The EU yeast sector and its carbon footprint

An overview of the greenhouse gas emissions of the yeast sector in the European Union in 2020

Evaluated by **Blonk**
at the request of **COFALEC**

June 2023

COFALEC
CONFEDERATION OF EUROPEAN **YEAST** PRODUCERS

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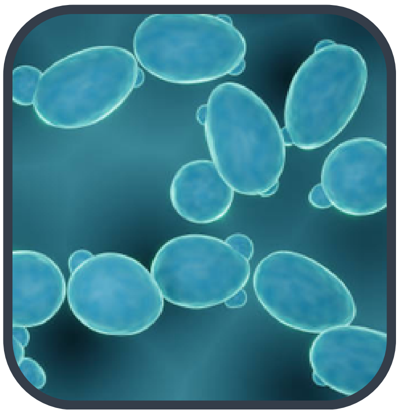
Summary and Presentation of the study

Facing the strategic challenges of climate change, the European Union intends to become the first climate neutral continent by 2050, with an important first step of a 55% reduction of greenhouse gas (GHG) emissions in 2030 compared to the 1990 levels.
COFALEC fully supports the ambition towards climate neutrality by 2050, alongside FoodDrinkEurope, taking an active part in the effort of European industries to improve their carbon footprint.
To be able to reach this goal, we decided to accurately and comprehensively measure our carbon footprint for all 3 emission scopes, and in particular scope 3 which represents an important part of emissions in the agri-food sector.

This GHG data collection was conducted for the year 2020, by Blonk, an independent cabinet. This study was based on an internationally recognized method, the GHG Protocol. The yeast sector has always been very conscious of the necessity to care for the environment, treating its waste waters as early as 1935. A first study was carried out in 2011 with PwC, upon request of COFALEC members, to measure the product carbon footprint of yeasts through a life cycle assessment (LCA) (limited to the GHG emissions assessment only). This initiative enabled us to evaluate the carbon footprint of each kilogram of the 3 types of baker's yeast placed on the market (liquid, compressed and dry).
This new study is an advance on the path towards a cleaner, more sustainable industry, by providing our sector with the tools necessary to measure its carbon footprint and adequately adapt and progress in the future.

What is yeast?

Yeast is a **single-cell microscopic fungus (*Saccharomyces spp.*** in bakery application*)*. Indigenous yeasts have been used by humans for millennia. At the dawn of the 20th century, European yeast producers succeeded in domesticating them and mastering their breeding to make products of high quality. In recent years, this industry has taken a turn beyond the traditional use of yeasts in bread-wine-beer making, and now offers key solutions for both human and animal health & nutrition as well as sustainable agricultural and ecological practices.



The EU Yeast sector can contribute to a climate-neutral Europe

Yeasts and their products can help improve the sustainability of the food chain

Yeasts and yeast-related products are interesting tools that can help for the transition towards a more sustainable food chain, contributing in many ways to a cleaner and less carbon-intensive food industry. By supporting the efforts of our various customers, we also take an active part in the EU's Farm to Fork strategy towards a greener economy.

- Yeasts are essential for the production of bioethanol, contributing to cleaner energy in the EU. **Advanced biofuels** produced from the fermentation of waste and biomass residues are a major ally in decarbonizing transport, without competing with food or feed resources.
- Yeasts can help contribute to the sustainability of **aquaculture and livestock farming**. For example by improving Feed Conversion Rate (FCR) or Feed Efficiency, they improve animal performance. They also contribute to maintain animal health, which in turns helps reducing the need for veterinary medicinal treatments such as antibiotics.
- **In crops and plant production**, yeasts contribute to the reduction of chemical pesticide use through biocontrol and biostimulation alternatives.
- As an alternative to synthetic chemicals, natural products such as yeasts products can contribute to the **sustainability of viticulture** increasing grapes yields and quality. In wineries, the use of natural selected wine yeasts and yeast products help secure fermentation, optimize wine production and quality, and can also help better manage energy demand for wine making.
- Yeasts are an alternative **protein source**, that can be used in meals as a substitute for animal protein, with a potentially smaller carbon footprint.
- Yeasts have growing potential as an asset in the development of bioeconomy, especially through **precision fermentation**. Some yeast strains could be used as biological factories to produce a wide range of food ingredients, such as dairy protein, palmitic fatty acids...

