

## Carbon sink and social impact certificate

Carbon sink certificate based on EBC tropical farmer standard.

General Data	ID	BL003
	Production period	18.11.2021-24.11.2021
Producer(s)	Multiple smallholder farmers, see Annex 1 for more details.	
Region	Kenya	
Email contact	jason@biochar.life	
Biomass	Type of biomass	Corn cobb & husk
	Estimated total amount of biomass (dry matter) used for production	6.25 t
	Emissions due to fertilization	0.00 t CO <sub>2</sub> eq
	Transportation of biomass to pyrolysis site	0.00 t CO <sub>2</sub> eq
	Preparation of feedstock	0.00 t CO <sub>2</sub> eq
	Emissions for drying of feedstock	0.00 t CO <sub>2</sub> eq
	Feedstock storage emissions	0.00 t CH <sub>4</sub>
	<b>Total biomass related GHG emissions without CH<sub>4</sub></b>	<b>0.00 t CO<sub>2</sub> eq</b>
Pyrolysis	Source of electric energy used on site	
	Emissions due to electricity consumption for entire pyrolysis plant including pyrolysis treatment	0.00 t CO <sub>2</sub> eq
	Emissions due to LPG and other external fuel for reactor heating	0.00 t CO <sub>2</sub> eq
	Emissions due to carrier gas	0.00 t CO <sub>2</sub> eq
	CH <sub>4</sub> -emissions of pyrolysis unit in kg CH <sub>4</sub> / t biochar	30.00 kg CH <sub>4</sub>
	<b>Total pyrolysis related GHG emissions without CH<sub>4</sub></b>	<b>0.00 t CO<sub>2</sub> eq</b>
Methane	Total methane emissions	37.50 kg CH <sub>4</sub>
	Amount of compensated methane emissions	37.50 kg CH <sub>4</sub>
	Type of methane compensation	cease open field burning
	<b>Total non compensated CH<sub>4</sub> emissions in CO<sub>2</sub> eq (@GWP20 of 86)</b>	<b>0.00 t CO<sub>2</sub> eq</b>
Post-pyrolysis Tracking	Total preparation of BC-based fertilizer (milling, mixing) in t CO <sub>2</sub> eq	0.00 t CO <sub>2</sub> eq
	Total transport emissions from kiln to field in t CO <sub>2</sub> eq	0.00 t CO <sub>2</sub> eq
	Total emissions from soil application of biochar in t CO <sub>2</sub> eq	0.00 t CO <sub>2</sub> eq
	Amount of compensated CO <sub>2</sub> eq from soil application in t CO <sub>2</sub> eq	0.00 t CO <sub>2</sub> eq
	<b>Total post-pyrolysis emissions</b>	<b>0.00 t CO<sub>2</sub> eq</b>
Margin of security	<b>10% of total GHG emissions (incl. GWP20 of CH<sub>4</sub>)</b>	<b>0.32 t CO<sub>2</sub> eq</b>
Total emissions	Total GHG emissions in CO <sub>2</sub> eq	<b>0.32 t CO<sub>2</sub> eq</b>
	Total GHG emissions in Ceq per ton of biochar (dry matter)	<b>0.070 t C</b>
Biochar	Amount of biochar (DM) produced	1.25 t
	H/C org ratio	0.26
	C-content	<b>65 %</b>
	<b>C-sink potential</b>	<b>64.9 % of DM</b>
C-sink potential	Total GHG emissions per t biochar (dry matter)	<b>0.258 t CO<sub>2</sub> eq</b>
	CO <sub>2</sub> eq-content per t of biochar (dry matter) [gross C-sink]	<b>2.38 t CO<sub>2</sub> eq</b>
	C-sink potential in tCO <sub>2</sub> eq per t of biochar (dry matter) [net C-sink]	<b>2.13 t CO<sub>2</sub> eq</b>
Total C-sink data	Csink100 in tCO <sub>2</sub> eq for the entire C-sink [persistent C of the sink after 100 years when applied to soil @ P100 = 74%]	<b>1.97 t CO<sub>2</sub> eq</b>

## **Carbon sink and social impact certificate**

**Issued by Biochar Life, PBC. Accredited by Warm Heart Worldwide, Inc.**

*Based on the European Biochar Certification ("EBC") tropical farmer standard.*

The biochar production and usage by farmers located in the Kenya region has a carbon sink value of 64.9%. The accountable fraction of carbon that is persistent after 100 years (C<sub>sink100</sub>) is 1.57 t CO<sub>2</sub> eq per ton of biochar on a dry matter base.

