

Supplier Onboarding Manual

Guideline for Biochar Producer and Wholesaler

How to get remunerated for effective
climate protection services through
Carbonfuture

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Carbonfuture GmbH

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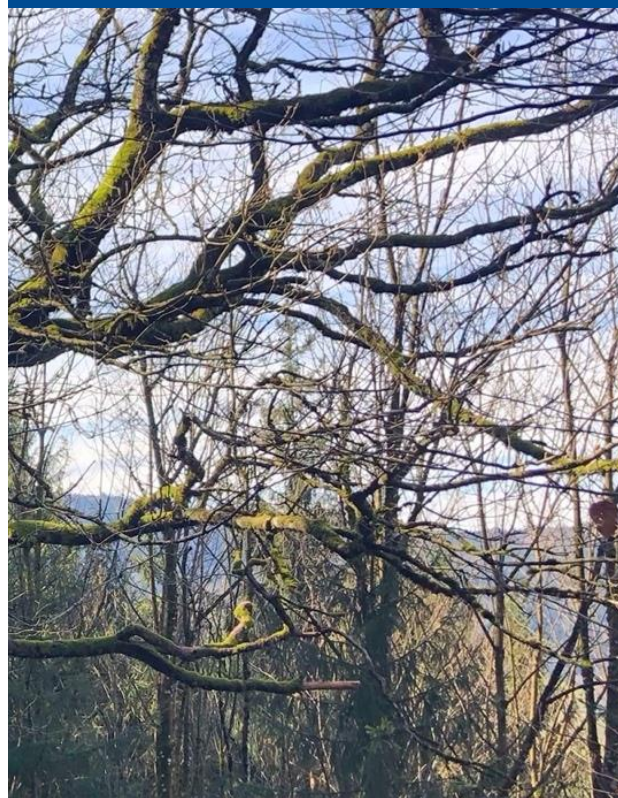


Table of Contents

1	Preface - About this Manual.....	3
2	Overview	3
2.1	Why Carbonfuture?.....	3
2.2	What is Carbonfuture and What's in it for You as Biochar Producer and Wholesaler?	4
2.3	Standards and Processes.....	4
2.3.1	The Carbonfuture Coupon.....	5
2.3.2	Linking Production and Sink Certificates in the cf-Certificate	6
2.3.3	Cash-Flows	6
3	Quantifying the Climate Benefit of Biochar-Based Sinks.....	8
4	Detailed Manual for the Carbonfuture Platform	9
4.1	Registering a new (EBC) Production Certificate on the Carbonfuture Platform	9
4.2	Wholesaler / Sink Registrar	11
5	Appendix	14
	Appendix A: Carbonfuture Coupon.....	14
	Appendix B: Application for the EBC-Sink Certificate	15

1 Preface - About this Manual

This manual is designed to help C-Sink providers with the onboarding process on the Carbonfuture platform.

It provides insights to specific standards and procedures that suppliers need to be aware of, in order to successfully register biochar-based carbon sinks. Besides this manual, Carbonfuture may provide context sensitive help for additional questions and problems if needed.

The manual aims to inform producers and wholesalers of biochar as well as other traders and end users. Also, organizations that intend to produce and distribute biochar in the near future may use this manual to find all the necessary information, documents and to understand processes required to be remunerated for the climate benefit from persistent biochar applications with Carbonfuture.

The manual is organized in the following manner:

- I. The first chapter provides a general overview of the relevance carbon sinks
- II. The second chapter names reasons and incentives for producers and traders to enter the carbon market and introduces the reader to necessary standards and processes that suppliers need to uphold in order to generate credits with Carbonfuture
- III. The third chapter provides more information about the calculation of the carbon sink value
- IV. The fourth chapter contains a detailed manual with all the steps that are necessary to register a biochar-based carbon sink at the Carbonfuture platform

2 Overview

2.1 Why Carbonfuture?

In order to limit global warming below catastrophic levels, significant emission reductions are essential but by no means sufficient. There is already too much CO₂ in the atmosphere, and we must capture and safely store billions of tons over the next decades. That is, we need carbon sinks. Carbon sinks are fundamentally different to emission reductions. Scalable and readily available technologies are rare but available:

