CARBON FOOTPRINT CALCULATION
SELKO SR30
NOREL SA

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CALCULATION OF THE CARBON FOOTPRINT OF THE PRODUCT SELKO SR30

1. CARBON FOOTPRINT OF THE PRODUCT — DETERMINATIONS

The carbon footprint is an environmental indicator that quantifies the total amount of greenhouse gases (GHGs) emitted directly or indirectly by a person, company, product, event, or organization. It is calculated based on GHG emissions generated throughout the life cycle within the scope defined in the study (e.g., cradle-to-gate, cradle-to-grave, etc.).

These emissions include both direct emissions from the process and indirect emissions associated with the production of inputs. The carbon footprint assessment covers 270 GHGs, categorized as halogenated compounds, HFCs, PFCs, CFCs, HCFCs, halons, and others such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Results are reported as a single consolidated figure expressed in mass of carbon dioxide equivalent (CO_2e).

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2. DECLARED UNIT

In a life cycle assessment (LCA), the declared unit is the functional reference—the product or service for which the study is conducted and against which carbon footprint results are reported.

In this study, the declared unit used for the LCA is:

1 kg of SELKO SR30 manufactured by Norel SA and delivered at the factory gate, after packaging and palletization.

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3. PRODUCT LIFE CYCLE

This study was carried out by assessing the cradle-to-gate life cycle of the SELKO SR30 product.

The life cycle considered includes the production of raw materials and their processing, up to the product packaging stage, prepared for shipment to the customer.

The product is manufactured at the NOREL plant in Valls. This facility operates seven production lines, including the encapsulation line (internally designated as Line 7), which produces the product under study (SELKO SR30).

3.1. COMPANY DESCRIPTION

NOREL SA is a Spanish company founded in 1980 that specializes in the development, manufacturing, and marketing of additives and ingredients for animal nutrition. Its headquarters are located in Madrid, Spain.

- **Global presence:** Operates in more than 70 countries and employs over 250 people worldwide.
- **Production plants:** Maintains five production facilities in Spain, Mexico, Egypt, and the United States.
- **Sector and activity:** Classified within the manufacturing industry, specifically under the production of feed products for farm animals (CNAE 1091).

Products and specialization

The company develops nutritional solutions designed to improve nutrient uptake and animal performance:

- **Bypass Fats:** Global leaders in protected fats for ruminants.
- **Physiological Additives:** Probiotics, organic acids, and non-medicated growth promoters.
- **Organic Minerals:** Production of methionates and fat concentrates by spraying.
- **Animal Health:** Natural alternatives to reduce the use of antibiotics in livestock production.

Strategic commitment (ESG)

- **Alignment with SDGs:** Norel states its commitment to the 17 United Nations Sustainable Development Goals, prioritizing those related to responsible production and climate action.
- **Equality and governance:** Norel has a Gender Equality plan and collaborates with NGOs. Although these initiatives are social in nature, they are commonly integrated into broader sustainability reporting frameworks (ESG).

3.2. METHODOLOGY AND APPLICABLE STANDARDS — CALCULATION SOFTWARE

The methodology applied in this project to calculate the carbon footprint of SELKO SR30 is based on **ISO 14067**.

The quantification of the carbon footprint for the feed additive assessed in this report has been structured in accordance with the methodological requirements of the international standard **UNE-EN ISO 14067:2019**. This standard defines the principles, requirements, and guidelines for the quantification and reporting of a Product Carbon Footprint (PCF), ensuring a scientifically robust baseline derived from Life Cycle Assessment (LCA) standards **ISO 14040** and **ISO 14044**.

Within this regulatory framework, the study applies a "**cradle-to-gate"** scope, defining the system boundary from the extraction and synthesis of raw chemical or biological ingredients and their transport, up to the thermal processing, blending, and/or reaction steps carried out at the manufacturing facility. The life cycle also includes product packaging and preparation for final use. Consequently, downstream stages such as commercial distribution, feed compounding, and animal metabolism are appropriately excluded from the system boundary.

For the selection of the **PCR (Product Category Rules)**, the study uses **P-2250 — Additives and Feed compounds** from the **Instituto de Huella Ambiental**.

