BiocharLife
An Impact Venture by Warm Heart Worldwide

## Carbon sink and social impact certificate

*Carbon sink certificate based on EBC tropical farmer standard.*

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|---|---|---|
| General Data | ID | BL005 |
| | Production period | 23.11.2021-08.12.2021 |

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|---|---|---|
| Producer(s) | Multiple smallholder farmers, see Annex 1 for more details. | |
| Region | Kenya | |
| Email contact | jason@biochar.life | |

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|---|---|---|
| Biomass | Type of biomass | Corn cobb & husk |
| | Estimated total amount of biomass (dry matter) used for production | 6.26 t |
| | Emissions due to ferlization | 0.00 t CO2 eq |
| | Transportation of biomass to pyrolysis site | 0.00 t CO2 eq |
| | Preparation of feedstock | 0.00 t CO2 eq |
| | Emissions for drying of feedstock | 0.00 t CO2 eq |
| | Feedstock storage emissions | 0.00 t CH4 |
| | **Total biomass related GHG emissions without CH4** | **0.00 t CO2 eq** |

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|---|---|---|
| Pyrolysis | Source of electric energy used on site | |
| | Emissions due to electricity consumption for entire pyrolysis plant including pyrolysis treatment | 0.00 t CO2 eq |
| | Emissions due to LPG and other external fuel for reactor heating | 0.00 t CO2 eq |
| | Emissions due to carrier gas | 0.00 t CO2 eq |
| | CH4-emissions of pyrolysis unit in kg CH4 / t biochar | 30.00 kg CH4 |
| | **Total pyrolysis related GHG emissions without CH4** | **0.00 t CO2 eq** |

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|---|---|---|
| Methane | Total methane emissions | 37.56 kg CH4 |
| | Amount of compensated methane emissions | 37.56 kg CH4 |
| | Type of methane compensation | cease open field burning |
| | **Total non compensated CH4 emissions in CO2 eq (@GWP20 of 86)** | **0.00 t CO2 eq** |

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|---|---|---|
| Post-pyrolysis Tracking | Total preparation of BC-based fertilizer (milling, mixing) in t CO2 eq | 0.00 t CO2 eq |
| | Total transport emissions from kiln to field in t CO2 eq | 0.00 t CO2 eq |
| | Total emissions from soil application of biochar in t CO2 eq | 0.00 t CO2 eq |
| | Amount of compensated CO2eq from soil application in t CO2eq | 0.00 t CO2 eq |
| | **Total post-pyrolysis emissions** | **0.00 t CO2 eq** |

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|---|---|---|
| Margin of security | **10% of total GHG emissions (incl. GWP20 of CH4)** | **0.32 t CO2 eq** |

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|---|---|---|
| Total emissions | Total GHG emissions in CO2 eq | **0.32 t CO2 eq** |
| | Total GHG emissions in Ceq per ton of biochar (dry matter) | **0.070** t C |

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|---|---|---|
| Biochar | Amount of biochar (DM) produced | 1.25 t |
| | H/C org ratio | 0.26 |
| | C-content | **65** % |
| | **C-sink potential** | **64.9 % of DM** |

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|---|---|---|---|
| C-sink potential | Total GHG emissions per t biochar (dry matter) | | **0.258** t CO2 eq |
| | CO2 eq-content per t of biochar (dry matter) | [gross C-sink] | **2.38** t CO2 eq |
| | C-sink potential in tCO2eq per t of biochar (dry matter) | [net C-sink] | **2.13** t CO2 eq |

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|---|---|---|
| Total C-sink data | Csink100 in tCO2eq for the entire C-sink [persistent C of the sink after 100 years when applied to soil @ P100 = 74%] | **1.97** t CO2 eq |

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## 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 (Csink100) is 1.57 t CO2 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 CO2eq per big bag when applied to the soil.

The production and usage of the biochar occurred on the farmer sites. Therefore, minimal emissions occured 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 CO2eq.

The CO2 emissions of the combustions of the pyrolysis gases are considered carbon neutral as the feedstock for the pyrolysis orginated from harvest residutes.

The 37.6 kg of CH4 emissions caused by the production in farm scale equipment (e.g., Kon-Tiki, TLUD, etc.) correspond to a global warming potential over 20 years (GWP20) of 3.2 t CO2eq. The GWP20 of these CH4 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 CH4-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 indepdently 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 (Csink100) 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 CO2eq.

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 certficate 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 PM2.5 and other particulates released in the atmosphere.

**Annex 1: Activity details**

**Production**

| id | timestamp | longitude | latitude | nearest_address | processing_date |
|---|---|---|---|---|---|
| https://go.task.io/7ofo5 | November 23 2021 13:49:06 | 34.6113955 | -0.0937124 | WJP5+9QG, Newa, Kenya | 23/11/2021 |
| https://go.task.io/q2o4u | November 23 2021 12:32:33 | 34.5733517 | -0.045867 | WJX5+QWJ, Newa, Kenya | 23/11/2021 |

**Usage**

| id | timestamp | longitude | latitude | nearest_address | kg_biochar |
|---|---|---|---|---|---|
| https://go.task.io/52kw4 | December 08 2021 15:20:54 | 34.6031859 | -0.0200355 | WJP5+9QG, Newa, Kenya | 625 |
| https://go.task.io/36032 | December 08 2021 16:19:04 | 34.6016177 | -0.0999541 | WJX5+QWJ, Newa, Kenya | 627 |

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**