- Carbon forestry
- Soil organic carbon
- Biochar

Many emission compensation schemes realized in various carbon markets already exist. However, very few strictly distinguish between carbon sinks from emission reduction projects (e.g., renewable energy). In addition, all existing schemes are vague on the duration of carbon sequestration. Third, the measurability, verifiability of carbon credits is weak and therefore may create a lack of trust. Many of them are oversupplied and many have specific additionality requirements which are much more tailored to emission reductions and seem in their current forms less suited for negative emission technologies (NET) and true carbon rebalancing. The Carbonfuture platform was created to address these shortcomings of existing schemes. In contrast to other carbon markets, Carbonfuture offers:

- True carbon sinks only
- Carbon sink tracking
- Persistence over 100 years¹
- Guaranteed unalterable documentation and end-to-end auditability on the Carbonfuture Blockchain²³

2.2 What is Carbonfuture and What's in it for You as Biochar Producer and Wholesaler?

The Carbonfuture platform provides both registry services and a trading platform for carbon sinks. Each individual carbon sink is represented and unalterably documented on the Carbonfuture blockchain by a **cf-Certificate**.

Each carbon sink certificate must meet our basic requirements in order to qualify to be eligible on the Carbonfuture platform. The Carbonfuture [C-Sink Certification Standards](#) describe in detail the criteria that the already existing and traded biochar-based C-sinks fulfil. Biochar-based sinks are the starting point and first use-case for Carbonfuture. By remunerating the climate benefit of persistent biochar applications, Carbonfuture injects money into the biochar value chain and fosters the creation of an additional revenue stream for biochar applications.

2.3 Standards and Processes

For biochar-based sinks, the C-Sink CreditsCertificates are based on two elements described below, the **Production Certificate** and the sink documentation as

¹ If a sink cannot be guaranteed to be fully stable over 100 years, e.g., through decomposition processes, more carbon must be stored initially in order to guarantee 1 ton over 100 years on average (a physicist would speak of "100 ton years")

² The applied blockchain technology is IBM Hyperledger, a non-energy intensive technology

³ We use a permissioned blockchain and guarantee data confidentiality; accordingly, we do disclose sensitive sink details only to admitted auditors and not to the general public

evidenced by the **Carbonfuture Coupon** (see *section 1.3.1*). In general, Carbonfuture may accept production certificates from any independent institution, provided they fulfil our Standards. Currently, the European Biochar Certificate (EBC) is the only issuer of eligible production certificates. We encourage alignment and collaboration between the respective national, regional and global standards and the EBC in order to ensure comparability and a level playing field.

Suppliers of biochar are obliged to follow the [EBC guidelines](#) to prevent any hazard for the health and for the environment while producing and using biochar. Furthermore, the EBC ensures that the feedstock used for the biochar production is harvested in a sustainably way, not causing environmentally harmful land-use changes.

The **biochar producer** must register the production certificate of the pyrolysis facility. During the certification process for the biochar production the percentage of a mass unit of biochar which can be considered to have a carbon sink potential and net of emissions related to feedstock preparation and pyrolysis are being assessed. This sink potential can be turned into a carbon-sink when the biochar is used in a carbon-preserving manner. There are two aspects to the production certificate:

- The pyrolysis plant must be certified. This includes in particular an assessment of the emissions and energy consumption of the pyrolysis process. The manufacturer of your pyrolysis plant must provide the required information on this to the reviewer.
- The individual production process must be certified. This includes an assessment of the feedstock production and preparation process and the energy used. It will become part of the general EBC⁴ certification beginning in Q2 2020.

With the registration of the production certificate, the producer assures not to realize the carbon sink potential which is registered with and traded through Carbonfuture under the respective certificate outside the Carbonfuture platform. This is key to prevent double counting.

2.3.1 The Carbonfuture Coupon⁵

Biochar as a raw material comes in a huge variety of qualities and respective price levels. In addition, biochar has a vast range of potential applications ranging from filtration material, construction additive to agricultural use. Not all of these

⁴ EBC stands for European Biochar Certificate, issued by the Ithaka Institute

⁵ An example of the Carbonfuture Coupon is provided in the Appendix

applications lead necessarily to a stable carbon sequestration and hence to not qualify as a stable carbon sink. Therefore, Carbonfuture requires that wholesalers and producers must follow the [EBC C-Sink](#). Following the EBC C-Sink, the biochar must be taken over at the factory gate by a tracking system that assesses all carbon expenditures and greenhouse gas emissions that occur on its pathway (i.e. transporting, milling, processing). As soon as the biochar is mixed into agricultural substrates such as [fodder](#)⁶, compost, liquid manure, and fertilizer or into durable materials such as concrete or resins, the C-sink potential can be converted into tradable C-sink certificates.