In line with the standard's strict requirements for the agri-food sector, rigorous allocation criteria have been applied to co-products and a specific treatment of biogenic carbon has been followed. In addition, potential impacts related to direct and indirect land use change (dLUC/iLUC) associated with plant-based ingredients—where applicable—have been considered, ensuring that the GHG inventory minimizes uncertainty and avoids bias. Accordingly, the results represent the real climate impact of the additive up to the point of dispatch, with the highest level of consistency, transparency, and reproducibility.

This provides a high-confidence environmental indicator that downstream customers and feed manufacturers can integrate into their own life cycle assessments. As a result, it supports the decarbonization of the animal nutrition supply chain and enables compliance with third-party verification audits.

Given the complexity of the analysis methodology, the model used in the study, and the multiple inputs and outputs, a robust software tool is required to perform the calculations, ensuring that data handling is accurate, efficient, and reliable. In this project, the **Air.E.LCA** software from **Solid Forest** was used (**www.solidforest.com**). The software version applied was **V3.22**.

3.3. LIFE CYCLE PHASES

The carbon footprint calculation applied in this study follows a **cradle-to-gate** approach. This means that emissions associated with **inputs and raw materials** are accounted for along the **supply chain**, up to the moment when the product is **ready to leave the factory**—after packaging and prepared for transport to the final customer.

a) Upstream processes:

- **Production of sodium butyrate** at the Cañete plant (Cuenca), within the same company.
- **Purchase of raw materials** (butyric acid and sodium hydroxide) for the Cañete plant.
- **Purchase of raw materials** (vegetable stearins) for the Valls plant.
- **Transport of sodium butyrate** from Cañete to the Valls plant (Tarragona), where the encapsulation (protection) process is performed.

b) Main processes:

- **Encapsulation of sodium butyrate** (SELKO SR30).
- **Packaging of SELKO SR30**.
- **Waste generated in the production process** (packaging).

c) Downstream processes:

Downstream processes are **not included**, as the study boundary corresponds to the **factory gate**. The system ends at our own facilities once the product is packaged and ready for shipment and marketing.

Therefore, the following elements were considered for the determination of the environmental footprint:

- **Energy use**
- Electricity
- Fuel consumption
- **Embedded emissions in the production of imported/purchased inputs**
- Raw materials required for the production process
- Transport to the different plants (for both production stages)
- Required packaging materials
- **Distribution of emissions related to waste materials**
- Packaging materials according to waste collection declarations
- Wooden waste

To calculate the GHG emissions associated with **fuel**, **process raw materials**, **product transport**, and the **collection and disposal/destruction of waste** (packaging and wood materials), the study used **Ecoinvent 3.11 emission factors**. For the calculation of **purchased electricity** used in the production process, as well as the **transport-related activities** in both plants, **OECD 2025 emission factors** and the **Ecoinvent dataset** were used.

4. LIFE CYCLE ASSESSMENT

As the product is manufactured in **two separate production sites**, two different life cycle stages are considered.

First life cycle stage — Cañete plant (Cuenca)

This stage takes place at the Cañete plant (Cuenca). Several production lines are involved; therefore, a **mass allocation** approach is applied for allocating electricity consumption, fuel consumption, and waste.
In this stage, **sodium butyrate** is produced and then sent to the **Valls plant**.
A total of **231,004 kg** of butyrate is produced within a total of **3,494,280 kg** of products (total). Therefore, the allocation factor is:

- **231,004 / 3,494,280 = 0.052** (approx.)

This factor is applied to allocate consumptions and waste associated with the butyrate relevant to SELKO SR30.

The **mass allocation** method is selected because the production lines are comparable, i.e., there are no specific lines with special requirements in terms of inputs or waste.
This mass allocation methodology is used for the following impact-related flows:

- Electricity consumption
- Fuel (gas) consumption
- Paper use
- Paper waste
- Water waste

Second life cycle stage — encapsulation at Valls plant (Tarragona)

The second life cycle stage corresponds to the encapsulation process carried out at the Valls plant (Tarragona). A mass allocation approach is also applied for allocating electricity consumption, fuel consumption, and waste.

