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Audit Report 2024

In accordance with the following requirements:

Puro.earth - Biochar Methodology

Carbon Cycle GmbH & Co KG
92286 Rieden
Operator's No.: PE-70829

Contact details operator

Name and address

Carbon Cycle GmbH & Co KG
Schwandorfer Strasse 30
DE-92286 Rieden

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Mobile: -
Fax: -
Email: info@carbon-cycle.de

Contact person(s)

Herr Michael Wiederer

Audit visit details

Date

08.10.2024

Duration

1 h 45 m

Persons present including their function

WIEDERER Michael, Authorized officer

KRAUSE Tobias, Project Manager

FERGUSON Paul, LCA provider

MORRISON Gregor, LCA provider

Philipp Seitz, bio.inspecta AG, Auditor

	very good			not satisfactory			
Clarity of documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Audit visit preparation:	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

O.K
 Corrective action required
 Not verified
 Not relevant

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				1	Audit Description
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1.01	Audited Standard: <i>Puro.earth CO2 Removal Marketplace General Rules 3.1 – Biochar Methodology (Annex A)</i>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1.02	Type of Audit: <i>Output Audit</i>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1.03	Auditing Body: <i>bio.inspecta AG, Ackerstrasse 117, CH-5070 Frick www.bio-inspecta.ch</i>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1.04	Audit order assigned to an impartial auditor, free from any conflicts of interest, capable and qualified to complete this audit according to Puro Standard.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1.05	Audit ID: <i>PE-70829</i>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1.06	Audit Date: <i>08.11.24</i>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1.07	Production Facility Location: <i>Schwandorfer Strasse 30, 92286 Rieden</i>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1.08	Production period: <i>01.10.23 - 31.08.24</i>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1.09	Audit could be finished within the scheduled time frame
				2	Standing Data Confirmation

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 Not verified
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				2 Standing Data Confirmation
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>2.01 The standing data has been collected from Puro and checked for consistency against other evidence. (GL Ref.1.2.5.)</p> <p><i>Trade registry available; location evidenced; removal method eligible; no public support! Evidence of output volume: The period of this LCA revision is 01.10.23 – 31.08.24 (no gap or overlap with previous validation period). Production figures are consolidated in an excel overview and displayed in aggregate form with pivot tables; validation period matches mostly with EBC batch period ba-de-29-1-4 (06.10.23 - 05.10.24); corroboration of consolidated production records with daily production protocols on a limited sample basis proofed correct (Nov 23). Consolidated production records include only ready-for-sale volumes after blending and conditioning. First-in-first-out principle followed. Maximum stock that may be kept is one truck load for each product line: Öko-Terr & Öko-Feed.</i></p>
				3 Evidence Confirmation
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>3.01 All necessary evidence has been provided to the auditor by the Production facility and has been used to complete the compliance checklist. (GL Ref. 5.)</p> <p><i>Proof of product quality: EUROFINS laboratory analysis AR-23-FR-056166-01 for biochar sampled in Oct 23 according to EBC standard annex 4A and 4C. EBC certificate renewed in Dec 2023. Production figures are consolidated in an excel overview and displayed in aggregate form with pivot tables; validation period matches mostly with EBC batch period ba-de-29-1-3 (=11 months from 01.10.23 to 30.08.24); corroboration of consolidated production records with daily production protocols on a sample basis (Nov 2023 proofed fully correct). Consolidated production records include only ready-for-sale volumes after blending and conditioning. Proof of sales/proof of no double counting: Available and verified in sales folder. No further research on end use as client base is similar to last year. No further investigation into whether clients are benefitting from other crediting scheme for the purchased volumes.</i></p>
				4 Eligibility Checklist