Yeasts and yeast products can be an important asset in the EU food chains, associated with significant benefits, for both **reducing the carbon footprint and contributing to healthier foods and diets.**

Method and scopes

An assessment based on the GHG protocol,
an internationally recognized method

Method

- GHG monitoring performed for **a reference year: 2020**.
- **Coverage of this project:** 5 companies, 21 factories, producing 95% of live yeasts in the EU.
- **Boundary set at the factory level:** all activities associated with producing, processing, and managing co-products and wastes of live yeasts, and, if applicable, other yeast-related (co-)products.
- **This study has been performed according to the GHG protocol GHG emission source classification,** and covers the **3 Scopes:** scope 1, 2, and the relevant* emission sources for scope 3.
- **Six greenhouse gases monitored**, as listed in the GHG protocol: carbon dioxide (CO_2) methane (CH4); nitrous oxide (N2O); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs) and sulphur hexafluoride (SF6). The result of the GHG monitoring is expressed as carbondioxide-equivalent (CO_2eq) emissions.
- **Biogenic CO2 is not taken into account in the data collection,** since they should be reported separately from the scopes, according to the GHG Protocol.

* *According to the cut off criteria: <5% of the total weight of all input materials*

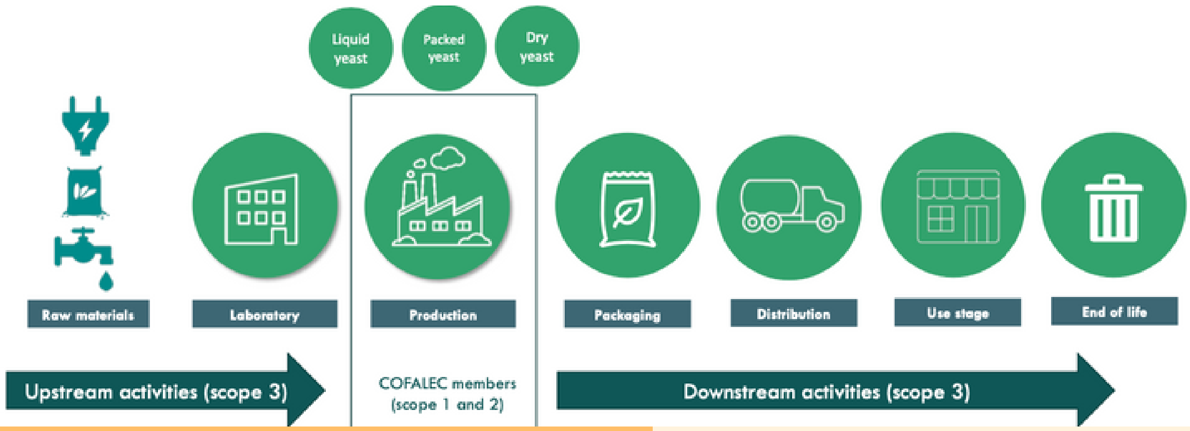
Scopes

Scope 1	Scope 2	Scope 3
Direct emissions from the company (owned and controlled resources)	Indirect emissions from heat and electricity (purchased energy)	Upstream and downstream emissions (not directly controlled) 5 most relevant* items out of 15 categories

The GHG protocol is used as a main methodological reference but specific choices, and boundaries are set in this project that are not fully compliant to the corporate GHG monitoring requirements as set in the GHG protocol.

Methodological references used:

- GHG Protocol Corporate Accounting and Reporting Standard (WRI/WBCSD, 2004);
- GHG Protocol Scope 2 Guidance (WRI/WBCSD GHG Protocol, 2015);
- GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard (WRI/WBCSD, 2011);
- GHG Protocol Technical Guidance for Calculating Scope 3 Emissions (WRI/WBCSD, 2013).

