Interreg Mediterranean PEFMED

Project co-financed by the European Regional Development Fund

INNOVATION AND SUSTAINABILITY IN THE MEDITERRANEAN AGRI-FOOD SYSTEMS

Project co-financed by the European Regional Development Fund

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PEFMED PROJECT

The European project "PEFMED – Uptake of the Product Environmental Footprint across the MED Agri-food Regional Productive Systems to Enhance Innovation and Market Value", running from November 2016 till July 2019, was financed by the Interreg Mediterranean Programme to promote eco-innovation in the food and drink industry in the Euro-Mediterranean area, by coupling environmental and socio-economic aspects.

THE EUROPEAN FOOD AND DRINK INDUSTRY

The food and drink industry is the largest manufacturing sector in the European Union in terms of turnover with 1,109 billion € generated in 2016 by 294,000 companies, 99.1% of which are represented by SMEs. In addition, it is the key job provider and leading employer in Europe; in the same year it employed 4.51 million people, spreading across all European Member States, mostly in rural areas, not to mention the indirect but associated jobs (FoodDrinkEurope: Data & Trends – EU Food & Drink Industry 2018).

In the last years, agri-food companies and consumers have increased their awareness on sustainability criteria and in particular on the environmental impacts caused by current consumption and production models. Several different standards and eco-labels have therefore been developed on an international level for assessing the environmental performance of products, used increasingly by companies to communicate their commitment towards sustainable development and to obtaining competitive advantages in the market. This proliferation of initiatives is creating confusion and mistrust of environmental information among the consumers and asks for companies to invest large amounts of resources to comply with misaligned schemes for specific markets and countries.

THE PRODUCT ENVIRONMENTAL FOOTPRINT

In order to face this situation, in 2013 the European Commission published a Recommendation on the use of the Product Environmental Footprint (PEF) method (2013/179/EU), with the aim of supporting the development of environmentally-friendly products to be sold on the European market and promoting competitiveness among companies. PEF is a harmonised life-cycle based method to assess the potential environmental impacts of products throughout their whole supply chain. Its main purpose is to increase the robustness, consistency, comparability, and reproducibility of the measurement of the life cycle environmental performance of products. It is based on the existing standards and methodologies, such as the ISO-standards for Life Cycle Assessment, and considers 16 potential impacts of the products' life cycle on the environment, human health, and resource use.

PEFMED OBJECTIVES

Within this context, PEFMED aimed to:

1. **Promote systemic eco-innovation interventions and the use of environmentally friendly technologies,** especially in Small and Medium Enterprises (SMEs), with the purpose to increase the sustainability of Mediterranean agri-food supply chains, providing tools, methods, and case studies.

2. **Guide a mind change from the traditional production model towards a PEF-oriented approach,** by means of training, transfer and dissemination actions, based on the results of the project pilot phase.

3. **Support the objectives of the Smart Specialization Strategies (S3) of the Mediterranean regions** involved in the project with regard to the agri-food sector, also by means of an active involvement of S3 managers of the pilot regions, who participated in the development of national roadmaps to promote the application of the PEF method to the Mediterranean agri-food sector.

PEFMED RESULTS

One of the main outcomes of the project was the development of the "PEFMED method", which combines PEF with a set of socio-economic indicators. The PEFMED method was tested in nine agri-food supply chains in the Mediterranean region and in six product categories: olive oil in France and Spain, wine in Italy, cheese in Italy, Slovenia, and Greece, feed in Portugal, cured meat in Spain and bottled water in France.

Companies of different sizes participated in this pilot phase. In particular, both SMEs and large companies were involved for the cheese and olive oil production chains, whereas either SMEs or large companies were involved for other productive sectors.

The following sections of this document contain:

1. the description of the PEFMED method and of the supporting tools developed during the project;
2. the main environmental and socio-economic results from the project pilot phase in the nine agri-food product chains as well as the identified improvement options;
3. the PEFMED position paper, presenting the conclusions drawn by the project partners about the use of the PEFMED method in Mediterranean agri-food supply chains, focused on the application of PEF and based on the experiences exchanged with all the stakeholders involved in the project pilot phase.

METHOD AND TOOLS

THE METHOD

The PEFMED method is based on the application of the European Product Environmental Footprint (PEF) method combined with a set of territorial-based socio-economic indicators and aims to evaluate the environmental and socio-economic performance of products throughout their life cycle, i.e. from the extraction of raw materials, through processing, distribution, use, and end-of-life, and along their supply chains. The PEFMED method supports the identification of both environmental and socio-economic hotspots and potential improvement options, within a systemic eco-innovation perspective. The final objective of the PEFMED method is the definition of a Sustainable Business Plan, aimed at reducing the environmental and socio-economic impacts of both the analyzed product and its supply chain as well as to enhance any potential positive aspects integrated in the company strategy.

THE TOOLS

Different tools have been developed during the project to support the use of the PEFMED method. They are briefly presented here below and are available on the PEFMED Wiki Platform (www.pefmed-wiki.eu).

A tool has been created to facilitate the realization of PEF studies in the olive oil sector, one of the supply chains involved in the pilot phase, in compliance with the relevant PEF Category Rules. In order to deal with socio-economic aspects, an Excel-based tool with social and economic key performance indicators (SE-KPIs) has been developed to assess the performance of companies and identify areas of possible improvement. The tool was tailored according to SMEs characteristics and needs and, after the first application with external expert support, companies can apply it according to their own needs in order to pursue continuous improvement. The chosen SE-KPIs follow a life cycle approach and include the whole product supply chain. The 14 KPIs are both qualitative and quantitative and study in 36 questions how a company implements policies, actions and controls in relation to 4 stakeholders, i.e. workers, local community, consumers and value chain (suppliers and partners), and several "subcategories", e.g. Health & Safety, Training, Working conditions.

The final output of the assessment is both a numerical result representing the level of maturity of the company in relation to each KPI (i.e. absence, basic, continuous improvement, proactive) and a graphic rendition of the results, where companies can see at a glance what to improve.

Finally, the PEFMED partners collected more than 60 informational sheets describing technological and management solutions to be used by companies willing to improve their environmental and socio-economic profile as a source of information and inspiration.

STEPS OF THE PEFMED METHOD

1.

WORKING GROUP

Different skills can contribute to the application of the PEFMED method: company and supply chain representatives, environmental and socio-economic experts, sector experts, and business plan experts.

2.

REFERENCE PRODUCT

The product to be analysed is chosen by the company with possible support of the working group, based on the company commercial and innovation interests.

3.

PRODUCT ENVIRONMENTAL FOOTPRINT

The environmental experts perform a PEF study to identify the product life cycle hotspots, e.g. in terms of most critical phases, processes, and impact categories, and under-valorised potentials.

4.

SOCIO-ECONOMIC KEY PERFORMANCE INDICATORS

The company assesses its socio-economic performance using the SE-KPIs tool with possible support from the socio-economic experts identifying the areas where the biggest improvements are foreseen.

5.

IMPROVEMENT OPTIONS

Based on environmental and socio-economic analyses, sector experts identify technological and management solutions which could improve the supply chain environmental and socio-economic performance.

6.

AVAILABLE FUNDS AND SUPPORTING POLICIES

The identified improvement options are evaluated considering also the availability of public funds and supporting policies. A focused discussion with Regional S3 managers could be helpful at this point.

7.

BUSINESS TRANSITION WORKSHOP (S)

The business plan, environmental and sector experts meet with the company to discuss company strategy and marketing in order to support the introduction of the identified improvement actions.

8.

SUSTAINABLE BUSINESS PLAN

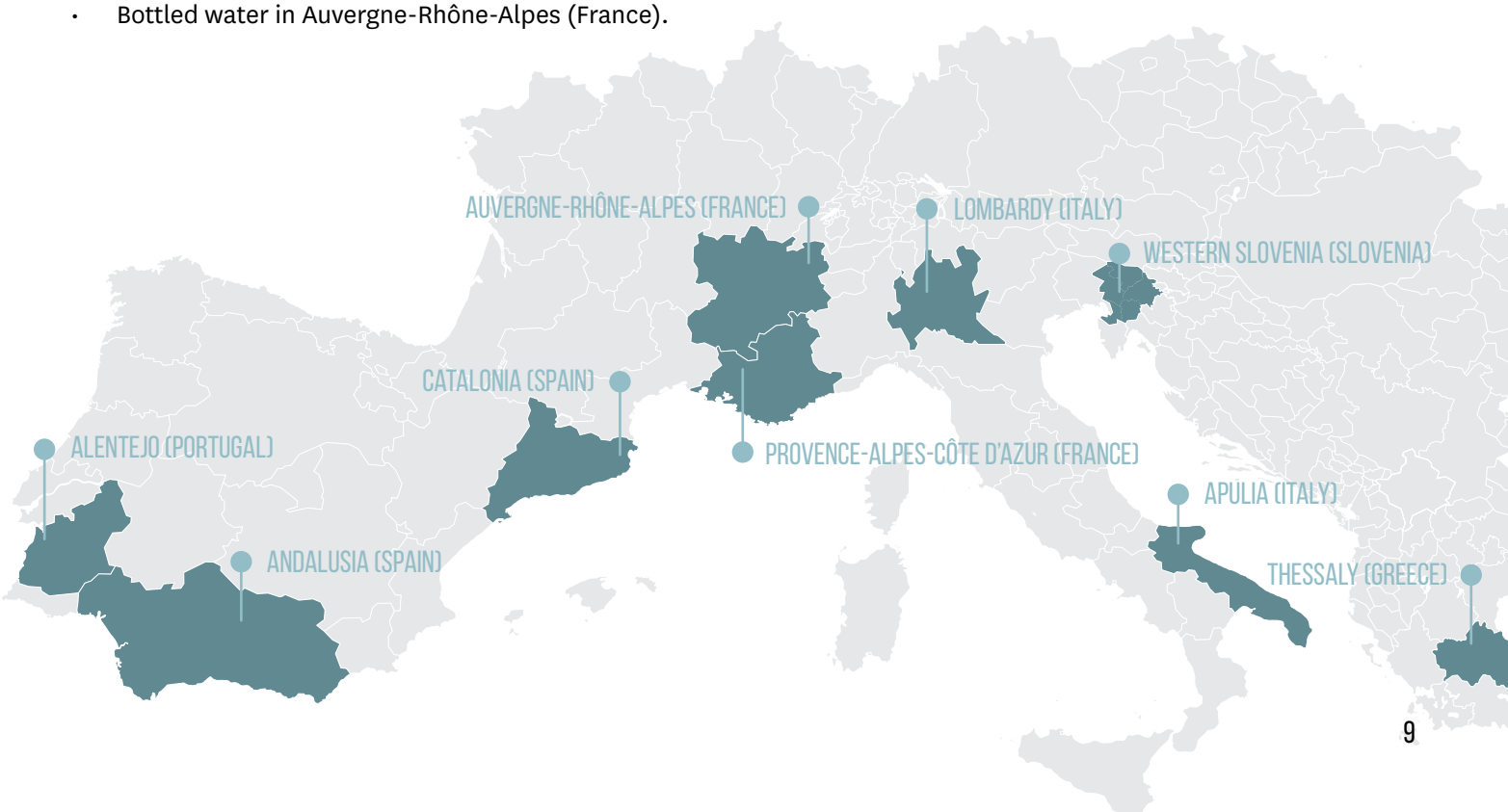
Based on the results of all the previous activities, some feasible eco-innovations and marketing strategies are defined with timelines, benefits, and defined costs, which are described in a document called Sustainable Business Plan. The results obtained with the PEFMED method can be shared within the company and the supply chain. They can also be used for communication and marketing towards clients, final consumers and the territory.

PILOT STUDIES

The PEFMED method was tested in nine agri-food product chains and clusters located in different Mediterranean regions:

- Cheese in Lombardy (Italy), Thessaly (Greece) and Western Slovenia (Slovenia);
- Cured meat in Catalonia (Spain);
- Olive oil in Andalusia (Spain) and in Provence-Alpes-Côte d'Azur (France);
- Wine in Apulia (Italy);
- Feed in Alentejo (Portugal);
- Bottled water in Auvergne-Rhône-Alpes (France).

The following sections describe the tested companies and products, present the results of the Product Environmental Footprint and Socio-Economic Key Performance Indicators analyses performed in the nine pilot cases, and include the most promising improvement options identified for each case, which were included in the Sustainable Business Plans developed for each pilot company.



CHEESE IN LOMBARDY (ITALY)

PARTNER: ITALIAN NATIONAL AGENCY FOR NEW TECHNOLOGIES, ENERGY AND SUSTAINABLE ECONOMIC DEVELOPMENT (ENEA) AND ITALIAN FEDERATION OF FOOD INDUSTRY (FEDERALIMENTARE SERVIZI)
COMPANY: LORENZO SANGIOVANNI (CASEIFICIO SANGIOVANNI S.R.L.)
CLUSTER MANAGER: MARCO DE VITO (TECNOALIMENTI SCPA.),
PEF EXPERTS: VALENTINA FANTIN AND SARA CORTESI (ENEA)
SECTOR EXPERTS: NICOLA COLONNA AND ANTONELLA DEL FIORE (ENEA)
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BUSINESS PLAN EXPERTS: RICARDO ALVAREZ AND JUAN ANDRES SALIDO (DNV GL)
AND FRANCISCO PUENTE (ESCAN S.A.)

Caseificio Sangiovanni s.r.l.

TALEGGIO CHEESE PDO

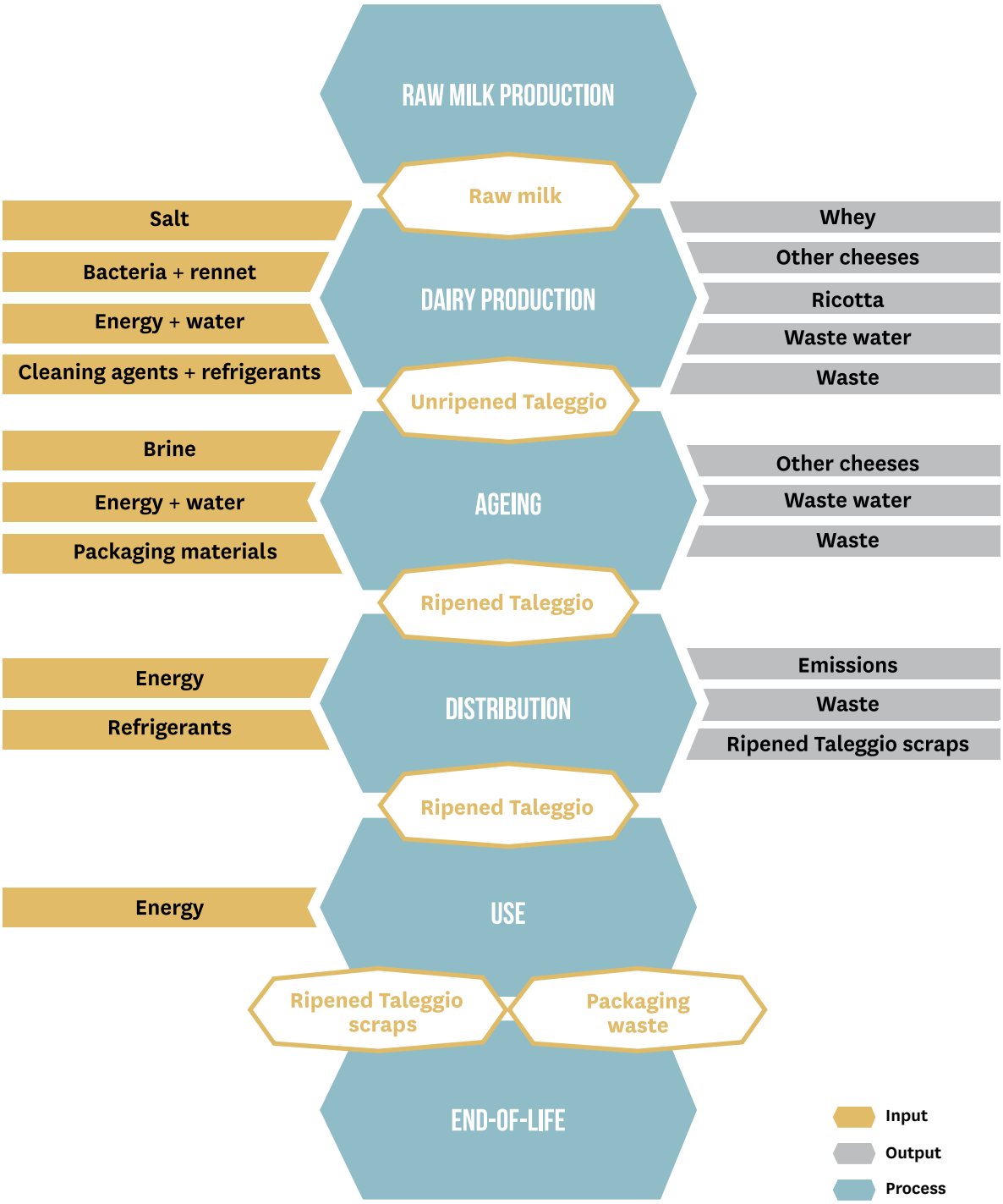
One of the companies in the Italian dairy sector is Caseificio Sangiovanni s.r.l., located in Palazzo Pignano (Cremona, Lombardy). The dairy processes about 16,000 tons of milk per year, producing approximately 1,700 tons of several types of cheese, e.g. Taleggio, Gorgonzola, Quartirolo Lombardo, Salva Cremasco, etc. Caseificio Sangiovanni has been producing Taleggio cheese since 1985 from both conventional and organic milk. Conventional Taleggio cheese was selected as the object of the pilot study due to the company's strong interest in this specific product.

Taleggio cheese is a semi-soft Italian cheese (min. fat content 48%) produced from whole pasteurized cow milk. It is entitled the Product Designation of Origin (PDO) label and is produced in few provinces within the following regions of Northern Italy: Lombardy, Piedmont and Veneto.

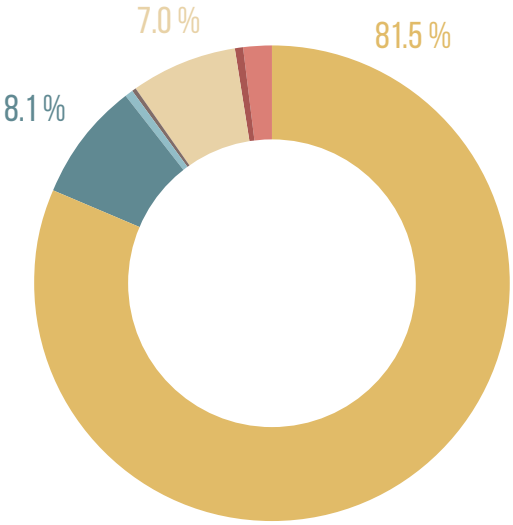
The raw milk for Taleggio production has to be produced exclusively in the dairy farms located in the above-mentioned areas, which have a specific quality control system. Each Taleggio cheese weighs between 1.7 and 2.2 kg and it is shaped in the form of a square slab. More than 80% of the conventional raw milk for Taleggio produced by Caseificio Sangiovanni comes from 11 dairy farms located in the dairy surrounding area.

The ageing process of Caseificio Sangiovanni Taleggio production is carried out by ageing companies located in Bergamo and Lecco provinces.

SEMI-SOFT ITALIAN CHEESE (MIN. FAT CONTENT 48%) PRODUCED WITH WHOLE PASTEURIZED COW MILK.

