Environmental Product Declaration

EMILIANE CHEF

Barilla
Emiliane
Chef

1 EPD PROCESS

The first EPD process certified in the Food industries

This EPD has been developed in conformity to ISO 14025. An EPD should provide current information and may be updated if conditions change. The stated validity is, therefore, subject to the continued registration and publication at www.environdec.com.

EPD®
ENVIRONMENTAL PRODUCT DECLARATION

Barilla
The Italian Food Company. Since 1877.

REGISTRATION NUMBER	CPC CODE	PUBLICATION DATE	REVISION	VALID UNTIL	PROGRAMME	PROGRAMME OPERATOR
S-P-05323	2371 Uncooked pasta, not stuffed or otherwise prepared PPCR 2010:01 v. 4.0.2 2022/04/13	2021/12/22	2 of 2022/11/30	2026/12/16	The International EPD® System www.environdec.com	EPD International AB

1. Brand and product

THE BRAND BARILLA

Founded in 1877 as a small bread and pasta shop in Parma, the Barilla brand is now the number one for pasta in Italy and around the world. The best durum wheat and cutting-edge technologies make it possible to offer pasta that always remains al dente and ready-made sauces to millions of people around the world.

Further information on ***Barilla*** website.

Barilla FoodService is a line of product for professional use designed to make the work of HoReCa Sector professionals easier and to enable people to enjoy the quality of Barilla products when they are eating away from home too.

Further information on Barilla Food Service Website.

THE PLANT AND THE PROCESS

Egg pasta Barilla Emiliane Chef, is produced in Pedrignano (PR) pasta plant (Italy).
The production process includes:

- semolina mixing with eggs;
- forming and cutting or layering (for lasagne);
- drying;
- cooling;
- packaging.

THE PRODUCT

Egg pasta is produced using durum wheat semolina and fresh free-range eggs. Products included in the analysis include al pasta formats in Emiliane Chef brand, that were grouped in two main categories: lasagne pasta and other pasta formats. They are all realised using semolina and fresh eggs as only ingredients. The following products are excluded from this declaration, since they are produced with other ingredients: pasta cereals and eggs, green lasagne, green egg pasta, filled pasta.

NUTRITIONAL INFORMATION

Egg pasta is made only by eggs and durum wheat semolina with final moisture content around 13%.

From a nutritional point of view, its main characteristics are:

NUTRITIONAL INFORMATION (for 100 g)		LASAGNE	OTHER FORMATS
Energy	kJ - *kcal*	1 549 - *366*	1 569 - *371*
Fats *of which saturated*	grams	4 *1.2*	5 1.2
Carbohydrates *of which sugars*	grams	67 *3*	*67* *3*
Fibres	grams	4	4
Proteins	grams	13.5	14.5
Salt	grams	0.030	0.088

2. Barilla Group

Thanks to a path characterised by passion, quality, and attention to people's needs, a small bread and pasta shop, that opened in Parma in 1877, over time became the "Barilla" we know today: a world leader in the market for pasta, ready-made sauces, baked goods, and crispbread.

Barilla is present in over 100 countries with its brands and 30 production sites, which, every year, together produce more than 2,134,000 tonnes of products.

In different ways, on different markets, all of our brands have a common objective: to bring joy and conviviality around everyone's table.

More information on Barilla website
www.barillagroup.com

*Production plant not included in Barilla EPD Process

Our Purpose: The joy of food for a better life

In order to make a concrete contribution to global challenges, Barilla has renewed its commitment to society and the planet with a new Purpose containing the "why" of our way of doing business: "The joy of food for a better life".

"Bringing people closer to the joy of good food and making quality the choice for a better life, from each individual to the planet. Because this is how we are nurturing the future, today."

It's a commitment from field to fork, to bring to the world tasty, joyful and wholesome products, made with selected raw materials from responsible supply chains.
Because what we eat today can change our tomorrow. Because good food is a joy for the present and a choice for a better future.

3. Environmental performance calculation

The environmental performance of pasta was calculated using the LCA (life cycle analysis) methodology, including the entire production chain, starting from the cultivation of the raw material until the delivery of the finished product to the retailer.

The study was conducted following the specific product rules published for the **International EPD System**: "CPC code 2371 – Uncooked pasta, not stuffed or otherwise prepared".

The contribution to the environmental impacts brought by generic data is less than the 10% in all impact categories.

DECLARED UNIT

Data are referred to 1 kg of product plus the related packaging.
For lasagne, the packaging is referred to the only format: 500 g.
For other pasta shapes, a weighted average was calculated considering production volumes of all formats: 1 kg and 6 kg packs.

SYSTEM BOUNDARIES

The processes constituting the analyzed system were organized in three successive phases, in compliance with the EPD system's requirements.

GEOGRAPHICAL SCOPE

The geographical scope of this EPD is the area where the product is distributed and sold, which is mainly Europe (> 99% of distributed volumes).

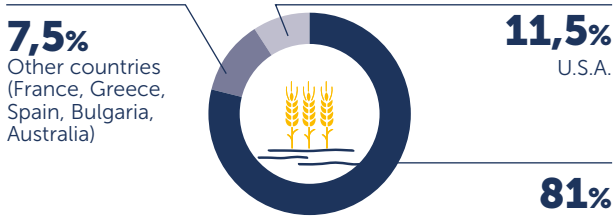
4. Ingredients production

UPSTREAM | CORE | DOWNSTREAM

Ingredients production | Milling | Packaging and auxiliary materials production | Pasta production | Distribution up to shelf | Cooking | Primary packaging end of life and food losses

DURUM WHEAT CULTIVATION

Durum wheat cultivation environmental performances were analysed considering the specific durum wheat origin; 9 different regions were analysed.
Percentages are calculated as average purchased amounts for years 2019, 2020, 2021.
Country specific data were used for fertilizers amount, crop yields and water use. Secondary data (mainly from Ecoinvent database) were used for fertilizers production and diesel production and use.
For every involved country, yield is calculated as average of three years (2019, 2020, 2021).



***64%** OF ITALIAN WHEAT* PURCHASED BY BARILLA COMES FROM AGRICULTURE THAT MEETS THE STANDARDS DEFINED BY BARILLA SUSTAINABLE FARMING.*

** Average value calculated considering the last three years (2019, 2020, 2021).*

UOVA

For its products, Barilla uses only Italian cage-free eggs.

Environmental performances of farming stage and pasteurization stage were evaluated using secondary data (mainly from Agribalyse database).

NATURALLY GOLDEN YELLOW PASTA

No artificial colors are used for Emiliane Barilla pasta making. The **MARIGOLD FLOWER FLOUR**, brightly colored, is mixed to hens feed and it is the only and natural element that gives a golden yellow color to our product.

OUR EGGS

OUR EGGS? THEY'RE FRESH, EXTRA FRESH!

Barilla works every day to use extra-fresh eggs: from eggs laying, to pasta production, the days can be counted on the fingers on one hand. It does that not only to comply with European legislation*, but above all to safeguard your health and preserve the unique taste of pasta.

EGGS FROM CAGE-FREE FARMING 100% ITALIAN

Lombardy, Veneto, Emilia Romagna: here is where eggs for our Emiliane pasta come from. We prefer Italian suppliers, that we carefully select.

It may happen that we also turn abroad, only to European countries, in case of temporary unavailability of the Italian supply chain. To date it has rarely happened: only once in ten years.

** THE EUROPEAN REGULATION ON FRESH EGGS.*
According to European Community regulations, eggs are considered fresh - or category A - if they are used within 28 days after laying. For eggs in shell, then, there is the denomination "extra fresh" if marketed 7 days after laying. The eggs we use for our pasta are normally processed within 5 days from being laid or, only in rare cases, between 7 and 14 days.

WE CARE ABOUT HENS' WELLBEING

- We choose farmers who take care of the hens and ensure their well-being.
- Each farm has different areas, to ensure free movement for the hens
- Hens can express their natural behaviors, such as socializing, foraging, flapping, pecking, and scratching the ground.
- In farms, every hen can lay her eggs with the tranquility she needs, in sheltered and intimate nests.
- Within the farms we have chosen, attention to hygiene and biosecurity is always very high.

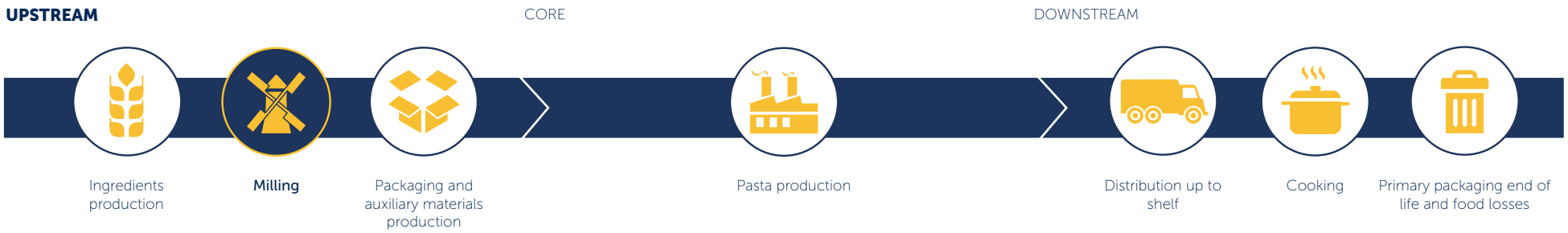
WE CARE ABOUT HENS' HEALTH

Our suppliers use medicines only if necessary, in full compliance with the law and, above all, with your health.

