AMORIM

Natural Cork Stopper Carbon Footprint

Amorim Cork, S.A
Executive summary
September 2022

pwc

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Introduction

About the study

Context

- Corticeira Amorim is the largest world producer of cork products. The company has conducted life cycle analyzes of various products over the years, with the purpose of evaluation of the impacts of the products in terms of carbon, during all stages of its life, from the extraction of natural resources to final waste processing.
- The main purpose of this study is to quantify the environmental impacts of natural cork stoppers, namely the Naturity stopper, versus aluminium and plastic closures on the UK market of wine, yet in this report are only presented the carbon footprint results. This study is an update of a similar study performed in 2008.

Objectives

- To identify opportunities to improve the environmental performance of cork stoppers.
- Understand the contribution of each production phase to the total footprint, in order to identify most relevant areas.
- Identify opportunities to improve the environmental performance of the natural cork stopper.

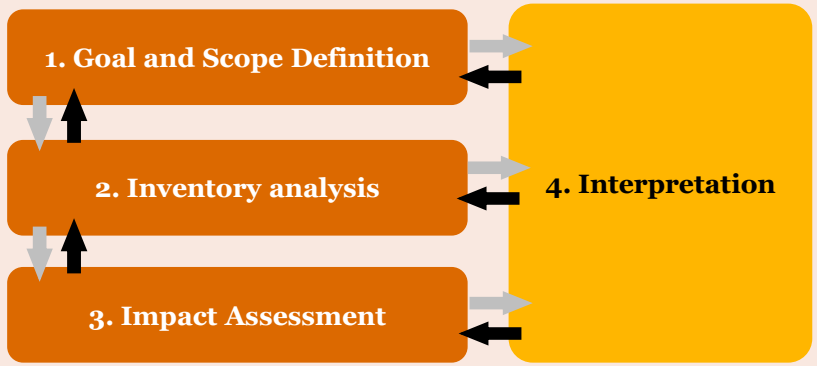
Product analysed

Product characteristics	
Name	Natural cork
Producer	Amorim Cork
Place of Production	Portugal – Santa Maria de Lamas
Dimensions (mm x mm)	45 x 24
Weight (g)	3.87
Composition	100% Cork

About the study

Methodology

- The carbon footprint presented in this report was developed according to the guidelines of Greenhouse Gas Protocol (GHG), developed by the World Business Council for Sustainable Development and the World Resources Institute.
- The methodology used is life cycle analysis (LCA) based, taking into consideration ISO 14040 series of standards and supported by estimated data from operational units, and also from bibliographic sources, complemented using the Ecobilan LCA database and PwC's specific life cycle analysis software – TEAM ®.
- The results presented are not third-party verified.



- The methodology used in emission accounting is based on emission factors and activity data provided by, using the following equation:

$$GHG\ Emission = Activity\ data \times Emission\ Factor$$

- Cork integrated into the product natural cork stoppers constitutes a carbon sink.
- Emissions from biomass energy production are considered neutral, according to GHG Protocol.
- The additional scenario considering carbon sequestration associated to cork oak forests is based on data from well-managed forest with a high tree coverage and good soil and climate conditions, reaching a maximum of 14,7 t CO_2 /ha, corresponding to 73 t CO_2 /t of cork extracted[1].

[1] Study led by researcher Ana Claudia Dias from the Department of Environment and Planning and CESAM reveals that the cork industry helps mitigate climate change (available at http://www.cesam.ua.pt/?menu=1251&language=eng&tabela=post)

About the study

(cont.)

- **Approach:** Cradle-to-Grave (from raw material extraction to the end-of-life of the product).
- **Life cycle stages assessed:** Production of raw materials, Transport of raw materials, Production of closures, Transport of closures, Bottling, Use of closures and End-of-life. Activity information was gathered from Amorim Cork until the Bottling stage.
- **Functional Unit:** a standard bottle of wine bottled sold on the UK market.
- **Reference flow:** The results are given per 1000 closures.
- **Modelling software and database:** TEAM™ software, Ecobilan database and data provided by Amorim Florestal and Amorim Cork (units Equipar and Distribution).