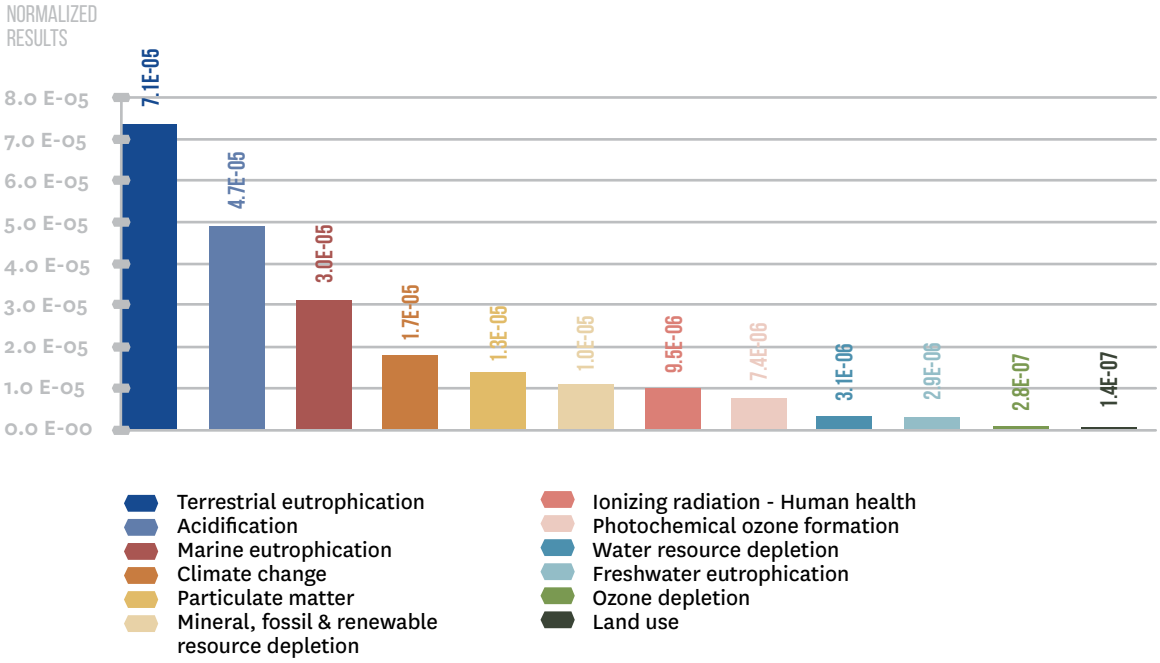

RAW MILK PRODUCTION
Raw milk
Salt
Bacteria + rennet
Energy + water
Cleaning agents + refrigerants
Whey
Other cheeses
Ricotta
Waste water
Waste
DAIRY PRODUCTION
Unripened Taleggio
Brine
Energy + water
Packaging materials
Other cheeses
Waste water
Waste
AGEING
Ripened Taleggio
Energy
Refrigerants
Emissions
Waste
Ripened Taleggio scraps
DISTRIBUTION
Ripened Taleggio
Energy
USE
Ripened Taleggio scraps
Packaging waste
END-OF-LIFE
Input
Output
Process

THE MAIN RESULTS OF THE PEF STUDY



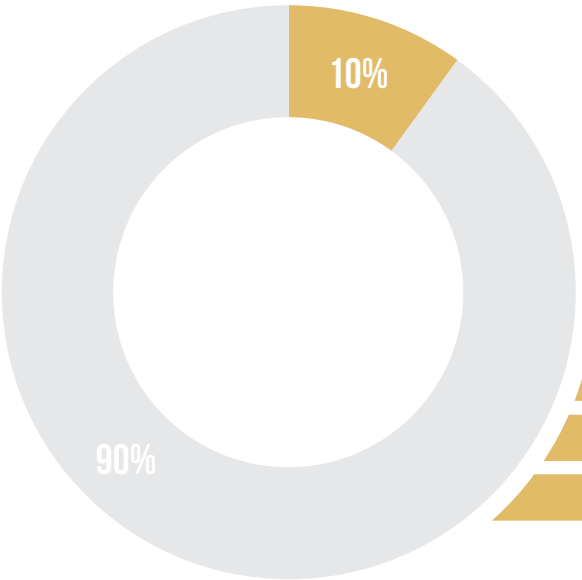
The most critical life cycle stage of Taleggio cheese is raw milk production, which accounts for more than 80% of the total environmental impact.

- **Raw milk supply**
- **Dairy processing**
- **Non-dairy ingredients**
- **Packaging**
- **Distribution**
- **Use**
- **End-of-Life**



The most critical impact categories in the Taleggio life cycle are Eutrophication and Acidification.

THE MAIN RESULTS OF THE SOCIO-ECONOMIC ANALYSIS



BIODIVERSITY

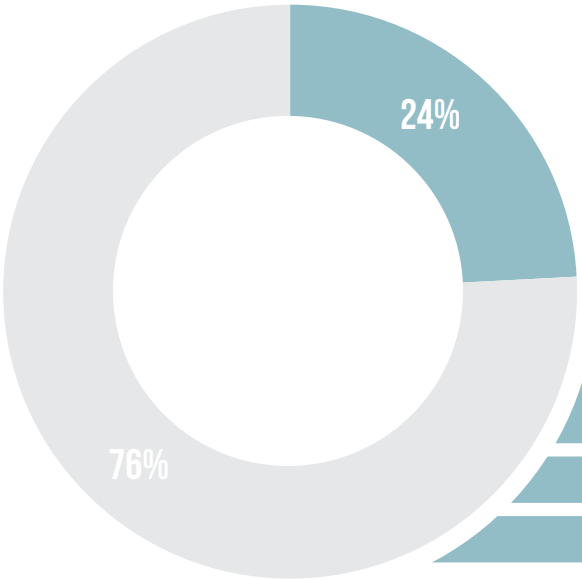
The company's contribution to the conservation and promotion of biodiversity was identified as one potential area of improvement.

CATEGORY: VALUE CHAIN

SUB-CATEGORY: BIODIVERSITY

RESULT: 10%

POTENTIAL IMPROVEMENT: 90%



INTEGRATION OF SUSTAINABILITY ON SUPPLY CHAIN

The integration of the concept of sustainability into the product's life cycle both upstream and downstream shows great potential for improvement as well.

CATEGORY: VALUE CHAIN

SUB-CATEGORY: INTEGRATION OF SUSTAINABILITY ON SUPPLY CHAIN

RESULT: 24%

POTENTIAL IMPROVEMENT: 76%

BOTH UPSTREAM AND DOWNSTREAM STAGES SHOW GREAT POTENTIAL FOR IMPROVEMENT AS WELL.

IMPROVEMENT OPTIONS

THERMAL SOLAR COLLECTORS

Installation of thermal solar collectors partially covers the energy demand of the boilers producing hot water and vapour used at different stages of the cheese processing, as well as for general and auxiliary processes.

The technology contributes to the reduction of fossil fuels consumption. The produced thermal energy reduces the annual gas consumption, consequently reducing the energy costs by 60-70%.

LIGHTING EFFICIENCY BY LED (LIGHT EMITTING DIODE)

The LEDs (Light Emitting Diodes) are optoelectronic lamps composed of semiconductor materials which produce light by emission. They could replace the traditional or fluorescent lamps.

LED lamps require very low maintenance and simple management. LED lights produce large energy savings and could decrease the environmental impact.

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WINE IN APULIA (ITALY)

PARTNER: ITALIAN NATIONAL AGENCY FOR NEW TECHNOLOGIES, ENERGY AND SUSTAINABLE ECONOMIC DEVELOPMENT (ENEA) AND ITALIAN FEDERATION OF FOOD INDUSTRY (FEDERALIMENTARE SERVIZI)
COMPANY REPRESENTATIVE: NICOLA SCARANO (DUE PALME S.R.L.)
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Cantine Due Palme soc. coop. agr.

TINAIA WINE

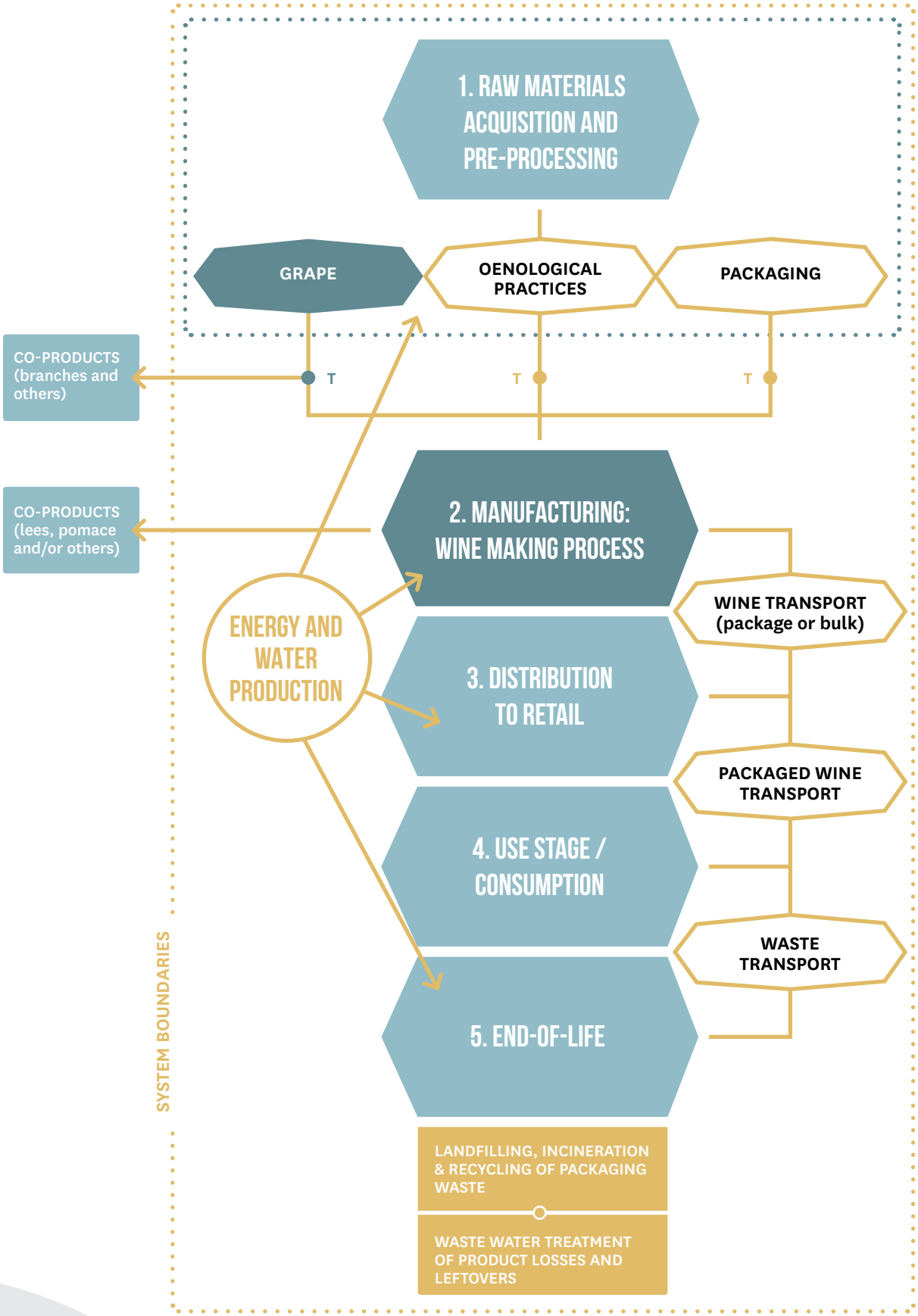
Cantine Due Palme is a wine making company based in Cellino San Marco, not far from Brindisi in the Apulia region.

It was established in 1989 as a cooperative and has more than 1,000 members and 2,500 ha of vineyards located in the province of Brindisi, Lecce and Taranto. All the wine-making processes occur in the main wine cellar located in Cellino San Marco, which includes the wine-making itself, the wine ageing, packaging and storage. All these processes are guaranteed by accurate quality controls. The company produces quality wine from typical grapes of the territory such as Negroamaro, Malvasia Nera, Primitivo and Susumaniello. All wines have a complete traceability system along the supply chain.

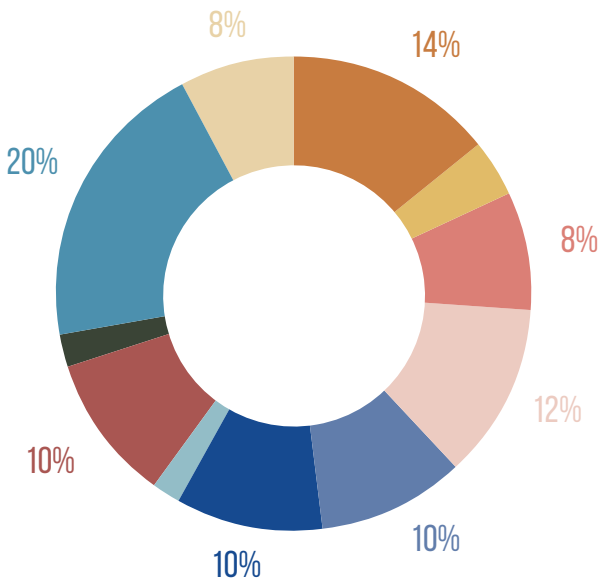
Tinaia wine is one of the best white wines produced by Cantine Due Palme. It is made from Salice Salentino Bianco DOP grapes.

Tinaia wine is mainly distributed in Italy; however, around 15% of the total amount of the Tinaia wine produced each year is sold throughout Europe.

THE GRAPE PRODUCTION IS NOT UNDER THE DIRECT CONTROL OF THE COMPANY; THE MAIN ACTIVITY OF THE LATTER IS GRAPE TRANSFORMATION FOR WINE PRODUCTION.

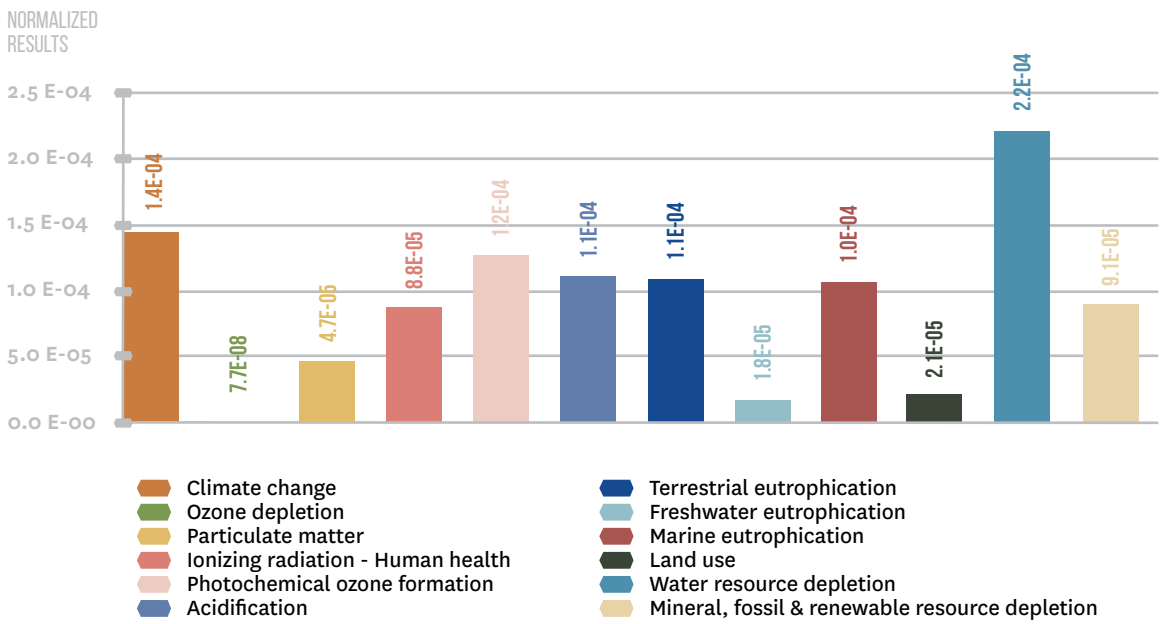

1. RAW MATERIALS ACQUISITION AND PRE-PROCESSING
GRAPE
OENOLOGICAL PRACTICES
PACKAGING
CO-PRODUCTS (branches and others)
T
T
T
CO-PRODUCTS (lees, pomace and/or others)
2. MANUFACTURING: WINE MAKING PROCESS
ENERGY AND WATER PRODUCTION
WINE TRANSPORT (package or bulk)
3. DISTRIBUTION TO RETAIL
PACKAGED WINE TRANSPORT
4. USE STAGE / CONSUMPTION
WASTE TRANSPORT
5. END-OF-LIFE
SYSTEM BOUNDARIES
LANDFILLING, INCINERATION & RECYCLING OF PACKAGING WASTE
WASTE WATER TREATMENT OF PRODUCT LOSSES AND LEFTOVERS

THE MAIN RESULTS OF THE PEF STUDY



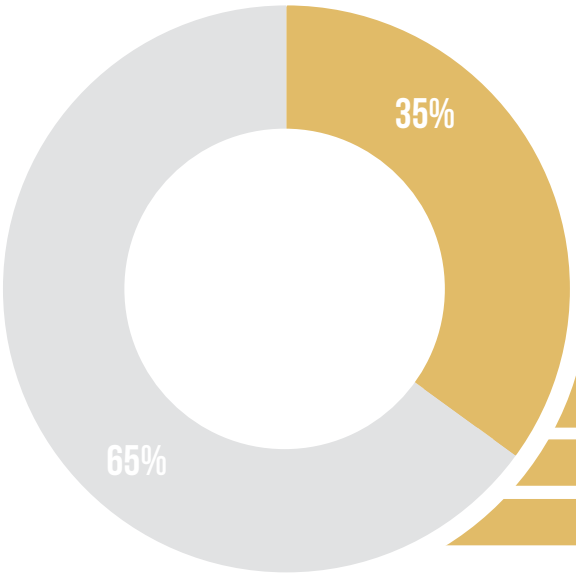
The most relevant impact categories are Terrestrial Eutrophication, Acidification, Photochemical ozone formation, Climate Change and Water depletion. Grape production, Distribution, Packaging production and Use account for around 90% of the impact of the complete life cycle. Packaging accounts for around 50% of the 5 most relevant impact categories.

- **Water resource depletion**
- **Mineral, fossil & renewable resource depletion**
- **Climate change**
- **Particulate matter**
- **Ionizing radiation - Human health**
- **Photochemical ozone formation**
- **Acidification**
- **Terrestrial eutrophication**
- **Freshwater eutrophication**
- **Marine eutrophication**
- **Land use**



The most critical impact categories in the Tinaia wine life cycle are Water resource depletion potential and Climate change potential.

THE MAIN RESULTS OF THE SOCIO-ECONOMIC ANALYSIS



VALUE CHAIN – INTEGRATION OF SUSTAINABILITY ON SUPPLY CHAIN

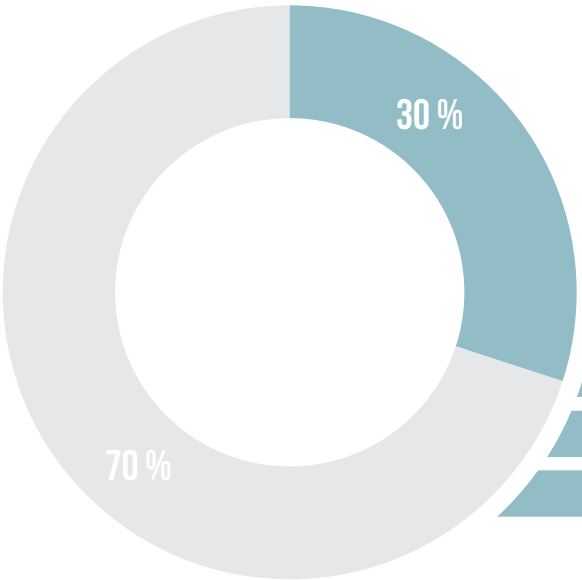
More sustainability criteria could be used by the company in the selection of suppliers.

CATEGORY: VALUE CHAIN

SUB-CATEGORY: INTEGRATION OF SUSTAINABILITY ON SUPPLY CHAIN

RESULT: 35%

POTENTIAL IMPROVEMENT: 65%



WORKERS – TRAINING

Specific training could be organized inside the company on sustainability issues.

CATEGORY: WORKERS

SUB-CATEGORY: TRAINING

RESULT: 30%

POTENTIAL IMPROVEMENT: 70%

IMPROVEMENT OPTIONS

LOW ENTHALPY GEOTHERMAL ENERGY

Installation of low enthalpy geothermal systems could partially cover for the energy demand of the conditioning system of the wine processing, as well as for the general and auxiliary processes. The technology contributes to the reduction of fossil fuels consumption. The produced thermal energy allows to reduce the annual gas and electric energy consumption, consequently reducing the energy costs.

MEMBRANE TECHNOLOGIES APPLIED TO BOTTLE WASHING PROCESS

The membrane technologies applied to wastewater from the bottle washing process allow for water to be recycled and reused in a continuous cycle or in other phases of the production process as well as in the irrigation process.

Through selective tangential filtration, this technology allows for the use of ultrapure water to be fed directly into the production cycle with the reduction of water resource use, groundwater pollution risks, and fossil fuels consumption.