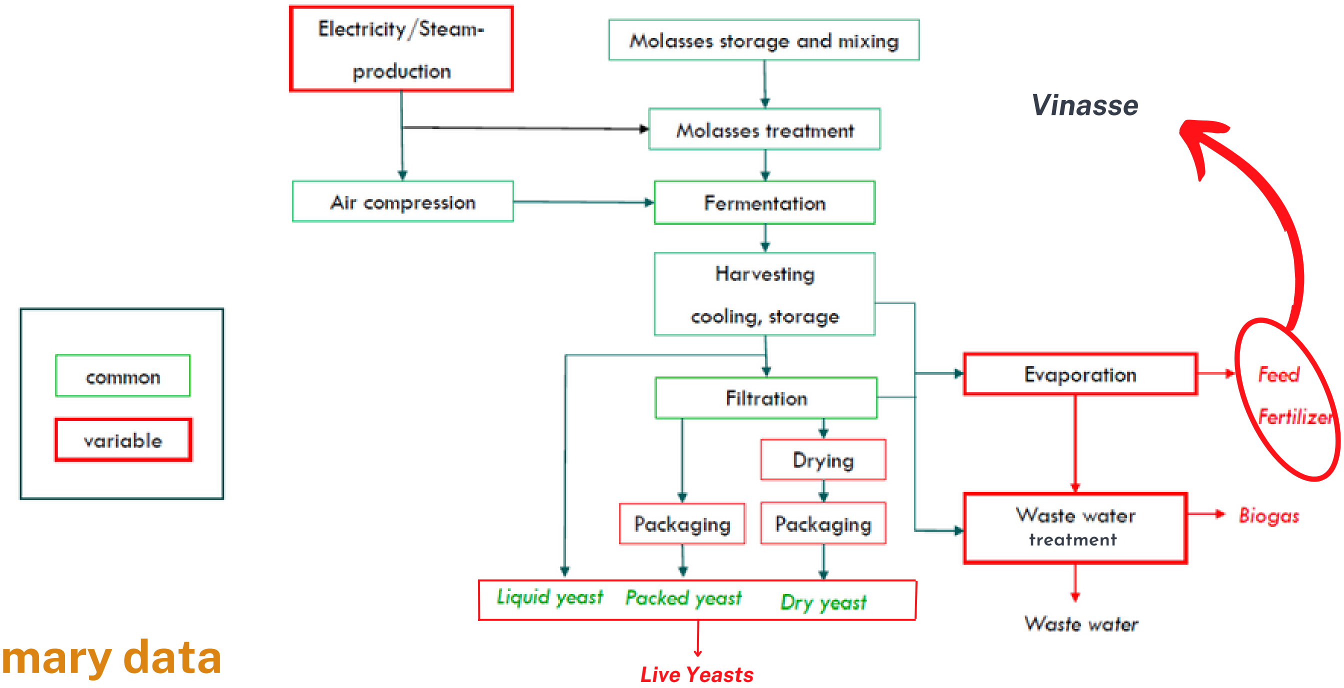


Data collection (1)

A focus on gathering as much primary data as possible

Representation of the processes at a yeast production site

The production process of yeasts has been modeled as follows:



Primary data

Primary data was prioritized and collected as much as possible, exclusively using secondary data when the primary was not available. Primary data was collected for the following processes on production sites for all elements with a volume above the cut off criteria in volume* :

- **Raw materials** : molasses and other sugar co-products, starch (volume used by origin of the crop)
- **Chemicals and processing aids** : N-sources, P-sources, salts, and vitamins (by origin and type of transport)
- **Energy** : amount per type of energy consumed.
  - purchased and/or produced electricity
  - fuel use for electricity and/or heat production
  - purchased heat
  - other energy sources (e.g., for own vehicles).
- **Packaging** : amount used per type and origin
- **Waste** : treatment type and amount per type of waste (solid waste and water effluent)
- **Refrigerants** : type and amount of leakage
- **Output products** : types and amounts produced

** Cut off criteria: <5% of the total weight of all input materials*

Data collection (2)

