


Arbaz, 3<sup>rd</sup> May 2022

## EBC carbon sink certificate

General Data	ID of C-sink certificate = C-sink register ID	cs-rw06-lw88-uplo-mkjl
	EBC ID	co-at-34
	EBC Batch ID	ba-at-34-1-1
	Production period	17.9.2020 - 16.9.2021
	QR-Code of Biochar Batch Analysis	

Producer	Sonnenerde GmbH Oberwarter Strasse 100 7422 Riedlingsdorf Austria
GPS of production	N 47.328925160820276, E 16.15179389679843 <a href="http://www.sonnenerde.at">www.sonnenerde.at</a> <a href="mailto:e.moisl@sonnenerde.at">e.moisl@sonnenerde.at</a>

Biomass	Type of biomass (EBC-class)	Ag-05, N-02
	Total amount of biomass (dry matter) used for the certified batch	390 t
	Emissions due to fertilization per batch	0 t CO <sub>2</sub> eq
	Transportation of biomass to pyrolysis site per batch	1.2 t CO <sub>2</sub> eq
	Preparation of feedstock per batch	7.5 t CO <sub>2</sub> eq
	Emissions for drying of feedstock per batch	0 t CO <sub>2</sub> eq
	Feedstock storage emissions per batch	0 t CH <sub>4</sub>
	<b>Total biomass related GHG emissions without CH<sub>4</sub> per batch</b>	<b>8.7 t CO<sub>2</sub>eq</b>

Pyrolysis	Source of electric energy used on site	renewable
	Emissions due to electricity consumption for entire pyrolysis plant incl. post pyrolysis treatment per batch	0 t CO <sub>2</sub> eq
	Emissions due to LPG and other external fuel for reactor heating per batch	6 t CO <sub>2</sub> eq
	Emissions due to carrier gas per batch	0 t CO <sub>2</sub> eq
	CH <sub>4</sub> -emissions of entire batch	0.04 t CH <sub>4</sub>
	<b>Total pyrolysis related GHG emissions without CH<sub>4</sub> per batch</b>	<b>6.0 t CO<sub>2</sub>eq</b>

Methane	Total methane emissions per batch	0.04 t CH <sub>4</sub>
	Amount of compensated methane emissions	0 t CH <sub>4</sub>
	Type of methane compensation	-
	Total non compensated CH <sub>4</sub> emissions per batch	0.04 t CH <sub>4</sub>
	<b>Total non compensated CH<sub>4</sub> emissions in batch (@ GWP20 of 86)</b>	<b>CO<sub>2</sub>eq per 3.35 t CO<sub>2</sub>eq</b>

Margin of security	<b>10% of total GHG emissions (incl. GWP20 of CH<sub>4</sub>) per batch</b>	<b>1.8 t CO<sub>2</sub>eq</b>
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<b>Total emissions</b>	<b>Total GHG emissions in CO<sub>2</sub>eq per batch</b>	<b>19.8 t CO<sub>2</sub>eq</b>
	Total GHG emissions in C per ton of biochar (dry matter)	0.050 t C

Energy	Carbon neutral thermal energy per batch	470 MWh
	Carbon neutral electricity per batch	- MWh

Biochar	Amount of biochar (DM) produced per certified batch	108.00 t
	H/Corg ratio	0.17
	C-content	63.2 %
	<b>C-sink potential</b>	<b>58.2% of DM</b>

Data per ton of biochar	Total GHG emissions per t biochar (dry matter)	0.18 t CO <sub>2</sub> eq
	CO <sub>2</sub> eq-content per t of biochar (dry matter) [gross C-sink]	2.32 t CO <sub>2</sub> eq
	C-sink potential in tCO <sub>2</sub> eq per t of biochar (dry matter) [net C-sink]	2.13 t CO <sub>2</sub> eq
	<b>Csink<sub>100</sub> in tCO<sub>2</sub>eq per t of biochar (dry matter) [persistent C of the sink after 100 years when applied to soil @ P<sub>100</sub>=74% ]</b>	<b>1.58 t CO<sub>2</sub>eq</b>

# EBC Carbon Sink Certificate

## Issued for Sonnenerde GmbH

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**The biochar batch ba-at-34-1-1 produced by Sonnenerde GmbH has carbon sink potential of 58.2 %. Each ton of biochar from the certified batch has a carbon sink potential of 2.13 t CO<sub>2</sub>eq. When applied to soil, the accountable fraction of carbon persistent after 100 years (C<sub>sink100</sub>) is 1.58 t CO<sub>2</sub>eq.**

The carbon sink potential of 58.2 % provides the percentage of a mass unit of biochar that, on a dry matter base, can be considered as a temporal carbon sink. For example, a big bag containing 131 kg biochar (dry matter) has a carbon sink potential of (131 kg \* 58.2 % C<sub>S</sub>) = 76.2 kg C which is the equivalent of 279.5 kg CO<sub>2</sub>eq per bigbag.

The 76.2 kg carbon of a 1m<sup>3</sup> big bag of biochar is the amount of carbon that can be considered a carbon sink once the biochar is applied to soil, to compost, to digestate, to animal feed or to any other durable product or protective matrix.

The production of 1 t of biochar (dry matter) caused emissions of 50 kg CO<sub>2</sub>eq due to feedstock production, transportation, storage, preparation and operation of the pyrolysis plant and methane emissions during both biomass storage and the combustion of the pyrolysis gases. These emissions were deduced from the carbon sink value of the biochar.

The CO<sub>2</sub> emissions of the combustions of the pyrolysis gases used for energy production are considered as carbon neutral as the feedstock for the pyrolysis originated from agricultural farms and food processing residues.

The CH<sub>4</sub> emissions were measured repeatedly during regular operation on at least three pyrolysis plants of the same type. The methane values are thus subject to some uncertainty in regard to start-up and shut down of the process or possible problems during regular operation. For this reason, a margin of 50% was added to the measured CH<sub>4</sub> emissions. It was guaranteed that the feedstock is never stored longer than 30 days before drying to below 20% water content, therefore no CH<sub>4</sub>-emissions due to self-heating were considered. All electricity used for the production was provided as renewable, carbon neutral energy.

Neither the carbon expenditures necessary to transport the biochar from the production site to the location of the final C-sink (via a merchant and/or processor) nor the carbon expenditures when manufacturing or blending the biochar into a carbon sink product are considered so far. These emissions must be deducted as soon as a C-sink certificate or an offset service is generated for an end customer based on this C-sink potential certificate. Equally, when applied to soil, only the carbon fraction that is persistent after 100 years (C<sub>sink100</sub>) or any other EBC-defined sequestration period should be traded as C-sink certificate.

During the biochar production, 470 MWh thermal energy was produced. As all GHG emissions of the entire process were deduced from the biochar carbon sink potential, this thermal energy is completely carbon neutral. The total certified amount of carbon neutral heat will be provided at the end of the batch.

The present ***EBC carbon sink potential certification*** is valid for the entire biochar batch produced between 17/09/2020 and 16/09/2021 and can be used for carbon sink certification and trade procedures.

The present EBC carbon sink potential certification was issued by the Ithaka Institute (Switzerland) on 3<sup>rd</sup> May 2022.



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Hans-Peter Schmidt  
Head of Ithaka Institute