About the study

Wine closures model

Cork

- Raw materials production
- Raw materials treatment
- Stoppers production and finishing

- All the transportation to the production process to the bottling centers

- PVC Cover

- **Stopper end-of-life scenario**: 98.8 % landfilled; 1.2% recycled

For the purpose of the present study, it was assume the worst scenario for the Naturity stopper

Delimitation of system boundaries – list of excluded life cycle stages

Due to lack of information in the public domain	• Paints used in PVC covers • Energy consumption in bottling activities
Due to methodological reasons	• Final destination and transportation of wastes • Transport after the bottling site
Due to having negligible impacts	• The construction of buildings on industrial sites and fabrication of tools and machines • The transport of workers related to the extraction of raw materials • Energy consumption in administrative areas and laboratory

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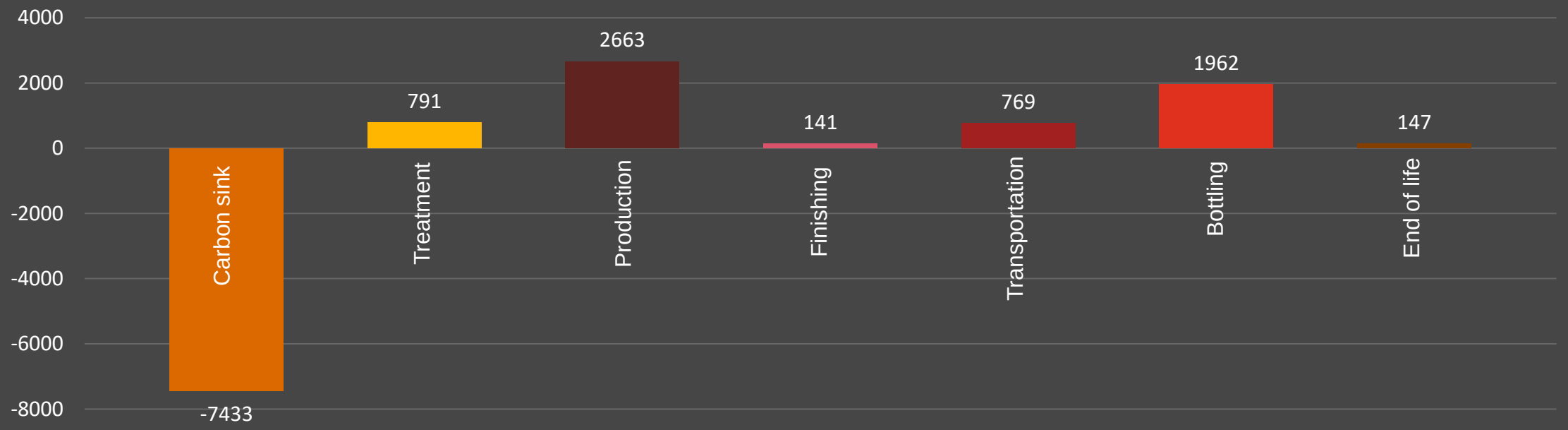
Carbon Footprint Results

Carbon Footprint Results

g CO2 eq. / 1000 stoppers



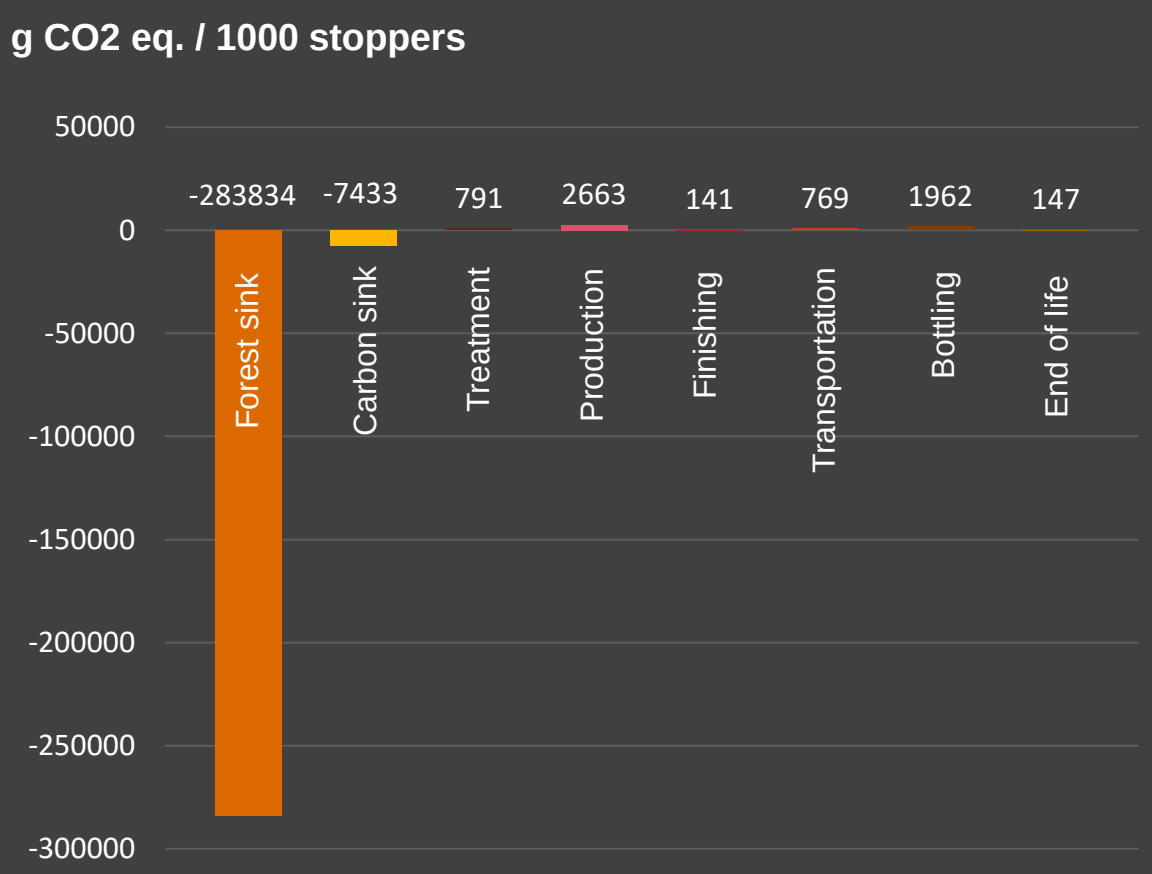
Total Cradle-to-gate Natural cork stopper: **- 3.8** g CO_2 e/stopper

