Batiste Rhum

Greenhouse Gas (GHG) Footprint Methodology & Disclosure

Prepared by Third Partners LLC
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Executive Summary

Since 2008, Batiste Rhum has produced high-quality sugarcane juice rhum with a focus on minimizing its environmental footprint. Batiste Rhum produces its rhum from sugarcane grown in Marie-Galante, Guadeloupe and conducts final proofing and bottling in Napa, California.

Batiste Rhum has engaged Third Partners – a firm with expertise in carbon footprinting and sustainability strategy for leading responsible brands – to conduct an independent review of Batiste Rhum's internal carbon footprint and finalize the accounting of the carbon footprint of its product.

Methodology

Measuring the carbon footprint of business activities is straightforward in concept. First, measure the amount of an activity over a period of time. Second, identify the carbon impact of that activity using a reliable academic or professional data source. Third, multiply the first two numbers.

The scope of business activities included in the analysis was consistent with that of the in-house carbon footprinting work previously conducted by Batiste Rhum. Third Partners supplemented the company's selection of data sources with additional, rigorous sources, including industry publications and peer-reviewed scientific literature. Below is a summary of the methodology.

Scope of Analysis

Batiste Rhum identified the phases of their production process. Each phase involves emission and/or removal of carbon, the sum of which yields the carbon footprint associated with producing one bottle of rhum. The phases are as follows:

- Sugarcane Farming
- Sugarcane Harvesting
- Bagasse Biomass Boiler
- Electricity Production and Usage
- Fermentation & Distillation
- Ocean freight from Guadeloupe to Napa, California
- Proofing
- Packaging

Data Source Prioritization

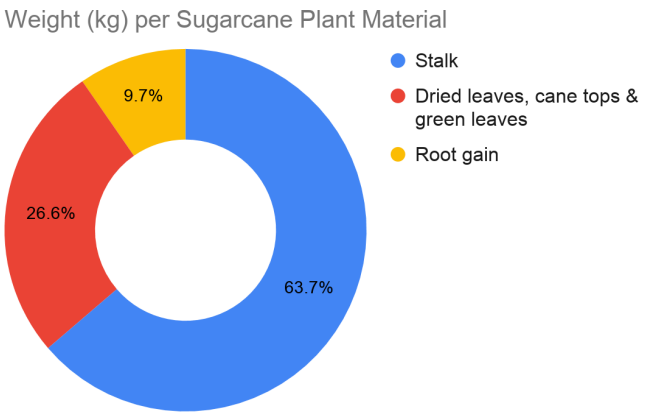
Business activity data was provided by Batiste Rhum and confirmed by the company's on-the-ground staff in Marie-Galante. Emissions factors were estimated using data from the external sources as cited.

For emissions data, Third Partners sought to use relevant peer-reviewed sources wherever possible. In some cases, close proxies were used where direct measurements were not available (e.g., sugarcane farming emissions in Mauritius as a stand-in for sugarcane farming emissions in Marie-Galante). These substitutions should not affect the footprinting results in any material way.

Carbon Footprint Analysis

Sugarcane Farming

Batiste Rhum employs advanced sustainable farming techniques when growing its sugarcane. Typical environmental issues related to industrial sugarcane cultivation are not relevant: there is no field burning of leaves & tops, no use of synthetic fertilizers or herbicides, and no tilling. Instead, all organic waste material (e.g. sugarcane tops, green leaves, and dry leaves) are left on the ground as weed suppression and additional organic material during the regrowth of cane.



To produce a carbon footprint, we took primary data on yield volumes per bottle of finished product and combined that with both primary data from Batiste Rhum farming operations and the Beeharry study on the carbon balance of sugarcane.