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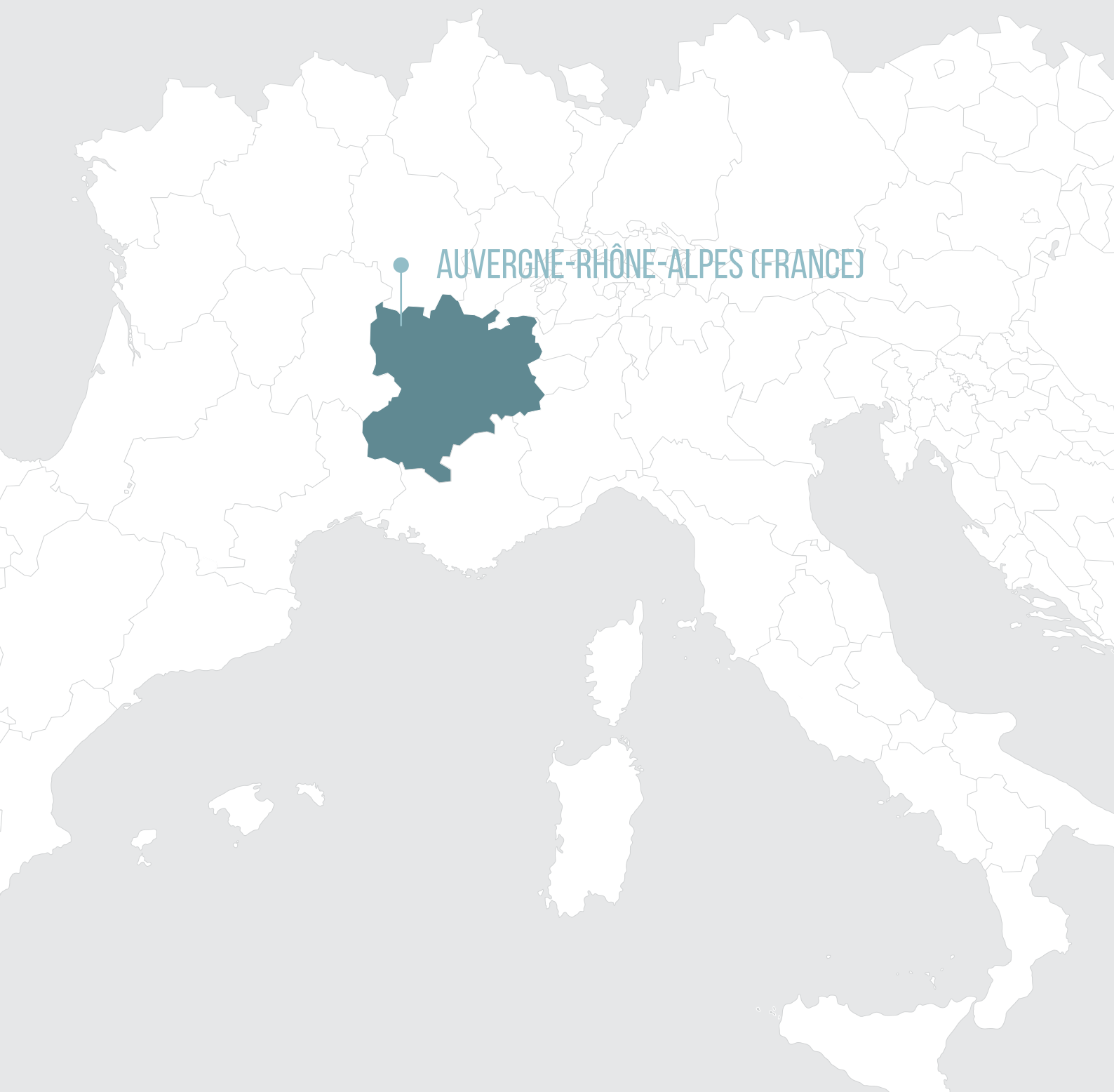


BOTTLED WATER IN AUVERGNE-RHÔNE-ALPES (FRANCE)

PARTNER: AGROFOOD REGIONAL INNOVATION AND TECHNOLOGY TRANSFER CENTER (CRITT PACA) AND FRENCH ASSOCIATION OF FOOD AND DRINK INDUSTRY (ANIA)
COMPANY REPRESENTATIVE: AGNES JACQUOT (EAUX DE THONON - SOURCES ALMA)
PEF EXPERTS: ESTELLE MARIN AND YVAN DELOCHE (CRITT) AND LAUREEN BADEY (ITERG)
SECTOR EXPERT: LAUREEN BADEY (ITERG)
S3 MANAGER/REGIONAL REPRESENTATIVE: LAUREEN BADEY (ITERG) AND VINCENT COLOMB (ADEME)
BUSINESS PLAN EXPERTS: RICARDO ALVAREZ AND JUAN ANDRÉS SALIDO (DNV GL) AND FRANCISCO PUENTE (ESCAN S.A.)

Eaux de Thonon (Sources Alma)

MINERAL WATER

IN PLASTIC CONTAINER (50 CL)

Sources Alma has been chosen for its brand Thonon. The importance of the brand, the localization, the availability of the technical staff and their reactivity were the reason for this choice.

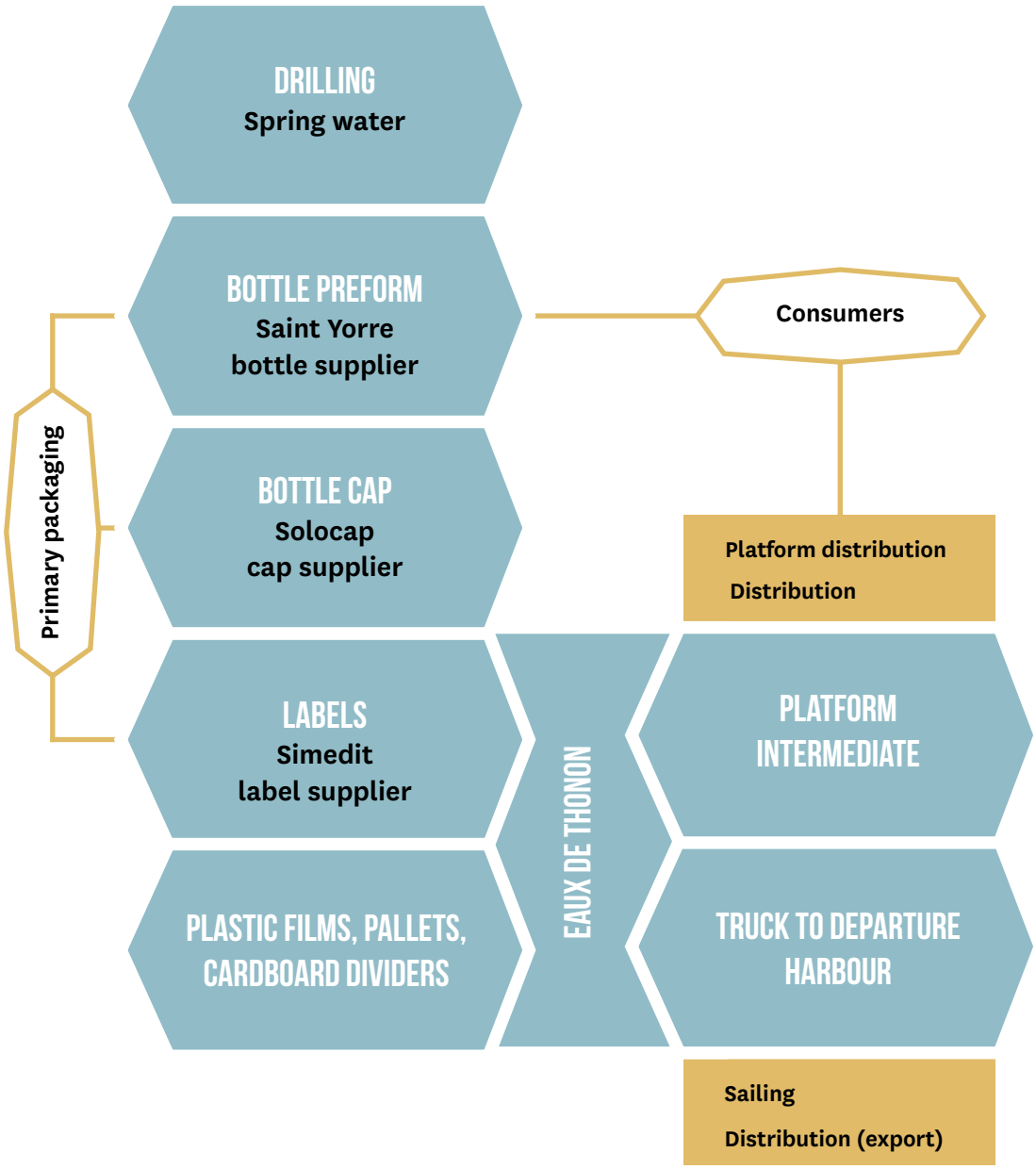
During its long journey, Thonon benefits from the alpine soils. Thonon passes through thick layers of limestone and crystalline rocks and collects their valuable minerals. Roaming the generous heart of the mountains, Thonon Mineral Water is enriched on contact.

Thonon Mineral Water acquires its unique composition of minerals and essential trace elements from the mountains. It owes its quality to the course in an exceptional and preserved environment.

The product studied is mineral water in a 50 cL plastic container with a screw and a clip cap.

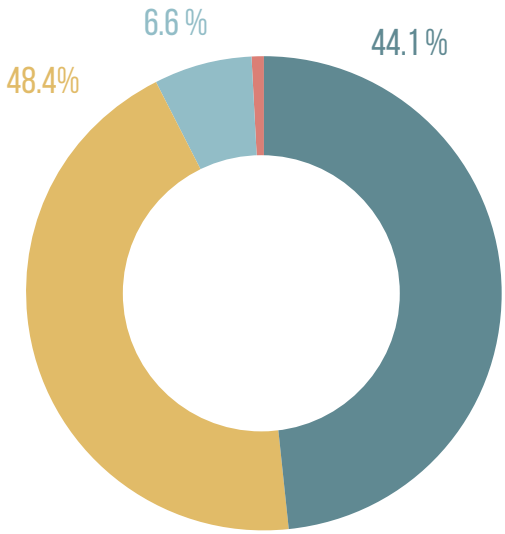
Despite the increase in recycling, plastic caps are sometimes found in nature. Marine birds are directly affected because they confuse this floating waste with food. Since the clip cap is attached to the bottle, the amount of caps found in nature is reduced. The use of a clip cap also improves the recycling process: by facilitating the selective sorting of bottles and the consumers being more familiar with bottle recycling. The bottle and the cap are sorted in one gesture, which requires less plastic.

The new cap is also more practical because it opens with a “click”, and hangs by pushing back to hear the sound “clack”. Since it does not fall to the ground, it is also more hygienic.



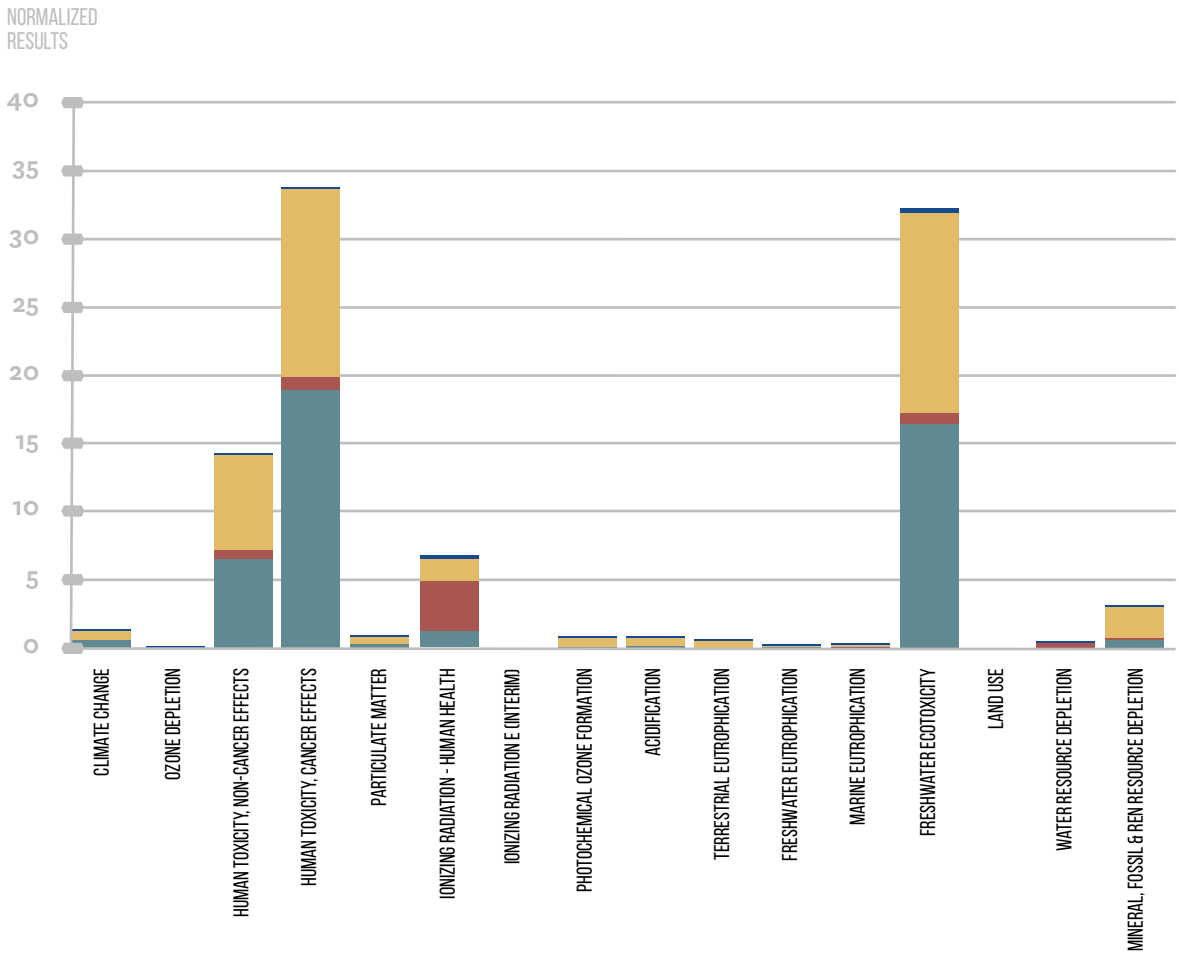
DESPITE THE INCREASE IN RECYCLING, PLASTIC CAPS ARE SOMETIMES FOUND IN NATURE. SINCE THE CLIP CAP IS ATTACHED TO THE BOTTLE, THE AMOUNT OF CAPS FOUND IN NATURE IS REDUCED.

THE MAIN RESULTS OF THE PEF STUDY



The most critical life cycle stage of mineral water in plastic container is Packaging material, which accounts for around 50% of the total environmental impact.

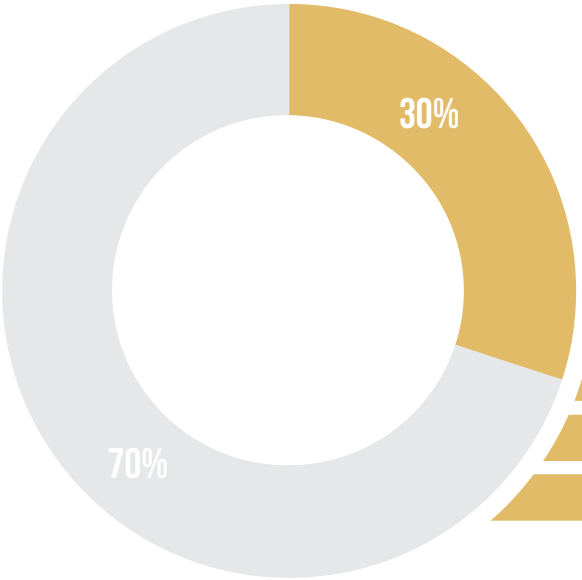
- Packaging material
- Distribution
- Manufacturing
- Use



The phases which contribute to the environmental impact the most are the Distribution (67%), and Packaging materials (28%).

- Packaging materials
- Distribution
- Manufacturing
- Use
- Eau de Thonon 50 cL

THE MAIN RESULTS OF THE SOCIO-ECONOMIC ANALYSIS



WORKERS – HEALTH AND SAFETY

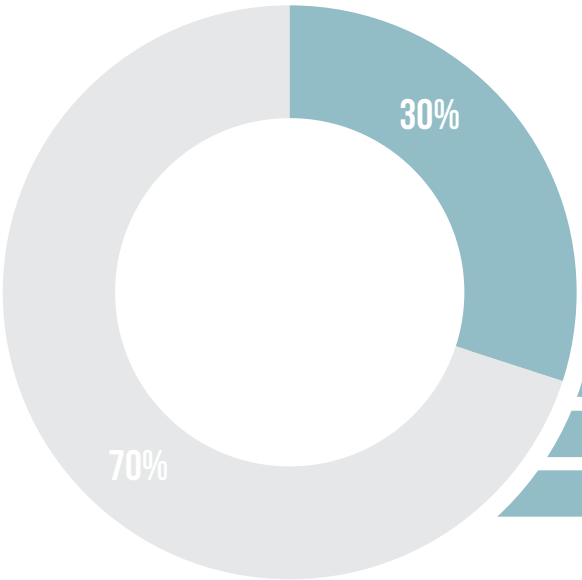
The company's contribution to its employees' health and safety was identified as one potential area of improvement.

CATEGORY: WORKERS

SUB-CATEGORY: HEALTH AND SAFETY

RESULT: 30%

POTENTIAL IMPROVEMENT: 70%



VALUE CHAIN – BIODIVERSITY

The company's contribution to the conservation and promotion of biodiversity was identified as the second potential area of improvement.

CATEGORY: VALUE CHAIN

SUB-CATEGORY: BIODIVERSITY

RESULT: 30%

POTENTIAL IMPROVEMENT: 70%

IMPROVEMENT OPTIONS

USING RECYCLED MATERIALS FOR PACKAGING

The use of recycled materials for packaging will reduce the global environmental impacts. The technology contributes to the reduction of environmental impacts but also contributes to the reduction of purchase prices.

The company can continue working on integration of recycled materials into the PET preform PET, taking into account the technical constraints of production and the investment costs linked to this integration.

USING NEW RESIN

It might be interesting to consider finding new resin which would replace or modify the PET material. New resin research could contribute to the reduction of environmental impact. The company is willing to participate in the development of the new resin which can be an alternative to the current material used (PET).

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OLIVE OIL IN PROVENCE-ALPES-CÔTE D'AZUR (FRANCE)

PARTNER: AGROFOOD REGIONAL INNOVATION AND TECHNOLOGY TRANSFER CENTER (CRITT PACA) AND FRENCH ASSOCIATION OF FOOD AND DRINK INDUSTRY (ANIA)
COMPANY REPRESENTATIVE: LAURENT ROSSI (MOULIN ROSSI)
PEF EXPERTS: ESTELLE MARIN AND YVAN DELOCHE (CRITT) AND LAUREEN BADEY (ITERG)
SECTOR EXPERT: LAUREEN BADEY (ITERG)
S3 MANAGER/REGIONAL REPRESENTATIVE: LAUREEN BADEY (ITERG) AND VINCENT COLOMB (ADEME)
BUSINESS PLAN EXPERTS: RICARDO ALVAREZ AND JUAN ANDRÉS SALIDO (DNV GL) AND FRANCISCO PUENTE (ESCAN S.A.)

Moulin Rossi

EXTRA VIRGIN OLIVE OIL

IN A GLASS OR BAG-IN-BOX CONTAINER

The leading French olive oil producer is Moulin Saint Michel (Moulin Rossi), located in Mouries, a village at the foot of Alpilles in the PACA region.