- Chicks are vaccinated before entering reproductive age.
- Antibiotics are no longer used during laying.
- The vet works closely with our suppliers, to examine and treat the hens when needed.
- If the hens are not fully healthy, any eggs laid are discarded.

For further information, see website (only italian available): WWW.BARILLA.COM/IT-IT/GUARDA-TU-STESSO

5. Milling

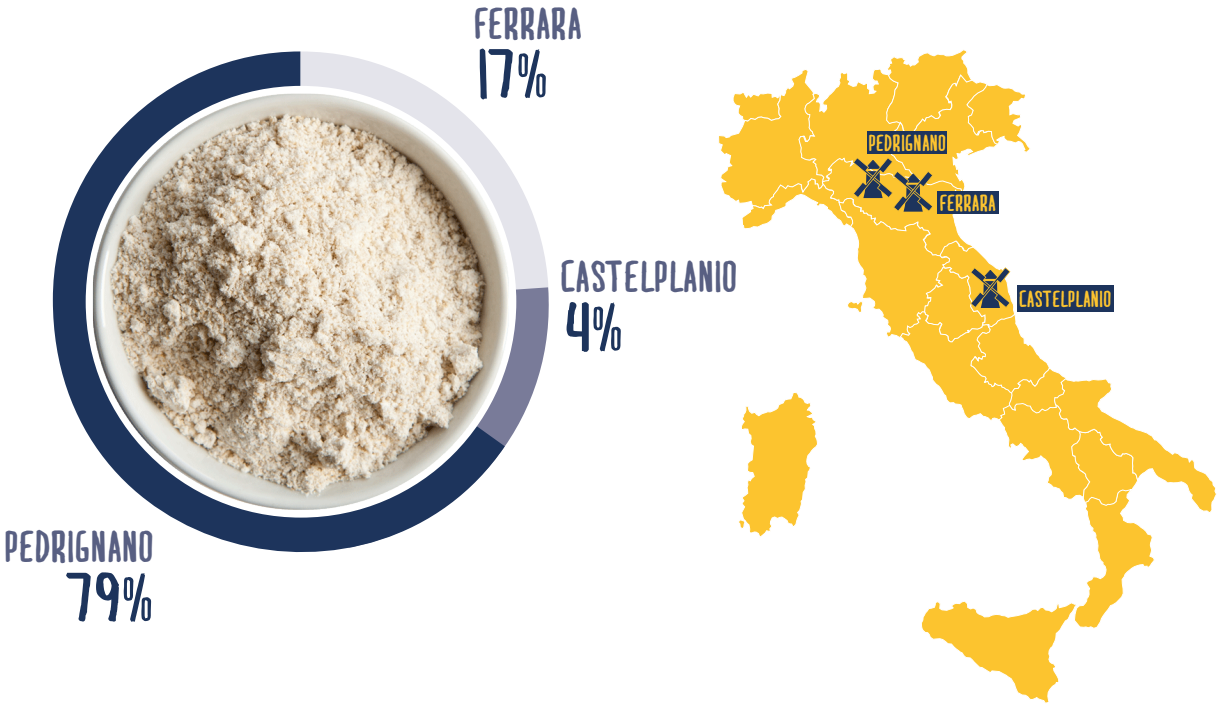


Semolina used for Emiliane pasta making is produced in italian property mills: Pedrignano (PR), Castelplanio (AN) and Ferrara.

Primary data (year 2021) were used for water and energy consumption and waste production. Secondary data, mainly from Ecoinvent databse, are used for environmental impacts calculation for water supply and energy production.

Environmental performances related to durum wheat transport from field to mill were evaluated by means of specific hypothesis for every production area. Secondary data, mainly from Ecoinvent database, are used for transport means.

Durum wheat does not need any particular storage condition (such as refrigeration).



THE EFFORTS FOR A RESPONSIBLE FARMING

Since 2010, a team of Barilla professionals has been carrying out a study designed to identify the main areas for growing durum wheat in Italy and the cultivation systems with lower environmental impact. The main results of the project have been the publication of the Handbook for sustainable cultivation of durum wheat and the development of Granoduro.net in collaboration with Horta srl, a spin-off of the Università Cattolica di Piacenza. Barilla's commitment to the future is to disseminate these practices to reduce the durum wheat supply chain's environmental impact.

2009

PASTA LCA
The EPD shows that the 60% of the Global Warming Potential of pasta is due to the cultivation of durum wheat.

2010

THE SUSTAINABLE AGRICOLTURE PROJECT BEGINNING
A multidisciplinary team, composed of agronomists and LCA experts, starts a study on the agricultural systems to individuate how to reduce the environmental impact of durum wheat cultivation on the environment.

2011

THE HANDBOOK FOR SUSTAINABLE CULTIVATION OF DURUM WHEAT
As a result of the project a handbook with suggested agricultural practices for the reduction of cultivation environmental impact was published and given to farmers.

2012

GRANODURO.NET
The web decision support system (DSS) granoduro.net is developed by Horta and given to farmers.
It supports farmers with information about the optimal seeding rate, the nitrogen requirement, the risk of diseases and about the weather forecast.

2013

CONTRACT WITH FARMERS FOR SUSTAINABLE DURUM WHEAT
Starting from 2013, bonus are given to farmers who cultivate durum wheat adopting the agricultural practices suggested within Barilla's handbook.

NEW HANDBOOKS AND INCREASED BSF APPLICATION
The positive experience with the first Handbook led to the development of four new handbooks for foreing countries.
Compared to 2013, the total area cultivated with BSF (granoduro.net) is more than doubled.

2017

THE DURUM WHEAT MANIFESTO
In 2020 Barilla brand launches in Italy its first pasta produced with 100% Italian durum wheat: this result is possible thanks to farmers ' engagement and the increasingly widespread application of responsible agricultural practices.
For more information, visit the dedicated page on Barilla website.

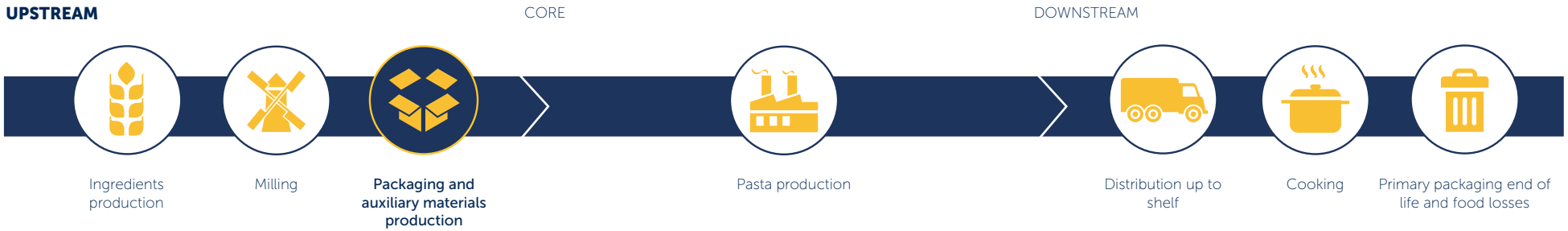
2020

BARILLA SUSTAINABLE FARMING (BSF) PROMOTES MORE EFFICIENT CROPPING SYSTEMS IN ORDER TO HAVE SAFE AND HIGH QUALITY AGRICULTURAL PRODUCTS IN A WAY THAT PROTECTS AND IMPROVES THE NATURAL ENVIRONMENT AND THE SOCIAL AND ECONOMIC CONDITIONS OF FARMERS.

European CSR Award Scheme

With the project Sustainable Agriculture, Barilla is the winner of the 1st European CSR Award Scheme which is an initiative promoted by the European Commission with the aim to give visibility to the best practices of Corporate Social Responsibility in Europe. The project, in collaboration with HORTA Srl and Life Cycle Engineering, has allowed the definition of the guidelines for the production of durum wheat with agricultural practices with lower environmental impact.

6. Packaging and auxiliary materials production



PRIMARY PACKAGING

Packaging environmental performances are calculated considering the 500g format for lasagne, that is the only format sold. For other pasta shapes, an average packaging weight was calculated considering the two existing formats: 1 kg or 6 kg of egg pasta in a plastic film.

Primary data (from packaging unit) are used for packaging amount and packaging materials production; they are referred to current year (2022). Data about packaging production process come from Barilla LCA database.