Secondary data and GHG emissions calculation

Secondary data and characterization factors

GHG emissions from yeast production are not directly measured but calculated from the activity of each production location. The different inputs and activities from yeast production are associated to an emission factor that relates those inputs to an amount of CO_2eq per amount of material used (kgCO_2eq/kg) or per amount of energy used (kgCO_2eq/MJ).
In all cases, **the emission factor considers all associated emission in the life cycle of a product.**
In general emission factors for the different processes are derived from commercial LCA databases like Agri- footprint 5.0 and Ecoinvent 3.8.
The emission factors used in the COFALEC study are based on economic value allocation.
To evaluate the release of all GHG emissions against a common measure, the GHGs are reported in terms of equivalents. **To calculate the CO_2 equivalents for each GHG, a characterization factor is used for the global warming potential (GWP)** which measures the radiative forcing of the different GHGs* over a certain period of time. For example, the characterization factors are 298 for the nitrous oxide (N20) and 34 for methane (CH4). This means that 1kg of N2O emissions has the same global warming potential over 100 years as 298 kg of CO_2 emissions (expressed as 298 kg CO_2 eq.).

** In this study, the GWP of GHGs are based on the 5th Assessment Report (AR) of IPCC 2013. The GWP is assessed within a 100-year time horizon including climate carbon feedback.*

GHG emissions calculation

A mix of primary and secondary data are used to calculate the GHG emissions of COFALEC's live yeast production in the European Union.
In general, for each item, the amount provided by the company (primary data) is multiplied by the corresponding emission factor (secondary data). The emission factor represents the GHG emission associated to that particular input in kg CO_2 eq.

Overview of GHG emission calculation categories and corresponding scopes

Category	Emission factors	Scope
Raw materials	69 countries and crop-specific factors	Scope 3: production of raw materials
Chemicals and processing aids	53 emission factors	Scope 3: production of chemicals and processing aids
Energy	71 emission factors	Scope 1: combustion of fuels Scope 2: purchased heat and electricity Scope 3: production of fuels
Packaging	17 emission factors	Scope 3: production of packaging materials
Waste	27 emission factors	Scope 1: on-site emissions from wastewater treatment and discharge of water effluent to surface water Scope 3: external waste(water) treatment
Refrigerants	15 emission factors	Scope 1: on-site emissions from refrigerant leakage Scope 3: production of refrigerants
Transport	1 for each of the 5 types of modalities	Scope 3: third party transport

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The yeast sector in the EU food & drink industry

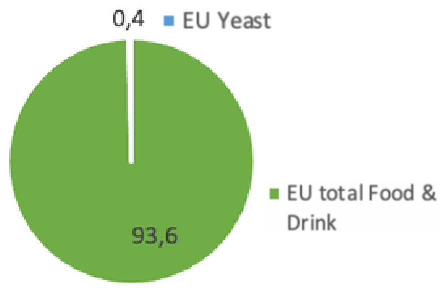
Slim emissions of the EU yeast sector compared to the global EU Food and Drink Industry

Share of the yeast GHG emissions in the Food and Drink industry

With 0,4 million tonnes (Mt) of GHG for scope 1 and 2, the EU yeast sector represents only 0.4% of the total GHG emissions of the EU Food and Drink sector.*

** Source : RICARDO study, July 2021: "Decarbonisation road map for the European food and drink manufacturing sector", a report for FoodDrinkEurope*

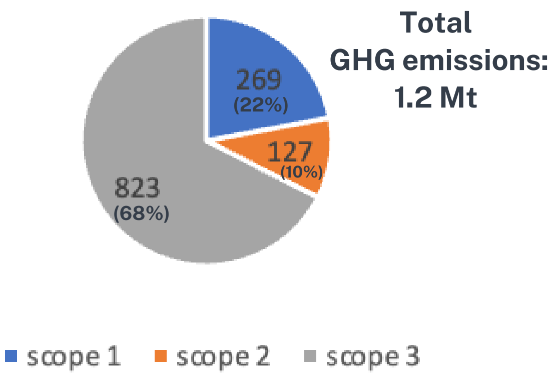
Scope 1 & 2 GHG emissions of the Food & Drink sector in the EU in Mt