O.K
 Corrective action required
 Not verified
 Not relevant

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				4 Eligibility Checklist
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4.01 Biochar is used in applications other than energy. (GL Ref. 1.1.1.) <i>The produced biochar is not used for energy purposes. There are two product groups: "Pflanzkohle ÖKO FEED" for animal feed and animal litter, and "Pflanzkohle ÖKO TERR" for soil improvement purposes. Both kinds are sold in multiple grading and packaging variants. Verification of bulk sales has not triggered any suspicion about the use of biochar for energy purposes. No further research on end use as client base is similar to last year. Retail sales to individual / private customers predominantly for animal husbandry, composting, biogas etc.</i>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4.02 Biochar is produced from sustainable forest or waste biomass raw materials (consult positive list of biomasses). (GL Ref. 1.1.2) <i>Coniferous wood extracted through sustainable forest management. PEFC certificates available for all but one new supplier (Weig), corresponding to 1% of purchased wood; no confirmed peatlands in areas where raw material (wood chips) is being sourced (supported by PEFC certificates for all but one supplier of raw material). Coniferous wood commonly not used in construction. Timber qualities that could be used for construction are assumed to have been precluded from the production of wood chips. Included in EBC list of permissible inputs.</i>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4.04 Pyrolysis reactor input fuel for heating is not a fossil fuel. Unless only used for ignition/pre heating or in a mobile unit and the emissions are fully included in the LCA. The use of waste heat from other industrial processes (eg. Biodigesters, cement production) is permitted. (GL Ref. 1.1.4.) <i>Fossil fuels are not used in the pyrolysis reactor, which is heated by electricity generated by the system. A limited quantity of propane is used to initialise the eFlox after maintenance stops. Fuel for ignition is included in the LCA.</i>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4.05 Pyrolysis gases are combusted or recovered. Bio-oil and pyrolysis gases can be stored for later use as renewable energy or materials. (GL Ref. 1.1.5.) <i>Pyrolysis gases are captured. The eFlox system transforms the pyrolysis gases into heat.</i>

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 Not verified
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				4 Eligibility Checklist
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4.06 The molar H/Corg ratio is less than 0.7. <i>The molar H/Corg ratio significantly below 0.7 across various EUROFINS analyses. According to EUROFINS analytical report AR-23-FR-056166-01 (analytical reference for EBC batch ba-de-29-1-3 and underlying validation period), H/Corg ratio is 0.16.</i>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4.07 The biochar produced meets any product quality requirements existing in the jurisdiction where biochar is used and for the specific applications considered (GL Ref 1.1.7). <i>The facility holds an EBC certificate. EBC certified according to EBC FeedPlus and EBC AgroOrganic qualities. The output is GMP+ and EBC-certified animal feed and soil improvement products.</i>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4.08 Evidence of safe handling and transport is provided and adequate for the production facility. (GL Ref. 1.1.8.) <i>Carbon Cycle has implemented appropriate measures to ensure safe storage and transport of biochar. They provide a material safety data sheet; biochar is moistened to average 20% (minimum 12%); and the output is covered during transport.</i>
				5 LCA Checklist
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	5.01 LCA complete and shows: carbon footprint of the biomass production and supply , emissions from the biochar production process , carbon footprint of the biochar end use - cradle to grave. (GL Ref. 1.1.3) <i>The LCA study considers the full product life cycle (system boundary A1-A4, B1 & Infrastructure). referred to as "cradle to grave", as per Puro earth requirements. All process emissions have been calculated in the LCA using the cradle-to-grave approach. The following emissions have been accounted for: Harvesting of the wood, production of wood chips, transport to the production site, the manufacturing of the biochar on site, transportation of the biochar, and use of the biochar. Respective emissions revised according to system boundaries.</i>

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5 LCA Checklist				
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>5.02 The CO2 Removal Supplier provides a life cycle assessment (LCA) for biochar activity including disaggregated information on the emissions arising at different stages. The system boundary is set cradle-to-grave and includes emissions from production and supply of the biomass, from biomass conversion to biochar, and from biochar distribution and use. (GL Ref. 3.1)</p> <p><i>All process emissions have been calculated in the LCA using the cradle-to-grave approach. The following emissions have been accounted for: Harvesting of the wood, production of wood chips, transport to the production site, the manufacturing of the biochar on site, transportation of the biochar, and use of the biochar.Regarding the infrastructure, the reactors manufacturing, installation and disposal are considered as part of the operation, and included in the assessment. The system boundary of this study accords to the Puro earth requirements. Respective emissions revised according to system boundaries.</i></p>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>5.04 The default baseline emission scenario for the project activity feedstock is zero, which is a conservative assumption since it is not taking into account methane emissions derived from decay of manure or combustion of waste biomass. If a non-zero baseline presented, needs to be accepted by Puro.earth</p> <p><i>By capturing waste forest biomass of low economic value from sustainably managed forests and stabilizing the carbon through pyrolysis, Carbon Cycle’s biochar safely captures CO2 that would otherwise be released back into the atmosphere. The wood is classified as energy wood, unsuitable for the timber industry and so the alternative pathway for the feedstock would be decomposition in the forest or unabated combustion in biomass energy production.</i></p>