LCA Pack Designer

Since 2004, Barilla designs new packaging with the"LCA packaging design tool". It allows the assessment of the environmental impacts of the packaging solutions already during the design phase.

PACKAGING USED FOR BARILLA PASTA IS DESIGNED FOR RECYCLING.

PACKAGING FOR DISTRIBUTION

The packaging for transport consists in cardboard boxes (american box), used for the distribution of the product, and a plastic extensible film.

Boxes are made mainly by recycled cardboard carton (pre and post consumer).

For the production of secondary packaging secondary data from LCA database (mainly Ecoinvent) are used.

AUXILIARY MATERIALS

Auxiliary materials environmental performances are evaluated by using primary data from plant, during 2021 year.

Secondary data (Ecoinvent) are used for environmental aspects associated to materials production.

7. Egg pasta production

GENERAL INFORMATION

The environmental performances related to the production process are evaluated considering primary data for energy and water consumption and the waste production. Secondary data (mainly Ecoinvent) are used for the environmental aspects related to the production of energy and water.
Barilla pasta plant in Pedrignano was considered in the analysis.

WATER

The water consumption is evaluated using primary data, measured by Pedrignano plant water meters. The overall value is attributed to the product using the mass allocation procedure.
Data are referred to year 2021.

RAW MATERIALS TRANSPORT

Environmental performances related to raw materials transport were evaluated considering road transport (truck) from the mills or suppliers and Pedrignano plant, using 2021 primary data.
Secondary data, mainly from Ecoinvent database, are used for transport means.

BARILLA PEDRIGNANO (PR) PASTA PLANT

WASTE

Primary data on waste production are collected by the plant registrations. Data are referred to year 2021.

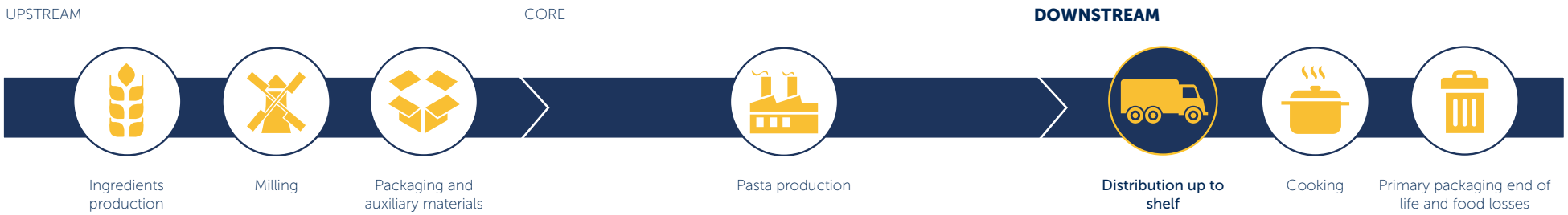
ELECTRICITY

Total plant electricity has been divided using mass allocation (the plant produces other products beyond egg pasta). In 2021 part of the electricity used in Pedrignano plant was purchased from the national grid, part was produced with a trigenerator. Electric energy production is related to specific country mix for year 2021 and to trigenerator.

NATURAL GAS

In Pedrignano plant a trigenerator is used. Using naturals gas, it produces electric, thermal and cooling energy.
The natural gas consumption is evaluated using primary data, referred to year 2021.

8. Distribution up to shelf



DISTRIBUTION

Egg pasta Emiliane Barilla is produced in Pedrignano plant, in Parma province.

The environmental impacts related to product distribution were evaluated considering volumes and destinations for italian market and export.

Primary data referred to 2020 year were used for distribution distances covered by truck and ship.
Secondary data (Ecoinvent database) were used for transport means.

Pasta does not need any particular storage condition (such as refrigeration) during distribution.

Impacts related to transport packaging end of life are calculated considering the average end of life scenario for paper, paperboard and plastic within the most relevant distribution countries (reference: Eurostat 2018).

LASAGNE

local 453 km
export 1297 km

local 11 km
export 220 km

OTHER SHAPES

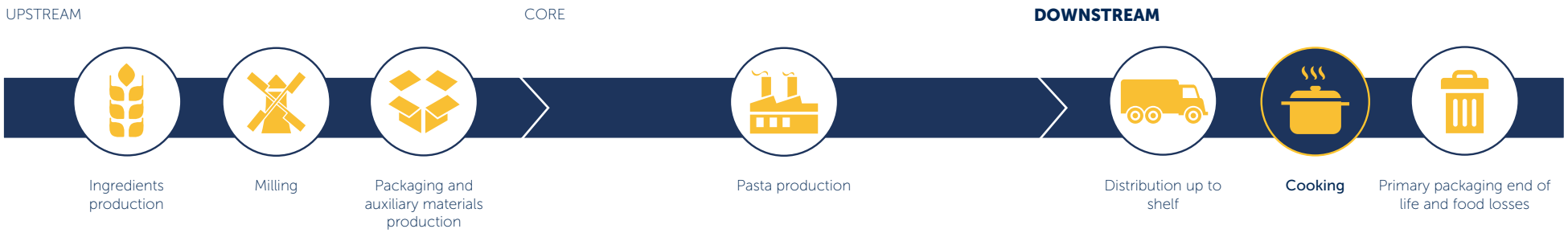
local 796 km
export 1 484 km

local 3 km
export 1 032 km

DISTRIBUTION LOSSES

Impacts related to product losses during distribution phase were estimated considering a 1 % loss (default value set in PCR) and assuming it is disposed in landfill.

9. Cooking



COOKING PHASE

The cooking phase is strictly correlated to consumer behaviour and the related impacts could be estimated taking into account the "cooking indications" that are usually provided by the company on packaging.

The impacts could be estimated considering the cooking of 1 kg of pasta and the hypothesis reported on the PCR:

- **Boiling phase: 0.18 kWh per kg of water;**
- **Cooking phase: 0.05 kWh per minute of cooking.**

Impacts were calculated considering the two most common scenarios: cooking with gas stove or electric stove.
For lasagne, only cooking in electric oven is considered and no salt and water are added; the analysis doesn't consider any other ingredient that could be used by final consumer.

1 kg pasta

1,8 kWh per kg of pasta (boiling phase)

10 liters of water per kg of pasta

0,05 kWh per minute of cooking

6 minutes cooking

100 grams of salt per kg of pasta

1 kg lasagne

0,03 kWh per minute cooking

15 minutes for oven heating

20 minutes cooking

BARILLA SUGGESTED COOKING METHOD

The energy necessary for the cooking stage has a significant impact. By choosing a cooking method that uses less energy, it is possible to sensibly reduce the carbon footprint of this stage.
Pasta cooking time can be divided in two parts: the time needed to boil water and the one necessary to cook pasta. Usually, after boiling water, pasta is cooked by keeping the heat on for the entire suggested cooking time, e.g. for 10 minutes (active cooking). However, pasta can be cooked in a more efficient way by keeping the heat on only for the first 2 minutes of cooking and then, for the remaining suggested time, the heat can be turned off while keeping the lid on the pot (passive cooking).

Passive cooking can reduce the carbon footprint, due to the savings of GHG emissions related to energy use, without affecting the product quality.

Considering the cooking process of a 10-minutes-cooking 80 gr portion of pasta, cooked with gas and electric stoves, these are the possible savings:

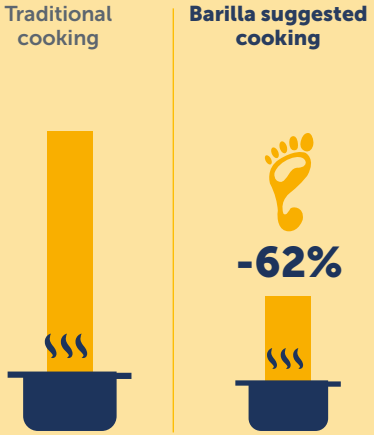
Cooking time:
10 min

*Cooking proportion is the following: 1l water x 100gr of pasta.

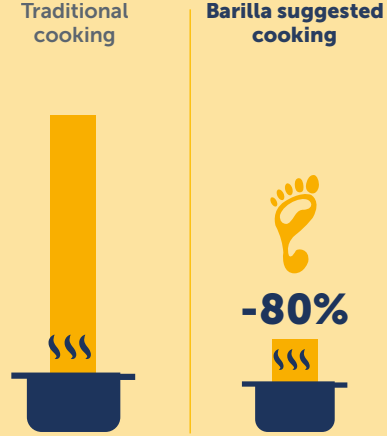
**The results are valid for gas and electric stove cooking.

PASTA COOKING METHODS* per 80 g

CARBON FOOTPRINT REDUCTION FOR WATER BOILING AND PASTA COOKING STAGE**



CARBON FOOTPRINT REDUCTION ONLY FOR COOKING STAGE**



Barilla-suggested cooking method does not affect the organoleptic properties of the product but it requires more attention during the cooking phase: pay attention that pasta is completely submerged into water and mix it regularly during cooking.