On the same production line at the Valls plant, the total amount produced is **1,186,374 kg** of encapsulated product. Of this, **551,000 kg** corresponds to **SELKO SR30**. Thus, the allocation factor applied for electricity and fossil fuel consumption is:

- **551,000 / 1,186,374 = 0.464** (approx.)

Electricity consumption (Valls):

- Total line consumption: **55,881 kWh**
- Attributed to SELKO SR30: **25,951.13 kWh**

Fossil fuel consumption (Valls):

- Only natural gas is consumed: **64,407 m³**
- Attributed to SELKO SR30: **29,910 m³**

The same allocation approach is used to attribute residues:

- **Paper residues (Cañete):**
- **12,430 kg** for total production of **3,494,280 kg**
- Attributed to SELKO SR30: **646.3 kg**
- **Wooden residues (Cañete):**

- **1,200 kg** for total production of **3,494,280 kg**
- Attributed to SELKO SR30: **62.4 kg**
- **Paper residues (Valls):**
- **32,370 kg** for total production of **77,165,000 kg**
- Attributed to SELKO SR30: **231 kg**
- **Wooden residues (Valls):**
- **73,820 kg** for total production of **77,165,000 kg**
- Attributed to SELKO SR30: **527 kg**

4.1 EXCLUSIONS TO THE CALCULATION

Due to the small quantity of wooden residues generated at both plants, they were excluded from the calculation.

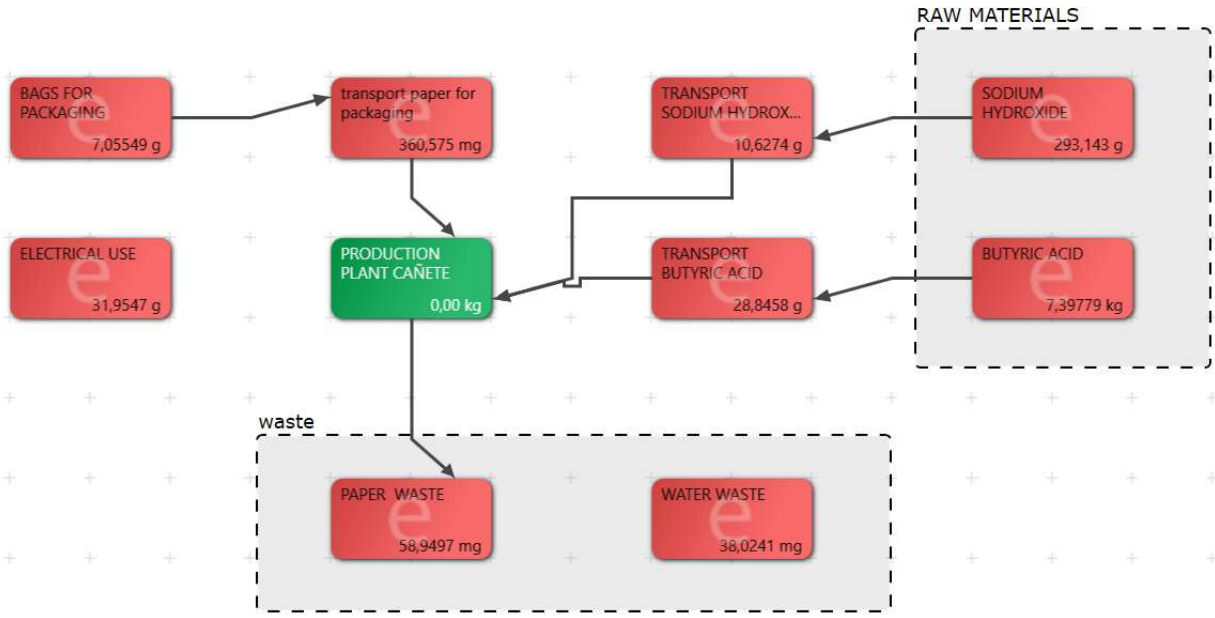
5. OPERATIONAL LIMIT

The operational boundary of the analyzed life cycle follows a **cradle-to-gate** approach. This means that all materials, processes, and other relevant elements required for the **manufacturing and packaging** of the **SELKO SR30** product are included in the LCA.