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				5	LCA Checklist
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	5.03	<p>Life cycle assessment (LCA) follows ISO standard, WRI GHG protocol or similar method. (GL Ref. 3.2)</p> <p><i>The carbon footprint calculation for the biochar produced during the validation period uses a life cycle assessment approach per ISO 14040 and 14044, ISO 14067 and the Puro Earth methodology for biochar edition 2022 version 3, where applicable. Ecoinvent 3.9.1 database cut-off version was used as secondary data, while whenever data was not available from the plant logs, other external sources and the Ecoinvent database were used (secondary data). For Ecoinvent data sets, the method "IPCC 2021 < global warming potential (GWP100)" is used.</i></p>
				6	Production Facility Checklist (Desktop and Verbal Confirmation).
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6.01	<p>Evidence of Production Facility eligibility under the general rules of Puro Standard. (GL Ref. 1.2.1)</p> <p><i>The produced biochar is not used for energy purposes (§1.1.1). The feedstock is untreated wood chips from local forestry operations being transport distances very short. Feedstock suppliers are PEFC certified (§1.1.2). The facility holds an EBC certificate. The output is GMP+ and EBC-certified animal feed and soil improvement products (§1.1.7). All process emissions have been calculated in the LCA using the cradle-to-grave approach (§1.1.3). Fossil fuels are not used in the pyrolysis reactor, which is heated by electricity generated by the system. Pyrolysis gases are captured. The eFlox system transforms the pyrolysis gases into heat. A limited quantity of propane is used to initialise the eFlox after maintenance stops (§1.1.4 - §1.1.5). The exhaust emissions have been analysed and quantified (§1.2.4). The produced biochar has a high, stable carbon content. The analysis performed for the EBC certification demonstrated a carbon content of 92.30% in the dry state (§5.3.3). The produced biochar has a molar H/Corg ratio of 0.16, well below the 0.7 threshold (§1.1.6). Carbon Cycle has implemented appropriate measures to ensure the safe storage and transport of the biochar. They provide a material safety data sheet, the biochar is moistened to 20% prior to storage, and the output is covered during transport (§1.1.8). The company has ready access to feedstock and does not store wood chips on site for more than 30 days. Therefore, in accordance with the EBC guideline, no stockpile emissions are calculated. The potential for fugitive release of syngas from pyrolysis is considered negligible.</i></p>

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 Corrective action required
 Not verified
 Not relevant

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				6	Production Facility Checklist (Desktop and Verbal Confirmation).
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6.02	The Production Facility demonstrate Environmental and Social Safeguards. (GL Ref. 1.2.2.) <i>Environmental and social safeguards met.</i>

O.K
 Corrective action required
 Not verified
 Not relevant

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				6 Production Facility Checklist (Desktop and Verbal Confirmation).
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>6.03 CO2 Removal Supplier shall be able to demonstrate additionality, meaning that the project must convincingly demonstrate that the CO2 removals are a result of carbon finance. Even with substantial non-carbon finance support, projects can be additional if investment is required, risk is present, and/or human capital must be developed. To demonstrate additionality, CO2 removal Supplier must provide full project financials and counterfactual analysis based on Baselines that shall be project-specific, conservative and periodically updated. Suppliers must also show that the project is not required by existing laws, regulations, or other binding obligations. (GL Ref. 1.2.3)</p> <p><i>Revenue from the sales of CORCs is an important part of Carbon Cycle's business case for future investment and to scale up the production technology. Revenue has been re-invested in repairs, improvements, and expansion of the facility. Operation and production of biochar requires skill and knowledge which Carbon Cycle has had to develop. Sales of CORCs make up approximately 23% of the revenues from the biochar operation. The net value realized by Carbon Cycle from the sales of the biochar only, is not sufficient to cover the production cost, and ongoing maintenance or expansion of the biochar production facility. A large barrier for small biochar producing businesses, is getting the biochar to market. The use of biochar in agriculture, although not completely new, is very much in its infancy. It is therefore a challenge to convince farmers in the area to change farming practices and adopt new products such as biochar. Infrastructure at the Carbon Cycle facility is a challenge. In Q4 2024, Carbon Cycle will commission a new, larger production system. The revenue from carbon removal certificates is an essential part of the business case for further investment. The revenue from carbon credit sales not only supports infrastructure expansion but supports Carbon Cycle in marketing their product to farmers. When considering purely financial factors, a certain amount of fixed and variable external costs will be incurred, such as the cost of carbon project developers and sales, materials and equipment, and training workers and end-users. Carbon Cycle have undertaken considerable investments to biochar production while hoping to benefit from the carbon credit market and bring growth to the carbon capture marketplace. The existence of the carbon revenue reduces the price risk from biochar sales and helps offset rising costs of production. The limiting factor for Carbon Cycle's growth is the sale of its biochar. The carbon revenue therefore enables Carbon Cycle to partially subsidize the price of biochar which can enable farmers who may not otherwise be able to afford it, to try it with the operations. The producer hopes that this strategy will be beneficial in the long run for its business and that it will create customer loyalty that increases the value of the business and provides a solid base for investment decisions in further biochar production capacity.</i></p>