10. Primary packaging end of life and food losses

UPSTREAM | CORE | **DOWNSTREAM**

Ingredients production | Milling | Packaging and auxiliary materials production | Pasta production | Distribution up to shelf | Cooking | **Primary packaging end of life and food losses**

ITALY

- 81% RECYCLE — Avoiding the production of virgin material.
- 8% ENERGY RECOVERY — Recovering the packaging energy content.
- 11% DISPOSAL — In Italy, 19% of waste sent to disposal are incinerated without energy recovery, the remaining part goes to landfill.

EXPORT = FRANCE

- 92% RECYCLE — Avoiding the production of virgin material.
- 4% ENERGY RECOVERY — Recovering the packaging energy content.
- 4% DISPOSAL — In France, 3% of waste sent to disposal are incinerated without energy recovery, the remaining part goes to landfill.

- 29% RECYCLE — Avoiding the production of virgin material.
- 61% ENERGY RECOVERY — Recovering the packaging energy content.
- 10% DISPOSAL — In Italy, 19% of waste sent to disposal are incinerated without energy recovery, the remaining part goes to landfill.

- 27% RECYCLE — Avoiding the production of virgin material.
- 43% RECUPERO ENERGETICO — Recovering the packaging energy content.
- 30% DISPOSAL — In France, 3% of waste sent to disposal are incinerated without energy recovery, the remaining part goes to landfill.

Environmental performances of packaging end of life, for export market, are calculated considering the end of life scenario in France, that represents the most relevant market for export of Emiliane Chef.
Data elaborated from COMIECO and COREPLA Report 2018.

Impacts related to food losses during consumption stage were estimated considering a 2% food loss (default value set in PCR), and assuming the following end of life scenario: 25% anaerobic digestion, 25% composting, 25% landfilling, 25% incineration without energy recovery.

II. Environmental results for Lasagne - Italian market

USE OF RESOURCES data referred to 1 kg of product		UPSTREAM		CORE	DOWNSTREAM	TOTAL	USE STAGE	
		Ingredients production	Packaging and auxiliary materiuals production	Pasta production	Distribution up to shelf		Packaging end of life and food losses	Pasta cooking. electric
PRIMARY ENERGY RESOURCES - RENEWABLE data in MJ	Used as energy carrier	6.46E-01	3.90E+00	5.20E-02	1.73E-03	4.60E+00	2.06E-04	6.50E-01
	Used as raw materials*	0.00E+00	1.17E+00	0.00E+00	0.00E+00	1.17E+00	0.00E+00	1.00E+00
	Total	6.46E-01	5.07E+00	5.20E-02	1.73E-03	5.77E+00	2.06E-04	1.65E+00
PRIMARY ENERGY RESOURCES - NON RENEWABLE data in MJ	Used as energy carrier	1.12E+01	3.12E+00	8.75E+00	1.04E+00	2.41E+01	6.45E-03	9.08E+00
	Used as raw materials	0.00E+00	3.45E-02	0.00E+00	0.00E+00	3.45E-02	0.00E+00	1.00E+00
	Total	1.12E+01	3.15E+00	8.75E+00	1.04E+00	2.41E+01	6.45E-03	1.01E+01
Secondary Material (g)		0.00E+00	1.00E+02	0.00E+00	0.00E+00	1.00E+02	0.00E+00	1.00E+00
Renewable secondary fuels (MJ. net calorific power)		2.84E-02	5.99E-02	0.00E+00	0.00E+00	8.83E-02	0.00E+00	0.00E+00
Non-renewable secondary fuels (MJ. net calorific power)		2.31E+01	0.00E+00	0.00E+00	0.00E+00	2.31E+01	0.00E+00	0.00E+00
Net use of fresh water (liters)		1.32E-08	3.28E+00	2.18E+00	5.10E-02	5.50E+00	1.58E-02	1.72E+00

OUTPUT FLOWS data referred to 1 kg of product	UPSTREAM		CORE	DOWNSTREAM	TOTAL	USE STAGE	
	Ingredients production	Packaging and auxiliary materiuals production	Pasta production	Distribution up to shelf		Packaging end of life and food losses	Pasta cooking. electric
Waste to animal feed or similar (g)	0.00E+00	0.00E+00	1.75E+01	0.00E+00	1.75E+01	0.00E+00	1.00E+00
Components for reuse (g)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling (g)	4.18E+00	1.39E+01	1.10E+01	8.22E+01	1.11E+02	6.18E+01	0.00E+00
Materials for energy recovery (g)	0.00E+00	0.00E+00	7.26E-01	8.01E+00	8.74E+00	1.29E+01	0.00E+00
Exported energy. electric (MJ)	0.00E+00	0.00E+00	3.61E-01	1.11E-03	3.63E-01	1.10E-03	0.00E+00
Exported energy. thermal (MJ)	0.00E+00	0.00E+00	1.00E-01	2.32E-03	1.03E-01	2.30E-03	0.00E+00

Secondary energy resources and recovered energy flows do not show relevant contributions.

**The biomasses transformed into the product are not considered.*

II. Environmental results for Lasagne - Italian market

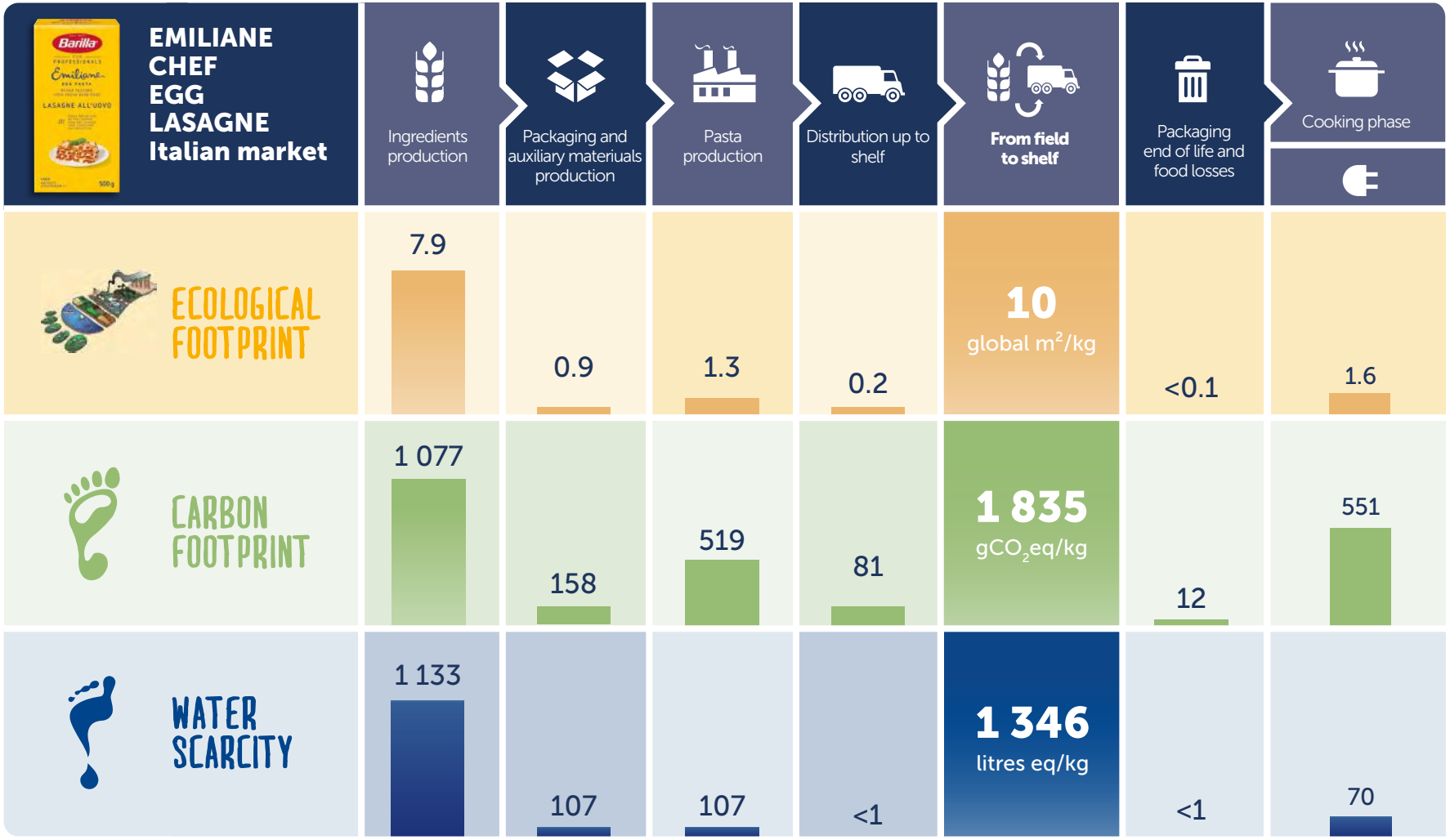
POTENTIAL ENVIRONMENTAL IMPACTS data referred to 1 kg of product		UPSTREAM		CORE	DOWNSTREAM	TOTAL	USE STAGE	
		Ingredients production	Packaging and auxiliary materiuals production	Pasta production	Distribution up to shelf		Packaging end of life and food losses	Pasta cooking. electric
GLOBAL WARMING POTENTIAL - GWP (g CO2 eq)	Fossil	9.58E+02	1.56E+02	5.19E+02	7.50E+01	1.71E+03	4.19E+00	5.51E+02
	Biogenic	1.55E+01	2.09E-01	5.05E-01	6.37E+00	2.26E+01	8.05E+00	9.98E-02
	Land use and land transformation	1.04E+02	1.58E+00	7.29E-03	7.57E-04	1.05E+02	2.23E-04	2.96E-02
	Total	1.08E+03	1.58E+02	5.19E+02	8.14E+01	1.83E+03	1.22E+01	5.51E+02
Acidification potential - g SO_2 eq		2.47E+01	5.77E-01	5.91E-01	3.78E-01	2.63E+01	4.82E-03	1.84E+00
Eutrophication potential - g PO_4^{---} eq		1.02E+01	1.99E-01	6.38E-02	5.98E-02	1.05E+01	7.35E-03	1.58E-01
Photochemical Oxidant Formation Potential - g NMVOC eq		3.98E+00	3.84E-01	4.68E-01	4.44E-01	5.28E+00	7.77E-03	9.97E-01
Abiotic Depletion Potential - Elements g Sb eq		1.74E-03	2.38E-05	1.22E-06	3.36E-06	1.76E-03	1.52E-07	8.11E-06
Abiotic Depletion Potential. Fossil fuels - MJ. potere calorifico netto		9.42E+00	2.31E+00	8.67E+00	1.04E+00	2.14E+01	6.16E-03	9.04E+00
Water scarcity potential. m^3 eq		1.13E+00	1.07E-01	1.07E-01	5.26E-05	1.35E+00	4.38E-04	7.01E-02