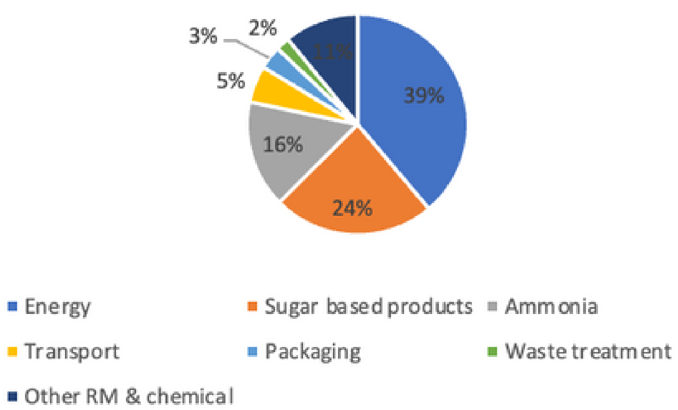
Global view of the EU yeast industry carbon footprint

- **The total GHG emissions of the EU yeast sector in 2020 represented** 1.2 Mt for the production of 1.1 Mt of yeasts and its coproducts (vinasse).
- **What we control** : the scopes 1 & 2 represented 32% of the total GHG emissions of our sector.
- **Scope 3,** the emissions that are not directly owned by the sector, represent the vast majority of its total GHG emissions : 68%.

EU yeast GHG emissions by scope in 2020 *(in CO2 eq. in kilo tons)*



Major GHG emissions sources *(in % total GHG emission on all 3 scopes)*



Yeasts related output products

EU yeasts related output products in 2020 (in volumes as is):

- Live yeasts ≃ 700 KT
- Inactive yeasts ≃ 35 KT
- Vinasse ≃ 385 KT

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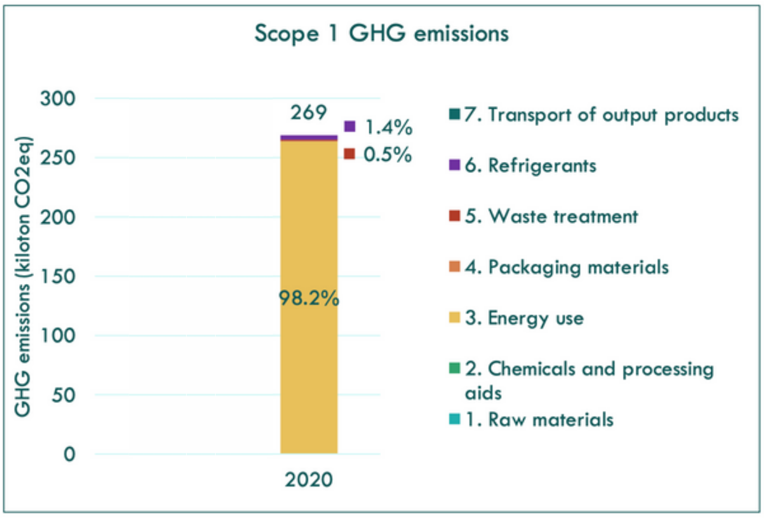
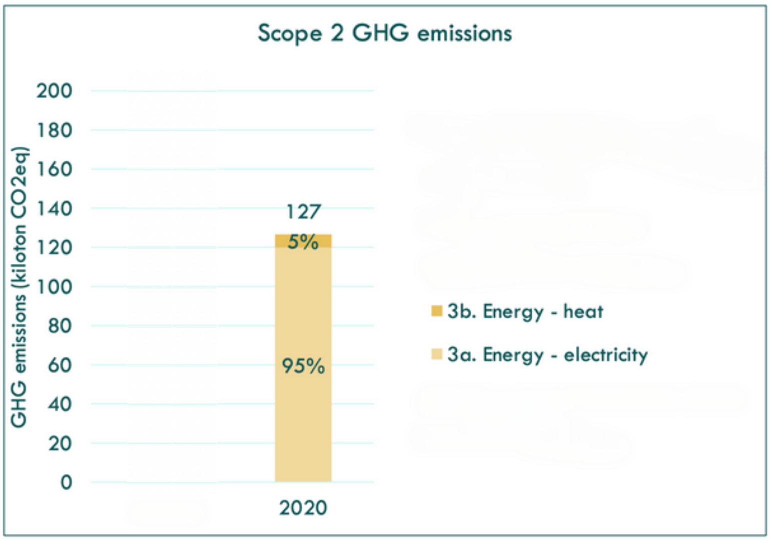
Key figures by scope

