THE CARBON FOOTPRINT OF SHEA BUTTER

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An assessment of the carbon footprint of crude shea butter for Olvea

Version 1.0

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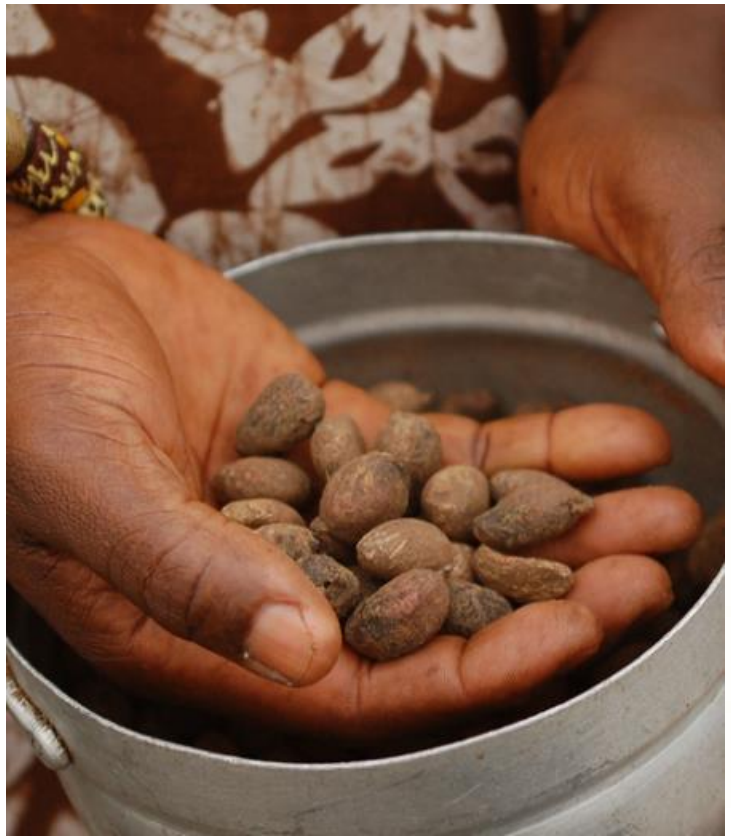

INTRODUCTION

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INTRODUCTION

Olvea wants insights into the climate impact of shea butter from Burkina Faso

Shea butter is a derivative of the shea tree that grows in Western Africa and has traditionally been used in medicines and cooking. In recent years, it is used commercially in cosmetics production and as a food additive.[1)] Shea butter is an important source of economic activity in Burkina Faso, largely managed by women, allowing them to reap economic and social benefits.[2)]

Olvea, a French producer of vegetable oils, participates in the shea butter value chain by extracting crude shea butter from shea nuts dried and cured by local women in Burkina Faso. This crude shea butter undergoes processing in France and is then shipped across the world. Olvea's production philosophy emphasises an ecological and sustainable production method, while empowering the local cultivating communities and its women.[3)]

Due to the cultivation being largely limited to agroforestry parklands, and the lack of use of agrochemicals, the environmental impact of shea butter cultivation is deemed quite low. It's being viewed as a sustainable alternative to more industrially cultivated vegetable oils.[4)] However, the literature on the contribution of shea butter production to greenhouse gas (GHG) emissions that cause climate change is limited and inconclusive.

In this report, Impact Institute present results of a carbon footprint assessment of Olvea's shea butter value chain in Burkina Faso. These results are then put into context with other relevant studies on the traditional and industrial production processes. Finally, key areas for reducing the contribution to climate change are highlighted.

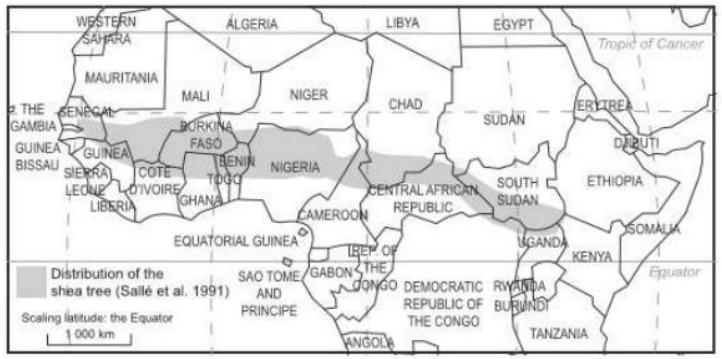

Figure 1: Map of shea growing regions in Western Africa (Alliance, 2020).

