EPD® System. Goal of the present LCA study has been to calculate environmental impact values for hydroponic cluster tomato to create this Environmental Product Declaration, to be used for communicating environmental performance to customers.

Scope of the study
The scope of the study is cradle to grave and includes all processes up until beef tomato is cultivated and transported to retail, including end-of-life processes, see Figure 1. All material and resource consumption is tracked back to the point of raw material extraction, mainly by using cradle to-gate data from the Ecoinvent database. The declared unit of the study is 1 kg of product sold unpacked, in accordance with the Product Category Rules (PCR).

Data collection
The inventory for the LCA study was carried out during 2020. The data for the cultivation of beef tomato was provided by Thrace Greenhouse S.A. staff.

Allocation
Allocation rules has been performed in accordance with the requirements of ISO 14044:2006. Wherever possible, allocation was avoided by dividing the unit process to be allocated into two or more sub-processes and collecting the input and output data related to these sub-processes. Where allocation cannot be avoided, the inputs and outputs of the system were partitioned between its different products or functions in a way that reflects the underlying physical or economic relationships between them.

Cut-off rules
Where there is insufficient data or data gaps for a unit process, the cut-off criteria are 1% of the declared environmental impacts.

Additional information about the LCA study

Time representativeness:
2020

Database(s) and LCA software used:
Ecoinvent 3.7.1
OpenLCA Software

Description of system boundaries:
Cradle-to-grave

System diagram
The system boundaries of this EPD are decided by the Product Category Rules (PCR) and illustrated by Figure 1.

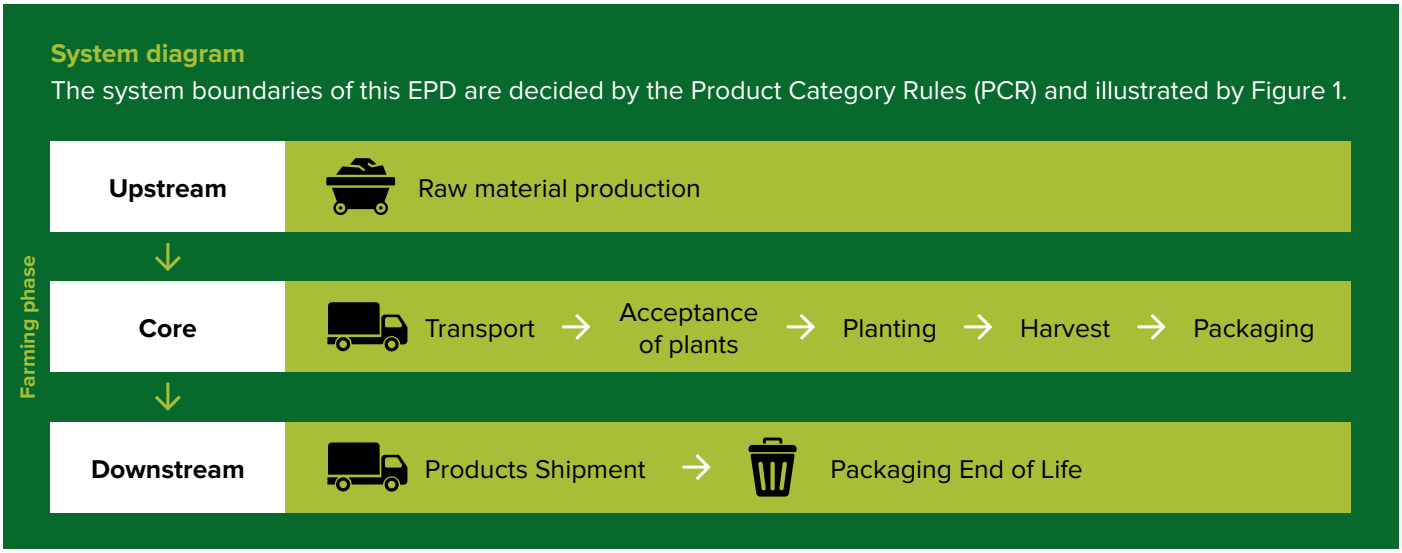


Figure 1

System boundaries

Upstream	Raw Materials Supply
Core	External transportation to the core processes
	Agriculture including e.g. operations at the farm(s), air water and soil emissions
	Waste treatment of waste generated during manufacturing
	Production of electricity and fuels used in the core module
Downstream	Transportation to an average customer
	End-of-life processes of packaging waste