The carbon sink value of 64.9% provides the percentage of a mass unit of biochar that, on a dry matter base, can be considered as a long-term (> 100 years) carbon sink. For example, a big bag containing 200 kg biocchar (dry matter) has a carbon sink value of (200 kg \* 64.9% CS) = 129.8 kg C which is the equivalent of 499 kg CO<sub>2</sub>eq per big bag when applied to the soil.

The production and usage of the biochar occurred on the farmer sites. Therefore, minimal emissions occurred for preparation and storage of the biomass. There was no transportation of the biomass or biochar. A security margin of 10% was applied to the carbon sink. The total emissions deducted from the carbon sink value was 0.32 t CO<sub>2</sub>eq.

The CO<sub>2</sub> emissions of the combustions of the pyrolysis gases are considered carbon neutral as the feedstock for the pyrolysis originated from harvest residues.

The 37.5 kg of CH<sub>4</sub> emissions caused by the production in farm scale equipment (e.g., Kon-Tiki, TLUD, etc.) correspond to a global warming potential over 20 years (GWP<sub>20</sub>) of 3.2 t CO<sub>2</sub>eq. The GWP<sub>20</sub> of these CH<sub>4</sub> emissions was entirely compensated by preventing and cessation of open field burning of the crop waste by the farmers. The cessation of open field burning of crop waste can be accounted for as CH<sub>4</sub>-compensation for 10 years (time horizon). After these 10 years, the new method of producing and using biochar will be considered the new standard and, therefore, no emission avoidance from crop waste burning can be account for anymore. Each farmer signed a declaration to stop crop waste burning, the signed document can be found in each production record

Every kg of biochar produced and applied has been tracked and recorded (see Annex 1). The data is independently reviewed and verified. Once verified, the data is committed to a blockchain ledger which prevents any modification. Additionally, each record includes timestamps, geographical data, images of the production and usage process. The geo-location data has been provided in Annex 2.

The biochar that is applied to soil undergoes a slow biological degradation of 26% over the first 100 years. Therefore, only the carbon fraction that is persistent after 100 years (C<sub>sink100</sub>) is herewith certified as C-sink certificate. Accounting only for the persistent fraction after 100 years, the total size of the C-sink is 1.97 t CO<sub>2</sub>eq.

The present carbon sink certificate is valid for all 1.25 t of biochar registered and documented in Annex 1 and 2.

The present carbon sink certificate was issued by Biochar Life, PBC on 17 February 2022. The system and procedures are accredited by Warm Heart Worldwide, an accredited agent of the Ithaka Institute's European Biochar Certification tropical farmer standard.

## **SOCIAL IMPACT**

The present certificate provides record of the social impact of engaging smallholder farmers and communities in the production and usage of biochar. A majority of the proceeds from the purchase of the present certificate is directly distributed to the farmer and local community personnel used to support the training of farmers, production of biochar and data gathering.

The prevention of open field burning has significant benefits to the health of the farmer and surrounding communities by the reduction of PM<sub>2.5</sub> and other particulates released in the atmosphere.

## Annex 1: Activity details

### Production

id	timestamp	longitude	latitude	nearest_address	processing_date
<a href="https://go.task.io/8re1t">https://go.task.io/8re1t</a>	November 20 2021 14:06:03	34.6150376	-0.3728404	JJX+JVG, Kendu Bay, Kenya	18-11-2021
<a href="https://go.task.io/vxpid">https://go.task.io/vxpid</a>	November 22 2021 14:12:22	34.6149373	-0.3641741	MH2R+7G3, Kendu Bay, Kenya	18-11-2021

### Usage

id	timestamp	longitude	latitude	nearest_address	kg_biochar
<a href="https://go.task.io/uv35i">https://go.task.io/uv35i</a>	November 24 2021 13:52:11	34.6309405	-0.3855971	MH2R+7G3, Kendu Bay, Kenya	625
<a href="https://go.task.io/7ut18">https://go.task.io/7ut18</a>	November 24 2021 13:31:24	34.5895683	-0.3491333	Unnamed Road, Kenya	625

The id includes the link to the detailed task record. Each record is recorded in the blockchain to ensure no tampering or changes.

## Annex 2: Biochar production and C-sink locations

