



Environmental Product Declaration

In accordance with the EN 15804 +A1 and +A2

European Bamboo Poles from BambooLogic

Scope of the declaration

Type of the EPD is Cradle to gate, including modules A1-A3

The LCA was carried out by Agrodome B.V. (NL)
according to the EN 15804 +A1 and +A2
based on production data from BambooLogic.

Release Date: 14 June 2024

Validity: 5 years

Functional unit: 1 m³



BambooLogic

Goal and target group

Goal

The declaration covers the environmental effects throughout the lifetime of the product: European Bamboo Poles from BambooLogic.

Target audience

The EPD can be used for building or building part level assessments by designers, architects, constructors, developers etc.

The EPD is mainly intended for business-to-business communication and may also be used for business-to-consumer communication purposes. The background EPD report is third party verified.

Product description

BambooLogic provides European bamboo poles in various sizes to meet different project needs. For this study, we assumed a unit mass of 650 kg/m³, based on data from bamboo poles with a diameter of 3 cm and a length of 1 meter.

Currently (April 2024), Bamboologic has one bamboo plantation, in Portugal. Other bamboo plantations in Europe are under development, in carefully selected locations favourable for bamboo growth and development. The poles in this study come from Portugal, which is immediately a worst case approach for bamboo poles from other parts of Europe due to the long distance from the Netherlands and the high impact of transportation.

Composition of European Bamboo Poles from BambooLogic (in weight %)

Material	Share
Bamboo	100 %

Table 1: Composition European Bamboo Poles from BambooLogic

Technical data European Bamboo Poles from BambooLogic

Name	Value
Reference diameter bamboo poles	3 cm
Diameter bamboo poles	2-12 cm
Reference thickness stem wall, bamboo pole Ø 3 cm	5 mm
Thickness stem wall	2-15 mm
Reference length bamboo poles	1 m
Length bamboo poles	0,5-6 m
Volumic mass of massive bamboo (moisture content 12%)	650 kg/m ³

Table 2: Technical data European Bamboo Poles from BambooLogic

Biogenic carbon storage¹

Biogenic carbon storage during the lifetime of European Bamboo Poles from BambooLogic with a moisture content of 12% is 1065 kg CO₂/m³, corresponding with 290,4 kg C/m³.

Biogenic carbon content in European Bamboo Poles from BambooLogic

Biogenic carbon	Share biogenic carbon per m ³
Biogenic carbon in product	290,4 kg C
Biogenic carbon in packaging	–

Table 3: Biogenic carbon content in European Bamboo Poles from BambooLogic

LCA calculation rules

Declared unit

European Bamboo Poles from BambooLogic, per m³ bamboo with a (solid) unit mass of 650 kg/m³.

Name	Value	Unit
Declared Unit	1,00	m ³
Weight	650	kg/m ³

Table 4: Declared unit European Bamboo Poles from BambooLogic

Scaling

The bamboo poles are available in lengths ranging from 0,5 to 6 m and in diameters ranging from 1 to 12 cm. The wall thickness ranges from 2 to 15 mm.

The environmental impact of bamboo poles of a given diameter can be calculated by multiplying the results in this EPD by the following factor:

$$\left(\frac{100 \text{ cm}}{\text{diameter (cm)}} \right)^2 \times \frac{\text{weight per m}^1 \text{ pole (kg)}}{650 \text{ kg}},$$

with the first term indicating the number of 1 m long bamboo poles in a cubic meter and the second term indicating the weight. For example, for bamboo poles 10 cm in diameter and weighing 1,81 kg, the conversion factor is 181/650 = 0.278.

Reference Service Life

In general, bamboo poles have a lifespan of 10 to 20 years or even longer if properly treated and maintained.

The lifespan of European Bamboo Poles from BambooLogic depends on the end product, application and whether or not the maintenance schedule recommended by the supplier is followed.

¹ Calculated according to the calculations methode in the norm EN 16449 'Wood and wood based products - Calculation of sequestration of atmospheric carbon dioxide'.

Comparability

A comparison or evaluation of the environmental performance of construction products using the EPD information is only possible if based on the product's use in and its impacts on the building, and if all datasets are made in accordance with EN 15804 and the same product-related standard properties and modules are taken into account.

System boundaries

The LCA study was created for 'Cradle to Gate A1-3' according to the modules below. All declared values relate to the specified functional unit.

In the European standard EN 15804, the environmental performance of building materials is categorized in four modules corresponding to different lifecycle phases in the building material; Modules A (production of materials and construction), B (use phase), C (end-of-life phase of the building) and D (loads and benefits outside the system boundary); see Figure 1.

Product stage			Construction installation stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Construction installation stage	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 1: Calculated modules European Bamboo Poles from BambooLogic

For this LCA study, modules A1-3 have been examined.