Environmental performance

Potential environmental impact

Parameter		Unit	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Global warming potential (GWP)	TOTAL	kg CO_2 eq	2,35E-01	3,56E-02	8,83E-02	3,59E-01
	Fossil	kg CO_2 eq	2,27E-01	3,41E-02	7,86E-02	3,39E-01
	Biogenic	kg CO_2 eq	7,42E-03	1,51E-03	9,71E-03	1,86E-02
	Land use and land transformation	kg CO_2 eq	6,83E-04	4,79E-05	2,21E-05	7,53E-04
Acidification potential (AP)		kg SO_2 eq	1,13E-03	1,79E-04	2,93E-04	1,60E-03
Eutrophication potential (EP)		kg PO_4^{-3} eq	4,84E-04	9,41E-05	8,68E-05	6,65E-04
Formation potential of tropospheric ozone (POCP)		kg NMVOC eq	7,03E-04	1,66E-04	3,59E-04	1,23E-03
Abiotic depletion potential - Elements		kg Sb eq	4,04E-06	2,77E-06	1,83E-07	6,99E-06
Abiotic depletion potential - Fossil resources		MJ	3,10E+00	4,96E-01	1,22E+00	4,81E+00
Water scarcity potential		m^3 eq	1,44E-01	1,12E-02	6,15E-03	1,62E-01

Use of resources

Parameter		Unit	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Primary energy resources - Renewable	Use as energy carrier	MJ	1,07E+00	2,01E+00	1,49E-02	3,10E+00
	Used as raw materials	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ	1,07E+00	2,01E+00	1,49E-02	3,10E+00
Primary energy resources - Nonrenewable	Use as energy carrier	MJ	3,10E+00	4,96E-01	1,22E+00	4,81E+00
	Used as raw materials	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ	3,10E+00	4,96E-01	0,00E+00	3,59E+00
Use of secondary material		kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels		MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non-renewable secondary fuels		MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Fresh water		m^3	3,36E-03	2,62E-04	1,43E-04	3,76E-03