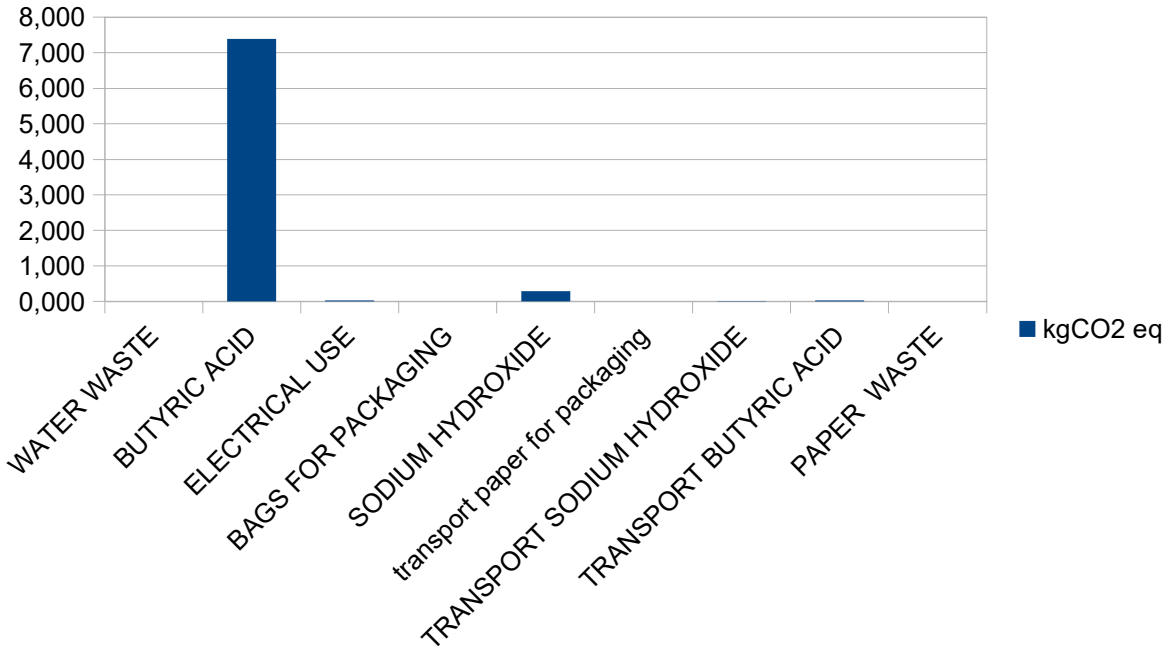
The **time horizon** of the data used in this study is **2025**; therefore, all data reported correspond to this period.

5.1. EMISSIONS INVENTORY

5.1.1. The first production cycle is the production of sodium butyrate at the Cañete plant, packaging ready to be transported to Valls



Impact	kgCO2 eq	DQR	
WATER WASTE		0,000	3,500
BUTYRIC ACID		7,398	3,100
ELECTRICAL USE		0,032	2,929
BAGS FOR PACKAGING		0,007	2,600
SODIUM HYDROXIDE		0,293	3,500
transport paper for packaging		0,000	3,500
TRANSPORT SODIUM HYDROXIDE		0,011	3,500
TRANSPORT BUTYRIC ACID		0,029	3,500
PAPER WASTE		0,000	3,000
		7,770	3,220