1) Glew and Lovett, 2014; 2) Alliance, 2020; 3) Olvea, 2020; 4) Glew and Lovett, 2014

SCOPE

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SCOPE OF OLVEA'S SHEA BUTTER VALUE CHAIN

Combining traditional harvesting and curing with industrial extraction

In order to assess the carbon footprint of crude shea butter, the value chain and subsequent system boundaries need to be clearly defined. This is an assessment of the absolute carbon footprint of crude shea butter from Burkina Faso, without comparing it to a reference scenario (i.e., what would happen otherwise?). The scope of the carbon footprint calculations includes three phases:

- Harvesting and curing: traditional processing of shea kernels by local women; and
- Extraction: industrial processing of crude shea butter at the Olvea processing facility in Burkina Faso.

Transportation between these stages and the transportation of crude shea butter to France is also included in the calculations.

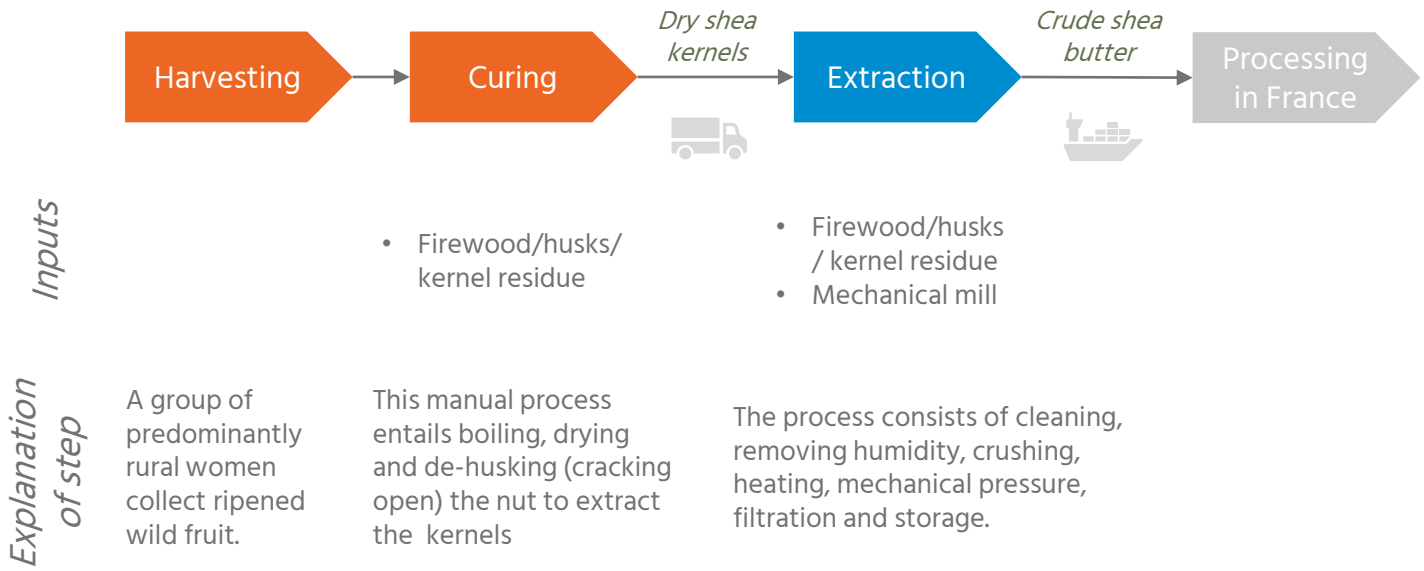

Figure 2: A schematic of the steps in scope for this assessment. The traditional processes of harvesting and curing are highlighted in orange, the industrial step of extraction in blue. The crude shea butter is then transported to France for processing. The processing step in grey (and further downstream use) is out of scope of this assessment.

SCOPE OF OLVEA'S SHEA BUTTER VALUE CHAIN

The assessment includes direct and indirect GHG emissions

This carbon footprint assessment is in accordance with the Greenhouse Gas Protocol. This is a global widely used standard for understanding life cycle greenhouse gas (GHG) emissions. The protocol differentiates between three scopes of emission sources:

1) Scope 1: Direct GHG emissions, such as burning of wood as fuel;
2) Scope 2: Indirect GHG emissions from electricity use; and
3) Scope 3: Indirect GHG emissions from other sources, such as upstream transportation of intermediate products.

