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Audit Report 2024

In accordance with the following requirements:

Puro.earth - Biochar Methodology

Sylva Fertilis France
61200 Argentan
Operator's No.: PE-71029

Contact details operator

Name and address

Sylva Fertilis France
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Contact person(s)

Mr. Cyprien Gosset

Audit visit details

Date
23.09.2024

Duration
5 h 45 m

Persons present including their function
GOSSET Cyprien, Environmental and carbon engineer
Philipp Seitz, bio.inspecta AG, Auditor

	very good						not satisfactory
Clarity of documentation	☐	☐	☐	☒	☐	☐	☐
Audit visit preparation:	☐	☐	☐	☒	☐	☐	☐

O.K | Corrective action required | Not verified | Not relevant

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				1	**Audit Description**
☒	☐	☐	☐	1.01	Audited Standard: *Puro.earth CO2 Removal Marketplace General Rules 3.1 – Biochar Methodology (Annex A)*
☒	☐	☐	☐	1.02	Type of Audit: *Output Audit*
☒	☐	☐	☐	1.03	Auditing Body: *bio.inspecta AG, Ackerstrasse 117, CH-5070 Frick* *www.bio-inspecta.ch*
☒	☐	☐	☐	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. *Auditor (name/surname): PHILIPP SEITZ*
☒	☐	☐	☐	1.05	Audit ID: *PE-71029*
☒	☐	☐	☐	1.06	Audit Date: *23.09.2024*
☒	☐	☐	☐	1.07	Production Facility Location: *2 Route de Sées, 61200 Argentan*
☒	☐	☐	☐	1.08	Production period: *The period of this LCA study is 1st September 2023 – 31st August 2024.*
☒	☐	☐	☐	1.09	Audit could be finished within the scheduled time frame *Perfectly maintained LCA reporting and calculation. Calculatory paths and raw data provided without default.*
				2	**Standing Data Confirmation**

O.K | Corrective action required | Not verified | Not relevant

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				2	**Standing Data Confirmation**
☒	☐	☐	☐	2.01	The standing data has been collected from Puro and checked for consistency against other evidence. (GL Ref.1.2.5.) *Trade registry available; location evidenced; removal method eligible; LCA calculation covers the period 1st Sep 2023 until 31st Aug 2024, corresponding roughly to EBC batch period ba-fr-84-1-4; no public support! Evidence of output volume: Two granularities of char are produced: > 1 mm and 0-1 mm. During the validation period, the company produced 106 dry metric tonnes of biochar and sold 100 dry metric tonnes of biochar. The bags are weighed immediately after production. This ensures that the atmospheric moisture does not impact the measurement. To ascertain the dry weight of the biochar, the moisture content has been deducted. Analysis shows that the moisture content of the biochar is 1.4%. Pellet consumption cannot be measured during the production process but outbalanced against the remaining stock. When set against production figures, a conversion ratio of 4.35 to 1 can be established which closely mirrors the conversion between biomass and biochar. The conversion ratio has been confirmed during the EBC audit.*
				3	**Evidence Confirmation**

