

Clarifications on Chapter 9.2 Dry Matter Content of Biochar: on-site measurement

Global Biochar C-Sink Standard (2024)

Initial Situation

The C-sink value of a given amount of biochar is defined by its mass and carbon content. Mass here refers to dry mass, and it is a true challenge to measure it regularly onsite. The dry matter content of biochar cannot be measured directly but must be calculated from the fresh weight and the measured water content.

The water content of biochar can be subject to considerable fluctuations at the time of sale or even directly at the discharge of the pyrolysis plant. Reasons for this can be a fluctuating intensity of the quenching at the discharge, the absorption of air humidity, or air drying.

Therefore, it is impossible to determine the C-sink using the dry matter content analyzed once per batch during the annual EBC/WBC-accredited laboratory analysis.

Also, the bulk density, which is needed to calculate mass from a given volume, can vary significantly within a batch, mainly due to variations in the particle size distribution of the pyrolyzed biomasses and abrasion during the transfer and transport of the biochar. Thus, a volumetric determination of the dry weight of the produced biochar is also not appropriate.

Chapter 9.2. of Global Biochar C-Sink Standard (2024) defines that: "For each sub-quantity of max. 10 m³ of biochar, at least 20 individual sub-samples must be taken using a sampling stick. Combining a minimum of 20 sub-samples must yield at least a total sample volume of 10 liters of biochar. The individual sub-samples can be taken either from a collected pile or container of max. 10 m³ of biochar or from each of several big bags presenting a total amount of max. 10 m³. The combined sample is weighed using a scale with a precision of at least 1 gram. The biochar is then dried at 110 °C for at least 16 hours and weighed again. Weighing must be done immediately (max. 1 minute) after removal from the 110 °C drying oven. Otherwise, moisture may condense on the biochar and falsify the result.

This method simplifies the usual DIN 51718 and ISO 589, which may also be followed"

Deviations from the procedure described here can be regulated during the technical EBC/WBC audit, if, e.g., the dry weight is determined via a deviating method. If a producer can prove that the dry matter content does not change by more than ±2% over extended periods and production quantities, larger intervals between measurements can be authorized.

Clarification

As an alternative method, a humidity scale can be recognized without additional approval. A moisture analyzer is permissible if it is calibratable based on ISO standards and the stop criteria selected on the device for reading the moisture content is a maximum variation of 20 mg within 60 seconds is selected as the stop criteria.

The methodology for dry matter determination with a humidity scale are:

1. Dry matter determination when filling in big bags/sales unit
2. Weighing each big bag with moist biochar
3. Take 1 sample of approx. 1l with the drill stick per 2m³ or big bag. The drill stick shall cover the complete height of the big bag. If the sales unit is significantly larger than 2m³, then the rate of samples should be still 1l per 2m³. The sample must be taken in a representative manner.
4. From the 1l (or more) sample per sales unit a representative subsample of approx. 100ml must be taken. It must be made sure by using a crusher or similar that the sample does not overrepresent a specific fraction of the biochar. It must be made sure that water is not changed as a result of sample preparation.
5. Place 100ml sample in the humidity scale and determine moisture content. Stop criteria as given above.
6. Allocation to the big bag according to the formula: Dry mass = mass x (1 - moisture)
7. Label each big bag with its specific dry mass

If a producer can prove that the dry matter content does not change by more than $\pm 10\%$ over extended periods and production quantities, these producers can also apply for larger intervals between measurements.

Reasoning

Various biochars were tested with a humidity balance and a very good agreement was found with the method described in the Global Biochar C-Sink Standard (2024).