Key figures on the GHG emissions of the EU yeast sector
Focus on scopes 1 and 2

Focus on scope 1

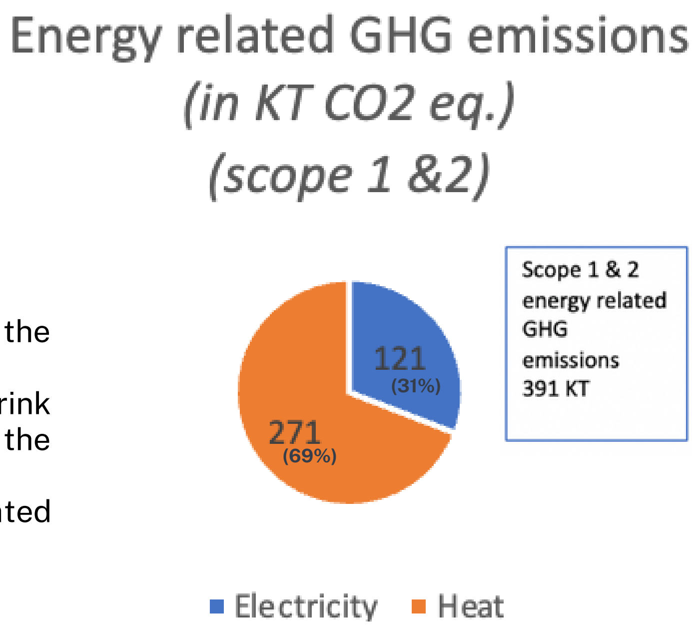
- Hotspot is energy use (98%) and these emissions are caused mostly by on-site production of heat and steam.
- Other scope 1 GHG emissions are related to refrigerant leakage (1.4%) and on-site wastewater treatment (0.5%).





Focus on scope 2

- Scope 2 GHG emissions are related to purchased energy use: electricity (95%) and heat (5%).
- This number is highly variable from site to site, depending on the electricity production sources.



Focus on energy-related emissions

- The energy-related emissions represent 38.8% of the total GHG emissions (on all 3 scopes).
- Energy in scope 1 & 2 : as in many Food and Drink sectors, heat represents an overwhelming part of the energy carbon footprint (69%).
- Electricity weights 31% of the energy-related emissions.