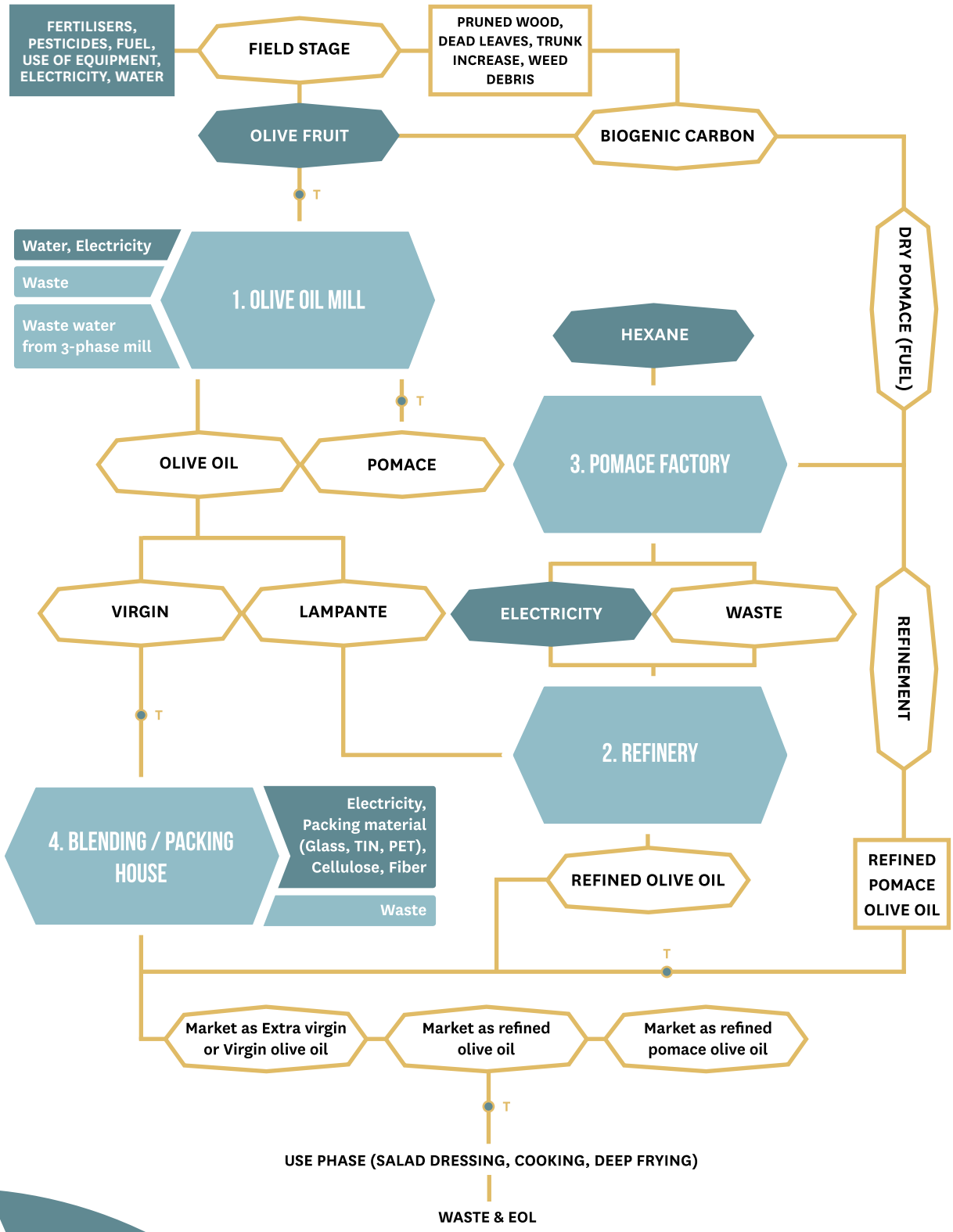
Today, with about 420,000 olive trees, the valley is the premier oil-producing region in France. There are several olive tree cultivars, including Salonenque, Aglandau (or Berruguette), Verdale-des-Baux, and Grossane. They yield Les Baux-de-Provence olive oil, which is entitled to the PDO label, known to gourmets all over the world.

Annually, the company processes between 4 and 6 hundred tons of olives found in the Les Baux-de-Provence valley: the Grossane olives, the Salonenque, the Verdale, the Berruguette, and the Picholine. Their olive oil is an ideal combination which refines and elevates the flavour of food with which it is used.

PDO olive oil by Moulin Saint-Michel is characterized by an herbaceous and raw artichoke taste. In the mouth, it develops an intense fruity and a moderate spicy flavour. The product is available in 25, 50 and 75 cL glass bottles.

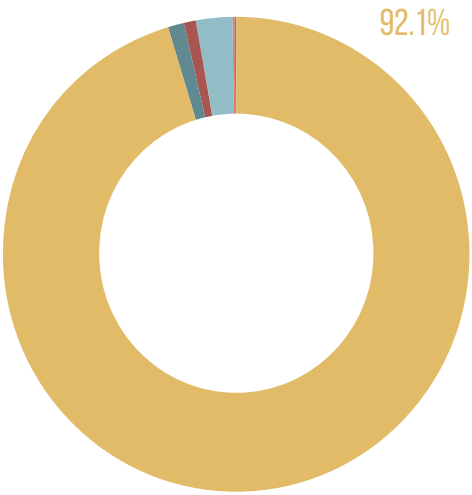
Extra virgin olive oil was selected for the object of the pilot study due to the strong interest of the company which is the biggest seller of the product.

The products studied are olive oil in a glass class container and olive oil in a bag-in-box. The aim of the study is to compare the environmental impact the two packages may have.



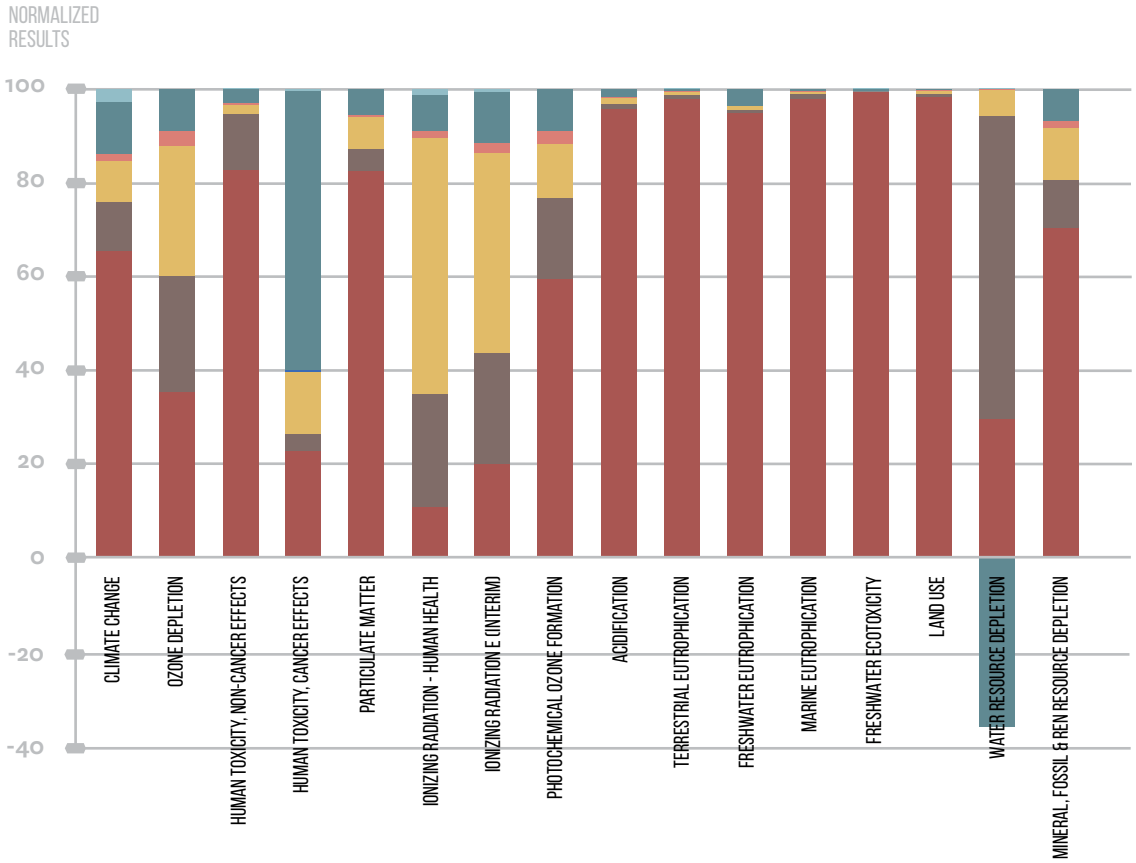
PDO OLIVE OIL BY MOULIN SAINT-MICHEL IS CHARACTERIZED BY AN HERBACEOUS AND RAW ARTICHOKE TASTE. IN THE MOUTH, IT DEVELOPS AN INTENSE FRUITY AND A MODERATE SPICY FLAVOUR.

THE MAIN RESULTS OF THE PEF STUDY



The most critical life cycle stage of olive oil in glass container is Cultivation of Moulin Rossi olives, which accounts for more than 90% of the total environmental impact.

- **Processing (for 1 kg of olives)**
- **Glass container 75 cl**
- **Cap**
- **Distribution of olive oil**
- **Cardboard**
- **Cultivation of Moulin Rossi olives**

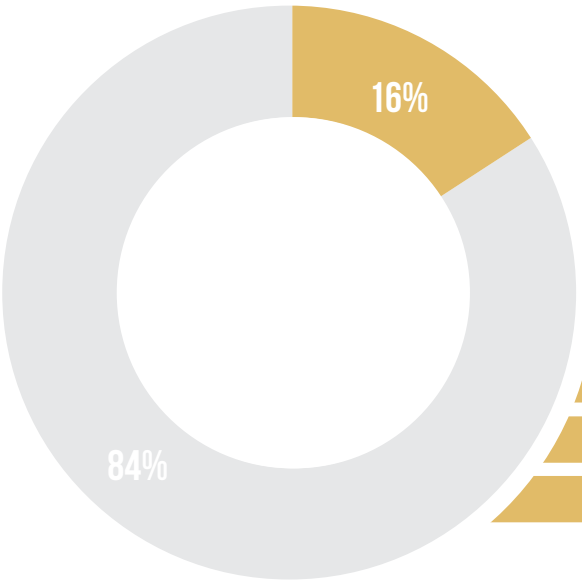


The stages which impact the environment the most are Cultivar and Packaging, depending on the impact category.

The most significant process of olive cultivation, which accounts for more than 80% of global impact is pomace fertilization.

- Carboard bottle boxes
- Bottle caps
- Olive oil in glass container distribution
- 75 cL glass containers
- Processing 1 kg of olives
- Moulin Rossi olives cultivation
- 1L of olive oil bottled in 75 cL Rossi bottle

THE MAIN RESULTS OF THE SOCIO-ECONOMIC ANALYSIS



WORKERS – HEALTH AND SAFETY

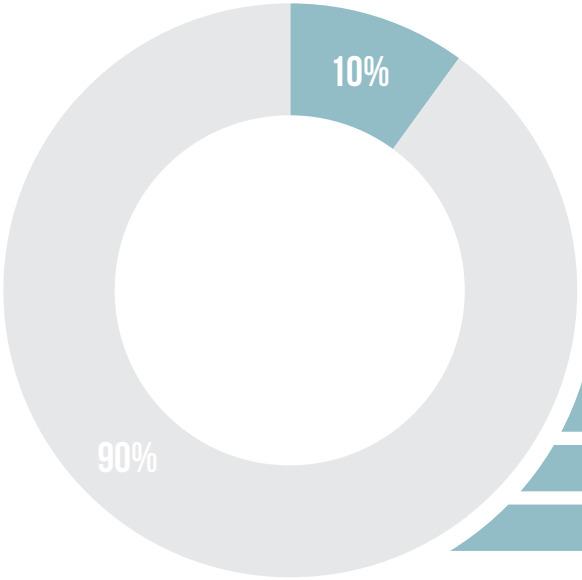
The company's contribution to its employees' health and safety was identified as one potential area of improvement.

CATEGORY: WORKERS

SUB-CATEGORY: HEALTH AND SAFETY

RESULT: 16%

POTENTIAL IMPROVEMENT: 84%



VALUE CHAIN – INTEGRATION OF SUSTAINABILITY ON SUPPLY CHAIN

The company's contribution to the integration of sustainability on supply chain was identified as one potential area of improvement.

CATEGORY: VALUE CHAIN

SUB-CATEGORY: INTEGRATION OF SUSTAINABILITY ON SUPPLY CHAIN

RESULT: 10%

POTENTIAL IMPROVEMENT: 90%

IMPROVEMENT OPTION

ANAEROBIC DIGESTION

Anaerobic digestion is a process of organic bio-waste fermentation which produces biogas and digestate. Biogas has methane concentration around 50%, which enables its use as a fuel. Digestate can be used for the fertilization of olive tree orchards.

The proposed solution contributes to the reduction of the environmental impact of pomace. It also contributes to the production of renewable energy, which can be used by the olive mill or other users.

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FEED IN ALENTEJO (PORTUGAL)

PARTNER: PORTUGUESE FOOD AND DRINK FEDERATION (FIPA)
COMPANY REPRESENTATIVE: JOAQUIM GRILO (HERDADE DE CARVALHOSO)
CLUSTER MANAGER: JAIME PIÇARRA (IACA)
PEF EXPERTS: TIAGO ROGADO AND SAMUEL NIZA (CARAVELA SUSTENTÁVEL)
SECTOR EXPERT: TIAGO ROGADO (CARAVELA SUSTENTÁVEL)
S3 MANAGER/REGIONAL REPRESENTATIVE: PEDRO CILÍNIO (IAPMEI)
BUSINESS PLAN EXPERTS: RICARDO ALVAREZ AND JUAN ANDRÉS SALIDO (DNV GL) AND FRANCISCO PUENTE (ESCAN S.A.)

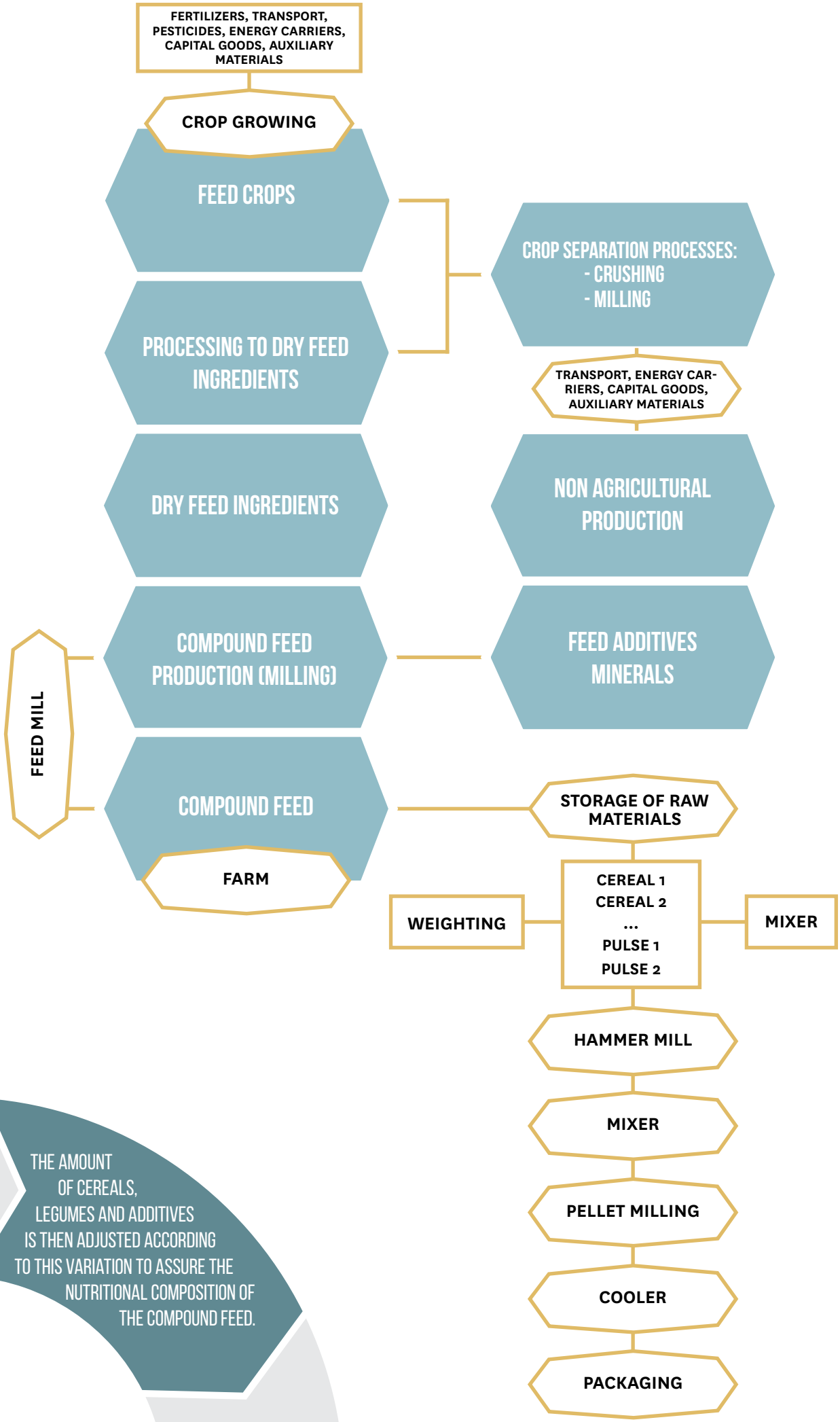
Sociedade Agrícola da Herdade de Carvalhoso, Lda.

ORGANIC BOVINE FEED 330N

Sociedade Agrícola da Herdade de Carvalhoso (HdC) is located in Alentejo, Portugal. It's managed by Eng. Joaquim Grilo. The company produces organic feed. HdC is classified as an SME (a local family business), which was founded in 1980. In 2003 HdC received a European certification for organic production (for human products and feed production). It develops the transformation and distribution of animal feed and products for human consumption. Presently HdC has 8 to 10 workers who operate these two activities.

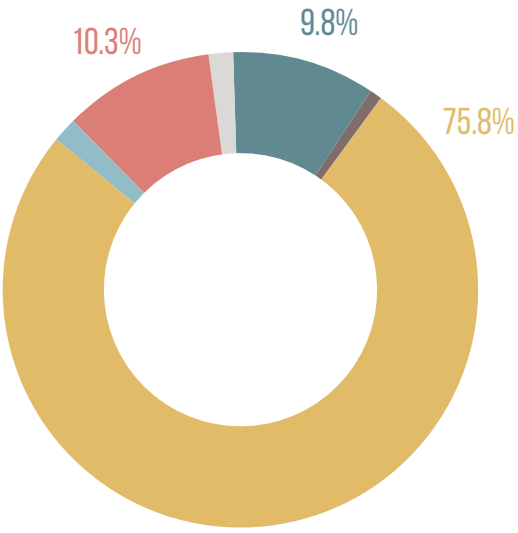
The product studied in the PEFMED project is Organic Bovine Feed 330N. Although the main components of the 330N BIO are unaltered, its composition may vary in terms of forage legume, according to its availability throughout the year.

The amount of cereals, legumes, and additives is then adjusted accordingly to assure the nutritional composition of the compound feed. From the different formulas provided by the company, an average formula was defined to perform the study. The feed ingredients are of national and foreign origin (i.e. Spain). The crop production technique of both, national and foreign ingredients, is organic. The additives come from a national supplier.



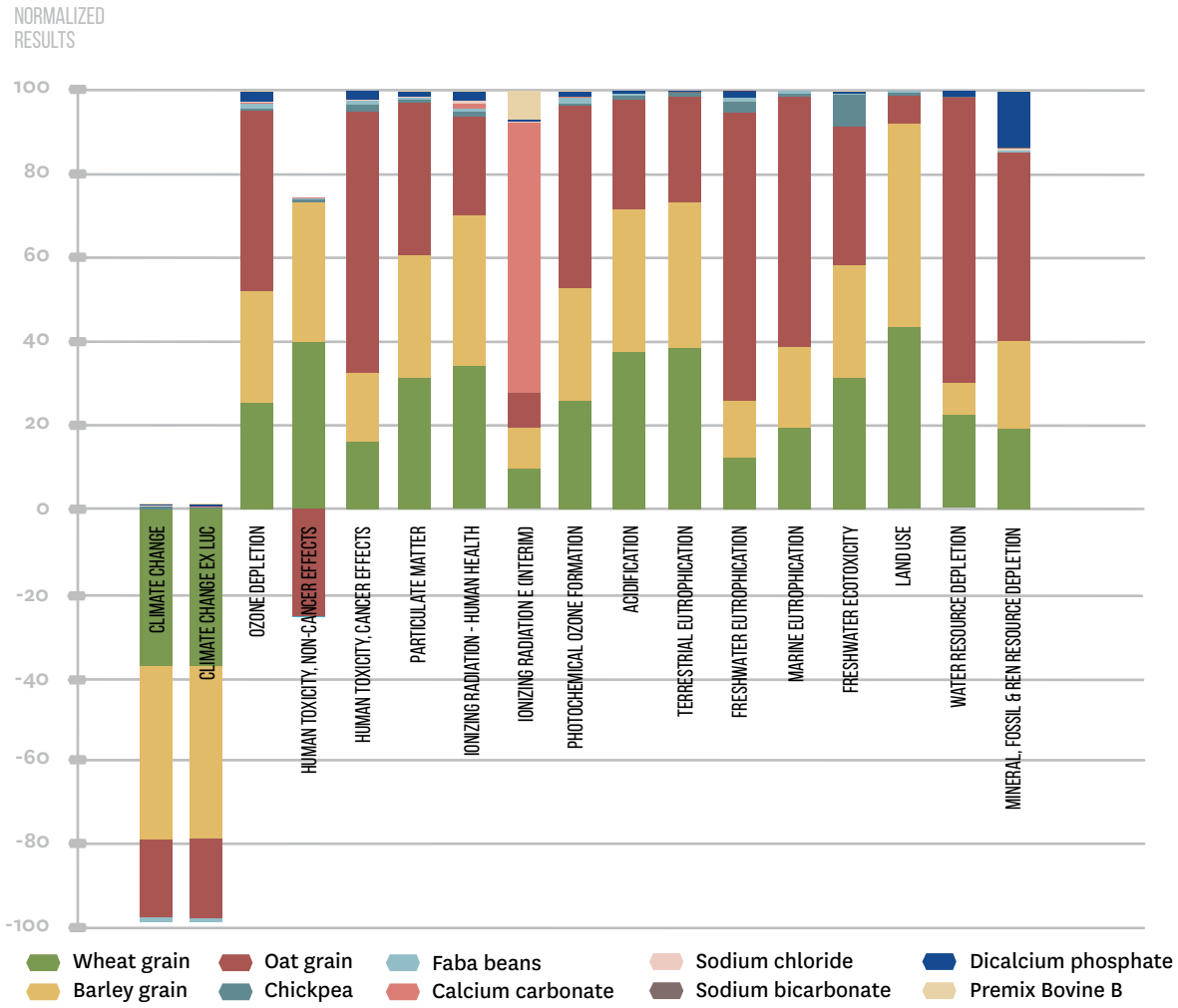
THE AMOUNT OF CEREALS, LEGUMES AND ADDITIVES IS THEN ADJUSTED ACCORDING TO THIS VARIATION TO ASSURE THE NUTRITIONAL COMPOSITION OF THE COMPOUND FEED.