Analysis Inputs *per 1 bottle of 40% proof rhum*	**Data Source**
4.615 kg sugarcane stalk	Beeharry, Batiste Rhum Distillery Data
1.935 kg estimated dried leaves, cane tops & green leaves	Beeharry, Batiste Rhum Distillery Data
0.699 kg estimated root gain	Beeharry, Batiste Rhum Distillery Data

From the yield information, and using data on moisture content and carbon content of each component material, we can calculate the embodied Carbon Dioxide equivalent (CO_2e) present in each kg of material.

Embodied CO_2e by Plant Material *per 1 bottle of 40% proof rhum*
1.500 kg estimated embodied CO_2e - bagasse
0.864 kg estimated embodied CO_2e - cane juice
1.535 kg estimated embodied CO_2e - trash and cane tops
0.377 kg estimated embodied CO_2e - roots

Data Sources

- Batiste Rhum Distillery Data
- Beeharry 2001 "Carbon balance of sugarcane bioenergy systems"
- Analysis (spreadsheet)

Sugarcane Harvesting

The harvester and tractor assembly that cut and deliver sugarcane to the distillery utilize 4.5 liters of diesel fuel per metric ton of sugarcane delivered. Cane tops & leaves left as ground cover are estimated to release 30% of their carbon content as they decompose.

Analysis Inputs *per 1 bottle of 40% proof rhum*	**Data Source**
4.615 kg sugarcane harvest (net of tops & leaves)	Batiste Rhum Distillery Data
0.21 L diesel fuel used in harvesting equipment	Batiste Rhum Distillery Data
2.695 kg CO_2e emitted per liter of fuel	US EPA
30% of the carbon content of ground cover emitted as the tops and leaves decompose	Vasconcelos et al.

Carbon Emissions CO_2e *per 1 bottle of 40% proof rhum*
0.056 kg CO_2e emitted from harvesting equipment
0.461 kg CO_2e emitted from decomposition of ground cover

Data Sources

- Batiste Rhum Distillery Data
- EPA "Emission Factors for Greenhouse Gas Inventories"
- Vasconcelos et al. 2018 "Greenhouse gas emission responses to sugarcane straw removal"

Bagasse Biomass Boiler

The mill and column still run on steam. The fuel for the steam arrives from dry shredded sugarcane stalk. Analysis used published data on the emissions from burning grass as a substitute for sugarcane.

Analysis Inputs *per 1 bottle of 40% proof rhum*	**Data Source**
0.840 kg bagasse combustion in biomass boiler to produce steam for distillation	Batiste Rhum Distillery Data
1.127 kg CO_2e emissions per kg of bagasse burned	Beeharry et al.

Carbon Emissions CO_2e *per 1 bottle of 40% proof rhum*
0.947 kg CO_2e emitted from combustion of bagasse

Electricity Consumption

All electricity consumed in distillery operations is powered by a 2 MW solar field. Consumption of electricity is not a GHG-generating activity at the Batiste Rhum distillery.

Fermentation & Distillation

The distillery ferments 135,000 L of sugarcane juice at approximately 5% ABV per day. This produces 7,500 L of 65% ABV (after distillation).

Distillation is powered by the biomass boiler. The distillation energy input does not produce any additional CO_2.

Analysis Inputs *per 1 bottle of 40% proof rhum*	**Data Source**
3.030 L of cane juice	Batiste Rhum Distillery Data
0.285 kg CO_2e embodied in cane juice and emitted during fermentation	Beeharry et al.

Carbon Emissions CO_2e *per 1 bottle of 40% proof rhum*
0.864 kg CO_2e emitted from fermentation

Data Sources

- Batiste Rhum Distillery Data
- Beeharry 2001 "Carbon balance of sugarcane bioenergy systems"

Freight

Transport of the distillate occurs by ship and truck, ultimately moving the product from the location of sugarcane production in Guadeloupe to the final proofing and bottling location in Napa, California.