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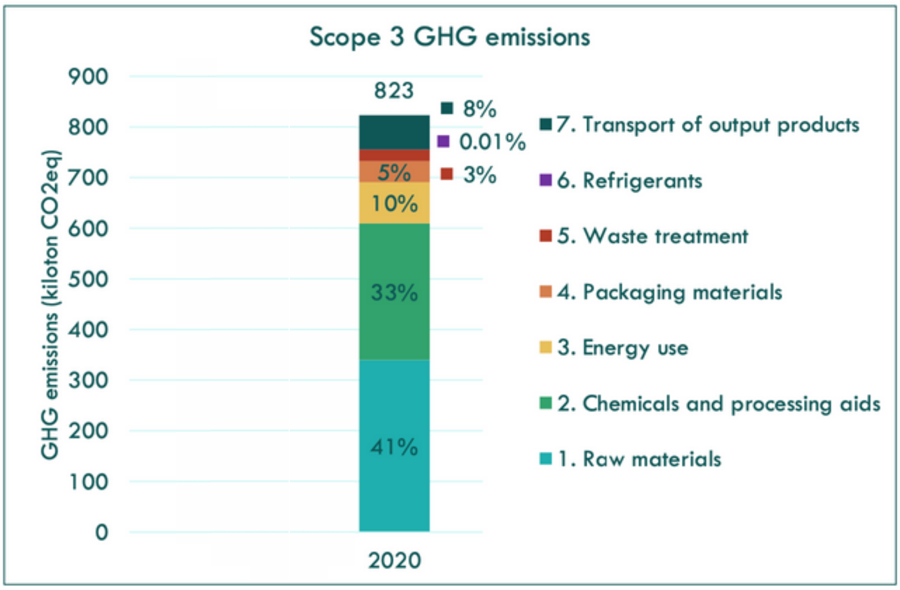
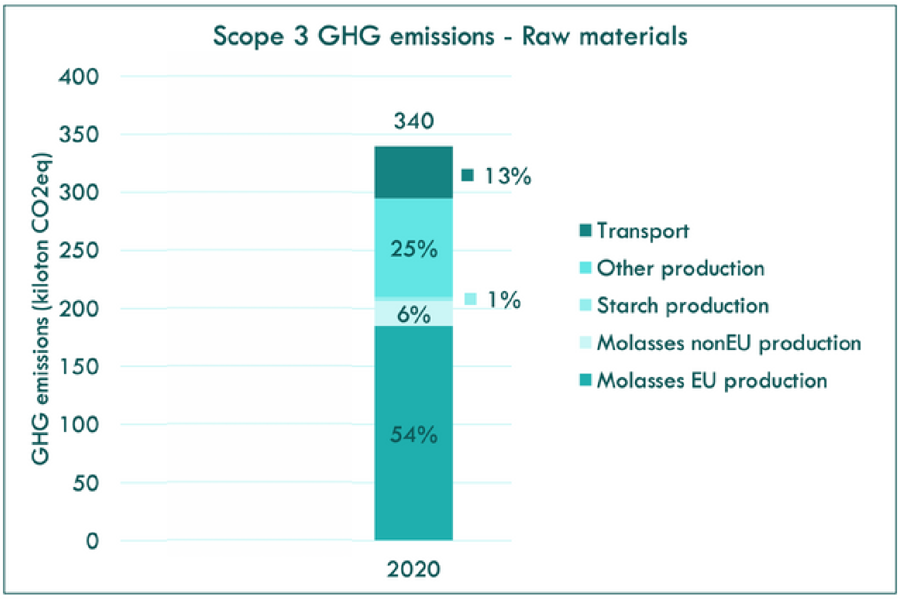
Key figures by scope (2)

Key figures on the GHG emissions of the EU yeast sector
Focus on Scope 3

Focus on scope 3

- The hotspots are raw materials (41%) as well as chemical & processing aids (33%).
- It covers both the production and the transport of these raw materials.
- Chemicals alone represent 22%.





Focus on scope 3 Raw materials

Hotspot is the production of molasses in the European Union (54%) as well as the other sugar sources used, Low-Green Syrup and raw sugar (25%)

Reminder: *total sugar based products represent 24% of total GHG emissions (scope 1, 2, and 3), of which molasses (EU + non EU) represent 17%.*
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What is next for COFALEC

A proactive sector, eager to accelerate its decarbonation

Policy support measures

COFALEC members share the ambition to reach climate neutrality by 2050, by developing a more sustainable and carbon-neutral value chain. Practices and technologies that are required to decarbonize our sector entail important costs and challenges, that our investments alone can hardly cover. For this reason, COFALEC calls for the attention of policy-makers and institutions to provide necessary support and funding, for example through research and development programmes encouraging innovation and the implementation of technologies, in order to guide the necessary changes for a greener future.

Lessons learned and next steps

As a proactive sector on the question of decarbonation, the EU yeast industry has taken the initiative to measure its carbon footprint as accurately as possible, taking all elements and scopes into account. This enables us to contribute in the global efforts towards a climate neutral future, providing our production sites with an efficient measuring tool to identify hotspots and potential points of improvement.

Through this study, we have identified the areas where more efforts are needed to decrease our sector's carbon emissions.

The assessment highlighted that our carbon footprint for scope 1 and 2 essentially stems from energy-related emissions. We are currently targeting them through investments promoting the energy efficiency of the production process and the use of renewable energy.

The accuracy and novelty of our assessment resides in the attention given to scope 3 emissions, making it especially relevant to tackle these emissions. Given the importance of emissions in scope 3, representing 68% of our total emissions, and in particular those related to our raw materials, sugar co-products, it is essential for us to work in close collaboration with our partners across the value chain to reduce significantly our carbon footprint in alignment with the EU ambitions.