THE MAIN RESULTS OF THE PEF STUDY



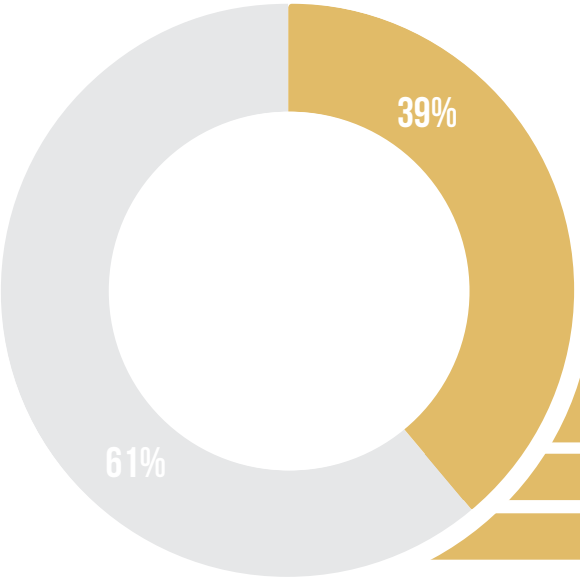
The life cycle stage which contributes to all impact categories the most is Production of raw materials (cereals, pulses, and minerals). The impact is positive for the Climate Change and Climate Change ex LUC impact categories, meaning that the production of raw materials potentially contributes to the reduction of substances which may have a potential effect on global warming.

- **Land use**
- **Water consumption, Terrestrial ecosystem**
- **Global warming, Terrestrial ecosystems**
- **Ozone formation, Terrestrial ecosystems**
- **Terrestrial acidification**
- **Freshwater eutrophication**



When assessing the potential contribution of each raw material to the impact categories, the production of cereals in general assumes higher importance, positively (Climate Change impact category) and negatively (most other categories). Ionizing radiation as an impact category is an exception; the latter is more affected by the production of Calcium Carbonate. These results reflect the relative weight of cereals in the assessed product (1000kg of 330N BIO): in weight, wheat, barley and oat grains represent more than 90% of the ingredients' share.

THE MAIN RESULTS OF THE SOCIO-ECONOMIC ANALYSIS



INTEGRATION OF SUSTAINABILITY ON SUPPLY CHAIN

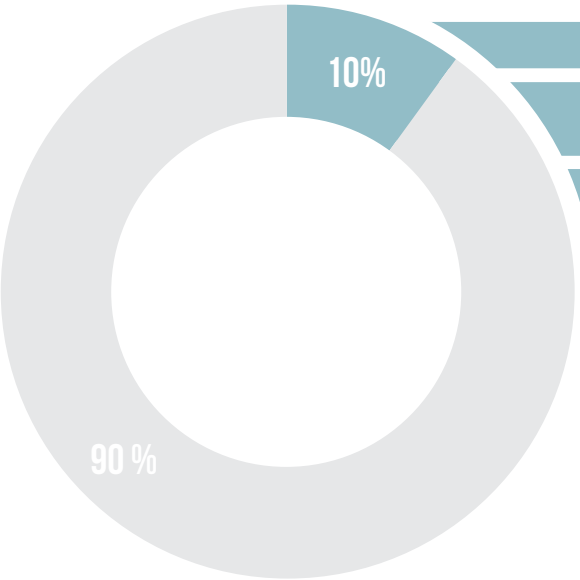
The integration of the concept of sustainability into the product's life cycle both upstream and downstream shows great potential for improvement.

CATEGORY: SUPPLIERS MANDATORY

SUB-CATEGORY: INTEGRATION OF SUSTAINABILITY ON SUPPLY CHAIN

RESULT: 39%

POTENTIAL IMPROVEMENT: 61%



CATEGORY: SUPPLIERS VOLUNTARY

SUB-CATEGORY: INTEGRATION OF SUSTAINABILITY ON SUPPLY CHAIN

RESULT: 10%

POTENTIAL IMPROVEMENT: 90%





IMPROVEMENT OPTIONS

ENERGY EFFICIENCY TECHNOLOGIES AND INSTRUMENTATION IMPLEMENTATION IN HDC FACILITIES

Energy efficiency measures for feed production process in the HdC facilities:

- heat pumps for heat recovery;
- turning off the equipment when not needed;
- minimizing motor load;
- minimizing engine losses;
- using motors with adjustable speed to reduce the load on fans and pumps;
- applying thermal insulation to equipment used to conduct, store or treat substances above or below room temperature, and in equipment used in processes involving heating or cooling;
- applying frequency controllers to motors, and
- adopting energy audit procedures.

WASTE MANAGEMENT IMPLEMENTATION IN HDC FACILITIES OR INTO SUPPLIERS

Applying general techniques of waste handling during the feed transformation process in the HdC facilities or suppliers:

- having systems and procedures in place to ensure that different waste is safely transferred to the appropriate storage;
- having a management system “in situ” for the loading and unloading of waste in the facility, taking into account the risks that these activities may incur;
- ensuring qualifications and training for the operator responsible for receiving and storing waste and raw materials;
- identifying older waste packages in order to reduce the risk;
- maintaining equipment in good operational conditions, and
- implementing temporary storage area with waste compactor (for plastic film, large paper bags, feed, etc).

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WEBSITE: **HTTP://WWW.HERDADEDECARVALHOSO.PT/INDEX.HTML**

OLIVE OIL IN ANDALUSIA (SPAIN)

PARTNER: SPANISH FOOD AND DRINK INDUSTRY FEDERATION (FIAB)
COMPANY REPRESENTATIVE: SALVADOR PANCORBO (OLEOCAMPO)
CLUSTER MANAGER: Mª DOLORES JIMÉNEZ (CITOLIVA)
PEF EXPERT: FRANCISCO PUENTE (ESCAN S.A.)
SECTOR EXPERT: MARGARITA SALVE (ESCAN S.A.)
S3 MANAGER/REGIONAL REPRESENTATIVE: Mª ÁNGELES RUIZ (AGENCIA DE INNOVACIÓN Y DESARROLLO DE ANDALUCÍA IDEA)
BUSINESS PLAN EXPERTS: RICARDO ALVAREZ AND JUAN ANDRÉS SALIDO (DNV GL) AND FRANCISCO PUENTE (ESCAN S.A.)

OLEOCAMPO, S. COOP.

EXTRA VIRGIN OLIVE OIL

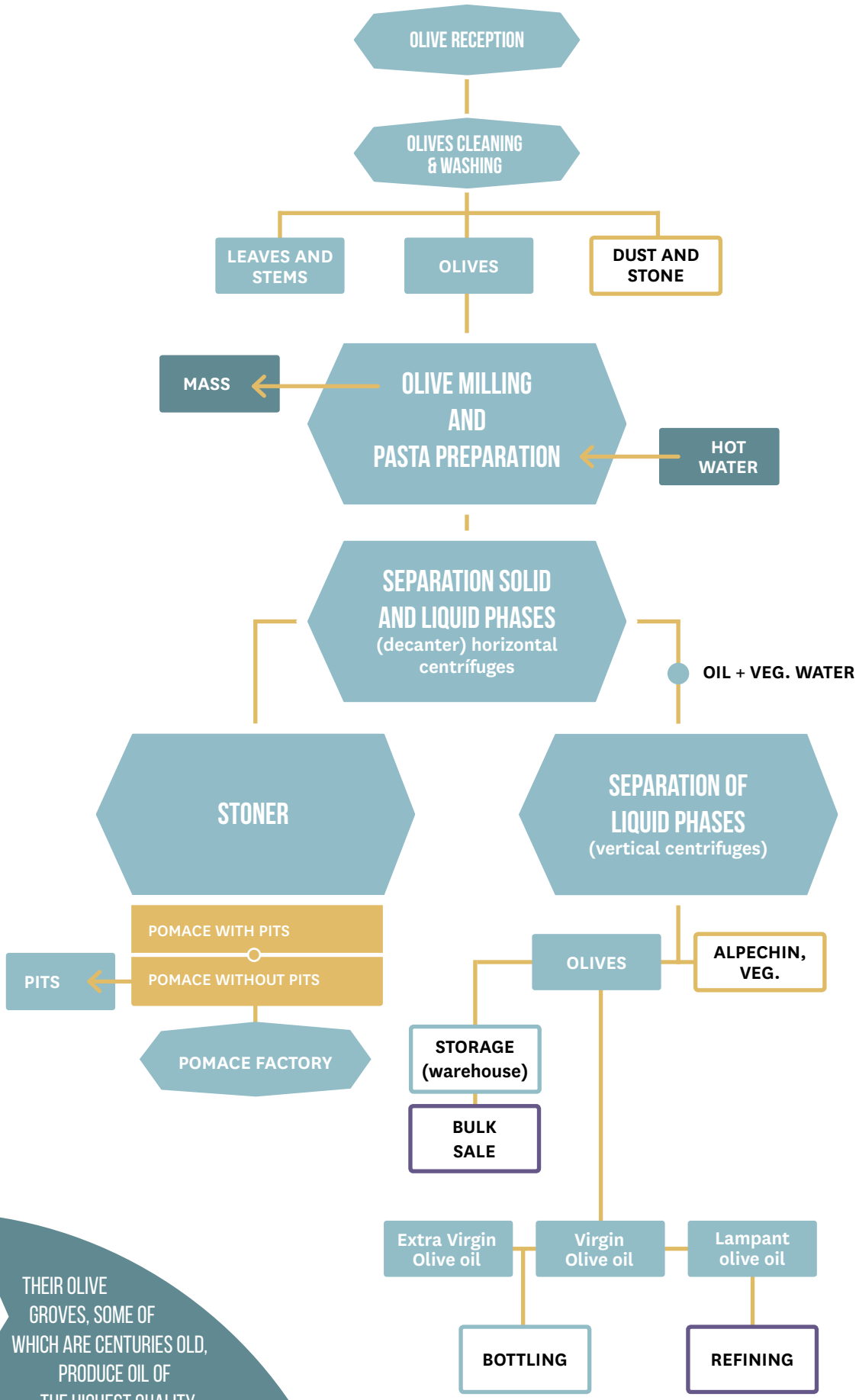
OLEOCAMPO Andalusian Cooperative Company was founded in 1994 and currently comprises three olive oil mills, the companies which have been producing extra virgin olive oil for bottling and marketing for over 50 years. All three companies are located in Torredelcampo in the centre of the province of Jaen, in the district of La Campiña Sur. Their olive groves, some of which are centuries old, produce oil of the highest quality under the supervision of their 2,000 olive-growing partners, cultivating 7,437.84 hectares of olive groves, mostly using the system of dry cultivation without irrigation and growing the Picual variety.

The study is based on thedirect data collection made in OLEOCAMPO and default data from the Product Environmental Footprint Category Rules (PEFCR) for Olive oil (Draft Version 0.5).

The functional unit is a litre of packed Extra Virgin Olive Oil used by consumers as salad dressing and for cooking.

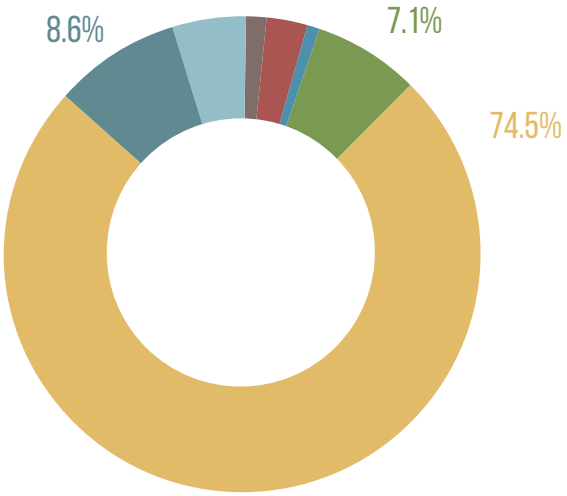
The main interests of Oleocampo to implement PEF Methodology are:

- evaluating the possible environmental impacts of their Extra Virgin Olive Oil product;
- evaluating the consumption of resources and emissions during the entire life cycle of their product;
- improving and optimizing the efficiency of processes and product management, and
- developing a methodology to communicate the environmental benefits of the consumption of their Extra Virgin Olive Oil product.



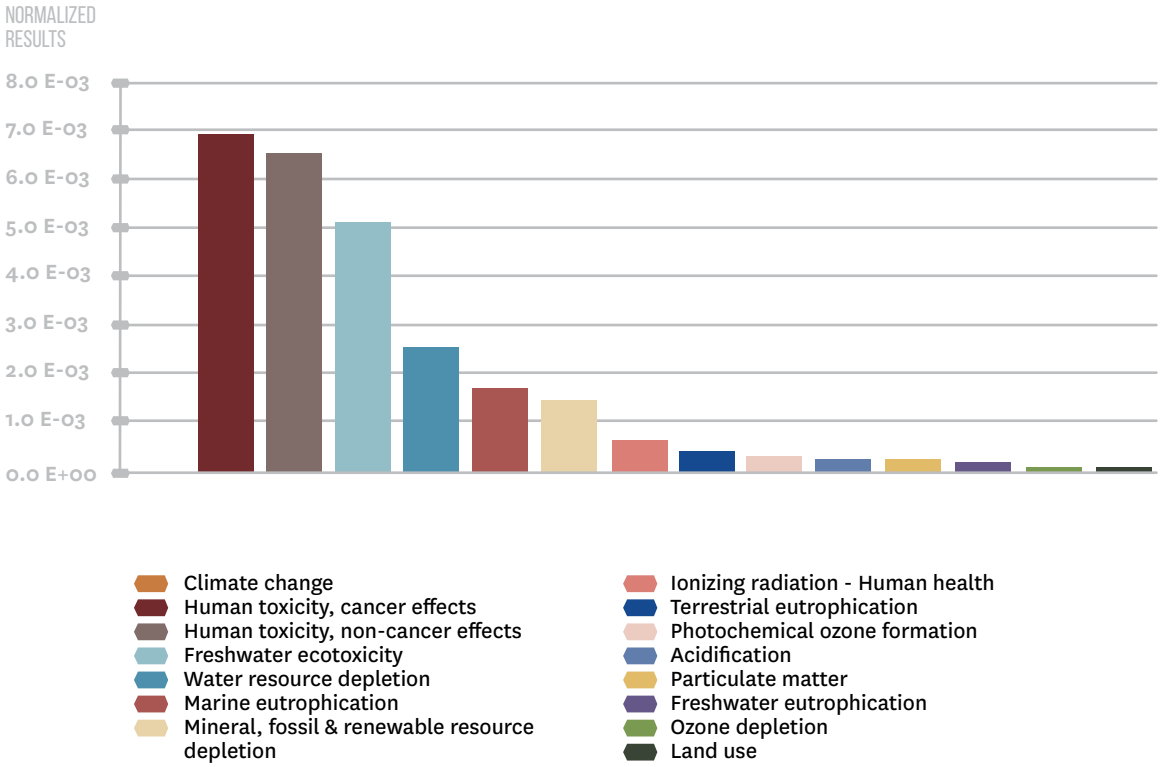
THEIR OLIVE GROVES, SOME OF WHICH ARE CENTURIES OLD, PRODUCE OIL OF THE HIGHEST QUALITY UNDER THE SUPERVISION OF THEIR 2,000 OLIVE-GROWING PARTNERS.

THE MAIN RESULTS OF THE PEF STUDY



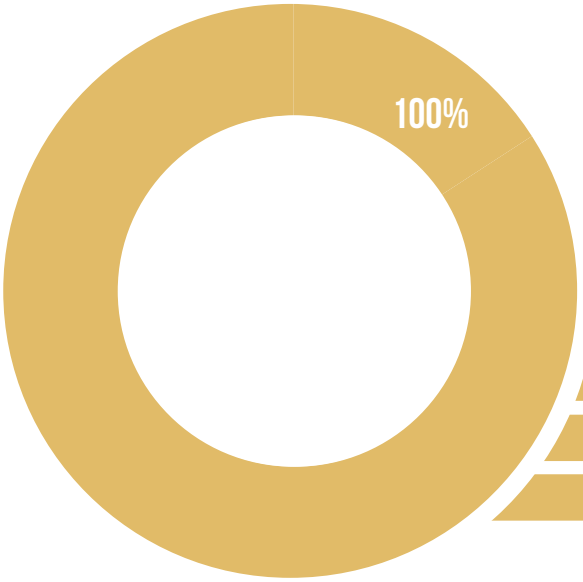
The most critical life cycle stage is Olive production, which accounts for more than 74% of the total environmental impact of olive oil life cycle.

- **Olive production**
- **Industrial process**
- **Packaging ingredients**
- **Packaging process**
- **Distribution**
- **Use**
- **End-of-Life**



The most critical impact categories in the olive oil life cycle are Human toxicity, Cancer effects, Human toxicity, Non-cancer effects, Freshwater ecotoxicity, and Water resource depletion.

THE MAIN RESULTS OF THE SOCIO-ECONOMIC ANALYSIS



LOCAL COMMUNITY – TOURISM

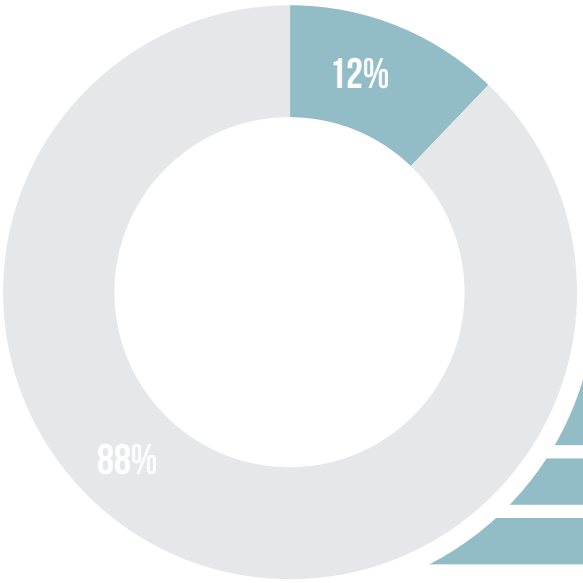
Touristic activities are fully implemented and are an example of good practice in this sector.

CATEGORY: LOCAL COMMUNITY

SUB-CATEGORY: TOURISM

RESULT: 100%

POTENTIAL IMPROVEMENT: 0%



LOCAL COMMUNITY – TERRITORY, LANDSCAPE AND CULTURAL HERITAGE

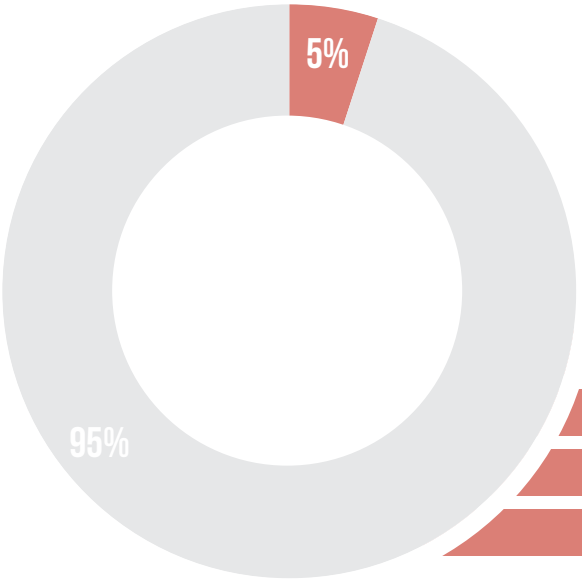
The company provides specific information to local people and foreigners on all the environmental and other issues, but some strategy and more projects could be established.