O.K | Corrective action required | Not verified | Not relevant

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				3	**Evidence Confirmation**
☒	☐	☐	☐	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.) *The feedstock consists exclusively of wood pellets. The pellets' supplier FICAP declares that the pellets produced come from non-controversial sources certified by PEFC / FR ST of the French Forest Certification Scheme. PEFC certificate attached which is valid until 16.03.2026. The LCA is categorised as cradle-to-grave as it considers the impacts from forestry through to the end use of biochar. The lab analysis performed by Eurofins in October 2023 demonstrated an organic carbon content of 92.8% in the dry state, while in July 2024 the lab analysis performed by Inovalys showed an organic carbon content of 90.5%. The average is 91.7%. The produced biochar has an average H/Corg molar ratio of 0.16, 0.12 in 2023 analysis (Eurofins, 2023) and 0.21 in 2024 analysis (Inovalys, 2024), well below the 0.7 threshold. The hydrogen content is also part of the analyses and used for calculation of the permanence factor. Evidence of output volume: Two granularities of char are produced: > 1 mm and 0-1 mm. During the validation period, the company produced 106 dry metric tonnes of biochar and sold 100 dry metric tonnes of biochar. The bags are weighed immediately after production. This ensures that the atmospheric moisture does not impact the measurement. To ascertain the dry weight of the biochar, the moisture content has been deducted.*
				4	**Eligibility Checklist**
☒	☐	☐	☐	4.01	Biochar is used in applications other than energy. (GL Ref. 1.1.1.) *The produced biochar is not used for energy purposes. Sylva Fertilis creates soil improvement products and sells the remaining biochar as soil improvement products to municipalities, farmers, golf courses, wine producers, and forestry operations.*
☒	☐	☐	☐	4.02	Biochar is produced from sustainable forest or waste biomass raw materials (consult positive list of biomasses). (GL Ref. 1.1.2) *The feedstock consists exclusively of wood pellets. The pellets' supplier FICAP declares that the pellets produced come from non-controversial sources certified by PEFC / FR ST of the French Forest Certification Scheme. PEFC certificate attached which is valid until 16.03.2026.*

O.K | Corrective action required | Not verified | Not relevant

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				4	**Eligibility Checklist**
☒	☐	☐	☐	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 processess (eg. Biodigesters, cement production) is permitted. (GL Ref. 1.1.4.) *The pyrolysis unit doesn't directly consume fossil fuels, only electricity for its periphery. The carbonisation itself is ignited like a camp fire with wood chips.*
☒	☐	☐	☐	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.) *Pyrolysis gases are captured and combusted within the reactor.*
☒	☐	☐	☐	4.06	The molar H/Corg ratio is less than 0.7. *The produced biochar has an average H/Corg molar ratio of 0.16, 0.12 in 2023 analysis (Eurofins, 2023) and 0.21 in 2024 analysis (Inovalys, 2024), well below the 0.7 threshold.*
☒	☐	☐	☐	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). *The facility holds an EBC certificate of the highest EBC status which is AgroOrganic. It is therefore most suitable for soil improvement products for which it is used for.*
☒	☐	☐	☐	4.08	Evidence of safe handling and transport is provided and adequate for the production facility. (GL Ref. 1.1.8.) *Sylva Fertilis has implemented appropriate measures to ensure the safe storage and transport of the biochar. They can provide a material safety data sheet for transport and storage. A certificate of succes to a self-heating test (attached) is reasonable proof that spontaneous self-ignition is unlikely.*
				5	**LCA Checklist**

O.K | Corrective action required | Not verified | Not relevant

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				5	**LCA Checklist**
☒	☐	☐	☐	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) *Compliance with comparable conditions is outlined in the LCA report, and 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, transport and production of pellets, transport to the production site, the manufacturing of the biochar on site, transportation of the biochar, and use of the biochar.*
☒	☐	☐	☐	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) *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, transport and production of pellets, transport to the production site, the manufacturing of the biochar on site, transportation of the biochar, and use of the biochar.*
☒	☐	☐	☐	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 *The default baseline emission scenario for feedstock is zero as no methane emissions from decay of biomass occurs. The pellet supplier declares that green wood chips in their production site are not stored for more than one month (self-declaration of date 17/06/2021).*
☒	☐	☐	☐	5.03	Life cycle assessment (LCA) follows ISO standard, WRI GHG protocol or similar method. (GL Ref. 3.2) *The calculation of the carbon footprint of the biochar has been carried out per ISO 14040, 14044, 14067 and Puro biochar methodology Edition 2022 version 3.*
				6	**Production Facility Checklist (Desktop and Verbal Confirmation).**