This assessment focused on scope 1, scope 2 and upstream scope 3 emissions, as these emissions are under Olvea's control. The assessment includes CO_2 and CH_4 emissions, and translates these to CO_2–equivalents for presentation purposes.

In case of secondary products being produced in the different phases, emissions were attributed to these products in accordance to the value of these products (by mass and monetary value).

What this assessment does not include

This assessment focuses on the direct value chain of crude shea butter production. Therefore the scope does not include the:

- Downstream processing of crude shea butter to refined shea butter to be used in cosmetics and confectionaries; and
- Local use of the crude shea butter. This would split the value chain into a large number of subsequent products unrelated to Olvea's operations.

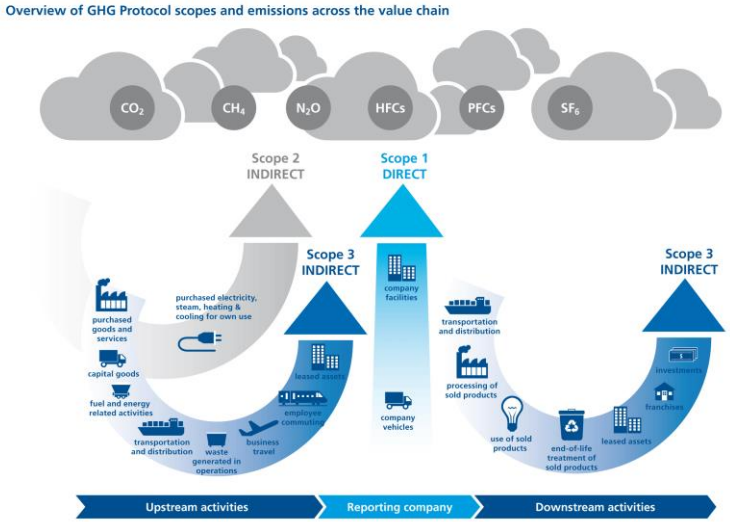

Figure 3: A schematic overview of the GHG protocol. (Greenhouse Gas Protocol, 2020).

RESULTS

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RESULTS

The curing stage is the largest contributor to Olvea's carbon footprint

The carbon footprint of Olvea's shea butter value chain is 2.6 kg CO_2-eq/kg crude shea butter. The largest contributor to the footprint is the curing stage followed by transportation.

Curing

The curing of shea fruit to produce dried shea nuts is the key contributor to the footprint, accounting for 89% of the total footprint. The main source of GHG emissions is the burning of wood in stoves for boiling. The curing process produces shea husks as a by-product that can be used as a type of fuel, but this because the market value is low, this does not significantly reduce the footprint.

Transportation

All transportation steps throughout the value chain account for 7% of the GHG emissions. The main contributor of these emissions is the transport by truck and ship from the Olvea factory in Bobo Dioulasso, Burkina Faso to its facilities in France.

Extraction

Industrial extraction accounts for 4% of the total GHG emissions, driven by the generation and use of electricity to run the machines to carry out the different steps of extraction. Olvea obtains 10% of its energy requirements from photovoltaics and the rest from the grid.

Harvesting

The GHG emissions from harvesting shea fruit from the wild are assumed to be negligible. The harvesting of the ripened shea fruit is predominantly carried out manually by women in the rural cultivating communities.