WASTE PRODUCTION * data referred to 1 kg of product	UPSTREAM		CORE	DOWNSTREAM	TOTAL	USE STAGE	
	Ingredients production	Packaging and auxiliary materiuals production	Pasta production	Distribution up to shelf		Packaging end of life and food losses	Pasta cooking. electric
Hazardous waste disposed (g)	0.00E+00	7.12E-09	0.00E+00	0.00E+00	7.12E-09	0.00E+00	0.00E+00
Non-Hazardous waste disposed (g)	0.00E+00	1.32E+01	0.00E+00	0.00E+00	1.32E+01	0.00E+00	0.00E+00
Radioactive waste disposed (g)	4.81E-05	4.17E-05	1.55E-05	5.11E-07	1.06E-04	7.81E-08	1.02E-04

The biogenic contribution to Global Warming Potential refers only to biogenic methane.
The contribution given by biogenic CO_2 is equal to zero, since the absorbed amount is equal to the emitted biogenic CO2 within the reference 100 years period.

**Zero values indicate that – even if some waste are produced and disposed – their impact is evaluated within the system boundaries.*

12. Product environmental performances of Lasagne - Italian market



13. Environmental results for Lasagne - Export market

USE OF RESOURCES data referred to 1 kg of product		UPSTREAM		CORE	DOWNSTREAM	TOTAL	USE STAGE	
		Ingredients production	Packaging and auxiliary materiuals production	Pasta production	Distribution up to shelf		Packaging end of life and food losses	Pasta cooking. electric
PRIMARY ENERGY RESOURCES - RENEWABLE data in MJ	Used as energy carrier	6.46E-01	3.90E+00	5.20E-02	4.88E-03	4.61E+00	3.08E-04	4.35E-01
	Used as raw materials*	0.00E+00	1.17E+00	0.00E+00	0.00E+00	1.17E+00	0.00E+00	1.00E+00
	Total	6.46E-01	5.07E+00	5.20E-02	4.88E-03	5.77E+00	3.08E-04	1.43E+00
PRIMARY ENERGY RESOURCES - NON RENEWABLE data in MJ	Used as energy carrier	1.12E+01	3.12E+00	8.75E+00	2.98E+00	2.60E+01	7.47E-03	1.37E+01
	Used as raw materials	0.00E+00	3.45E-02	0.00E+00	0.00E+00	3.45E-02	0.00E+00	1.00E+00
	Total	1.12E+01	3.15E+00	8.75E+00	2.98E+00	2.60E+01	7.47E-03	1.47E+01
Secondary Material (g)		0.00E+00	1.00E+02	0.00E+00	0.00E+00	1.00E+02	0.00E+00	1.00E+00
Renewable secondary fuels (MJ. net calorific power)		2.84E-02	5.99E-02	0.00E+00	0.00E+00	8.83E-02	0.00E+00	0.00E+00
Non-renewable secondary fuels (MJ. net calorific power)		2.31E+01	0.00E+00	0.00E+00	0.00E+00	2.31E+01	0.00E+00	0.00E+00
Net use of fresh water (liters)		1.32E-08	3.28E+00	2.18E+00	1.27E-01	5.58E+00	1.08E-02	3.17E+00

OUTPUT FLOWS data referred to 1 kg of product	UPSTREAM		CORE	DOWNSTREAM	TOTAL	USE STAGE	
	Ingredients production	Packaging and auxiliary materiuals production	Pasta production	Distribution up to shelf		Packaging end of life and food losses	Pasta cooking. electric
Waste to animal feed or similar (g)	0.00E+00	0.00E+00	1.75E+01	0.00E+00	1.75E+01	0.00E+00	1.00E+00
Components for reuse (g)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling (g)	4.18E+00	1.39E+01	1.10E+01	7.87E+01	1.08E+02	5.94E+01	0.00E+00
Materials for energy recovery (g)	0.00E+00	0.00E+00	7.26E-01	3.78E+00	4.50E+00	7.65E+00	0.00E+00
Exported energy. electric (MJ)	0.00E+00	0.00E+00	3.61E-01	3.11E-04	3.62E-01	3.30E-04	0.00E+00
Exported energy. thermal (MJ)	0.00E+00	0.00E+00	1.00E-01	6.50E-04	1.01E-01	6.90E-04	0.00E+00

Secondary energy resources and recovered energy flows do not show relevant contributions.

**The biomasses transformed into the product are not considered.*

13. Environmental results for Lasagne - Export market

POTENTIAL ENVIRONMENTAL IMPACTS data referred to 1 kg of product		UPSTREAM		CORE	DOWNSTREAM	TOTAL	USE STAGE	
		Ingredients production	Packaging and auxiliary materiuals production	Pasta production	Distribution up to shelf		Packaging end of life and food losses	Pasta cooking. electric
GLOBAL WARMING POTENTIAL - GWP (g CO2 eq)	Fossil	9.58E+02	1.56E+02	5.19E+02	2.14E+02	1.85E+03	3.48E+00	9.18E+01
	Biogenic	1.55E+01	2.09E-01	5.05E-01	1.84E+01	3.46E+01	1.70E+01	2.95E-02
	Land use and land transformation	1.04E+02	1.58E+00	7.29E-03	2.10E-03	1.05E+02	3.61E-04	1.76E-02
	Total	1.08E+03	1.58E+02	5.19E+02	2.33E+02	1.99E+03	2.04E+01	9.18E+01
Acidification potential - g SO_2 eq		2.47E+01	5.77E-01	5.91E-01	7.09E-01	2.66E+01	5.75E-03	2.38E-01
Eutrophication potential - g PO_4^{---} eq		1.02E+01	1.99E-01	6.38E-02	9.77E-02	1.05E+01	1.31E-02	3.32E-02
Photochemical Oxidant Formation Potential - g NMVOC eq		3.98E+00	3.84E-01	4.68E-01	6.97E-01	5.53E+00	1.12E-02	1.83E-01
Abiotic Depletion Potential - Elements g Sb eq		1.74E-03	2.38E-05	1.22E-06	9.32E-06	1.77E-03	1.07E-07	6.91E-05
Abiotic Depletion Potential. Fossil fuels - MJ. potere calorifico netto		9.42E+00	2.31E+00	8.67E+00	2.97E+00	2.34E+01	7.02E-03	1.50E+00
Water scarcity potential. m^3 eq		1.13E+00	1.07E-01	1.07E-01	-3.96E-04	1.35E+00	3.00E-04	2.16E-02

WASTE PRODUCTION * data referred to 1 kg of product	UPSTREAM		CORE	DOWNSTREAM	TOTAL	USE STAGE	
	Ingredients production	Packaging and auxiliary materiuals production	Pasta production	Distribution up to shelf		Packaging end of life and food losses	Pasta cooking. electric
Hazardous waste disposed (g)	0.00E+00	7.12E-09	0.00E+00	0.00E+00	7.12E-09	0.00E+00	0.00E+00
Non-Hazardous waste disposed (g)	0.00E+00	1.32E+01	0.00E+00	0.00E+00	1.32E+01	0.00E+00	0.00E+00
Radioactive waste disposed (g)	4.81E-05	4.17E-05	1.55E-05	1.44E-06	1.07E-04	1.22E-07	1.03E-04

The biogenic contribution to Global Warming Potential refers only to biogenic methane.
The contribution given by biogenic CO_2 is equal to zero, since the absorbed amount is equal to the emitted biogenic CO2 within the reference 100 years period.