Allocations

There are no allocations of co-products.

Assumptions, omissions and deviations

Maintenance

No maintenance is included for this semi-finished material. This only becomes relevant for the final products and depends on the application of the product.

No other significant assumptions, omissions or deviations apply to this LCA study.

Excluded processes

No processes have been excluded.

Production process and flowchart

The flowchart of the production process of European Bamboo Poles from BambooLogic below lists the production process starting with cultivating the bamboo.

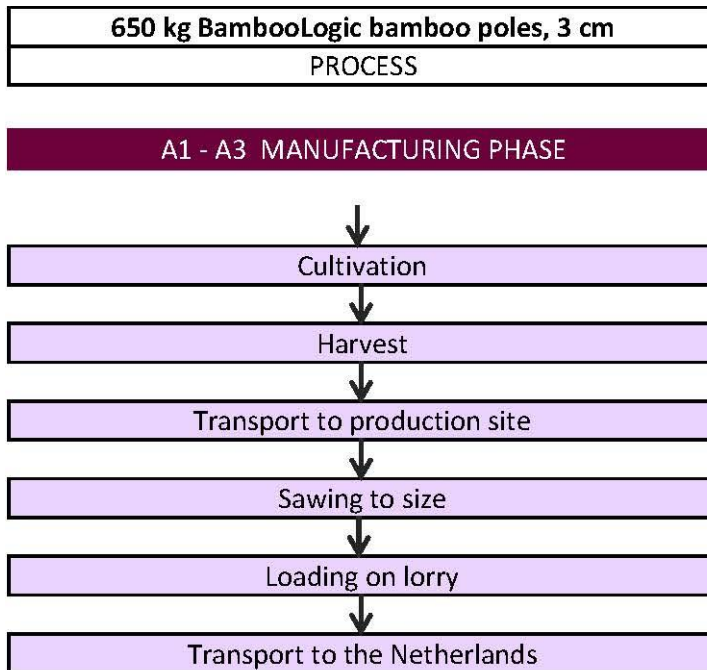


Figure 2: Flowchart European Bamboo Poles from BambooLogic

Explanation Flowchart and Life Cycle per phase

Production phase (A1-3)

Description production process

The European Bamboo Poles from BambooLogic originate from bamboo plantations in Europe. The poles in the underlying study come from Portugal. Delivery from France, Italy or Benelux is also possible in limited quantities. These plantations are located in specific locations favourable to bamboo growth and development.

Bamboo is a perennial crop. A bamboo plantation has a lifespan of 100 years. For a new plantation, bamboo seedlings are planted at sufficient distance from each other, considering growth; about 500 plantlets per ha. Tractors are used to prepare the field; planting is done by hand. The first three years the plantation is irrigated; after that the plants are sufficiently rooted and irrigation is no longer required. Harvesting can start after three years; from then on, one-third of the bamboo poles are harvested each year. This involves cutting or sawing the pole above the ground. The plant itself remains in the ground and grows back into a new bamboo pole from the underlying root system.

Various tools and machines are used to harvest the bamboo, such as machetes, saws and cutting tools. Only the lower two-third part of the bamboo is usable as a pole; the top with side branches is removed and shredded. Harvest residues are left in the field for soil improvement.

After harvesting, the bamboo stems are collected and carefully inspected. At the processing site, the bamboo poles undergo further processing. The bamboo poles are cut to the desired length and selected with the right quality and properties, after which they are sanded to obtain a smooth and splinter-free surface. They are then stored in suitable warehouses until they are ready for delivery to customers. Production waste is shredded and returned to the field for soil improvement. Transport between the plantation and the processing site takes place by road.

LCA results

The tables below list the results of the various environmental impacts of the production of European Bamboo Poles from BambooLogic per m³ massive bamboo². For illustrative purposes, the results for 1 m³ of bamboo poles of 10 cm diameter are also shown, calculated according to the formula on page 3.

EN 15804 +A1, Environmental impact indicators European Bamboo Poles from BambooLogic per m³

Potential Environmental Impacts	Production (A1-3)	
	massive bamboo 650 kg/m ³	hollow pole 10 cm 181 kg/m ³
ADPE (kg Sb-eq)	2,40E-03	6,68E-04
ADPF (kg SB-eq)	1,07E+00	2,97E-01
GWP (kg CO2-eq)	1,46E+02	4,06E+01
ODP (kg CFC 11-eq)	2,71E-05	7,55E-06
POCP (kg C2H4-eq)	5,79E-01	1,61E-01
AP (kg SO2-eq)	5,54E-01	1,54E-01
EP (kg (PO4)3-eq)	2,14E-01	5,96E-02
HTP (kg 1,4-DB-eq)	9,43E+01	2,62E+01
FAETP (kg 1,4-DB-eq)	4,92E+00	1,37E+00
MAETP (kg 1,4-DB-eq)	6,93E+03	1,93E+03
TETP (kg 1,4-DB-eq)	1,30E+00	3,63E-01