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 Corrective action required
 Not verified
 Not relevant

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				6 Production Facility Checklist (Desktop and Verbal Confirmation).
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>6.04 The Production Facility's documentation system is accurate and reliable (GL Ref. 1.2.4)</p> <p><i>349 dry tonnes of biochar were produced during the period 1st October 2023 – 31st August 2024. Production figures are consolidated in an excel overview and displayed in aggregate form with pivot tables. All biochar was sold to customers who provide an application for which Puro CORCs are claimed. For the purpose of the issuance of CORC certificates, the dry mass of sold biochar has been used to ensure accountability for the end usage of the biochar. The bags are weighed after production. To ascertain the dry weight of the biochar, the moisture content has been deducted. Carbon Cycle measures the moisture content of each bag, being the average of the period assessed 17%.</i></p>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>6.05 The quantity of the biochar produced and sold is quantified and documented in a reliable manner (GL Ref. 1.2.4)</p> <p><i>Production figures are consolidated in an excel overview and displayed in aggregate form with pivot tables</i></p>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>6.06 Relevant meters are in place and they are calibrated (GL Ref. 1.2.4)</p> <p><i>The bags are weighed after production. Weighing scale is regularly calibrated as per regulations.</i></p>

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 Corrective action required
 Not verified
 Not relevant

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				6	Production Facility Checklist (Desktop and Verbal Confirmation).
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6.07	<p>The emissions from the cultivating, harvesting and transporting of the biomass are estimated and calculated in a reliable manner (GL Ref 1.2.4)</p> <p><i>The calculation of the emissions from the forestry and harvesting of the wood chip includes loss of sinks. The data source is "softwood forestry, pine, sustainable forest management - DE - wood chips, wet, measured as dry mass" from Ecoinvent 3.10 (2023) being the original inventory data source used by Ecoinvent a German study (Albrecht et al, 2009). The CO2e emissions linked to the feedstock needed to produce each tonne of biochar is 179 kg CO2e per declared unit of output. The wood chips are transported by lorry from the forest harvesting sites to the production site. The wet mass-weighted average distance travelled from the suppliers is 7 km. Emissions from transport data are from the Ecoinvent 3.10 lorry transport Euro VI dataset. However, indicated transport distances for 2 suppliers (Staatsforsten Burglengenfeld (17 km instead of 3 km) and VOGL Josef (70 km instead of 5 km) differ as google map search reveals. Further, the dry weight of wood chips is not corresponding to % moisture in 7 instances.</i></p>

O.K
 Corrective action required
 Not verified
 Not relevant

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				6 Production Facility Checklist (Desktop and Verbal Confirmation).
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>6.08 The energy use of the Production Facility can be quantified and the emissions from the process calculated (GL Ref. 1.2.4)</p> <p><i>Carbon Cycle purchases renewable electricity. So the electricity emissions have been calculated using the electricity consumption and the renewable electricity mix based on the tariff from the electricity supplier and the renewable mix in Germany. CO2e emissions from electricity amount to 56 kg CO2e per declared unit of output, considering electricity generation life cycle emissions. A total of 15,569 litres of propane were consumed during the period. Life cycle CO2e emissions from propane have been calculated using a global dataset for propane that includes the combustion and upstream emissions from Ecoinvent 3.10. The CO2e emissions are 108 kg CO2e per declared unit of output. Carbon Cycle uses a telescopic extender in order to move feedstock and output on the site. The vehicle uses diesel fuel which is delivered to the site. The CO2e emissions from diesel usage have been calculated using a global data set from Ecoinvent 3.10 and amount to 24 kg CO2e per unit of output. The equipment and infrastructure were installed in 2019. The expected productive lifetime of the installation is 25 years. Emissions from the installation were not accounted at the time, but the emissions related to the main components have been estimated and allocated to the biochar produced since then. Assuming 30 tonnes of industrial machinery and 150 m3 of concrete for the civil works the value of 106,200 kg CO2e is obtained for the infrastructure. These emissions are allocated to the assessed 11 months period and considering the assessed period biochar production, resulting in 11 kg CO2e for each tonne of biochar produced.</i></p>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>6.09 The auditor goes through the Quantification of CO2 Removal requirements with the CO2 Removal Supplier, so that the Supplier is able to calculate the CO2 Removal independently in its Output Report</p> <p><i>Together with the LCA provider.</i></p>
				7 Calculation Checklist