Analysis Inputs *per 1 bottle of 40% proof rhum*	**Data Source**
Trucking distance 1,381 km	Batiste Rhum Distillery Data
Ocean Freight distance 18,685 km	Batiste Rhum Distillery Data
0.4615 kg 65% distillate shipped	Batiste Rhum Distillery Data
62 g CO_2/tonne-km by truck	European Chemical Transport Association (ECTA)
8.4 g CO_2/tonne-km by ship	ECTA

Carbon Emissions CO_2e *per 1 bottle of 40% proof rhum*
0.040 kg CO_2e emitted from Trucking
0.072 kg CO_2e emitted from Ocean Freight

Data Sources

- Batiste Rhum Distillery Data
- ECTA "Guidelines for Measuring and Managing CO_2 Emissions from Freight Transport Operations"

Distilled Water Production

Distilled water is produced in California and used to proof the rhum from 65% to 40%.

Analysis Inputs *per 1 bottle of 40% proof rhum*	**Data Source**
365.10 btu natural gas produces 0.135 L distilled water	Pure Water Inc.
0.000053181818182 kg CO_2e per btu natural gas	US EIA
0.135 L distilled water per bottle rhum to proof from 65% to 40%	Batiste Rhum Distillery Data

Carbon Emissions CO_2e *per 1 bottle of 40% proof rhum*
0.0194 kg CO_2e from combustion of natural gas to produce distilled water

Data Sources

- Batiste Rhum Distillery Data
- Pure Water Inc. "Benefits of Distilled Water"
- US Energy Information Administration "How much carbon dioxide is produced when different fuels are burned?"

Packaging

Glass bottle

Analysis Inputs *per 1 bottle of 40% proof rhum*	**Data Source**
0.603 kg glass	Batiste Rhum Distillery Data
1.25 kg CO_2e/kg glass	Glass Packaging Institute, via BeverageDaily

Carbon Emissions CO_2e *per 1 bottle of 40% proof rhum*
0.754 kg CO_2e emitted from glass production

Data Sources

- Batiste Rhum Distillery Data
- Glass Packaging Institute, via BeverageDaily "'Benchmark' study on glass offers clear carbon footprint picture"

Bottle labeling

Analysis Inputs *per 1 bottle of 40% proof rhum*	**Data Source**
0.0175 kWh electricity (CA) per bottle labeled	Batiste Rhum Distillery Data
0.02 btu natural gas per bottle labeled	Batiste Rhum Distillery Data
0.00022661 kg CO2e per kWh electricity	US EPA
0.000053181818182 kg CO2e per btu natural gas	US EPA

Carbon Emissions CO_2e *per 1 bottle of 40% proof rhum*
0.00000503 kg CO_2e emitted from bottle labeling

Data Sources

- US EPA "Emission Factors for Greenhouse Gas Inventories"

Paper for label & closure

Analysis Inputs *per 1 bottle of 40% proof rhum*	**Data Source**
Weight of label 0.001 kg	Batiste Rhum Distillery Data
0.95 kg CO_2e per kg paper	Sun et al.

Carbon Emissions CO_2e *per 1 bottle of 40% proof rhum*
0.001 kg CO_2e emitted from paper label

Data Sources

- Batiste Rhum Distillery Data
- Sun et al. 2018 Uncovering energy use, carbon emissions and environmental burdens of pulp and paper industry: A systematic review and meta-analysis

Wood and cork closure

Analysis Inputs *per 1 bottle of 40% proof rhum*	**Data Source**
10g wood and cork closure	Batiste Rhum Distillery Data
0.121 kg CO_2e per kg wood	Ruuska

Carbon Emissions CO_2e *per 1 bottle of 40% proof rhum*
0.001 kg CO_2e emitted from wood top & cork

Data Source

- Batiste Rhum Distillery Data
- Ruuska "Carbon footprint for building products"

Cardboard cartons and inserts

Analysis Inputs *per 1 bottle of 40% proof rhum*	**Data Source**
0.227 g paperboard carton	Batiste Rhum Distillery Data
0.326 kg CO_2e per kg carton	ProCarton