ADPE = Abiotic Depletion Potential – Elements; ADPF = Abiotic Depletion Potential – Fossil Fuels; GWP = Global warming Potential; ODP = Ozone Depletion Potential; POCP = Photochemical Ozone Creation; AP = Acidification Potential for Soil and Water; EP = Eutrophication Potential; HTP = Human Toxicity Potential ; FAETP = Fresh Aquatic Ecotoxicity Potential ; MAETP = Marine Aquatic Ecotoxicity Potential; TETP = Terrestrial Ecotoxicity Potential

Table 5: EN 15804 +A1, Environmental impact indicators, European Bamboo Poles from BambooLogic, per FU (m³)

² The results were calculated based on data from bamboo poles 3 cm in diameter. This is a worst-case approach.

EN 15804 +A2, basic environmental impact indicators European Bamboo Poles from BambooLogic per m³

Potential Environmental Impacts	Production (A1-3)	
	massive bamboo 650 kg/m ³	hollow pole 10 cm 181 kg/m ³
CC total (kg CO2 eq)	-9,10E+02	-2,53E+02
CC fossil (kg CO2 eq)	1,46E+02	4,07E+01
CC biogenic (kg CO2 eq) ³	-1,06E+03	-2,95E+02
CC luluc (kg CO2 eq)	4,21E+00	1,17E+00
ODP (kg CFC 11 eq)	3,40E-05	9,46E-06
AP (mol H+ eq)	7,30E-01	2,03E-01
EP – freshwater (kg P eq)	2,61E-02	7,28E-03
EP – marine (kg N eq)	2,62E-01	7,30E-02
EP – terrestrial (mol N eq)	2,68E+00	7,45E-01
POCP (kg NMVOC eq)	1,76E+00	4,90E-01
ADP Elements (kg Sb eq)	2,40E-03	6,68E-04
ADP fossil fuels (MJ)	2,24E+03	6,25E+02
WDP (m ³ water eq deprived)	2,56E+01	7,14E+00

CC total = Climate Change total; CC fossil = Climate Change fossil; CC biogenic= Climate Change biogenic; CC-luluc = Climate Change land use and land use change; ODP = Ozone Depletion Potential; AP = Acidification Potential for Soil and Water; EP = Eutrophication Potential; POCP = Photochemical Ozone Creation; ADPE = Abiotic Depletion Potential – Elements; ADPF = Abiotic Depletion Potential – Fossil Fuels; WDP = water use (Water (user) deprivation potential, deprivation-weighted water consumption)

Table 6: EN 15804 +A2, basic environmental impact indicators, European Bamboo Poles from BambooLogic, per m³

³ This includes the biogenic carbon stored in the bamboo, hence the negative value. When processed into a product, the stored carbon is released as a positive value in module C3/C4, with which the biogenic carbon on balance across modules A1 to C4 should arrive at 0 according to EN15804+A2.

Additional environmental impact indicators EN 15804 +A2 European Bamboo Poles from BambooLogic per m³

Potential Environmental Impacts	Production (A1-3)	
	massive bamboo 650 kg/m ³	hollow pole 10 cm 181 kg/m ³
<i>PM (disease incidence)</i>	1,25E-05	3,47E-06
<i>IRHH (kg U235 eq)</i>	9,77E+00	2,72E+00
<i>ETF (CTUe)</i>	2,04E+03	5,68E+02
<i>HTCE (CTUh)</i>	1,44E-07	4,00E-08
<i>HTnCE (CTUh)</i>	4,36E-06	1,21E-06
<i>Land Use (Pt)</i>	2,59E+03	7,21E+02
<i>PERE (MJ, net calorific value)</i>	6,78E+01	1,89E+01
<i>PERM (MJ, net calorific value)</i>	9,09E+03	2,53E+03
<i>PERT (MJ, net calorific value)</i>	9,16E+03	2,55E+03
<i>PENRE (MJ, net calorific value)</i>	2,38E+03	6,63E+02
<i>PENRM (MJ, net calorific value)</i>	0,00E+00	0,00E+00
<i>PENRT (MJ, net calorific value)</i>	2,38E+03	6,63E+02
<i>SM (kg)</i>	0,00E+00	0,00E+00
<i>RSF (MJ, net calorific value)</i>	0,00E+00	0,00E+00
<i>NRSF (MJ, net calorific value)</i>	0,00E+00	0,00E+00
<i>FW (m³ water eq)</i>	7,33E-01	2,04E-01
<i>Hazardous waste disposed (kg/FU)</i>	9,46E-03	2,63E-03
<i>Non-hazardous waste disposed (kg)</i>	1,78E+02	4,94E+01
<i>Radioactive waste disposed (kg)</i>	1,53E-02	4,25E-03
<i>Components for reuse (kg)</i>	0,00E+00	0,00E+00
<i>Materials for recycling (kg)</i>	0,00E+00	0,00E+00
<i>Materials for energy recovery (kg)</i>	0,00E+00	0,00E+00
<i>Exported energy Heat (MJ)</i>	0,00E+00	0,00E+00
<i>Exported energy Energy (MJ)</i>	0,00E+00	0,00E+00