O.K
 Corrective action required
 Not verified
 Not relevant

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				7	Calculation Checklist
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.01	<p>Qbiochar = Quantity of biochar produced and sold to end user. (dry char) (GL Ref. 4.2.)</p> <p><i>Systemised in excel overview, consolidated and displayed in aggregated form with pivot tables. Final weight (wet) and moisture content of production output measured at factory gate prior to sales. Dry weight obtained by factoring in moisture content. Mass of biochar sold slightly superior than production because of stock at validation start.</i></p>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.02	<p>FpTHTs = c + m x H/Corg (GL Ref. 4.2.)</p> <p><i>Buffer for degradation. Provided in the Gross embodied CO2 calculator at given soil temperature and selected time horizon (attached).</i></p>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.03	<p>C Biochar = carbon content of biochar (GL Ref. 4.2.)</p> <p><i>Carbon content constantly over 90% across various EUROFINS analyses. According to reference analytical report AR-23-FR-056166-01 =92,3%.</i></p>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.04	<p>Estored = biochar carbon storage = Qbiochar x Cbiocharorg x FpTHTs x 44/12 (GL Ref. 4.2.)</p> <p><i>For October 2023 – August 2024, the net carbon removal is 2.916 tonnes CO2e/tonne of dry biochar, being the emissions arising from the biochar life cycle 0.46 tonnes CO2e/tonne of dry biochar. Given the mass of 355 dry tonnes sold during the assessed period, the resulting total CO2e removed was 1,036 tonnes CO2.</i></p>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.05	<p>Ebiomass = LCA emissions of production and supply of biomass (GL Ref. 4.3.)</p> <p><i>According to feedstock consumption and biochar production during the study period, 3.9 tonnes of dry wood pellets were required to produce 1 tonne of dry biochar. The CO2e emissions linked to the feedstock needed to produce each tonne of biochar is 215 kg CO2e per declared unit of output.</i></p>

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7 Calculation Checklist				
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>7.06 Eproduction = LCA emissions from biochar manufacturing (GL Ref. 4.4)</p> <p><i>Emissions from the production process of the biochar are limited to electricity, propane used to prime the eFloX after production stops, and diesel for on-site vehicle usage. Moreover, allocated emissions arise from the machinery. In total, emissions of greenhouse gases related to the manufacturing phase of biochar amount to 199 kg CO2e per tonne of dry biochar. Electricity consumption: Carbon Cycle purchases renewable electricity. So the electricity emissions have been calculated using the electricity consumption and the renewable electricity mix based on the tariff from the electricity supplier and the renewable mix in Germany. CO2e emissions from electricity amount to 56 kg CO2e per declared unit of output, considering electricity generation life cycle emissions. Propane consumption: A total of 15,569 litres of propane were consumed during the period. Life cycle CO2e emissions from propane have been calculated using a global dataset for propane that includes the combustion and upstream emissions from Ecoinvent 3.10. The CO2e emissions are 108 kg CO2e per declared unit of output. Diesel consumption: Carbon Cycle uses a telescopic extender in order to move feedstock and output on the site. The vehicle uses diesel fuel which is delivered to the site. The CO2e emissions from diesel usage have been calculated using a global data set from Ecoinvent 3.10 and amount to 24 kg CO2e per unit of output. Infrastructure emissions: The equipment and infrastructure were installed in 2019. The expected productive lifetime of the installation is 25 years. Emissions from the installation were not accounted at the time, but the emissions related to the main components have been estimated and allocated to the biochar produced since then. Assuming 30 tonnes of industrial machinery and 150 m3 of concrete for the civil works the value of 106,200 kg CO2e is obtained for the infrastructure. These emissions are allocated to the assessed 11 months period and considering the assessed period biochar production, resulting in 11 kg CO2e for each tonne of biochar produced.</i></p>