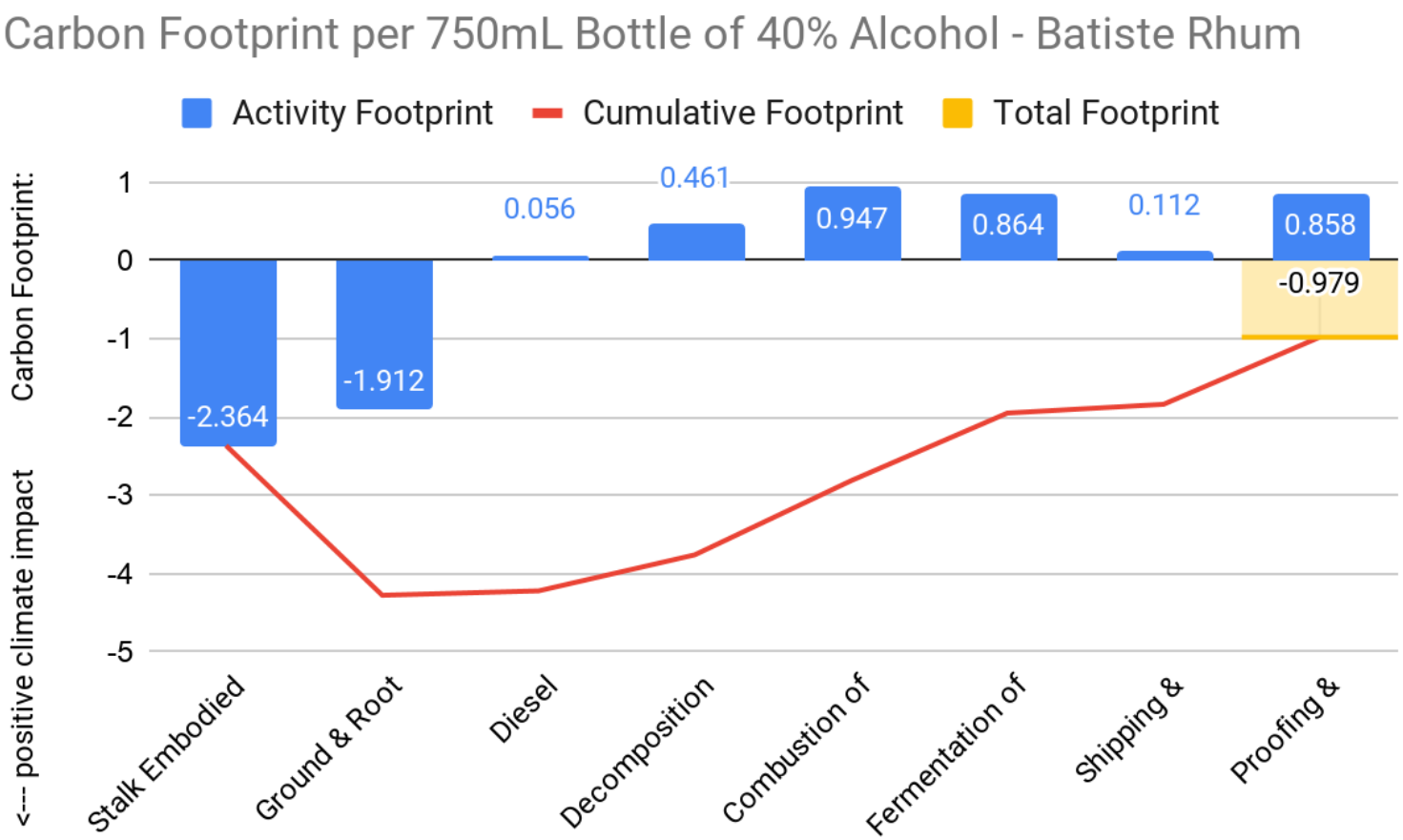
Carbon Emissions CO_2e *per 1 bottle of 40% proof rhum*
0.074 kg CO_2e emitted from wood top & cork