PM = Particulate Matter; IRHH = Ionizing Radiation – human health effects; ETF = Ecotoxicity – freshwater; HTCE = Human Toxicity – cancer effects; HTnCE = Human Toxicity – non cancer effects; PERE = use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water

Table 7: Additional environmental impact indicators EN 15804 +A2, European Bamboo Poles from BambooLogic, per m³

Analysis of the results

As part of the sensitivity analysis, the impact of transport on the results was studied. The table below shows the impact on global warming indicators for different locations. For these numbers the assumption was made that the cultivation of bamboo and the means of transport are identical to the location in Portugal. Every single change of these aspects will give an other outcome of the numbers in Table 8.

Different origins of European Bamboo Poles from BambooLogic, per 650 kg bamboo

Location	Portugal	Italy	France	Belgium
Impact category (kg CO2 eq)				
Set +A1				
004. global warming (GWP) (kg CO2 eq)	1,46E+02	8,79E+01	6,43E+01	3,54E+01
Set +A2				
051. Climate change - Total (kg CO2 eq)	-9,10E+02	-9,68E+02	-9,92E+02	-1,02E+03
052. Climate change - Fossil (kg CO2 eq)	1,46E+02	8,80E+01	6,43E+01	3,51E+01
053. Climate change - Biogenic (kg CO2 eq)	-1,06E+03	-1,06E+03	-1,06E+03	-1,06E+03
054. Climate change - Land use (kg CO2 eq)	4,21E+00	4,19E+00	4,18E+00	4,17E+00

Table 8: Comparison of environmental impact indicators GWP and Climate change for different locations of Bamboo Poles from BambooLogic, per 650 kg bamboo, in kg CO2 eq

Representativeness of the production process

Origin of raw materials

The cultivation of bamboo poles as described in the underlying LCA takes place in Portugal. Due to the long distance from the Netherlands and the high impact of transport, this is a worst-case approach for bamboo poles from other parts of Europe.

Data quality

For the collection of the process and product data, information is used provided by the client Bambulogic Europe B.V (BambooLogic). BambooLogic submitted physical and digital documentation, as well as a statement of materials showing the operations and quantities required for the product tested.

Energy consumption of equipment and equipment required to produce the product under investigation is based on consumption figures for 2021.

For the cultivation processes, a choice was made from available data in the Ecoinvent database, version 3.6 and the NMD database version 3.8.

Production processes can change over time. The information used in this LCA of the production process of the product is based on measurements and observations from 2021 (energy, waste percentages, quantities net, production volume).

Accountability

LCA study was conducted by Agrodome B.V. in 2022 - 2024.

The data provided by BambooLogic have been extensively discussed with Agrodome B.V.

The final version of the LCA study has been submitted to LBP|SIGHT for external peer review.

The LCA is carried out according to EN 15804 +A1 and +A2 in compliance with the standards from the ISO 14000 series: 14025, 14040 and 14044. The LCA report has been verified according to EN 15804.

When calculating the environmental impact categories, SimaPro, version 9.5.0.2 and environmental data from the NMD-basic processes database, version 3.8 October 2022 and in some cases, the Ecoinvent database, version 3.6, were used.

When making calculations in SimaPro, the long-term effects (emissions that can occur after 100 years) are not taken into account, in accordance with EN 15804. The effects of capital goods and infrastructural processes are included.

References

ISO 14040

ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework; EN ISO 14040:2006

ISO 14044

ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines; EN ISO 14040:2006

ISO 14025

ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804+A1





EN 15804+A1: 2013: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

EN 15804+A2

EN 15804+A2: 2019: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

Caroline van der Laan, Sissy Verspeek en Fred van der Burgh, 2024

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Declaration Agrodome B.V.

LBP|SIGHT has reviewed the LCA background report BambooLogic, 2024 as an external reviewer.

This EPD is the summary of that LCA background report, to be used for external communication.

The LCA background report is approved by René Kraaijenbrink, LBP|SIGHT, 24 april 2024.