CATEGORY: LOCAL COMMUNITY

SUB-CATEGORY: TERRITORY, LANDSCAPE AND CULTURAL HERITAGE

RESULT: 88%

POTENTIAL IMPROVEMENT: 12%



CONSUMERS – TRANSPARENCY

The company keeps an updated website where relevant information is published. ISO 22000:2005, IFS Food and BRC certifications are in place; social and product-specific certifications would be an appropriate next step.

CATEGORY: CONSUMERS

SUB-CATEGORY: TRANSPARENCY

RESULT: 95%

POTENTIAL IMPROVEMENT: 5%

IMPROVEMENT OPTION

THE USE OF COMPACT PEH TECHNOLOGY FOR CLEANING, DRYING AND BAGGING OLIVE KERNEL - NEW BUSINESS LINE FOR OLIVE OIL COOPERATIVES

From the energetic and environmental points of view, the separation and obtaining of the olive marc in the own ALMAZARA is much more efficient, because in the industries orujeras the product to treat has higher humidity which has to evaporate. The round-trip transportation is necessary as well.

For this, we propose installing a new system "Compact PEH" for the cleaning (separation of pulp and stones), drying (up to less than 10%) and bagging (prevents the olive bone from acquiring moisture) of the olive kernel.

The new process is the following:

- a wet olive kernel enters a "tromel" from the current "wet olive kernel hopper (35% H)" in the mill and passes through an endless screw.
- The "tromel" dries the olive kernel (input wet olive kernel and output dry olive kernel). To do so, it receives hot and dry air from a biomass burner, which is fed with dry olive kernel from the process itself. The burner consumes 5% of the dry olive kernel produced.
- The pulp which sticks to the olive kernel is aspirated as the kernel passes from the "tromel" through a "vacuum cleaner". The pulp is deposited in a drawer and later used as green manure.
- Dry olive kernel (10% H) goes from the "tromel" to a "dry olive kernel hopper". In the hopper there is a "screen" which removes stones and other non-combustible elements. There are two dry olive outlets from the hopper: one outlet goes to the biomass burner via a worm screw, the other goes to the "weighing and bagging system.
- The "weighing and bagging system" allows 15 kg bags or 800-900 kg bags of clean and dry olive kernels.

The whole system is fully automated.
Clean and dry olive kernel has characteristics and uses similar to pellets.

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WEBSITE: **WWW.OLEOCAMPO.COM**

MEAT IN CATALONIA (SPAIN)

PARTNER: SPANISH FOOD AND DRINK INDUSTRY FEDERATION (FIAB)
COMPANY REPRESENTATIVE: MIGUEL AGUILERA (ARGAL ALIMENTACIÓN S.A.)
PEF EXPERT: JOAN COLÓN (CENTRO TECNOLÓGICO BETA – UNIVERSIDAD DE VIC)
SECTOR EXPERT: JOAN COLÓN (CENTRO TECNOLÓGICO BETA – UNIVERSIDAD DE VIC)
S3 MANAGER/REGIONAL REPRESENTATIVE: PEP ORELLANA (ACCIÓ)
BUSINESS PLAN EXPERTS: RICARDO ALVAREZ AND JUAN ANDRÉS SALIDO (DNV GL) AND FRANCISCO PUENTE (ESCAN S.A.)

Argal Alimentación SA

EXTRA COOKED HAM AND RESERVE CURED HAM

(JAMÓN SERRANO RESERVA)

Argal started as a family business in a little butcher's shop in the famous Calle de la Estafeta in Pamplona, known for the festival of San Fermin. It has always worked with high quality raw ingredients, continuously improving its facilities and processes with the best technology, always respecting tradition.

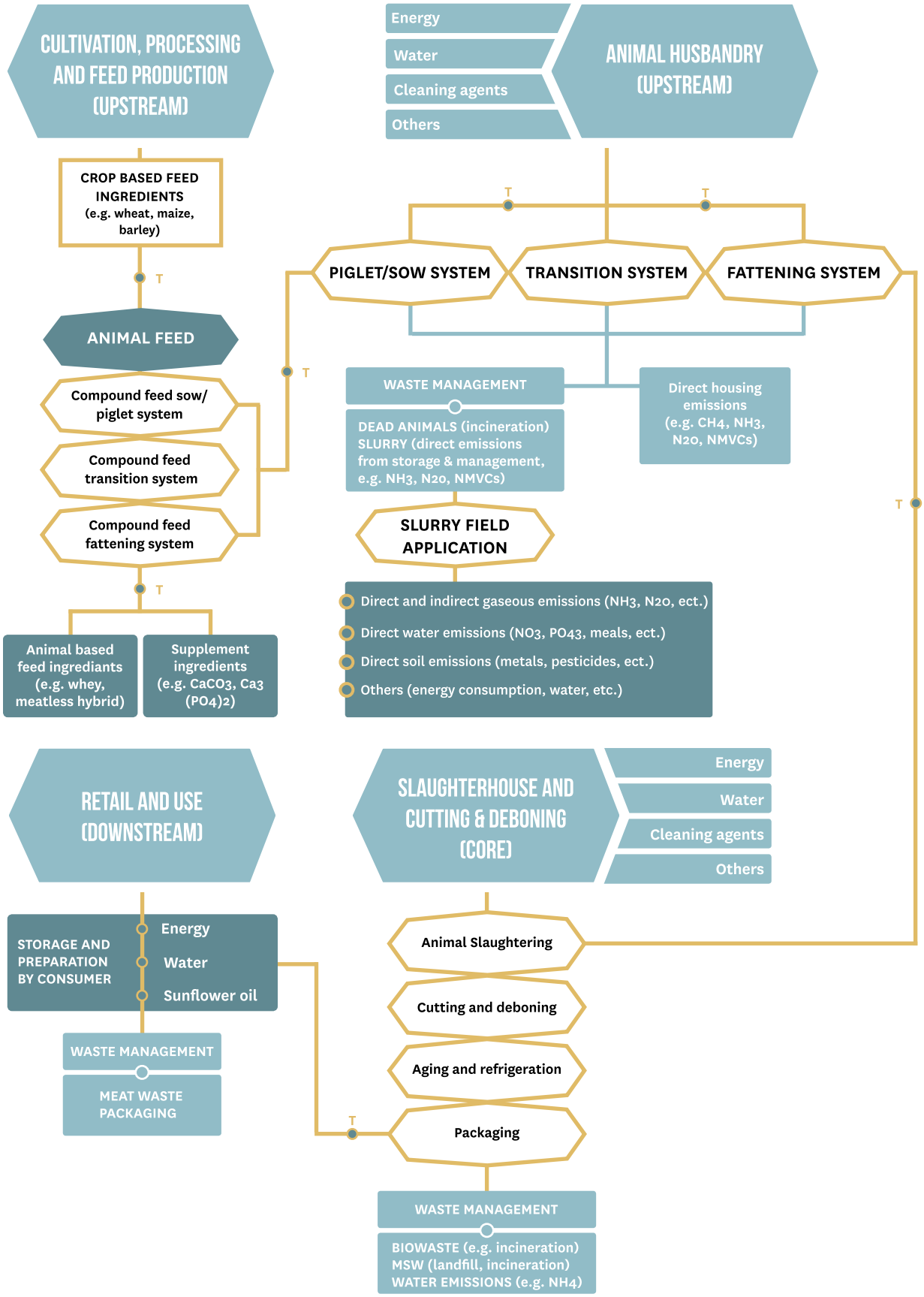
During its over 100 years of existence, it has always promised quality, development and innovation throughout its product range. Natural cured meats, such as cooked and cured ham, jamón iberico, turkey, salchichón, paté and many other ready-to-eat products can be found in over 30 countries.

Argal figures:

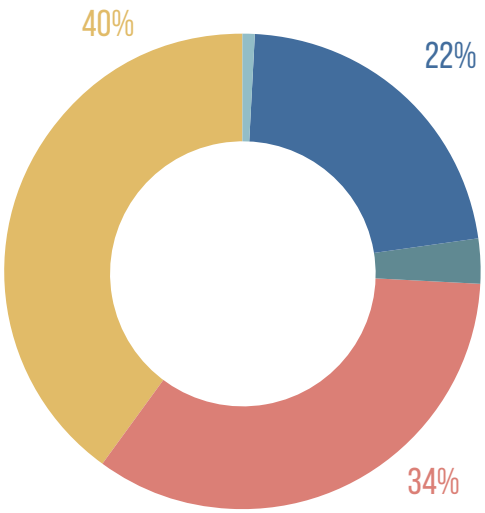
- over 1,000 employees
- over 2,350 orders daily
- found in over 40 countries
- 5 plants in Spain
- 11 logistic centers in the world

The functional units of the study are 1kg of product (ham and cured ham), presented to the consumer in retail packaging.

The main reason for carrying out the study for Argal is to know how they perform in terms for environmental impacts compared to the supporting study carried out during the PEF pilots.

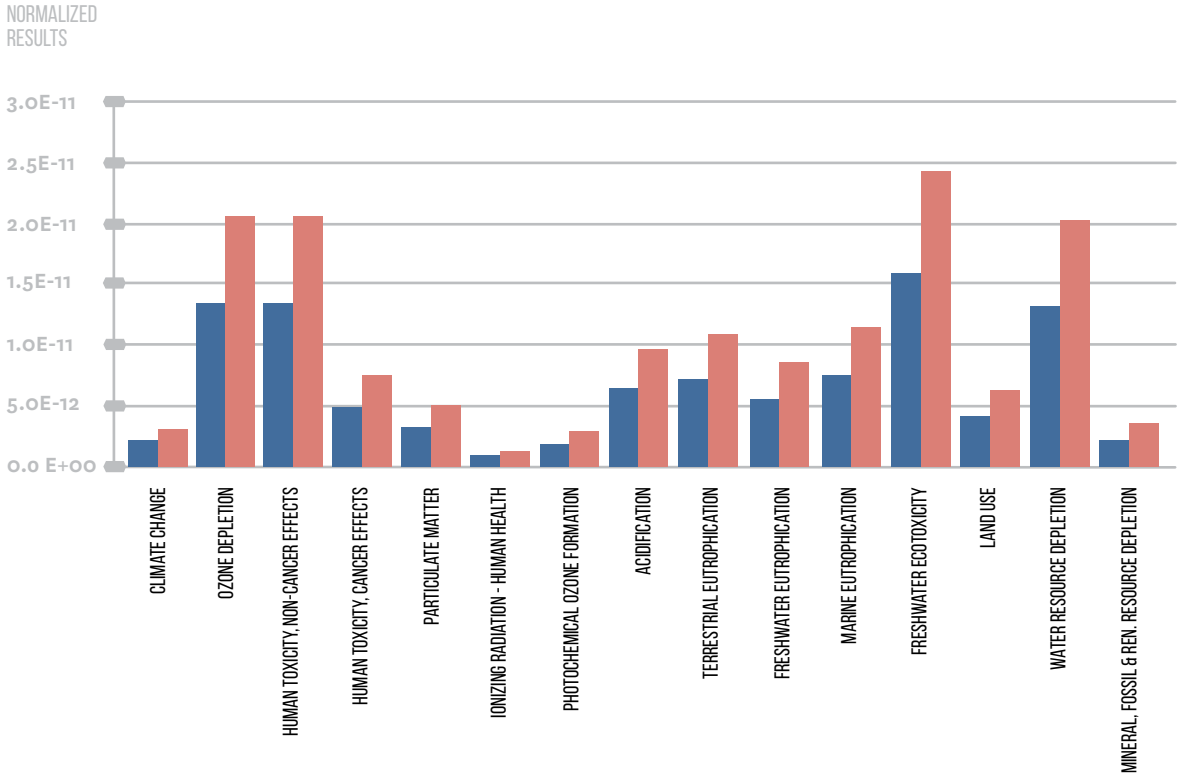

CULTIVATION, PROCESSING AND FEED PRODUCTION (UPSTREAM)
CROP BASED FEED INGREDIENTS (e.g. wheat, maize, barley)
T
ANIMAL FEED
Compound feed sow/ piglet system
Compound feed transition system
Compound feed fattening system
T
Animal based feed ingrediants (e.g. whey, meatless hybrid)
Supplement ingredients (e.g. CaCO3, Ca3 (PO4)2)
Energy
Water
Cleaning agents
Others
ANIMAL HUSBANDRY (UPSTREAM)
T
T
PIGLET/SOW SYSTEM
TRANSITION SYSTEM
FATTENING SYSTEM
T
WASTE MANAGEMENT
DEAD ANIMALS (incineration)
SLURRY (direct emissions from storage & management, e.g. NH3, N2O, NMVCs)
Direct housing emissions (e.g. CH4, NH3, N2O, NMVCs)
SLURRY FIELD APPLICATION
Direct and indirect gaseous emissions (NH3, N2O, ect.)
Direct water emissions (NO3, PO43, meals, ect.)
Direct soil emissions (metals, pesticides, ect.)
Others (energy consumption, water, etc.)
T
RETAIL AND USE (DOWNSTREAM)
STORAGE AND PREPARATION BY CONSUMER
Energy
Water
Sunflower oil
WASTE MANAGEMENT
MEAT WASTE PACKAGING
SLAUGHTERHOUSE AND CUTTING & DEBONING (CORE)
Energy
Water
Cleaning agents
Others
Animal Slaughtering
Cutting and deboning
Aging and refrigeration
T
Packaging
WASTE MANAGEMENT
BIOWASTE (e.g. incineration)
MSW (landfill, incineration)
WATER EMISSIONS (e.g. NH4)

THE MAIN RESULTS OF THE PEF STUDY



The most relevant stages of the project are the compound feed production and the farming systems, especially the fatten¬ing system. The core process (Meat processing) have little contribution to the main impact categories (from 1 to 20%) and the use stage (refrigeration, cooking, EoL and food waste) have and overall impact ranging from 1 to 8% of most relevant categories.

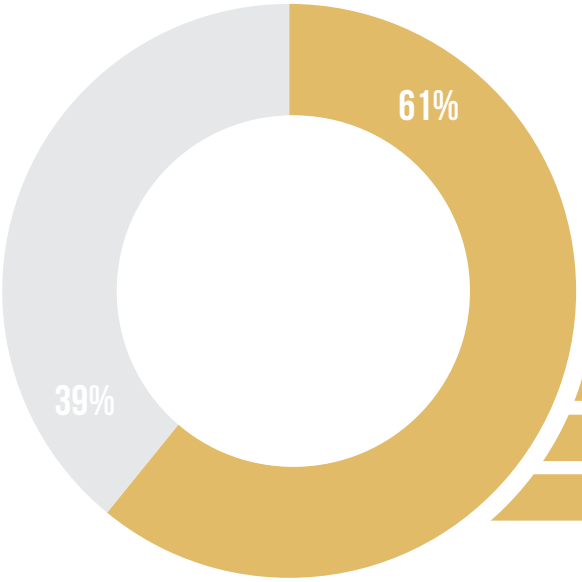
- **Processing**
- **Retail and use stage**
- **Cutting and deboning**
- **Farm stage**
- **Feed production**



The most critical impact categories in the pork meat life cycle (as defined in the screening study, normalization results) are Climate Change, Terrestrial eutrophication, Marine eutrophication and acidification.

- **Cooked Ham**
- **Cured Ham**

THE MAIN RESULTS OF THE SOCIO-ECONOMIC ANALYSIS



WORKERS – HEALTH AND SAFETY

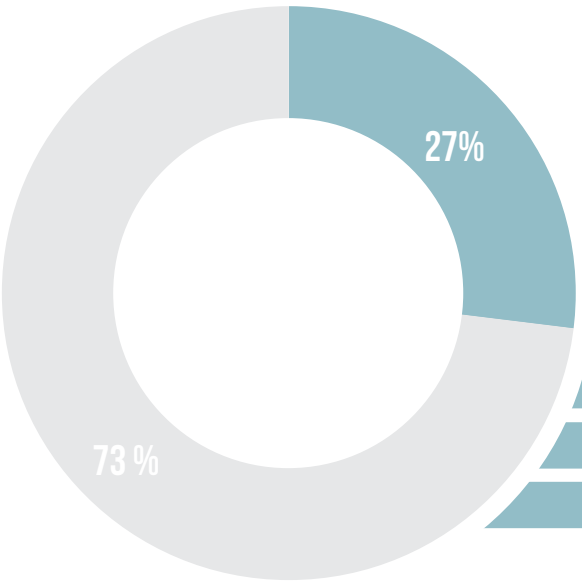
There is a training plan in place, but it shall include specific sustainability and social matters.

CATEGORY: WORKERS

SUB-CATEGORY: TRAINING

RESULT: 61%

POTENTIAL IMPROVEMENT: 39%



VALUE CHAIN – BIODIVERSITY

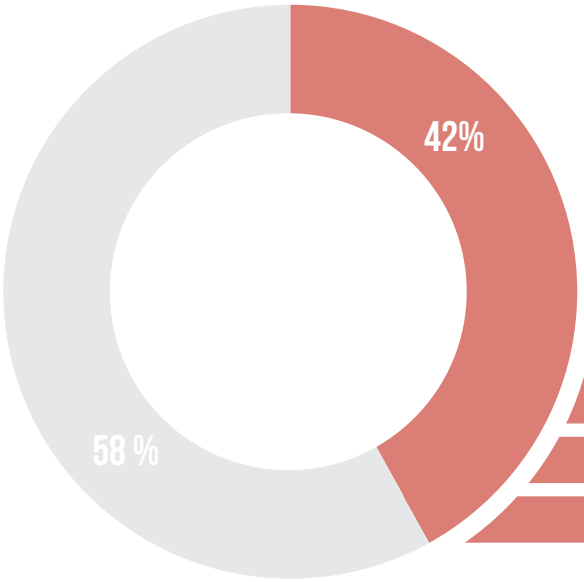
The company's contribution to the conservation and promotion of biodiversity was identified as one potential area of improvement for ARGAL.

CATEGORY: VALUE CHAIN

SUB-CATEGORY: BIODIVERSITY

RESULT: 27%

POTENTIAL IMPROVEMENT: 73%



VALUE CHAIN – INTEGRATION OF SUSTAINABILITY ON SUPPLY CHAIN

The integration of the concept of sustainability into the product's life cycle both upstream and downstream shows great potential for improvement as well.

CATEGORY: VALUE CHAIN

SUB-CATEGORY: INTEGRATION OF SUSTAINABILITY ON SUPPLY CHAIN

RESULT: 42%

POTENTIAL IMPROVEMENT: 58%

IMPROVEMENT OPTION

IMPROVEMENT OF IN-SITU ELECTRICITY PRODUCTION SYSTEMS

The proposed intervention is to substitute the engines to produce electricity from natural gas for biomass boilers coupled with CHP to recover both electricity and heat.

The process carried out is based on the generation of heat through the combustion of wood chips in an oven and the transmission of this heat to an ORC module that uses it to produce electrical energy. In addition to electricity, useful heat which can be used for other uses such as hot water, drying processes, etc. is generated during the process.

Among others, energy consumption is one of the main contributors to different impact categories such as global warming and resource use.

The proposed intervention is aligned with the European 2020 strategy, which focuses on smart, sustainable and inclusive growth, within the flagship initiative "An Efficient Europe with the Resources ". The intervention will contribute to the 20/20/20 objective in climate/energy that includes the reduction of the GHG emissions by 20% (in respect to 1990), the use of 20% of renewable energies, and the increase of energy efficiency by 20%.

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CHEESE IN THESSALY (GREECE)

PARTNER: FEDERATION OF HELLENIC FOOD INDUSTRIES (SEVT)
COMPANY REPRESENTATIVE: IOANNIS VASTARDIS (DELTA FOODS S.A.)
CLUSTER MANAGER: CHRISTOS APOSTOLOPOULOS (HELLENIC ASSOCIATION OF MILK AND DAIRY PRODUCTS INDUSTRY)
PEF EXPERTS: ANNA VATSANIDOU AND VASILLIS ANESTIS (CERTH)
SECTOR EXPERTS: AGGELOS TSAKANIKAS AND ELIAS DEMIAN (IOBE)
S3 MANAGER/REGIONAL REPRESENTATIVE: THOMAS BARTZANAS (GSRT)
BUSINESS PLAN EXPERTS: RICARDO ALVAREZ AND JUAN ANDRÉS SALIDO (DNV GL)
AND FRANCISCO PUENTE (ESCAN S.A.)