5.1.1.1 UPSTREAM PROCESSES AND TYPE OF EMMISIONS. LIFE CYCLE SODIUM BUTYRATE

Impact		Kg CO2 eq
BAGS FOR PACKAGING	GWP100 fossil	6,93E-03
BAGS FOR PACKAGING	GWP100 air emissions	0,00E+00
BAGS FOR PACKAGING	GWP100 absortions	-2,12E-07
BAGS FOR PACKAGING	GWP100 biogenics	4,18E-05
BAGS FOR PACKAGING	GWP100 land use	8,48E-05
BAGS FOR PACKAGING	GWP100 TOTAL	7,06E-03
BUTYRIC ACID	GWP100 fossil	7,39E+00
BUTYRIC ACID	GWP100 air emissions	0,00E+00
BUTYRIC ACID	GWP100 absortions	-6,71E-05
BUTYRIC ACID	GWP100 biogenics	2,86E-03
BUTYRIC ACID	GWP100 land use	3,24E-03
BUTYRIC ACID	GWP100 TOTAL	7,40E+00
SODIUM HYDROXIDE	GWP100 fossil	2,92E-01
SODIUM HYDROXIDE	GWP100 air emissions	0,00E+00
SODIUM HYDROXIDE	GWP100 absortions	-3,12E-06
SODIUM HYDROXIDE	GWP100 biogenics	7,21E-04
SODIUM HYDROXIDE	GWP100 land use	4,86E-04
SODIUM HYDROXIDE	GWP100 TOTAL	2,93E-01
TRANSPORT BUTYRIC ACID	GWP100 fossil	2,88E-02
TRANSPORT BUTYRIC ACID	GWP100 air emissions	0,00E+00
TRANSPORT BUTYRIC ACID	GWP100 absortions	-1,20E-07
TRANSPORT BUTYRIC ACID	GWP100 biogenics	9,13E-06
TRANSPORT BUTYRIC ACID	GWP100 land use	9,21E-06
TRANSPORT BUTYRIC ACID	GWP100 TOTAL	2,88E-02
TRANSPORT PAPER FOR PACKAGING	GWP100 fossil	3,60E-04
TRANSPORT PAPER FOR PACKAGING	GWP100 air emissions	0,00E+00
TRANSPORT PAPER FOR PACKAGING	GWP100 absortions	-1,48E-09
TRANSPORT PAPER FOR PACKAGING	GWP100 biogenics	1,13E-07
TRANSPORT PAPER FOR PACKAGING	GWP100 land use	1,14E-07
TRANSPORT PAPER FOR PACKAGING	GWP100 TOTAL	3,61E-04
TRANSPORT SODIUM HYDROXIDE	GWP100 fossil	1,06E-02
TRANSPORT SODIUM HYDROXIDE	GWP100 air emissions	0,00E+00
TRANSPORT SODIUM HYDROXIDE	GWP100 absortions	-4,40E-08
TRANSPORT SODIUM HYDROXIDE	GWP100 biogenics	3,37E-06
TRANSPORT SODIUM HYDROXIDE	GWP100 land use	3,39E-06
TRANSPORT SODIUM HYDROXIDE	GWP100 TOTAL	1,06E-02

	KG C02 EQ
GWP100 fossil	7,72E+00
GWP100 air emissions	0,00E+00
GWP100 absortions	-7,05E-05
GWP100 biogenics	3,63E-03
GWP100 land use	3,82E-03
GWP100 TOTAL	7,73E+00

5.1.1.2.CORE PROCCESSES AND TYPE OF EMISSIONS . LIFE CYCLE SODIUM BUTYRATE

ELECTRICAL USE	GWP100 fossil	3,14E-02
ELECTRICAL USE	GWP100 air emissions	0,00E+00
ELECTRICAL USE	GWP100 absortions	-5,32E-08
ELECTRICAL USE	GWP100 biogenics	7,60E-05
ELECTRICAL USE	GWP100 land use	4,31E-04
ELECTRICAL USE	GWP100 TOTAL	3,20E-02
PAPER WASTE	GWP100 fossil	5,89E-05
PAPER WASTE	GWP100 air emissions	0,00E+00
PAPER WASTE	GWP100 absortions	-1,91E-10
PAPER WASTE	GWP100 biogenics	1,18E-08
PAPER WASTE	GWP100 land use	2,04E-08
PAPER WASTE	GWP100 TOTAL	5,89E-05
WATER WASTE	GWP100 fossil	3,28E-05
WATER WASTE	GWP100 air emissions	0,00E+00
WATER WASTE	GWP100 absortions	-4,24E-10
WATER WASTE	GWP100 biogenics	5,22E-06
WATER WASTE	GWP100 land use	4,43E-08
WATER WASTE	GWP100 TOTAL	3,80E-05