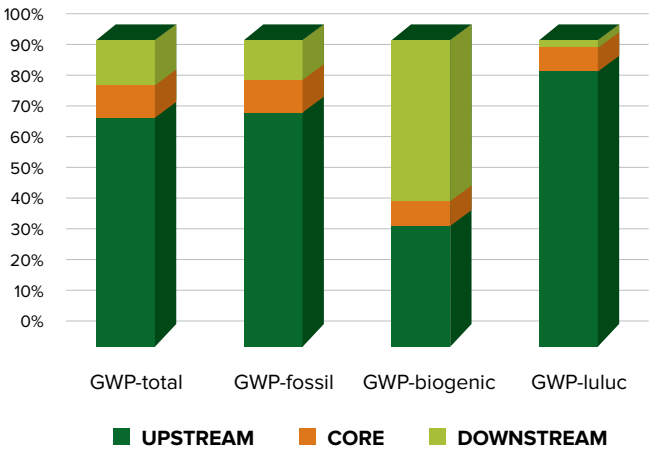
Waste production

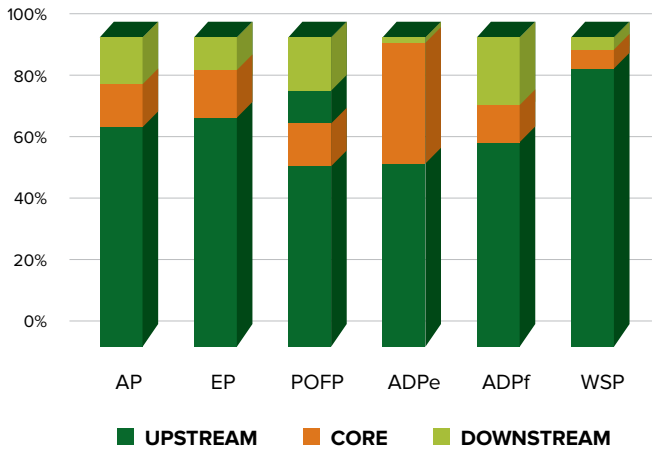
Parameter	Unit	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Hazardous waste disposed	Kg	4,88E-06	3,60E-06	2,93E-06	1,14E-05
Non-hazardous waste disposed	Kg	1,95E-01	2,41E-02	1,13E-01	3,33E-01
Radioactive waste disposed	Kg	9,50E-06	2,75E-06	8,33E-06	2,06E-05

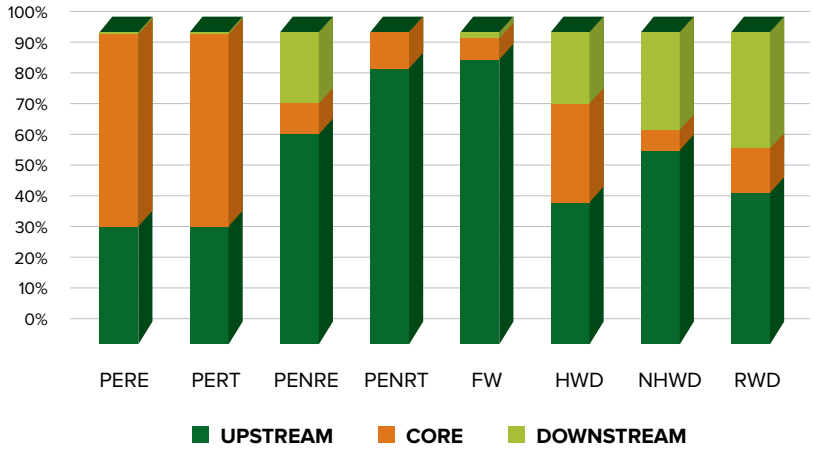
Output flows

Parameter	Unit	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Components for reuse	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for recycling	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for energy recovery	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Graphic results







Analysis

As it is presented in Figures, the upstream activities are the ones which contribute the most to almost all impact categories for the cultivation of cluster tomato. Upstream activities (raw materials supply) are the dominant stage for the majority of the impacts.

For Global Warming potential-luluc, Global Warming potential-fossil, Global Warming potential (total) (GWP), upstream activities contribution ranges from 91% to 65%, while in core activities (i.e., the transport of raw materials to production site and the cultivation of the vegetable), the corresponding contribution does not exceed 10%.

For Acidification potential (AP), Eutrophication potential (EP), Abiotic depletion potential for fossil resources (ADPf), Use of non-renewable primary energy excluding resources used as raw materials (PENRE), Use of net fresh water (FW), the upstream activities contribution ranges from 64% to 73%, while the corresponding contribution of those indicators in core stage ranges from 7% to 14%. The impact category Use of renewable primary energy excluding resources used as raw materials (PERE), is contributing the most to the core activities (i.e., the transport of raw materials to production site and the manufacturing process of the product).

References

General Programme Instructions of the International EPD® System. Version 3.01, 2019-09-18

PCR 2020:07. Version 1.0. Arable and Vegetables Crops. EPD System. Date 2020-12-07. Valid until 2024-12-07

ISO 14020:2000 Environmental labels and declarations - General principles

ISO 14025:2006 Environmental labels and declarations - Type III environmental declarations - Principles and procedures

ISO 14040:2006 Environmental management - Life cycle assessment-Principles and framework

ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines

Contact information

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