Delta Foods S.A. (Dairy Factory in Elassona)

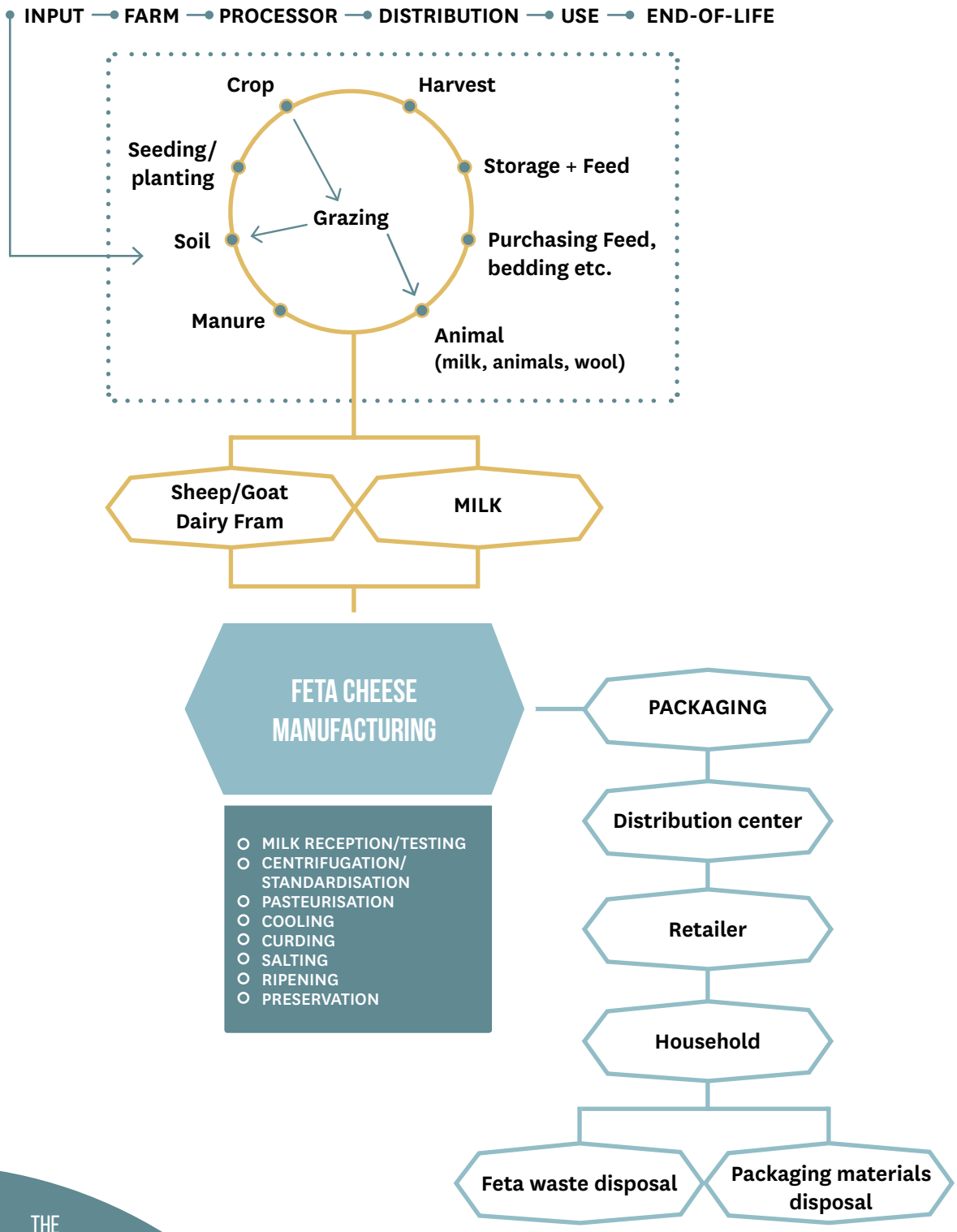
FETA CHEESE PDO

The Dairy Factory in Elassona is a branch of DELTA Foods Company of the VIVARTIA group (one of the biggest dairy companies in Greece).

The production facilities (area of 7,800 m²) of the dairy are located in Elassona (the Region of Thessaly), an area widely famous for its long tradition in cheese making. It produces several types of cheese, mainly Feta and Kasseri Cheese PDO from sheep and goat milk, following the highest quality and safety standards and with respect to the environment.

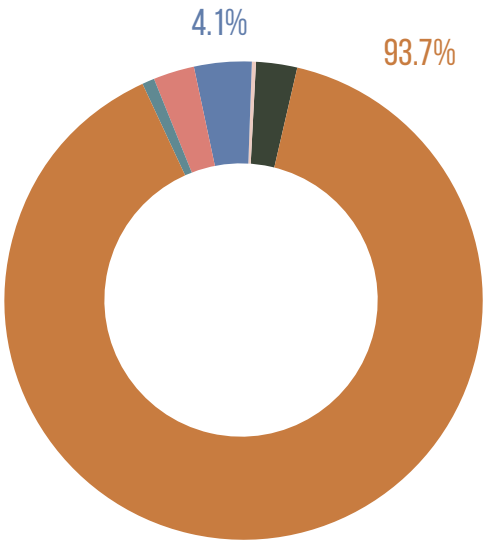
The commitment in producing PDO products reflects the DELTA's aspect regarding environmental issues and social chesion support in rural areas.

The raw milk for FETA production is produced in an extended network of supplying farms (587 farms in 2016) within 245 km and transported by isothermal trucks.



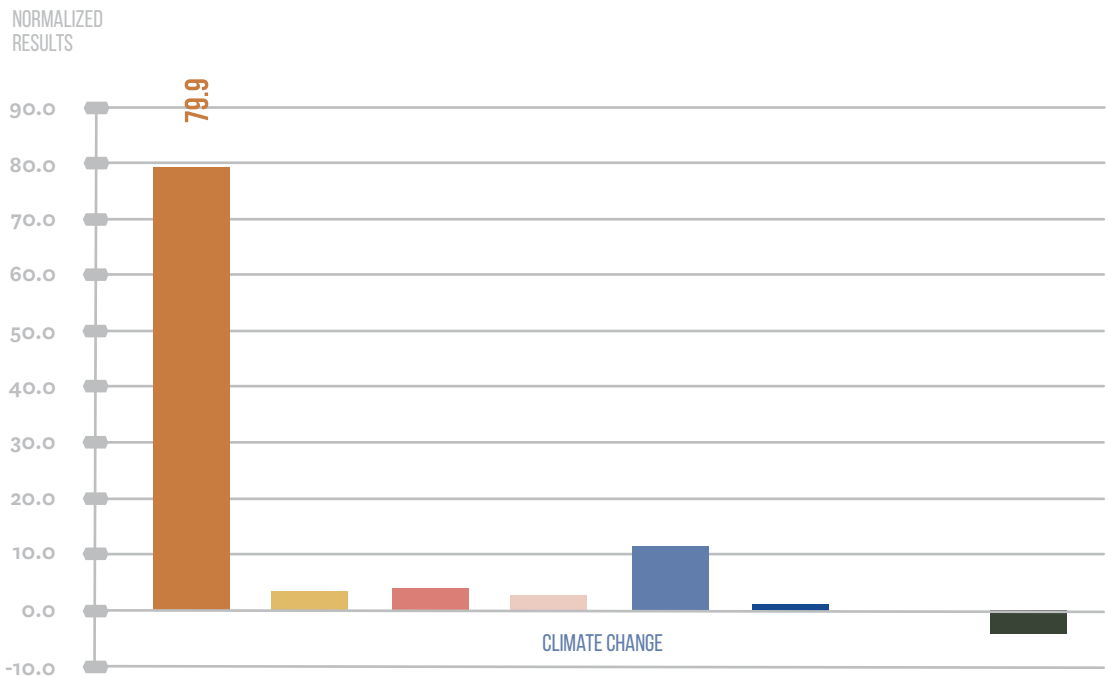
THE PRODUCTION FACILITIES (AREA OF 7,800 M2) OF THE DAIRY ARE LOCATED IN ELASSONA (THE REGION OF THESSALY), AN AREA WIDELY FAMOUS FOR ITS LONG TRADITION IN CHEESE MAKING.

THE MAIN RESULTS OF THE PEF STUDY



This figure presents the contribution of each life cycle stage of Feta cheese to the overall environmental impact resulting from a 'cradle to grave' PEF Feta study in weighted phase. The most critical life cycle stage is Raw milk supply, which accounts for more than 90% of the total environmental impact. Dairy processing industry, not considering the electricity, has little contribution (0.9%) to the overall environmental impact of Feta cheese.

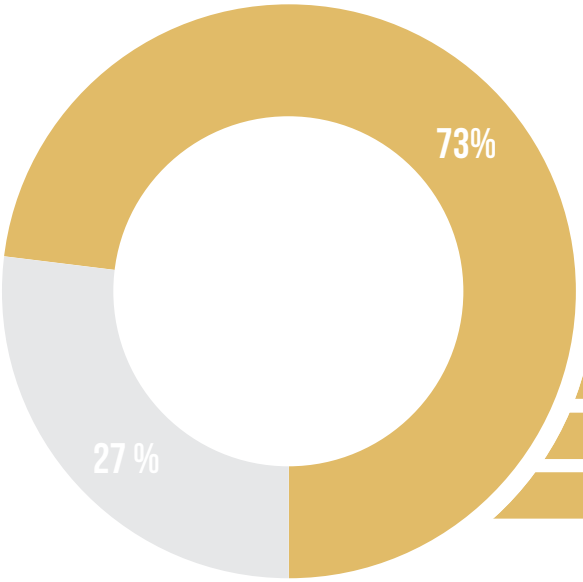
- **Raw milk supply**
- **Dairy processing**
- **Packaging**
- **Non-dairy ingredients**
- **Electricity**
- **Distribution**
- **Use**
- **End-of-Life**



This figure presents the contribution of each life cycle stage in regard to the Climate Change impact category. Raw milk supply stage is the most critical life cycle stage, contributing almost 80% to Climate Change, while the electricity consumed in Dairy industry follows with 11.8%.

- **Raw milk supply**
- **Feta cheese manufactoring**
- **Packaging supply**
- **Non dairy material supply**
- **Electricity supply**
- **Distribution**
- **Use**
- **End-of-Life**

THE MAIN RESULTS OF THE SOCIO-ECONOMIC ANALYSIS



WORKERS – TRAINING

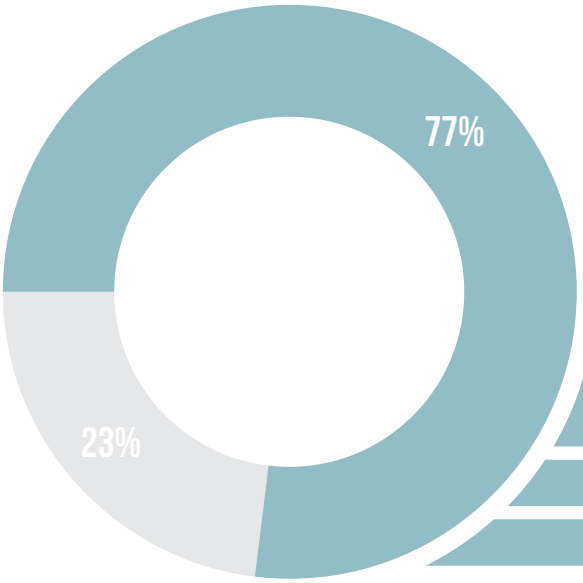
The company's contribution to the training of its employees was identified as one of the areas in which the company had acted proactively.

CATEGORY: WORKERS

SUB-CATEGORY: TRAINING

RESULT: 73%

POTENTIAL IMPROVEMENT: 27%



VALUE CHAIN – INTEGRATION OF SUSTAINABILITY ON SUPPLY CHAIN

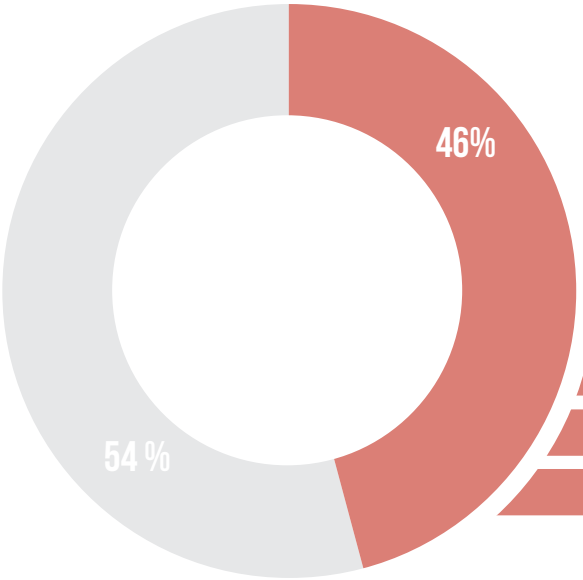
The company's contribution to the Integration of sustainability on supply chain was identified as one of the areas in which the company had acted proactively shares initiative/good practice with the supply chain actors.

CATEGORY: VALUE CHAIN

SUB-CATEGORY: INTEGRATION OF SUSTAINABILITY ON SUPPLY CHAIN

RESULT: 77%

POTENTIAL IMPROVEMENT: 23%



LOCAL COMMUNITY – LOCAL CAPACITY BUILDING

The company's contribution to the local capacity building was identified as one potential area of improvement.

CATEGORY: LOCAL COMMUNITY

SUB-CATEGORY: LOCAL CAPACITY BUILDING

RESULT: 46%

POTENTIAL IMPROVEMENT: 54%

IMPROVEMENT OPTIONS

ENERGY AUDIT AT THE DELTA-DAIRY PLANT

An energy audit to identify the energy performance of the plant is proposed. After the conduction of the energy audit, interventions can be decided on in order to achieve energy savings. DELTA intending to reduce the environmental impact has already conducted the energy audit and is now working on the findings and the proposed interventions in order to improve the energy behavior of energy-intensive systems of the plant.

DEVELOPING GUIDELINES FOR THE FARMS CONCERNING DATA COLLECTION AND INCREASING FARM AWARENESS

The PEF analysis of FETA cheese revealed that there is a lack of data collection and organization on a farm level concerning significant data for environmental issues in the way that PEFMED methodology demands, which makes it difficult for the company to map the whole supply chain. DELTA runs the "GAIA project", an initiative for the sustainable development and support of Greek primary dairy sector through research, training and technical improvements and by promoting the cultivation of alternative crops for animal feed. This project is implemented throughout Greece in the areas where DELTA's activity in milk collection is carried out. In the frame of "GAIA project" DELTA can include targeted training actions, regarding environmental issues and practices and be actively involved in increasing the awareness on farm level.

IMPEL COMPETENT BODIES TO DEVELOP METHODOLOGIES AND DATABASES ON A NATIONAL LEVEL - SUPPORT ACTIONS ON THE EU LEVEL

DELTA as the leading company in Greek dairy sector can play its role to impel competent bodes at a national level to take actions: a) for increasing the awareness on farm level b) to develop representative national data for the estimation of livestock unit emissions and secondary data in the crop and feed industry. On the direction of supporting actions on the EU level, DELTA along with the Hellenic Food Industries Federation- SEVT, & the Institute of Bio-economy and Agri-Technology (iBO) framed a paper "Proposals & Recommendations for the updating of the existing PEF on Dairy products" for the improvement of PEFMED. In this paper, a series of more qualitative environmental factors to be taken under consideration for the calculation of the PEF and integrated to the methodology is proposed. Factors, such as, the biodiversity of small ruminant breeds, the conservation of the indigenous sheep and goat breeds, the extensive and semi-extensive sheep and goat livestock farming etc. Another significant need which is mentioned in the paper and which DELTA intents to support is the development of Product Environmental Footprint Category Rules on small ruminant food production chains in order to get a reliable and representative PEF in this product category. This product category regards a significant number of traditional products like FETA cheese, so all the above actions intend to enhance the added value of this value chain in the frame and scope that PEFMED sets.

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CHEESE IN WESTERN SLOVENIA (SLOVENIA)

PARTNER: CCIS-CAFE - CHAMBER OF COMMERCE AND INDUSTRY OF SLOVENIA - CHAMBER OF AGRICULTURAL AND FOOD ENTERPRISES (GZS)
COMPANY REPRESENTATIVE: MLEKARNA PLANIKA D.O.O. (DAIRY COMPANY)
CLUSTER MANAGER: BARBARA RUPNIK
PEF EXPERT: KATJA MALOVRH REBEC (ZAG)
SECTOR EXPERT: JOŽE VERBIČ (KIS)
S3 MANAGER/REGIONAL REPRESENTATIVE: TATJANA ZAGORC AND PETRA MEDVED DJURAŠINOVIĆ
BUSINESS PLAN EXPERTS: RICARDO ALVAREZ AND JUAN ANDRÉS SALIDO (DNV GL) AND FRANCISCO PUENTE (ESCAN S.A.)

Mlekarna planika d.o.o.

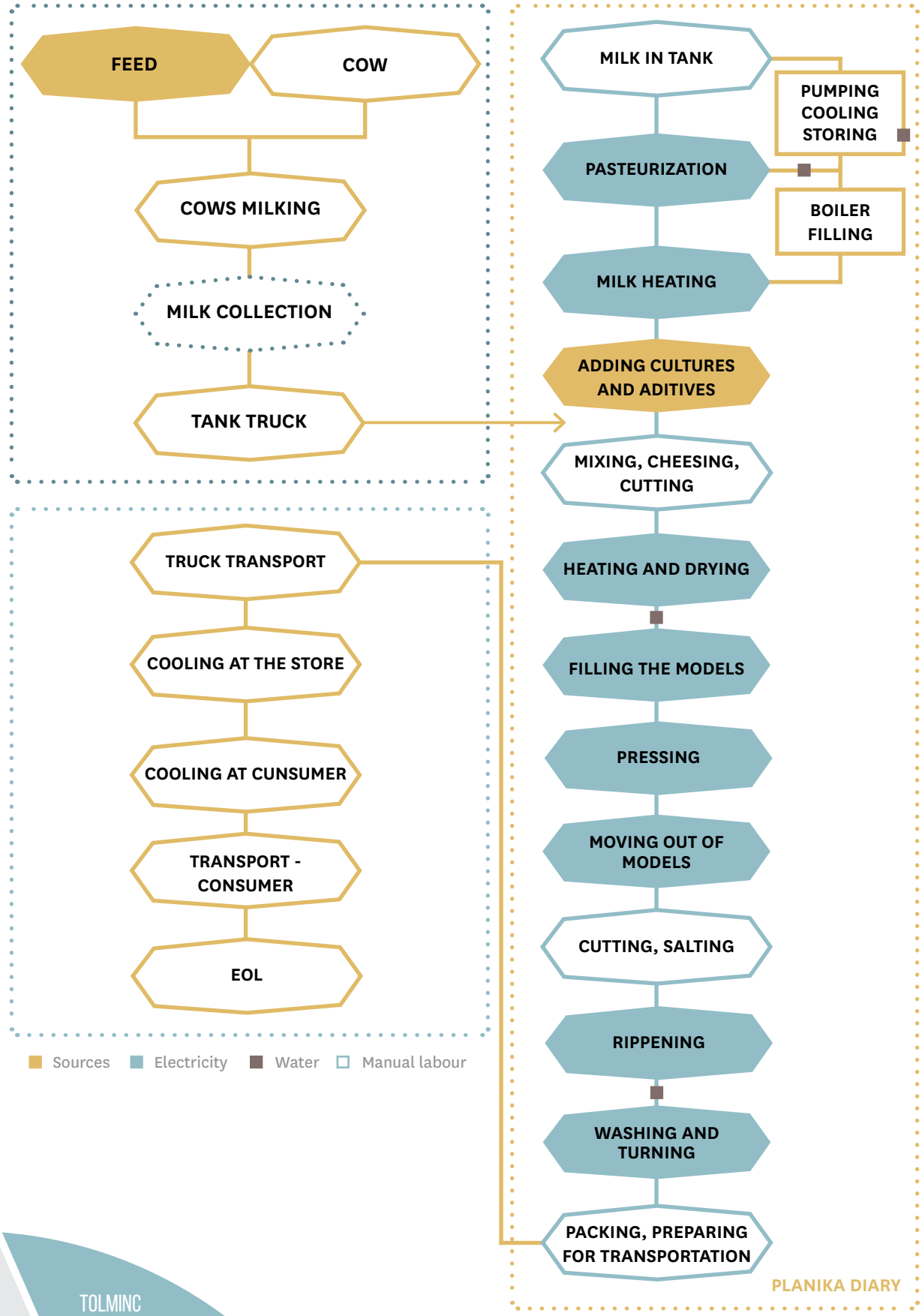
TOLMINC CHEESE

The dairy in Kobarid, Slovenia was built in 1957. The dairy started with cheese and later with the production of yogurt. Their products carry the energy of unspoiled nature, coming from the part of Slovenia, where the air is full of life energy, and nature is fairly beautiful and luxurious. Their desire is to give adults and children access to this important source of health and vitality.