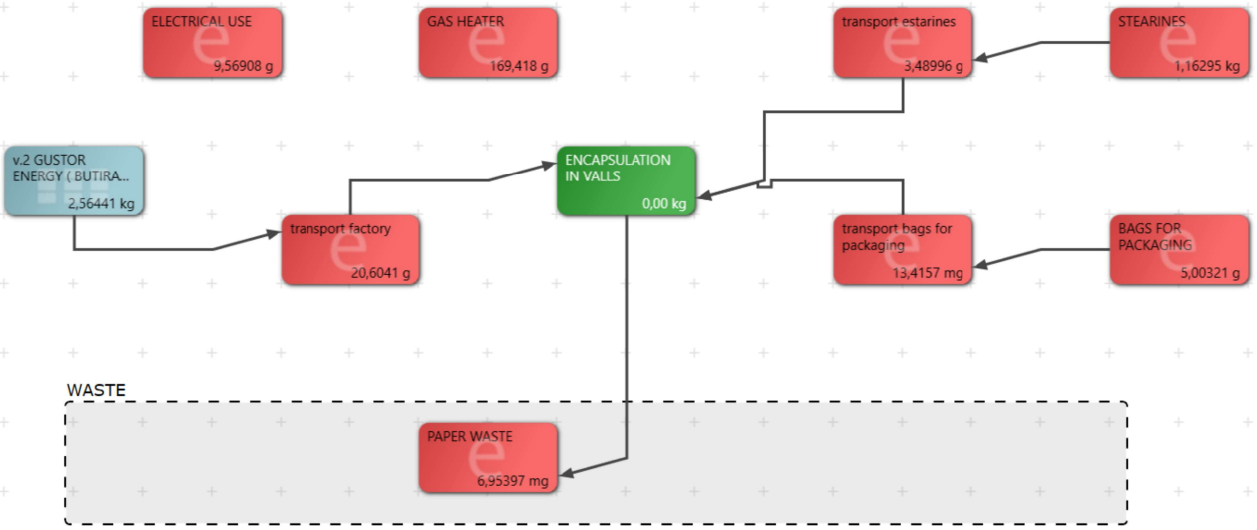
	KG C02 EQ
GWP100 fossil	3,15E-02
GWP100 air emissions	0,00E+00
GWP100 absortions	-5,39E-08
GWP100 biogenics	8,13E-05
GWP100 land use	4,31E-04
GWP100 TOTAL	3,21E-02

5.1.1.3. TOTAL EMMISIONS BY TYPE. SODIUM BUTYRATE (CAÑETE)

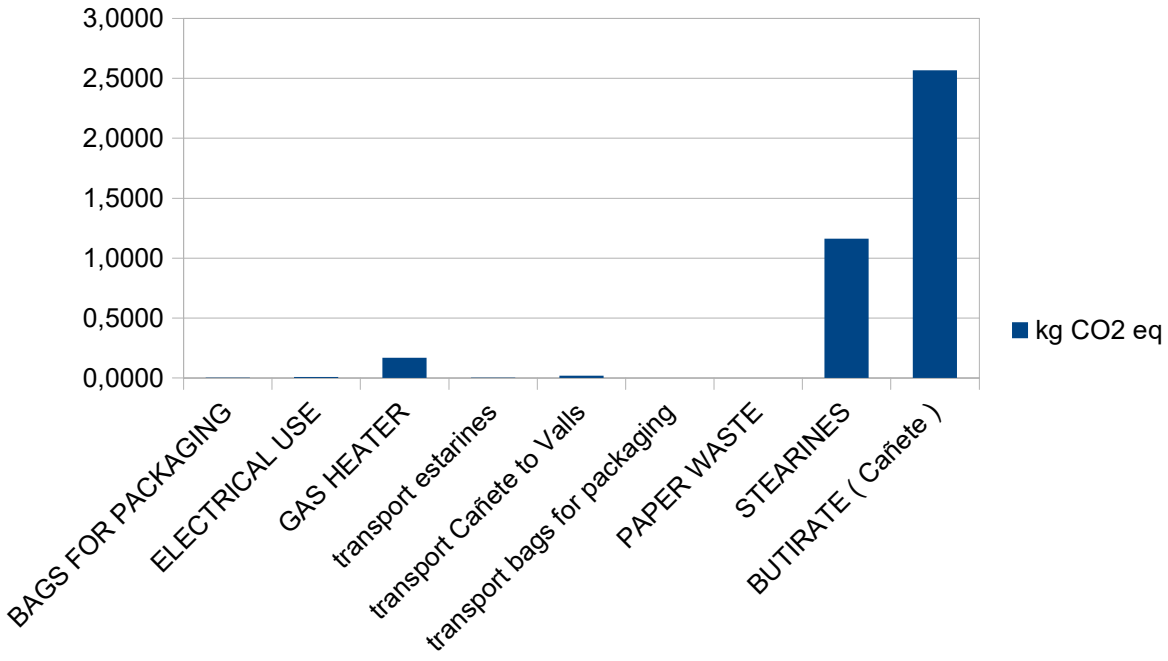
	UPSTREAM	CORE	TOTAL
GWP100 fossil	7,72E+00	3,15E-02	7,75E+00
GWP100 air emissions	0,00E+00	0,00E+00	0,00E+00
GWP100 absortions	-7,05E-05	-5,39E-08	-7,06E-05
GWP100 biogenics	3,63E-03	8,13E-05	3,71E-03
GWP100 land use	3,82E-03	4,31E-04	4,26E-03
GWP100 TOTAL	7,73E+00	3,21E-02	7,76E+00