O.K Corrective action required Not verified Not relevant

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				6	**Production Facility Checklist (Desktop and Verbal Confirmation).**
☒	☐	☐	☐	6.01	Evidence of Production Facility eligibility under the general rules of Puro Standard. (GL Ref. 1.2.1) *Trade registry available; location evidenced; removal method eligible; LCA calculation covers the period 1st Sep 2023 until 31st Aug 2024, corresponding roughly to EBC batch period ba-fr-84-1-4; no public support!*
☒	☐	☐	☐	6.02	The Production Facility demonstrate Environmental and Social Safeguards. (GL Ref. 1.2.2.) *Environmental and Social safeguards available.*
☒	☐	☐	☐	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) *Revenue from the sales of CORCs is an important part of Sylva Fertilis business case for future investment and to scale up the production technology. Revenue has been re-invested in improvements, and expansion of the facility as well as in marketing of their Terra Fertilis brand. Sales of CORCs make up approximately 23% of the revenues from the biochar operation. The net value realised by Sylva Fertilis 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. The revenue gained by carbon removal suppliers speeds their growth, compounding the climate effect and accelerating the carbon net-negative economy. To scale up production and maintain quality, Sylva Fertilis requires new equipment. They have recently received a second machine, which will double the capacity of their current machine and is expected to be in production by January 2025. Additionally, a third machine is planned for 2026. The revenue from carbon credit sales can support Sylva Fertilis in this scale up, along with expanding their marketing efforts for their product brand.*

O.K | Corrective action required | Not verified | Not relevant

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				6	**Production Facility Checklist (Desktop and Verbal Confirmation).**
☒	☐	☐	☐	6.04	The Production Facility's documentation system is accurate and reliable (GL Ref. 1.2.4) *Evidence of output volume: Two granularities of char are produced: > 1 mm and 0-1 mm. During the validation period, the company produced 106 dry metric tonnes of biochar and sold 100 dry metric tonnes of biochar. The bags are weighed immediately after production. This ensures that the atmospheric moisture does not impact the measurement. To ascertain the dry weight of the biochar, the moisture content has been deducted. Analysis shows that the moisture content of the biochar is 1.4%.*
☒	☐	☐	☐	6.05	The quantity of the biochar produced and sold is quantified and documented in a reliable manner (GL Ref. 1.2.4) *During the validation period, the company produced 106 dry metric tonnes of biochar and sold 100 dry metric tonnes of biochar. Two granularities of char are produced: > 1mm and 0-1 mm. The bags are weighed immediately after production. This ensures that the atmospheric moisture does not impact the measurement. To ascertain the dry weight of the biochar, the moisture content has been deducted. The moisture content of the biochar used for the calculation is the average of the last two measurements (Eurofins, 2023 and Inovalys, 2024), measured at 1.4% in both cases.*
☒	☐	☐	☐	6.06	Relevant meters are in place and they are calibrated (GL Ref. 1.2.4) *Biochar is weighed w/ calibrated weighing scales. Electricity: Power consumption data from 2nd Semester 2023 and 1st Semester 2024 from invoices have been used as the basis for the calculation. Stack emissions: Sylva Fertilis commissioned an exhaust gas analysis in April 2021 (APAVE NORD-OUEST SAS, 2021).*

O.K | Corrective action required | Not verified | Not relevant

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				6	**Production Facility Checklist (Desktop and Verbal Confirmation).**
☒	☐	☐	☐	6.07	The emissions from the cultivating, harvesting and transporting of the biomass are estimated and calculated in a reliable manner (GL Ref 1.2.4) *The GHG emissions arising from the feedstock production were calculated based on a LCA study for wood pellets production in Sweden (Hagberg et al 2009), adjusted with specific data from the supplier, FICAP, regarding wood transport from the forest to the pellet production plant and wood processing. IPCC AR6 GWP100 (Smith et al, 2021) have been used to calculate the GHG emissions. The GHG emissions from wood pellets production is 181 kg CO2e/tonne dry biochar. The pellet manufacturer declares that they do not store wood in chipped form on site for any length of time that would result in greenhouse gas emissions, no more than 1 month (self-declaration of date 17/06/2021). Therefore, no pile emissions have been calculated in accordance with the guidelines from EBC. In addition, the emissions related to the production of the packaging have been accounted for.*
☒	☐	☐	☐	6.08	The energy use of the Production Facility can be quantified and the emissions from the process calculated (GL Ref. 1.2.4) *Emissions from the production process of the biochar arise from electricity consumption at the facility and process emissions. Moreover, allocated emissions arise from the machinery. For further details see above.*
☒	☐	☐	☐	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 *Onsite during the EBC audit on 23.09.2024.*
				7	**Calculation Checklist**
☒	☐	☐	☐	7.01	Qbiochar = Quantity of biochar produced and sold to end user. (dry char) (GL Ref. 4.2.) *Certificates are claimed based on sales, rather than production as they are asynchronous. For the validation period Sep 2023 to Aug 2024, Sylva Fertilis has sold 99.76 dry tons of biochar.*