Total Cradle-to-gate + distribution to UK Natural cork stopper: **- 3.1** g CO_2 e/stopper

Total Cradle-to-grave Natural cork stopper: **- 1** g CO_2 e/stopper

Note: These are preliminary results, to be reviewed after submission of the study for review by external experts.

Scenario analysis with carbon sequestration in the cork oak montado



Forest storage up to: **- 284** kg CO_2 e/1000 stoppers*

Carbon balance (scenario cradle-to-gate) reaches up to:

- 288 kg CO_2 e/1000 stoppers*

Carbon balance (scenario cradle-to-gate + distribution to UK) reaches up to: **- 287** kg CO_2 e/1000 stoppers*

Carbon balance (scenario cradle-to-grave) reaches up to: **- 285** kg CO_2 e/1000 stoppers*

* Analysis based on well-managed cork oak montado with a high tree coverage and good soil and climate conditions, reaching a maximum of 14,7 t CO_2/ha, corresponding to 73 t CO_2/t of cork extracted[2].

[2] Study led by researcher Ana Claudia Dias from the Department of Environment and Planning and CESAM reveals that the cork industry helps mitigate climate change (available at http://www.cesam.ua.pt/?menu=1251&language=eng&tabela=post)

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Conclusions

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- ✓ The production phase is the most intensive in terms of CO_2 emissions, essentially due to energy consumption, followed by the bottling phase in the UK, downstream of the production site.
- ✓ Total emissions account for an overall climate change impact of 3,595 g CO2eq/stopper on a cradle-to-gate approach. Considering the carbon stored in Natural cork stopper (7433 g CO_2e/stopper), the carbon footprint of the product is -3,838 g CO_2e/stoppers, under a cradle-to-gate approach. Total emissions account for an overall climate change impact of 4,364 g CO_2e/stopper on a cradle-to-gate approach plus transport to UK and the carbon footprint of the product is -3,069 g CO_2e/stopper. Lastly, in a cradle-to-grave approach, the total emissions of CO_2 per stopper are 6,473 g CO_2e/stopper, and the carbon footprint is -0,961 g CO_2e/stopper.
- ✓ When considering the additional scenario of carbon sequestration at the oak forest associated to cork production (-284 kg CO_2e/1000 stoppers), the results are significantly more positive, corresponding to -288 kg CO_2e/1000 stoppers (288 g CO_2e/stopper) on a cradle-to-gate approach, to -287 kg CO_2e/1000 stoppers (287 g CO_2e/stopper) on a cradle-to-gate plus transport to UK approach and -285 kg CO_2e/1000 stoppers (285 g CO_2e/stopper) on a cradle-to-grave approach.

Distribution and use of this report

Our report is sent for the attention of Corticeira Amorim within the context of the agreement of 11th October 2021. Corticeira Amorim has informed us of its intention to circulate this report to a wide audience. We do not accept any responsibility vis-a-vis any third party to whom the report has been shown or disclosed to in any form, the use of the report by them being their sole responsibility.

We would remind you that this survey is based solely on the facts, circumstances and hypotheses submitted to us and which are specified in the report. If these facts, circumstances or hypotheses differ, our conclusions are liable to change.

In addition, the results of the survey should be considered in their entirety in respect of the hypotheses, and not taken in isolation.