**Zero values indicate that – even if some waste are produced and disposed – their impact is evaluated within the system boundaries.*

14. Product environmental performances of Lasagne - Export market

EMILIANE CHEF EGG LASAGNE Export market	Ingredients production	Packaging and auxiliary materiuals production	Pasta production	Distribution up to shelf	From field to shelf	Packaging end of life and food losses	Cooking phase
ECOLOGICAL FOOTPRINT	7.9	0.9	1.3	0.6	**11** global m^2/kg	<0.1	0.3
CARBON FOOTPRINT	1 077	158	519	233	**1 986** gCO_2eq/kg	20	92
WATER SCARCITY	1 133	107	107	<1	**1 346** litres eq/kg	<1	22

15. Environmental results for other pasta shapes - Italian market

USE OF RESOURCES data referred to 1 kg of product		UPSTREAM		CORE	DOWNSTREAM	TOTAL	USE STAGE		
		Ingredients production	Packaging and auxiliary materiuals production	Pasta production	Distribution up to shelf		Packaging end of life and food losses	Pasta cooking. gas	Pasta cooking. electric
PRIMARY ENERGY RESOURCES - RENEWABLE data in MJ	Used as energy carrier	7.16E-01	5.79E-01	5.20E-02	2.89E-03	1.35E+00	1.13E-04	4.77E-02	1.36E+00
	Used as raw materials*	0.00E+00	2.32E-01	0.00E+00	0.00E+00	2.32E-01	0.00E+00	0.00E+00	1.00E+00
	Total	7.16E-01	8.11E-01	5.20E-02	2.89E-03	1.58E+00	1.13E-04	4.77E-02	2.36E+00
PRIMARY ENERGY RESOURCES - NON RENEWABLE data in MJ	Used as energy carrier	1.19E+01	2.48E+00	8.73E+00	1.77E+00	2.48E+01	5.31E-03	9.99E+00	2.00E+01
	Used as raw materials	0.00E+00	5.88E-01	0.00E+00	0.00E+00	5.88E-01	0.00E+00	0.00E+00	1.00E+00
	Total	1.19E+01	3.07E+00	8.73E+00	1.77E+00	2.54E+01	5.31E-03	9.99E+00	2.10E+01
Secondary Material (g)		0.00E+00	1.32E+02	0.00E+00	0.00E+00	1.32E+02	0.00E+00	0.00E+00	1.00E+00
Renewable secondary fuels (MJ. net calorific power)		3.14E-02	7.89E-02	0.00E+00	0.00E+00	1.10E-01	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels (MJ. net calorific power)		2.59E+01	0.00E+00	0.00E+00	0.00E+00	2.59E+01	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water (liters)		1.30E-08	2.06E+00	2.18E+00	8.33E-02	4.32E+00	1.03E-02	1.08E+01	1.43E+01

OUTPUT FLOWS data referred to 1 kg of product	UPSTREAM		CORE	DOWNSTREAM	TOTAL	USE STAGE		
	Ingredients production	Packaging and auxiliary materiuals production	Pasta production	Distribution up to shelf		Packaging end of life and food losses	Pasta cooking. gas	Pasta cooking. electric
Waste to animal feed or similar (g)	0.00E+00	0.00E+00	1.75E+01	0.00E+00	1.75E+01	0.00E+00	0.00E+00	1.00E+00
Components for reuse (g)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling (g)	4.69E+00	1.79E+01	1.10E+01	1.09E+02	1.42E+02	8.50E+00	0.00E+00	0.00E+00
Materials for energy recovery (g)	0.00E+00	0.00E+00	7.26E-01	1.04E+01	1.11E+01	1.24E+01	0.00E+00	0.00E+00
Exported energy. electric (MJ)	0.00E+00	0.00E+00	3.61E-01	2.22E-03	3.64E-01	9.90E-04	0.00E+00	0.00E+00
Exported energy. thermal (MJ)	0.00E+00	0.00E+00	1.00E-01	4.65E-03	1.05E-01	2.07E-03	0.00E+00	0.00E+00

Secondary energy resources and recovered energy flows do not show relevant contributions.

**The biomasses transformed into the product are not considered.*

15. Environmental results for other pasta shapes - Italian market

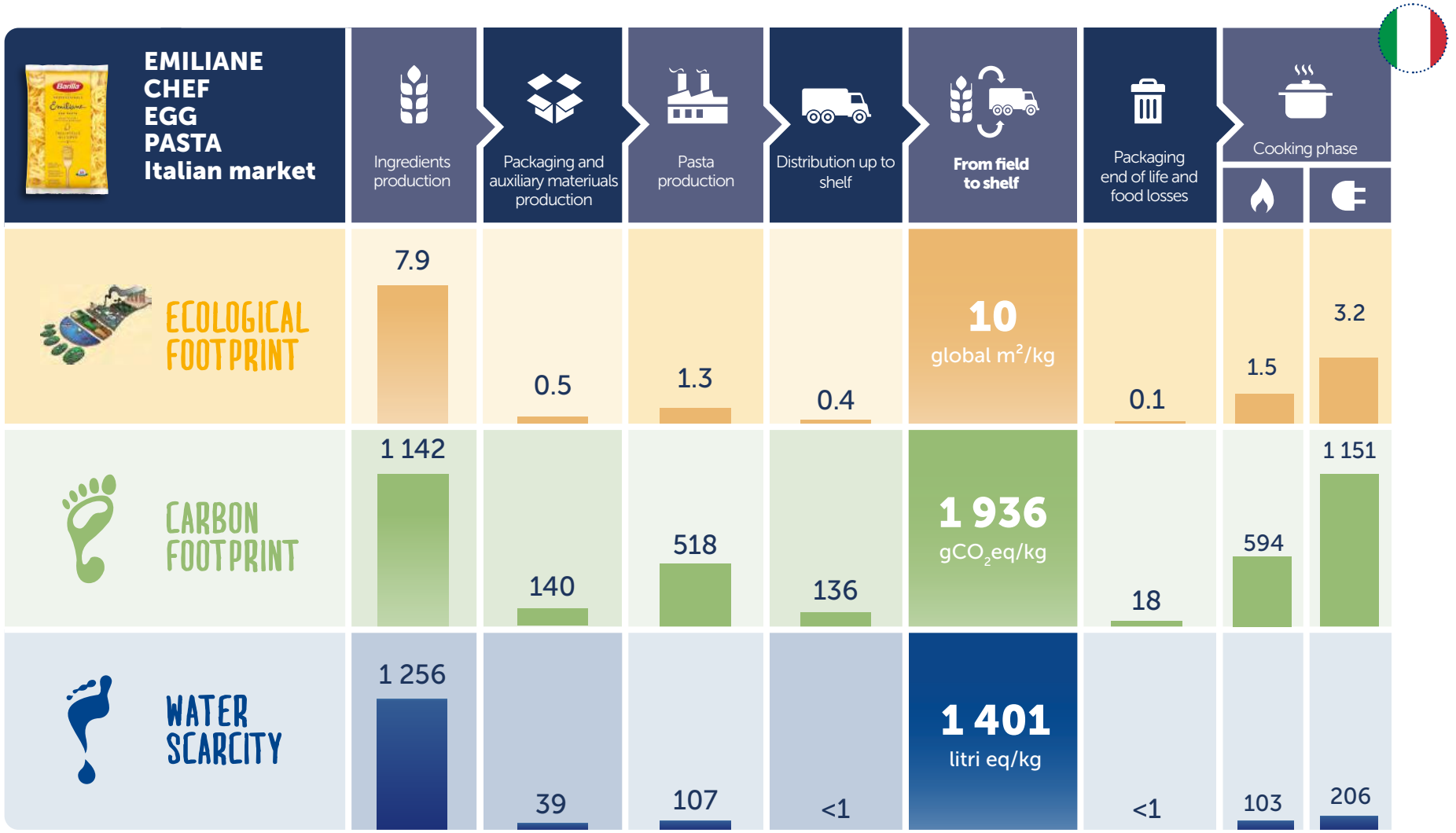
POTENTIAL ENVIRONMENTAL IMPACTS data referred to 1 kg of product		UPSTREAM		CORE	DOWNSTREAM	TOTAL	USE STAGE		
		Ingredients production	Packaging and auxiliary materiuals production	Pasta production	Distribution up to shelf		Packaging end of life and food losses	Pasta cooking. gas	Pasta cooking. electric
GLOBAL WARMING POTENTIAL - GWP (g CO2 eq)	Fossil	1.01E+03	1.39E+02	5.18E+02	1.28E+02	1.79E+03	1.49E+01	5.93E+02	1.15E+03
	Biogenic	1.76E+01	2.68E-01	5.04E-01	8.09E+00	2.65E+01	2.89E+00	3.01E-01	4.23E-01
	Land use and land transformation	1.17E+02	1.25E+00	7.28E-03	1.23E-03	1.19E+02	1.16E-04	4.69E-02	1.01E-01
	Total	1.14E+03	1.40E+02	5.18E+02	1.36E+02	1.94E+03	1.78E+01	5.94E+02	1.15E+03
Acidification potential - g SO_2 eq		2.62E+01	5.21E-01	5.85E-01	6.38E-01	2.80E+01	3.96E-03	6.47E-01	3.89E+00
Eutrophication potential - g PO_4^{---} eq		1.06E+01	1.38E-01	6.30E-02	9.92E-02	1.09E+01	3.71E-03	1.80E-01	4.56E-01
Photochemical Oxidant Formation Potential - g NMVOC eq		4.19E+00	4.78E-01	4.62E-01	7.47E-01	5.88E+00	5.60E-03	4.91E-01	2.12E+00
Abiotic Depletion Potential - Elements g Sb eq		1.78E-03	2.29E-05	1.17E-06	5.67E-06	1.81E-03	1.38E-07	8.16E-06	2.45E-05
Abiotic Depletion Potential. Fossil fuels - MJ. potere calorifico netto		9.91E+00	2.78E+00	8.66E+00	1.76E+00	2.31E+01	5.15E-03	9.94E+00	1.88E+01
Water scarcity potential. m^3 eq		1.26E+00	3.89E-02	1.07E-01	-1.39E-05	1.40E+00	2.39E-04	1.03E-01	2.06E-01