O.K | Corrective action required | Not verified | Not relevant

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				7	Calculation Checklist
☒	☐	☐	☐	7.02	FpTHTs = c + m x H/Corg (GL Ref. 4.2.) *Provided in the Gross embodied CO2 calculator at averaged soil temperature and selected time horizon = 0.9951. Average soil temperature between 9.7 (Romania) and 11.1 ºC (France) used as a proxy as 53% was sold in Romania and the rest in France.*
☒	☐	☐	☐	7.03	C Biochar = carbon content of biochar (GL Ref. 4.2.) *The organic carbon content of the biochar was measured at 91.65% in* *the 2023 analysis of biochar, in the dry state (AR-23-FR-057432-01, 2023). Therefore, the mass of captured CO2 contained in each dry mt of biochar can be expressed as 3.664*0.9165= 3.36 tonnes CO2/tonne* *of biochar.*
☒	☐	☐	☐	7.04	Estored = biochar carbon storage = Qbiochar x Cbiocharorg x FpTHTs x 44/12 (GL Ref. 4.2.) *Laboratory tests show that the biochar has an average H/Corg ratio of 0.16 (0.12 in 2023 analysis and 0.21 in 2024 analysis), indicating a good level of stability. Using the combination of H/Corg ratio and an average soil temperature of 10.4ºC based on the end-use location, it has been determined that 99.5% of biochar is durable at 100 years. A 0.5% buffer has therefore been factored into the carbon removal calculation per the Puro.Earth methodology for biochar.*
☒	☐	☐	☐	7.05	Ebiomass = LCA emissions of production and supply of biomass (GL Ref. 4.3.) *The assessed period operations data shows that 4.36 tonnes of dry wood chips were required to produce 1 dry tonne of biochar during the study period. The calculation of the emissions from the forestry and harvesting of the wood chips includes loss of sinks. The additional process step of chipping has been added using an industry-standard factor for diesel-powered chipping. The GHG emissions arising from the feedstock production were calculated based on a LCA study for wood pellets production in Sweden (Hagberg et al 2009), adjusted with specific data from the supplier, FICAP, regarding wood transport from the forest to the pellet production plant and wood processing. IPCC AR6 GWP100 (Smith et al, 2021) have been used to calculate the GHG emissions. The GHG emissions from wood pellets production is 181 kg CO2e/tonne dry biochar.*