5.1.2.The second production cycle is the microencapsulatio of the product at the plant of VALLS (TARRAGONA)

It is also included the transportation of the SODIUM BUTIRATE from Cañete.



Impact	kg CO2 eq	DQR
BAGS FOR PACKAGING	0,0050	3,1
ELECTRICAL USE	0,0096	2,9
GAS HEATER	0,1694	3,5
transport estarines	0,0035	1,9
transport Cañete to Valls	0,0206	1,9
transport bags for packaging	0,0000	1,9
PAPER WASTE	0,0000	3,0
STEARINES	1,1629	3,5
BUTIRATE (Cañete)	2,5644	3,1
TOTAL	3,9355	2,7


3,0000
2,5000
2,0000
1,5000
1,0000
0,5000
0,0000
BAGS FOR PACKAGING
ELECTRICAL USE
GAS HEATER
transport estarines
transport Cañete to Valls
transport bags for packaging
PAPER WASTE
STEARINES
BUTIRATE (Cañete)
kg CO2 eq

5.1.2.1. UPSTREAM PROCESSES AND TYPE OF EMISSIONS. LYFE CYCLE SELKOSR30 (VALLS)

BAGS FOR PACKAGING	GWP100 fossil	4,86E-03
BAGS FOR PACKAGING	GWP100 air emissions	0,00E+00
BAGS FOR PACKAGING	GWP100 absortions	-2,24E-07
BAGS FOR PACKAGING	GWP100 biogenics	6,35E-05
BAGS FOR PACKAGING	GWP100 land use	7,65E-05
BAGS FOR PACKAGING	GWP100 TOTAL	5,00E-03
STEARINES	GWP100 fossil	7,10E-01
STEARINES	GWP100 air emissions	0,00E+00
STEARINES	GWP100 absortions	-1,82E-05
STEARINES	GWP100 biogenics	1,90E-01
STEARINES	GWP100 land use	2,63E-01
STEARINES	GWP100 TOTAL	1,16E+00
TRANSPORT BAGS FOR PACKAGING	GWP100 fossil	1,34E-05
TRANSPORT BAGS FOR PACKAGING	GWP100 air emissions	0,00E+00
TRANSPORT BAGS FOR PACKAGING	GWP100 absortions	-5,31E-11
TRANSPORT BAGS FOR PACKAGING	GWP100 biogenics	4,67E-09
TRANSPORT BAGS FOR PACKAGING	GWP100 land use	4,37E-09
TRANSPORT BAGS FOR PACKAGING	GWP100 TOTAL	1,34E-05
TRANSPORT STEARINES	GWP100 fossil	3,49E-03
TRANSPORT STEARINES	GWP100 air emissions	0,00E+00
TRANSPORT STEARINES	GWP100 absortions	-1,38E-08
TRANSPORT STEARINES	GWP100 biogenics	1,20E-06
TRANSPORT STEARINES	GWP100 land use	1,13E-06
TRANSPORT STEARINES	GWP100 TOTAL	3,49E-03
TRANSPORT SODIUM BUTYRATE	GWP100 fossil	2,06E-02
TRANSPORT SODIUM BUTYRATE	GWP100 air emissions	0,00E+00
TRANSPORT SODIUM BUTYRATE	GWP100 absortions	-8,16E-08
TRANSPORT SODIUM BUTYRATE	GWP100 biogenics	7,18E-06
TRANSPORT SODIUM BUTYRATE	GWP100 land use	6,71E-06
TRANSPORT SODIUM BUTYRATE	GWP100 TOTAL	2,06E-02
SODIUM BUTYRATE	GWP100 fossil	2,56E+00
SODIUM BUTYRATE	GWP100 air emissions	0,00E+00
SODIUM BUTYRATE	GWP100 absortions	-2,33E-05
SODIUM BUTYRATE	GWP100 biogenics	1,23E-03
SODIUM BUTYRATE	GWP100 land use	1,41E-03
SODIUM BUTYRATE	GWP100 TOTAL	2,56E+00