Data Sources

- Batiste Rhum Distillery Data
- ProCarton "Carbon Footprint"

Carbon Footprint Summary by Activity

Production Phase	Activity	Quantity	Unit	Carbon Coefficient (kg CO_2e per input)	kg CO_2e per 750ml 40% bottle
Sugarcane Farming	Sugarcane (stalk) embodied CO_2	4.615	kg stalk	-0.512	-2.364
Sugarcane Farming	Sugarcane (root & trash) embodied CO_2	2.634	kg tops, leaves, trash, roots	-0.726	-1.912
Sugarcane Harvesting	Diesel Used	0.021	L diesel	2.695	0.056
Sugarcane Harvesting	Decomposition of ground cover / released CO_2e	30%	tops & leaves		0.461
Biomass Boiler	Dry sugarcane burned for steam	0.102	kg directly used	1.127	0.114
Biomass Boiler	Additional dry sugarcane burned for surplus steam	0.739	kg leftover	1.127	0.832
Electricity	100% renewable electricity via solar array				
Fermentation & Distillation	Fermentation of sugarcane (juice)	3.030	kg liquid	0.285	0.864
Shipping	Freight from Guadeloupe to Napa, California	8.624	ton-km	0.008	0.072
Trucking	Freight from Guadeloupe to Napa, California	0.637	ton-km	0.062	0.040
Distilled Water	Creation of vapor distilled water	0.135	L	0.144	0.019
Packaging	Bottle	0.603	kg glass	1.250	0.754
Packaging	Labeling	0.020	btu natural gas	0.000053	0.000001
Packaging	Labeling	0.018	kWh	0.000227	0.000004
Packaging	Paper for cork closure	0.001	kg paper	0.950	0.000950
Packaging	Wood bar top and cork closure	0.010	kg wood / cork	0.121	0.001
Packaging	Cardboard carton and insert	0.227	kg cardboard	0.326	0.074
				TOTAL	**-0.988**



Estimated Partitioning of Biomass, Moisture, and Carbon in Sugarcane Plant

Material	kg	Estimated moisture content (Beeharry)	Carbon Content	kg CO2e Uptake	kg CO2e Uptake (per kg material)
stalk	4.615	69%	22%	2.364	0.512
sugar molasses water	3.030	81%	8%	0.864	0.285
bagasse	1.585	47%	49%	1.500	0.947
trash and cane tops and roots	2.634	60%	49%	1.912	0.726
root only	0.699	70%	49%	0.377	0.539
trash and cane tops	1.935	56%	49%	1.535	0.793

Appendix

Additional sources consulted:

Agricultural Production Systems Simulator "Sugar"

Alcademics "Hand sugar cane harvesting demo for Zacapa rum"

Barbosa et al. 2015, "Biomass and bioenergy partitioning of sugarcane plants under water deficit"

Canilha et al. 2012, "Bioconversion of sugarcane biomass into ethanol: An overview about composition, pretreatment methods, detoxification of hydrolysates, enzymatic saccharification, and ethanol fermentation"

Food and Agriculture Organization (FAO) of the United Nations "Sugar cane"

FAO "Sugar crops and sweeteners and derived products"

Ptasinski 2016, *Efficiency of Biomass Energy*

Rubens et al. 2019, "Effect of water stress on renewable energy from sugarcane biomass"

Silva-Olaya et al. 2017, "Quantifying aboveground and belowground biomass carbon inputs for sugar-cane production in Brazil"

About Third Partners

Third Partners is a management consulting firm that specializes in sustainability strategy. Third Partners works with leadership teams at responsible brands and helps design innovative solutions that achieve business growth, positive external impact and world-class operations. As third party sustainability advisors, Third Partners brings a multifaceted perspective grounded in resource management best practice, data science and business performance. Solutions help leaders align commercial growth with specific environmental and social impact goals.