O.K Corrective action required Not verified Not relevant

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				7	Calculation Checklist
☒	☐	☐	☐	7.06	Eproduction = LCA emissions from biochar manufacturing (GL Ref. 4.4) *Emissions from the production process of the biochar arise from electricity consumption at the facility and process emissions. Moreover, allocated emissions arise from the machinery. No wood pellets pile stocking emissions are generated, as they are stored for a maximum of 6 months in big bags placed on pallets and in dry conditions (moisture content of pellets between 5% and 7%). The pyrolysis reactor uses electricity from the grid for its operation, as does the suction system for the pellets, lighting, ventilation and forklifts. Power consumption data from 2nd Semester 2023 and 1st Semester 2024 from invoices have been used as the basis for the calculation. 3.2MWh of electricity are used for each tonne of dry biochar. Emissions related to electricity consumption have been calculated using the French database Base Carbone□ emission factor for 2022 grid electricity in France (the latest available mix): 0.0520 kg CO2e/kWh. The emissions related to the electricity consumption in Sylva Fertilis facility in Argentan, Normandy are 167 kg CO2e/tonne of dry biochar produced. Sylva Fertilis commissioned an exhaust gas analysis in April 2021 (APAVE NORD-OUEST SAS, 2021). The GHG gases analysed included were methane and CO2. CO2 emissions are considered to be carbon neutral, so only methane is included in the LCI. The report shows a rate of 0.005 kg CH4/hour. The productive days provided by Sylva Fertilis and hours of operation were used to calculate the methane emissions during the period assessed. Using GWP values for 100-year time horizon from the IPCC Sixth Assessment Report (Forster et al, 2021) the methane emissions amount to 7 kg CO2e/tonne of dry biochar produced. Emissions that arise from the production, installation and disposal of the pyrolysor used to manufacture the biochar have been considered. GHG emissions related to the pyrolysor used for one year and allocated to the biochar produced is 31 kg CO2e/tonne of dry biochar produced.*

O.K | Corrective action required | Not verified | Not relevant

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				7	**Calculation Checklist**
☒	☐	☐	☐	7.07	Euse = LCA emissions of the use of biochar, including distribution up to the point of final use (GL Ref 4.5) *The bagged biochar is mainly transported to the customer by truck. The calculated weighted-average road distance to the customer using Mappy is 1804 km. Greenhouse gas emissions from biochar transport have been calculated using the tkm transported, including the biochar and packaging mass, and the Base Carbone□ dataset "Rigide/12 à 20 tonnes/Diesel routier, incorporation 7 % de biodiesel". The most dominant usage of biochar is as soil amendment. It is assumed that the biochar is spread on fields in a similar manner to manure, manually or by mechanical means. According to Sylva Fertilis, only professional customers would apply the biochar using a tractor, being customers who buy more than 20 kg. The emissions arising from the application of biochar to soil using tractors have been modelled based on the diesel consumption of a tractor during manure spreading operations, 0.3 litres/tonne spread. The manual application has no allocated impact.*
☒	☐	☐	☐	7.08	CORCs = Estored - Ebiomass - Eproduction - Euse *For September 2023 – August 2024, the net carbon removal is 2.47 tonnes CO2e/tonne of dry biochar, being the emissions arising from the biochar life cycle 0.87 tonnes CO2e/tonne of dry biochar. Given the mass of 100 dry tonnes sold during the assessed period, the resulting total CO2e removed was 246 tonnes CO2.* *CORCs: 246,352*
☒	☐	☐	☐	7.09	Quantity of CORCs (in evidence). *Given the mass of 100 dry tonnes sold during the assessed period, the resulting total CO2e removed was 246 tonnes CO2.* *CORCs: 246,352*
☒	☐	☐	☐	7.10	Confirm consistency. *Sylva Fertilis intends to claim CORC certificates using the factor 2.47 ton CO2e/dry ton biochar. Certificates are claimed based on sales, rather than production as they are asynchronous. For the period Sep 2023 to Aug 2024, Sylva Fertilis has sold 99,76 dry tons of biochar and claims 246,352 CORCs.*
				9	**Overall conclusion**

O.K | Corrective action required | Not verified | Not relevant

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				9	**Overall conclusion**
☒	☐	☐	☐	9.01	Overall conclusion: *The validator confirms that the LCA calculation 01.09.23 - 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. Despite the lack of traceability to private customers and online retail, sales have not been precluded due to their very limited participation in the overall sales. The validator is confident that the conservativeness has been applied to a sufficient degree to say that declared CO2 removals are fully justified.*

Auditor’s evaluation and recommendation

Non-compliance	Corrective action	Deadline
Puro.earth - Biochar Methodology		
None		

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, 10.10.2024	Argentan, ...
bio.inspecta AG / q.inspecta GmbH International Department	Sylva Fertilis France
	.....
Philipp Seitz	name, first name.....
Auditor	function.....