The diameter of the Tolminc Cheese produced in Planika dairy is 25 cm and it is roughly 9 cm high. The weight of the loaf is roughly 4.5 kg may vary, depending on the size. This cheese has the tradition of 700 years. Tolminc cheese ripens for 60 days. It is sold with just a thin cardboard label; no foil is used to cover it. The cheese is produced from milk which is collected from 20 farms in the distance of 130 km every 2 days.

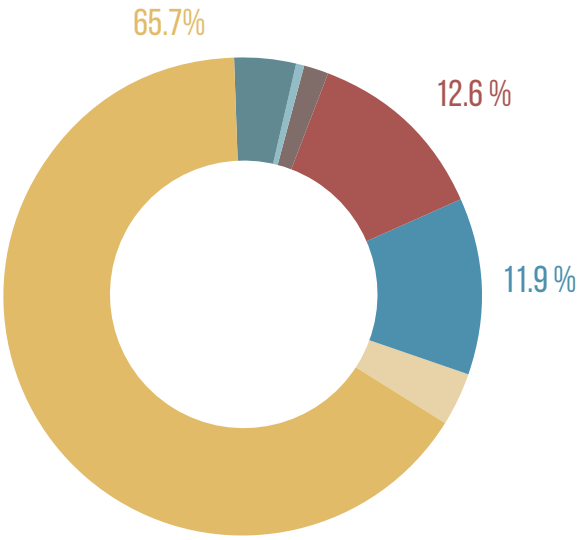
Tolminc cheese is specially certified as Protected designation of origin (PDO) and only a few farmers provide the milk for this product. The milk for Tolminc production is collected and treated separately.

In our case, the functional unit was 10 g of cheese Tolminc dry matter consumed at home as final product without cooking or further transformation. 16.7 g of Tolminc cheese is the reference flow needed to get 10 g of cheese Tolminc dry matter, which is the functional unit. 1.78 l of milk is needed to produce 16.7 g of cheese.



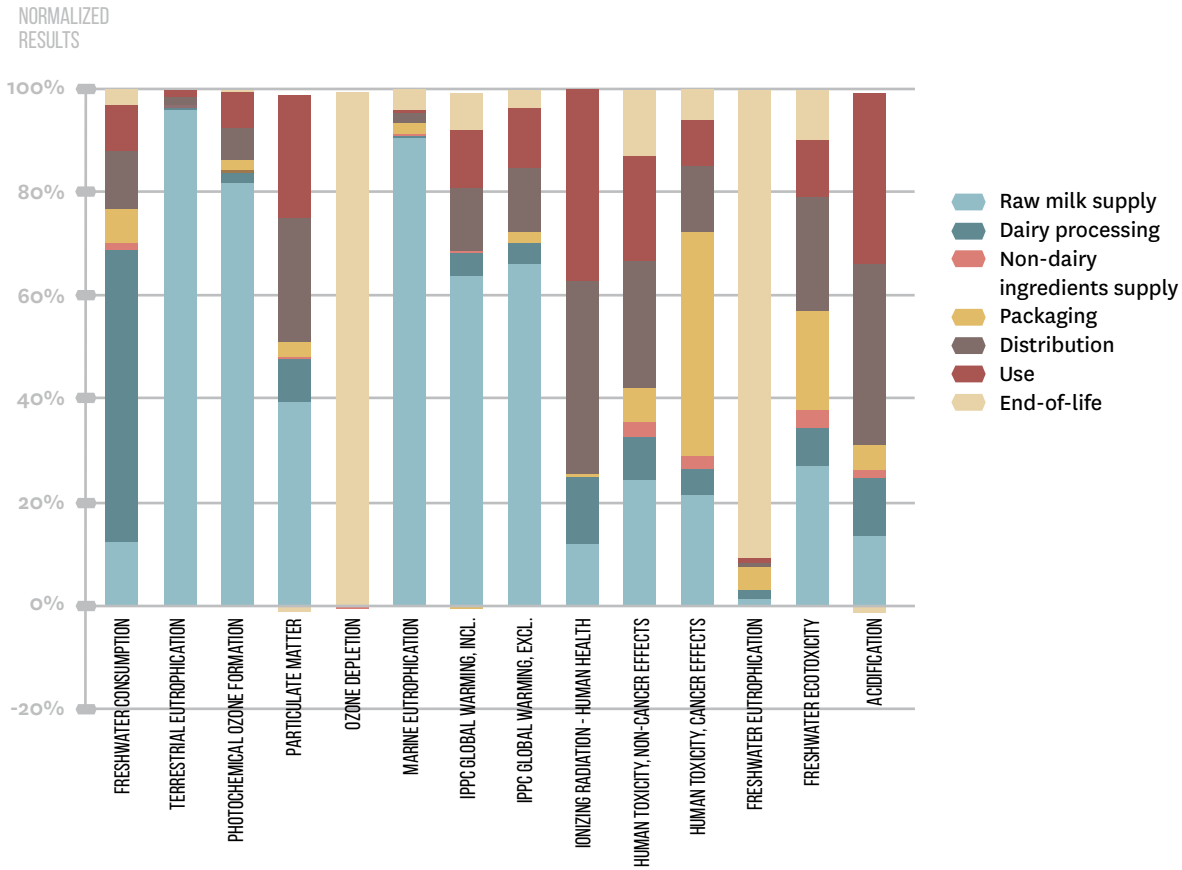
TOLMINC CHEESE IS SPECIALLY CERTIFIED AS PROTECTED DESIGNATION OF ORIGIN (PDO) AND ONLY A FEW FARMERS PROVIDE THE MILK FOR THIS PRODUCT.

THE MAIN RESULTS OF THE PEF STUDY



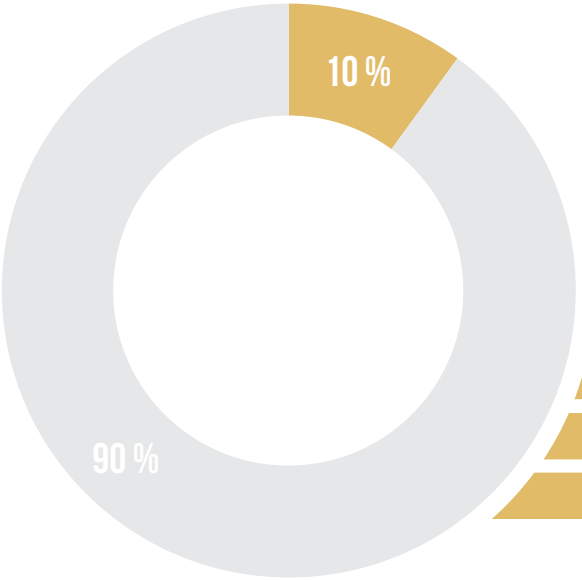
Climate change parameter calculated according to the IPCC global warming model excluding biogenic carbon shows, that Raw milk supply life cycle stage has the greatest impact by far (65.7%), followed by the Use and Distribution phases (~12% each). End-of-life and Dairy processing stages contribute as little as 3 and 4% respectively. Packing and Non-dairy ingredients are lower than 2% of the overall sum.

- **Raw milk supply**
- **Dairy processing**
- **Non-dairy ingredients**
- **Packaging**
- **Distribution**
- **Use**
- **End-of-Life**



In the stage of Raw milk supply, enteric fermentation and manure storage are most relevant processes, feed production is also relevant. In Dairy, energy and water use are most important processes, In the overall picture, Packaging, Use and End-of-life for cheese Tolminc are of minor relevance regarding environmental footprints. All transports are of middle relevance (they can always be improved). Regarding the entire system and life stages for cheese production, acidification is mainly caused by Distribution (35%) and Use (34%). Climate change is largely caused by Raw milk production (66%). Total freshwater consumption, including rainwater is mainly caused by Dairy processes (56%).

THE MAIN RESULTS OF THE SOCIO-ECONOMIC ANALYSIS



VALUE CHAIN – BIODIVERSITY

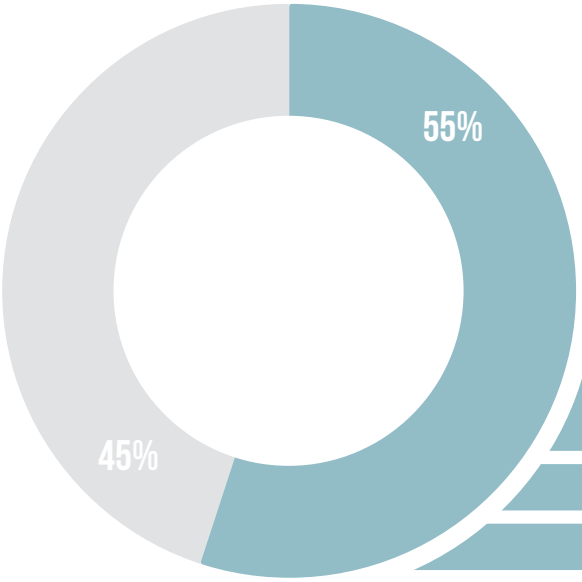
The company's contribution to the conservation and promotion of biodiversity was identified as one potential area of improvement.

CATEGORY: VALUE CHAIN

SUB-CATEGORY: BIODIVERSITY

RESULT: 10%

POTENTIAL IMPROVEMENT: 90%



VALUE CHAIN – INTEGRATION OF SUSTAINABILITY ON SUPPLY CHAIN

Regarding product's sustainability, examining the range of products, their design and the packaging, energy consumptions etc. could be useful in terms of improvement. With these activities the company will start monitoring the trends which will provide more appropriate information on whether the production techniques and controls are helping reduce the footprint.

CATEGORY: VALUE CHAIN

SUB-CATEGORY: INTEGRATION OF SUSTAINABILITY ON SUPPLY CHAIN

RESULT: 55%

POTENTIAL IMPROVEMENT: 45%

IMPROVEMENT OPTIONS

OPTIMIZATION OF MILK PRODUCTION USING THE ONLINE INFORMATION SYSTEM, CATTLE

The online information system, cattle, stores milk production data for farms. Farmers are regularly informed about the results by means of printed material, web application, e-mail or SMS message. The use of available services should be stimulated by awareness campaigns and educational action.

IMPROVEMENT OF NITROGEN USE EFFICIENCY THROUGH LOW EMISSION FARMING PRACTICES

Animal manure, a valuable source of nitrogen, is among the most important plant nutrients. Unfortunately, it is extremely mobile and can easily be lost into the environment, threatening water quality, air quality, climate, biodiversity and human health. For Slovenia it was estimated that around 20 % of the nitrogen excreted by farm animals is lost from barns and manure storage areas. About 20 % of the nitrogen retained during storage is lost in field application (in the form of NH_3). Leaching, runoff, nitrification and denitrification cause another 20 % of applied nitrogen loss from soils into water and air. Nitrogen loss from animal manure can be considerably reduced by various practices.

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POSITION PAPER

PEFMED MAIN RESULTS

The Product Environmental Footprint (PEF) method is a part of the European political agenda (and therefore of the Member States agenda) and it is an important instrument for implementing circular economy actions. There is a growing market request towards PEF and other product/organization footprints based on life-cycle approach (i.e. Carbon and Water Footprints), particularly in the agri-food sector. Furthermore, consumers have changed their behaviour, asking for clearer and more scientifically-based information about the sustainability of products and their producers.

In this context, the PEFMED project has successfully contributed to both promoting systemic eco-innovation in the Mediterranean agri-food chains and supporting a mind change towards the PEF approach, thus increasing the overall sustainability of the sector and providing companies with tools to communicate their efforts and results in a robust and trustworthy way.

With the help of a multidisciplinary team of experts and the guidelines and tools developed and tested during the project, the PEFMED method, which is one of the main results of the project, supports companies through the entire eco-innovation process, leading to a continuous improvement of the environmental and social performances of the product's life cycle and the entire supply chains. The first step of the method is the application of the PEF and SE-KPIs tools to identify environmental and socio-economic hotspots along the supply chain. Furthermore, sector experts suggest technical and managerial improvement solutions, and regional/national financial measures are identified to support their implementation in cooperation with Smart Specialization Strategies (S3) managers. After sharing these results with a company, a Sustainable Business Plan is delivered, describing the improvement solutions integrated in the company strategy, with timing, costs and benefits.

The PEFMED method was tested in nine companies in six European Mediterranean countries producing final products (which have tested the SE-KPIs tool as well) and included the suppliers of a total of fifty-six enterprises. The application of the PEFMED method to both large and small companies belonging to supply chains with specific characteristics and located in different territories of the Mediterranean region allowed a comprehensive evaluation of its effectiveness in different contexts, its strengths and achievable advantages.

Moreover, two specific seminars were organized during the project with the environmental experts responsible for the PEF studies in order to present the PEFMED method and to find solutions for common critical issues. At the end of the pilot phase, a transnational boot camp was organized in Lisbon to define the modalities to transfer the PEFMED method to new nine clusters/supply chains, by means of a knowledge vouchering activity addressed to industrial

associations and clusters/supply chains managers.
Pilot results were disseminated to the sector through different initiatives to increase awareness, to guide a mind change in the traditional agri-food production system towards both circular economy and PEF approaches, and to support the S3 goals. About 200 agri-food companies participated to the dissemination events (PEFDAYS), the training sessions (knowledge vouchering) and the transnational workshops organized in France, Italy, Spain, Slovenia, Greece and Portugal.

In addition, S3 managers have been involved from the beginning of the project by agri-food national Federations to connect regional policies and related financial measures with the pilot results, in order to identify opportunities and needs. The cooperation amongst agri-food federations from different countries established in the project was important also from another perspective, since agri-food Federations could have a major role in disseminating, creating awareness and training on PEF-related topics within each regional context. Two transnational roundtables with S3 managers and supply chains/clusters managers of the six Mediterranean countries were organized in Madrid and in Lisbon respectively, in the beginning and in the end of the project to share project goals and results. National roadmaps for France, Italy, Slovenia, Greece, Spain, and Portugal were developed in cooperation with national policy makers (in particular S3 managers) with the aim to both extend the PEF method to new Mediterranean agri-food supply chains and clusters and favour SMEs eco- innovation.

Finally, the test of the PEFMED method during the pilot phase led to the development of tools and documents (available on PEFMED website and PEFMED Wiki platform) which could support in particular SMEs, but also agri-food Federations, consultants and policy makers, to facilitate further dissemination of the PEF approach into the sector:

- A "Joint protocol for the business exploitation of territory PEF-compliant eco-innovation standards", which intends to be a "guide", including several aspects of a Business Plan (product to commercialize, costs and benefits, SWOT analysis, marketing aspects, etc.) and proposes a method to develop a Sustainable Business Model, where positive and negative environmental-social-economic impacts are integrated into business.
- The SE-KPIs tool and the tool for calculating PEF for olive oil and packed water targeted to SMEs and user-friendly that require an initial support by consultants, but afterwards they can be used autonomously by the companies and in a combined way, as a part of the company management strategy.
- A Wiki web-platform to facilitate sharing and transfer of knowledge in highly accessible and visible manner. It contains more than 60 environmental best practices (mainly technologies) in the agri-food sector identified by the Partners during the project and highlighted from the pilot results.

INSIGHTS FROM THE PEFMED EXPERIENCE

The application of the PEFMED method in the pilot companies allowed for them to evaluate their strengths and weaknesses, as well as to highlight some possible future improvements and companies' needs. The following considerations are based on the feedbacks provided by the different stakeholders involved in PEFMED pilot actions (companies, environmental experts, sector experts, S3 managers, policy makers, cluster/supply chain managers, and agri-food Federations), who had the opportunity to meet and exchange their experience in Lisbon during PEFMED Transnational Round Table and the Leadership and Changeover workshop, held on 28th November 2018.
The following factors led to a successful application of the PEFMED method in the pilot companies:

- the integration of PEF with socio-economic indicators;
- good cooperation and knowledge sharing among environmental, sector and business plan experts, who worked together to support the whole process;
- the commitment by most of the company managers and in case of large companies (e.g. in Greece) this was a driver to involve the smaller ones of the supply chain;
- the development of the Sustainable Business Plan, the contents of which can complement the companies' strategies;
- the possibility to communicate, after external verification, the relevant impacts of the product's life cycle and the related improvement plans (environmental and socio-economic) to consumers, suppliers, and other stakeholders;
- an opportunity, as a result of the applied method, to stand out among competitors and to drive a mentality change in the management of companies' environmental impacts.

According to the project pilot experience, on one hand, PEF can be a powerful diagnostic tool for agri-food companies and can lead to several advantages:

- It provides a global overview of the product system, i.e. the supply chain and connected activities (e.g. waste treatment processes).
- It enables the identification of the environmental hotspots through the application of a common methodology defined in the relevant Product Environmental Footprint Category Rules (PEFCRs).
- It encourages a better cooperation of the supply chain enterprises, especially SMEs.
- Being customized for a specific product group a product group, it allows for the measurement, improvement, and communication of all relevant environmental impact categories and, in particular, the Carbon Footprint, which is well known by consumers and

suppliers.

- It supports comparability among products of the same category and with European benchmarks and raises traceability and monitoring of environmental aspects along the supply chain.
- If it became a certification scheme, the communication to customers and public would have common rules in Europe and would be a competitive factor in exports and trades.
- It could provide a common framework to harmonize available environmental tools, methodologies, labels on the European level.

On the other hand, PEF was found too complex to be used by companies, and its application framework is still uncertain. Some drawbacks are highlighted here below:

- PEF application was difficult and time consuming, in particular for SMEs, due to some methodological issues still unresolved and because it requires data which is not always available (in particular those of the suppliers). Large companies can involve their suppliers more easily and once collected for the first time, the data can be updated smoothly; however, for SMEs this is not always the case. Moreover, PEF is quite expensive for SMEs because it frequently requires external expertise. Therefore, at present, only large companies can take advantage of it.
- A robust expertise and practice on both Product Environmental Footprint and agri-food sector was required by consultants involved in the PEF studies.
- A large quantity of secondary data must be used, which is not representative of each national situation. Furthermore, also at a country level, major differences among different types of companies can exist, e.g. between small and large farms, which can significantly influence the results.
- PEFCRs are not in the final version for all product groups and sometimes they do not include all product types of the same category (e.g. the PEFCR for dairy products is only related to cow milk products and thus is not applicable to sheep and goat cheese).
- A further difficulty was that PEF-compliant datasets have not been implemented in all LCA softwares yet. This aspect did not enable a correct comparison among similar products and with the benchmarks.
- The future of PEF in the different European countries is not clear and long procedures are still needed for improving the PEF method and for the development of PEFCRs. Consequently, slow application and dissemination are envisaged.

At this stage of the PEF development, companies and interested stakeholders can contribute to the improvement of the methodology by participating in the EU Technical Advisory Board on PEF/OEF and in the PEFCRs working groups. The PEFMED project contributed to this issue with the development of a "Feedback document on PEF testing phase in Mediterranean agri-food product chains", which was delivered to the EU Technical Advisory Board and contains technical feedbacks from both PEFMED pilots and two LIFE EU projects which tested the same product groups: TTGG – The Tough Get Going and EFFIGE – Environmental Footprint For Improving and Growing Eco-efficiency.

CONCLUSIONS

Three main needs have been highlighted from the project pilots for a wider use of the PEF method:

- final PEFCRs to guarantee comparability and equal opportunities to all European products;
- simplified tools for PEF application by companies;
- availability of datasets specific for the Mediterranean area.

On one hand, the PEF application opportunities could be higher if a certification or labelling scheme was developed (e.g. Italy approved the national "Made Green in Italy" environmental certification scheme in 2018, based on PEF) and if its use become mandatory or, at least, more regulated by the Member States.

On the other hand, PEF cannot be always applicable by agri-food companies (farms and small agri-food companies in particular) because other priorities, i.e. economic constraints and legal obligations, and the need for financial and technical support, in particular when the applicants are SMEs. In addition, other widely known schemes and labels, e.g. Carbon Footprint are available for the sector and companies are not always aware of motivation for using PEF other than that.

Moreover, financial and supporting measures are strongly needed such as funds for PEF application in SMEs (e.g. consultancy vouchers), training courses for consultants and companies involving the supply chains, helpdesks at local level, and networks for spreading best practices related to PEF application in the agri-food sector.

Based on a more robust and easier application of PEF, the PEFMED method could then be a smooth way to complement environmental and socio-economic aspects within the company strategy and operations.

In conclusion, with the support of regional policy makers and political choices which enable the increase of PEF scientific robustness and significance, the transfer of the PEFMED approach, particularly through the agri-food Federations could lower the sector's environmental and socio-economic impacts and improve the companies' response to consumers' needs, expand the market for green products and circulate economy initiatives.

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