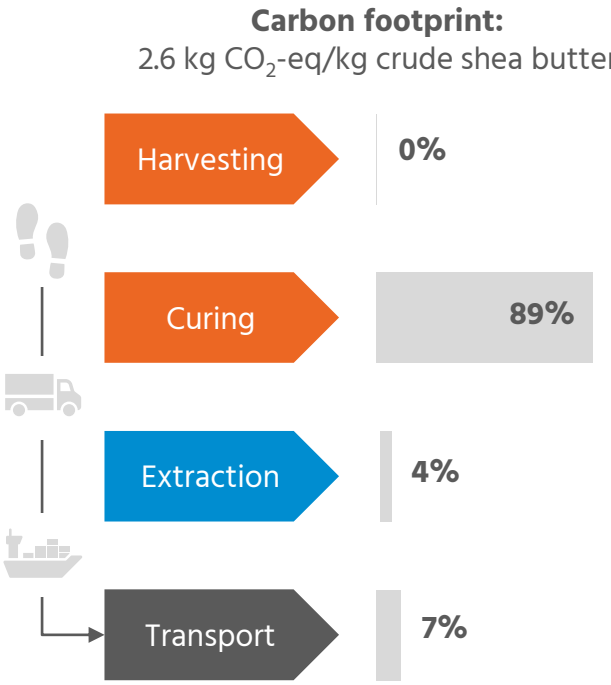

Figure 4: An overview of results for each step in scope for this assessment. The traditional processes of harvesting and curing are highlighted in orange, the industrial step of extraction in blue and the transportation in grey. The Appendix provides a further breakdown of results.

COMPARING RESULTS TO LITERATURE

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COMPARING RESULTS TO LITERATURE

Olvea's traditional curing process uses lower amounts of wood

Olvea has a hybrid value chain structure, combining traditional and industrial processes. As part of the assessment, the results of this value chain are compared with sources form literature. Overall, both this assessment and other literary sources confirm that the curing phase contributes most to the total GHG emissions.

The results of this assessment are specifically compared to two sources analysing:

1. The traditional curing stage in Western-Africa;
2. Mechanised shea butter extraction in Nigeria.

Curing shea nuts may have a larger footprint

A study by Lovett et al. (unpublished) notes that there is a large variation in emissions from traditional curing depending on the methods adopted and local conditions. It calculates the average carbon footprint of traditional curing to be 1.38 kg CO_2-eq/kg dry kernels. This is 55% larger than the footprint from this assessment. The main contributor of these emissions is the burning of wood in a stove for boiling shea nuts. Two drivers of the difference in results could be that:

- In 2016, Olvea along with its partners, supplied shea producers with improved stoves to use to cure shea fruits. This helped reduce the GHG emissions from curing, fuel poverty and deforestation in the value chain[5)].
- While Lovett et al. collected data for various curing conditions such as different amount (and type) of fuel used, location and quantity of the wood used as fuel, the stove type and its efficiency and volume of nuts boiled, they only report an aggregated carbon footprint for the curing process. This aggregated footprint includes a multitude of process efficiencies. Due to data availability this current assessment accounts for wood burning and generic efficiency in stoves.

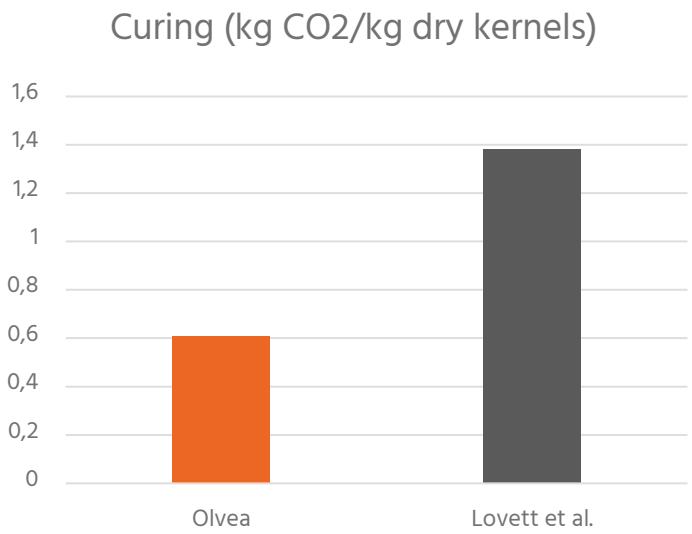

Figure 5: A comparison of the carbon footprint of the curing phase of the current assessment of Olvea's value chain against the study by Lovett et al. (unpublished).

5) Olvea, 2020.

COMPARING RESULTS TO LITERATURE

Olvea's industrial extraction process has a lower carbon footprint

A study on the impact of the mechanised extraction methods in Nigeria calculated a carbon footprint of 0.48 kg CO_2-eq/kg shea butter, excluding the travel and packaging emissions. This study analysed mechanised extraction systems that were powered by LPG generators[6].

In contrast, the Olvea plant uses electricity from the grid to power its industrial extraction systems, and only emits 0.10 kg CO_2-eq/kg crude shea butter. The lower emissions of the extraction process can be attributed to the source of energy; electricity use has lower emissions than LPG use.