WASTE PRODUCTION * data referred to 1 kg of product	UPSTREAM		CORE	DOWNSTREAM	TOTAL	USE STAGE		
	Ingredients production	Packaging and auxiliary materiuals production	Pasta production	Distribution up to shelf		Packaging end of life and food losses	Pasta cooking. gas	Pasta cooking. electric
Hazardous waste disposed (g)	0.00E+00	9.38E-09	0.00E+00	0.00E+00	9.38E-09	0.00E+00	0.00E+00	0.00E+00
Non-Hazardous waste disposed (g)	0.00E+00	1.75E+01	0.00E+00	0.00E+00	1.75E+01	0.00E+00	0.00E+00	0.00E+00
Radioactive waste disposed (g)	5.08E-05	4.93E-05	1.55E-05	8.51E-07	1.16E-04	4.23E-08	1.26E-05	1.26E-04

The biogenic contribution to Global Warming Potential refers only to biogenic methane.
The contribution given by biogenic CO_2 is equal to zero, since the absorbed amount is equal to the emitted biogenic CO2 within the reference 100 years period.

**Zero values indicate that – even if some waste are produced and disposed – their impact is evaluated within the system boundaries.*

16. Product environmental performances of other pasta shapes - Italian market



17. Environmental results for other pasta shapes - Export market

USE OF RESOURCES data referred to 1 kg of product		UPSTREAM		CORE	DOWNSTREAM	TOTAL	USE STAGE		
		Ingredients production	Packaging and auxiliary materiuals production	Pasta production	Distribution up to shelf		Packaging end of life and food losses	Pasta cooking. gas	Pasta cooking. electric
PRIMARY ENERGY RESOURCES - RENEWABLE data in MJ	Used as energy carrier	7.16E-01	5.79E-01	5.20E-02	5.61E-03	1.35E+00	1.13E-04	4.14E-02	9.18E-01
	Used as raw materials*	0.00E+00	2.32E-01	0.00E+00	0.00E+00	2.32E-01	0.00E+00	0.00E+00	1.00E+00
	Total	7.16E-01	8.11E-01	5.20E-02	5.61E-03	1.58E+00	1.13E-04	4.14E-02	1.92E+00
PRIMARY ENERGY RESOURCES - NON RENEWABLE data in MJ	Used as energy carrier	1.19E+01	2.48E+00	8.73E+00	3.40E+00	2.65E+01	5.02E-03	9.65E+00	2.94E+01
	Used as raw materials	0.00E+00	5.88E-01	0.00E+00	0.00E+00	5.88E-01	0.00E+00	0.00E+00	1.00E+00
	Total	1.19E+01	3.07E+00	8.73E+00	3.40E+00	2.71E+01	5.02E-03	9.65E+00	3.04E+01
Secondary Material (g)		0.00E+00	1.32E+02	0.00E+00	0.00E+00	1.32E+02	0.00E+00	0.00E+00	1.00E+00
Renewable secondary fuels (MJ. net calorific power)		3.14E-02	7.89E-02	0.00E+00	0.00E+00	1.10E-01	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels (MJ. net calorific power)		2.59E+01	0.00E+00	0.00E+00	0.00E+00	2.59E+01	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water (liters)		1.30E-08	2.06E+00	2.18E+00	1.46E-01	4.38E+00	8.96E-03	1.09E+01	1.73E+01

OUTPUT FLOWS data referred to 1 kg of product	UPSTREAM		CORE	DOWNSTREAM	TOTAL	USE STAGE		
	Ingredients production	Packaging and auxiliary materiuals production	Pasta production	Distribution up to shelf		Packaging end of life and food losses	Pasta cooking. gas	Pasta cooking. electric
Waste to animal feed or similar (g)	0.00E+00	0.00E+00	1.75E+01	0.00E+00	1.75E+01	0.00E+00	0.00E+00	1.00E+00
Components for reuse (g)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling (g)	4.69E+00	1.79E+01	1.10E+01	1.02E+02	1.35E+02	9.08E+00	0.00E+00	0.00E+00
Materials for energy recovery (g)	0.00E+00	0.00E+00	7.26E-01	5.76E+00	6.48E+00	8.48E+00	0.00E+00	0.00E+00
Exported energy. electric (MJ)	0.00E+00	0.00E+00	3.61E-01	3.33E-04	3.62E-01	2.97E-04	0.00E+00	0.00E+00
Exported energy. thermal (MJ)	0.00E+00	0.00E+00	1.00E-01	6.97E-04	1.01E-01	6.21E-04	0.00E+00	0.00E+00

Secondary energy resources and recovered energy flows do not show relevant contributions.