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 Corrective action required
 Not verified
 Not relevant

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				7	Calculation Checklist
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.07	<p>Euse = LCA emissions of the use of biochar, including distribution up to the point of final use (GL Ref 4.5)</p> <p><i>The mass-weighted average distance travelled for biochar to customers is 373 km. Greenhouse gases emissions from biochar transport have been calculated using the Ecoinvent 3.10 lorry Euro VI transport dataset. Moreover, the big bags and paper bags delivered from the suppliers is accounted for. Emissions related to the transport from the packaging manufacturers amount 0.4 kg CO2e per unit. Total biochar transport emissions, including the biochar and packaging mass, are 47 kg CO2e per tonne of dry biochar. Notwithstanding, inconsistencies of transport distances and weighted average transport distance may arise from the fact that for several buyers who are practising drop shipping the company address is being referenced instead of the actual application sites. The biochar is sold to farms, soil amendment companies, manure manufacturers. The application emissions are related to the processes that each company has for application. These processes can vary significantly, from hand feeding to animals to spreading and mixing. As a proxy for the average application process, an emissions profile for spreading dry fertilizer has been selected from Ecoinvent 3.10. The biochar application emissions are estimated to be 5 kg CO2e per tonne of dry biochar.</i></p> <p><i>Inconsistencies of transport distances and weighted average transport distance to the end consumer may arise from the fact that for several buyers who are practising drop shipping the company address is being referenced instead of the actual application sites. It is strongly advised that in future a Tracking App shall be utilized which will enable the handling of real transport distances to the application sites.</i></p>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.08	<p>CORCs = Estored - Ebiomass - Eproduction - Euse</p> <p><i>1.036 CORC for 355 tonnes dry matter shipped and accounted for within the period of validation (01.10.23 - 31.08.24) after deduction of emissions from material, feedstock transport, manufacturing, biochar transport to application sites, processing and application from the Estored value.</i></p>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.09	<p>Quantity of CORCs (in evidence).</p> <p><i>1.036 CORC for 355 tonnes dry matter shipped and accounted for within the period of validation (01.10.23 - 31.08.24).</i></p>

O.K
 Corrective action required
 Not verified
 Not relevant

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				7	Calculation Checklist
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.10	Confirm consistency. <i>Inconsistencies have been solved with the LCA provider during validation.</i>
				9	Overall conclusion
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9.01	Overall conclusion: <i>The validator confirms that the LCA calculation 01.10.23 - 31.08.24 provides a credible and faithful account of output volumes and emissions, and thus of declared carbon dioxide removals from sales which have occurred in the same period, as stated in the Output statement. The validator is confident that the conservativeness has been applied to a sufficient degree to say that declared CO2 removals are fully justified.</i>

Auditor’s evaluation and recommendation

Non-compliance	Corrective action	Deadline
Puro.earth - Biochar Methodology		
<p>4.02 PEFC certificates available for all but one new supplier (Weig), corresponding to 1% of purchased wood.</p>	<p>The lack of a certificate for the new supplier Weig is not further stressed because of the low participation in the overall purchase volume. A sustainable forest certificate can be presented for next year validation if purchases happen with the same supplier.</p>	
<p>6.07 Indicated transport distances for 2 suppliers (Staatsforsten Burglengenfeld (17 km instead of 3 km) and VOGL Josef (70 km instead of 5 km) differ as google map search reveals. The dry weight of wood chips is not corresponding to % moisture in 7 instances.</p>	<p>Please rectify dry weight, transport distances and weighted average transport distance, and submit the updated LCA.</p>	<p>completed</p>

The Right to be Heard

The undersigned has reviewed the outcome of the audit documented in this report and confirms the completeness and accuracy of the information provided in the audit and the content of this report.

He/ she has taken note of the non-conformities, measures, deadlines and sanctions described in this report.


The undersigned has the option of submitting a counter-notification in writing to bio.inspecta AG within three working days of receipt of this report. If no reply is received within this period, the contents of this report shall be deemed to be acknowledged.

Frick, 01.12.2024

Rieden,

bio.inspecta AG / q.inspecta GmbH
International Department

Carbon Cycle GmbH & Co KG



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Philipp Seitz

name, first name.....

Auditor

function.....