A limitation of this comparison is however that this assessment focuses on the value chain up to crude shea butter, while the other source look at the full value chain up to refined shea butter. However, the study by Ewemoje & Oluwaniyi also shows that the emissions in the final stages of the value chain are not most material (Figure 6).

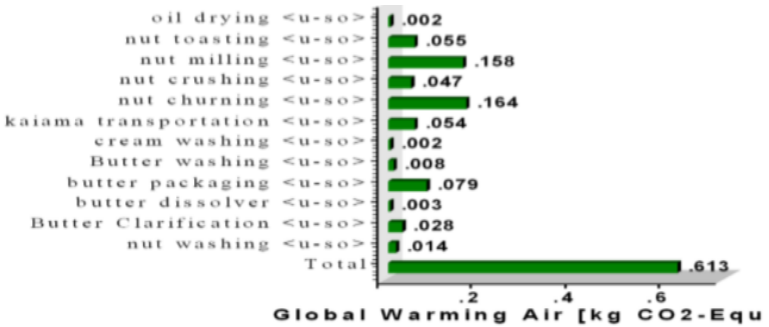

Figure 6: A breakdown of the carbon footprint of mechanised extraction by Ewemoje & Oluwaniyi (2016). To compare the carbon footprint of this study to that of Olvea, the packaging (not in scope) and travel emissions were subtracted. Travel emissions were eliminated due to the variable emissions from different distances travelled.

6)Ewemoje & Oluwaniyi, 2016

COMPARING RESULTS TO LITERATURE

FAO & GSA show the potential carbon footprint of the shea butter value chain

In a joint study by the Food and Agriculture Organisation (FAO) of the United Nations and the Global Shea Alliance (GSA)[7] looked into the impact of the shea value chain on climate mitigation, climate resilience, and socio-economic impact across some of the largest exporters of shea butter, mostly in West Africa.

The study showed that the shea value chain fixes 1.5 million tonnes of CO_2 every year, that the traditional production of shea butter has a negative carbon footprint relative to its production volumes and could play an important role in climate change mitigation. The agroforestry method of cultivation of shea trees acts as a carbon sink and offsets the emissions from the shea butter production operations. Shea trees grow naturally in these habitats and do not have negative land use impacts. Carbon sequestration of shea trees is not in scope of this assessment.

While the FAO and GSA study is very insightful and provides a perspective on the shea value chain, taking into account the carbon sequestration of shea trees that are not deliberately planted (and would therefore grow anyway), seems to shed a too positive light on the value chain's carbon footprint and diminish the focus on actual emissions that occur throughout the value chain.

There are areas of improvement in the shea butter value chain that can make it more sustainable. The amount of wood that is used in the curing phase as fuel as reported by the FAO and GSA study, based on previous literature[8,9], to produce 1 kg of kernels was 1.46 kg, whereas in this current assessment the data provided showed 0.39 kg of wood was required to produce 1 kg of kernels. This difference might be due to more efficient use of fuel by using modern stoves and following better curing practices.

Figure 7: A study by the FAO and GSA showed that the shea nuts value chain had a positive effect on climate change by fixing carbon, therefore, having a negative footprint relative to its production volumes.

7) Alliance, 2020; 8) Noumi, Dabat and Blin, 2013 9) Boffa, 2015

APPENDIX

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DETAILED RESULTS

	GHG emissions (kg CO_2-eq/kg crude shea butter)
Total footprint	2.60
Harvesting phase	0.00
Transport from shea tree forests to curing	0.00
Curing phase	2.30
Transport from curing to extraction	0.05
Extraction	0.10
Transport from Olvea facility in Burkina Faso to Olvea's processing facility in France	0.10

Table 1: A detailed overview of carbon footprint results.
Results may not add up due to rounding.

DATA SOURCES AND LIMITATIONS

Overview of sources

The primary data used in the carbon footprint assessment was provided by Olvea.

This was further combined with secondary data, such as:

- Publicly available literature and research;
- Carbon footprint databases; and
- Internal research provided by Olvea.

Limitations

- Data points used for the assessment of the curing stage represent a generic curing process. The availability of data points that account for specific stove type, species of wood or the conditions in the cultivating villages can provide a more accurate footprint.
- In the extraction phase, this assessment did not account for the emissions associated with the burning of the by-product (shea cakes and other fuel) and production of factory machinery. The burning of shea husks is in some studies accounted for as a positive effect, because it could replace the burning of wood. This assessment looks at the absolute emissions and therefore this effect is not taken into account.

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