GWP100 fossil	3,30E+00
GWP100 air emissions	0,00E+00
GWP100 absortions	-4,18E-05
GWP100 biogenics	1,91E-01
GWP100 land use	2,64E-01
GWP100 TOTAL	3,76E+00

5.1.2.2. CORE PROCESSES AND TYPE OF EMISSIONS. LYFE CYCLE SELKOSR30 (VALLS)

ELECTRICAL USE	GWP100 fossil	9,42E-03
ELECTRICAL USE	GWP100 air emissions	0,00E+00
ELECTRICAL USE	GWP100 absortions	-1,59E-08
ELECTRICAL USE	GWP100 biogenics	2,28E-05
ELECTRICAL USE	GWP100 land use	1,29E-04
ELECTRICAL USE	GWP100 TOTAL	9,57E-03
GAS HEATER	GWP100 fossil	1,69E-01
GAS HEATER	GWP100 air emissions	0,00E+00
GAS HEATER	GWP100 absortions	-1,27E-07
GAS HEATER	GWP100 biogenics	2,07E-05
GAS HEATER	GWP100 land use	2,29E-05
GAS HEATER	GWP100 TOTAL	1,69E-01
PAPER WASTE	GWP100 fossil	6,95E-06
PAPER WASTE	GWP100 air emissions	0,00E+00
PAPER WASTE	GWP100 absortions	-2,25E-11
PAPER WASTE	GWP100 biogenics	1,39E-09
PAPER WASTE	GWP100 land use	2,41E-09
PAPER WASTE	GWP100 TOTAL	6,95E-06

GWP100 fossil	1,79E-01
GWP100 air emissions	0,00E+00
GWP100 absortions	-1,43E-07
GWP100 biogenics	4,35E-05
GWP100 land use	1,52E-04
GWP100 TOTAL	1,79E-01

5.1.2.3 TOTAL EMISSIONS BY TYPE OF SELKOSR30

	UPSTREAM	CORE	TOTAL
GWP100 fossil	3,30E+00	1,79E-01	3,48E+00
GWP100 air emissions	0,00E+00	0,00E+00	0,00E+00
GWP100 absortions	-4,18E-05	-1,43E-07	-4,20E-05
GWP100 biogenics	1,91E-01	4,35E-05	1,92E-01
GWP100 land use	2,64E-01	1,52E-04	2,64E-01
GWP100 TOTAL	3,76E+00	1,79E-01	3,94E+00

IMPACT	**KG CO2eq**
GWP100 TOTAL	**3,93546**
GWP100 FOSSIL	**3,47951**
GWP100 BIOGENICS	**0,19154**
GWP100 LAND USE	**0,26445**
GWP100 ABSORTIONS	**-0,00004**
GWP100 AIR EMISSIONS	**0,00000**

6. RESULTS AND VERIFICATION

These results have been reviewed and independently verified by the Environmental Footprint Institute and certified in November 2026 based on records provided by NOREL and the study conducted by NUVET AGRISERVICES, S.L.U. The certification was issued under reference number 261002PCD CRP-2250.