**The biomasses transformed into the product are not considered.*

17. Environmental results for other pasta shapes - Export market

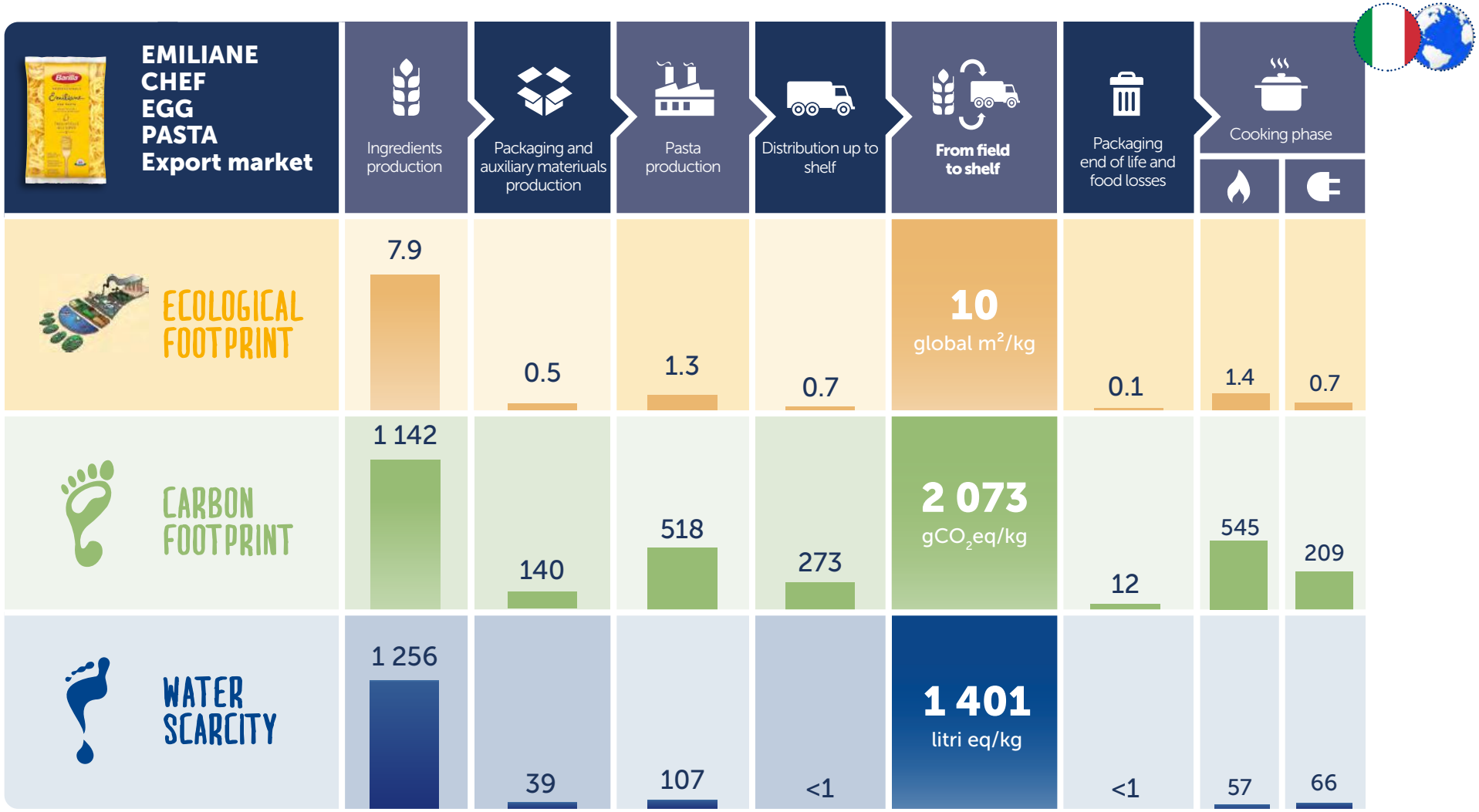
POTENTIAL ENVIRONMENTAL IMPACTS data referred to 1 kg of product		UPSTREAM		CORE	DOWNSTREAM	TOTAL	USE STAGE		
		Ingredients production	Packaging and auxiliary materiuals production	Pasta production	Distribution up to shelf		Packaging end of life and food losses	Pasta cooking. gas	Pasta cooking. electric
GLOBAL WARMING POTENTIAL - GWP (g CO2 eq)	Fossil	1.01E+03	1.39E+02	5.18E+02	2.46E+02	1.91E+03	8.89E+00	5.45E+02	2.09E+02
	Biogenic	1.76E+01	2.68E-01	5.04E-01	2.65E+01	4.49E+01	2.89E+00	2.28E-01	2.51E-01
	Land use and land transformation	1.17E+02	1.25E+00	7.28E-03	2.49E-03	1.19E+02	1.18E-04	4.29E-02	7.63E-02
	Total	1.14E+03	1.40E+02	5.18E+02	2.73E+02	2.07E+03	1.18E+01	5.45E+02	2.09E+02
Acidification potential - g SO_2 eq		2.62E+01	5.21E-01	5.85E-01	9.92E-01	2.83E+01	3.39E-03	4.57E-01	6.17E-01
Eutrophication potential - g PO_4^{---} eq		1.06E+01	1.38E-01	6.30E-02	1.28E-01	1.09E+01	3.60E-03	1.70E-01	2.01E-01
Photochemical Oxidant Formation Potential - g NMVOC eq		4.19E+00	4.78E-01	4.62E-01	9.18E-01	6.05E+00	4.93E-03	3.99E-01	4.52E-01
Abiotic Depletion Potential - Elements g Sb eq		1.78E-03	2.29E-05	1.17E-06	1.04E-05	1.81E-03	9.96E-08	9.46E-06	1.50E-04
Abiotic Depletion Potential. Fossil fuels - MJ. potere calorifico netto		9.91E+00	2.78E+00	8.66E+00	3.40E+00	2.48E+01	4.86E-03	9.43E+00	3.35E+00
Water scarcity potential. m^3 eq		1.26E+00	3.89E-02	1.07E-01	-4.28E-04	1.40E+00	2.22E-04	5.74E-02	6.57E-02

WASTE PRODUCTION * data referred to 1 kg of product	UPSTREAM		CORE	DOWNSTREAM	TOTAL	USE STAGE		
	Ingredients production	Packaging and auxiliary materiuals production	Pasta production	Distribution up to shelf		Packaging end of life and food losses	Pasta cooking. gas	Pasta cooking. electric
Hazardous waste disposed (g)	0.00E+00	9.38E-09	0.00E+00	0.00E+00	9.38E-09	0.00E+00	0.00E+00	0.00E+00
Non-Hazardous waste disposed (g)	0.00E+00	1.75E+01	0.00E+00	0.00E+00	1.75E+01	0.00E+00	0.00E+00	0.00E+00
Radioactive waste disposed (g)	5.08E-05	4.93E-05	1.55E-05	1.66E-06	1.17E-04	4.29E-08	2.54E-05	1.39E-04

The biogenic contribution to Global Warming Potential refers only to biogenic methane.
The contribution given by biogenic CO_2 is equal to zero, since the absorbed amount is equal to the emitted biogenic CO2 within the reference 100 years period.

**Zero values indicate that – even if some waste are produced and disposed – their impact is evaluated within the system boundaries.*

18. Product environmental performances of other pasta shapes - Export market



19. Differences versus previous version

The differences versus previous EPD version are due mainly to updated yields for durum wheat cultivation, updated data on milling and production plant consumption, updated emission factors for the energy mixes, updated packaging materials weight.

Moreover, the present English version has been published (while the previous version was published only in Italian with English Summary).

20. Additional information

REFERENCES

- International EPD Consortium, General Programme Instructions (EPD), ver. 3.01 of 18/09/2019;
- WWF, Global Footprint Network, Zoological Society of London, Living
- PCR 2010:01; CPC 2371 - PCR for uncooked pasta, not stuffed or otherwise prepared; ver. 4.0.2 of 2022-04-13;
- COMIECO Raccolta, Riciclo e Recupero di carta e cartone 2020;
- COREPLA relazione sulla gestione 2020
- EUROSTAT

Environmental declarations published within the same product category, though originating from different programs. may not be comparable.
This declaration and further information in regards are available at **www.environdec.com**

As EPD owner, Barilla has the sole ownership, liability and responsibility for the EPD.

EPD PROCESS CERTIFICATION

Product category Rules (PCR) review conducted by:
Technical Committee of the International EPD® system.
Chair Filippo Sessa
Contact via info@environdec.com

Program operator:
EPD International AB
Box 210 60, SE-100 31 Stockholm, Sweden
info@environdec.com

EPD®
ENVIRONMENTAL PRODUCT DECLARATION

EPD PROCESS CERTIFICATION

Independent verification of the declaration and data, according to ISO 14025:

- [x] EPD process verification
- [ ] EPD verification - Third party verifier

PROCESS INTERNAL VERIFICATION

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

- [x] Yes
- [ ] No

Third party verifier: Bureau Veritas Certification Sweden AB, Accredited by: SWEDAC

BUREAU VERITAS

Process internal verifier: Ugo Pretato, Approved by: The International EPD® System

STUDIOFIESCHI & SOCI

CONTACTS

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Barilla
The Italian Food Company. Since 1877.

Technical support and grafic design: Life Cycle Engineering SpA - Italy www.lcengineering.eu

LCE

21. Glossary

ECOLOGICAL FOOTPRINT

The ecological footprint measures the area of biologically productive land and water required to provide the resources used and absorb the carbon dioxide waste generated along the entire life cycle. It is measured in standard units called global hectares (gha).

www.globalfootprint.org

CARBON FOOTPRINT

A product carbon footprint is the total amount of greenhouse gases produced along the entire life cycle.

It is expressed in equivalent mass of carbon dioxide (CO2-eq).

In agriculture a significant contribution is given by the emission of nitrous oxide (N2O) due to the fertilizers use. It is also known as Global Warming Potential (GWP).

www.ipcc.ch

WATER SCARCITY

Water scarcity measures the available water remaining per unit of surface in a given watershed relative to the world average, after human and aquatic ecosystem demands have been met. This method builds on the assumption that the potential to deprive another user of water is directly proportional to the amount of water consumed and inversely proportional to the available water remaining per unit of surface and time in a region (watershed).

www.wulca-waterlca.org

ACIDIFICATION (AP)

It is a phenomenon for which precipitation is unusually acidic, meaning that it has substandard levels of pH.

It can have harmful effects on plants, aquatic animals and infrastructure.

Acid rain is caused by emissions of SO_2. NO_x and NH_3.

The acidification potential is measured in mass of sulphur dioxide equivalent (SO_2-eq).

EUTROPHICATION (EP)

It is an abnormal proliferation of vegetation in the aquatic ecosystems caused by the addition of nutrients into rivers. lakes or ocean. which determinates a lack of oxygen.

The eutrophication potential is mainly influenced by emission into water of phosphates and nitrates. It is expressed in mass of PO_4^{---}equivalent.

PHOTOCHEMICAL OXIDANT FORMATION POTENTIAL (POFP)

Production of compounds that, under the light effect, are able to promote an oxidation reaction leading to ozone production in the troposphere.
The indicator is mainly influenced by VOCs (Volatile organic compounds) is usually expressed in mass of ethylene equivalent (g NMVOC - equivalent).