Therefore, the key to creating an accurately quantified carbon sink based on biochar lies in confirmation and documentation of the actual carbon preserving application of the material. To ensure that the biochar is used in a manner that does actually sequester the carbon, the biochar wholesaler together with the end user must document the use of the material on the Carbonfuture platform.

This documentation validates the actual sinks in a very granular way. For each shipping of biochar from the wholesaler to the end user, an individual Carbonfuture Coupon, filled out and signed by the end user of the biochar, provides the required evidence. Furthermore, with this document, the end user **warrants to transfer all rights that come with the respective carbon sink creation**. This is key to prevent double counting.

From Q2 2021, a fully digital sink tracking will be available, including a digital Coupon. Physical signatures are still possible and accepted, but a fully digital and streamlined process will be available.

2.3.2 Linking Production and Sink Certificates in the cf-Certificate

The Production Certificate and the Carbonfuture Coupon are linked on the Carbonfuture platform. After the validation of both documents, Carbonfuture issues a cf-Certificate for each individual sink. This cf-Certificate represents the claim on the climate service provided by the sink and therefore has a monetary countervalue in the carbon market. After issuance, it is assigned to the registrar of the sink (which is typically the wholesaler or the end user), who is then the registered owner of the cf-Certificate.

2.3.3 Cash-Flows

The owner of the cf-Certificate may sell it to any entity which acts as Broker on the Carbonfuture platform. Initially, Carbonfuture GmbH will act as the primary Broker

⁶ Additional parameters and analytical methods for the EBC-certification of biochar as animal feed additive ([EBC FEED](#)) are outlined in the linked document

and will buy cf-Certificates from the sink registrar (e.g., the wholesaler). As the marketplace evolves, we expect and encourage new brokers to join.

In essence, Carbonfuture compensates the sink registrar in exchange of the cf-Certificate. However, both the biochar producer and the end user are key contributors to the climate service:

- **The producer** sells certified biochar with a sink potential. This sink potential has a value as in the end, it can be turned into a sink and reimbursed. Some producers are billing the sink potential in a separate line item in addition to the material, others just calculate it in with the biochar price.
- **The end user** signs the Coupon, providing relevant data and substantiating the claim related to the climate service (i.e. carbon sequestration), and transferring all claims related to the climate service. Some wholesalers issue a credit note (reverse bill) to the end users in return of the Coupon.

These two parties deliver their service to the wholesaler and, strictly speaking, the monetary compensation is subject to the respective contractual relations. Together with our pilot partners we currently have a model where the sink registrar reimburses the end user in exchange of a signed Carbonfuture Coupon. In this model, the sink registrar keeps a handling margin, and the end user receives a fair share. The biochar producer benefits as the demand for the certified product is strengthened and better prices can be realized. In buying the C-Sink Credits from the wholesaler, Carbonfuture injects money into the biochar value chain and fosters the creation of an additional revenue stream.

In addition to that, **Carbonfuture compensates the producer** when registering a production certificate in exchange of the assurance not to claim the sink potential registered and traded with Carbonfuture outside the perimeter of the Carbonfuture platform.

3 Quantifying the Climate Benefit of Biochar-Based Sinks

In order to quantify the climate benefit of the biochar, it is decisive to determine the overall emission balance of the biochar including pyrolysis, further processing and application. If this balance is overall positive, meaning more carbon has been permanently sequestered than emitted, we can speak of a true carbon sink. The biomass production must be climate-neutral, i.e. it must not diminish existing carbon sinks. This can be ensured, for example, by using agricultural or other waste, rapidly growing biomass or other material recovered from the care and maintenance of biodiversity areas, the countryside and roadsides. Wood from sustainably managed forests can also meet the criteria.

In order to calculate the net CO₂ equivalent value of a biochar-based sink, the following calculation steps are performed.

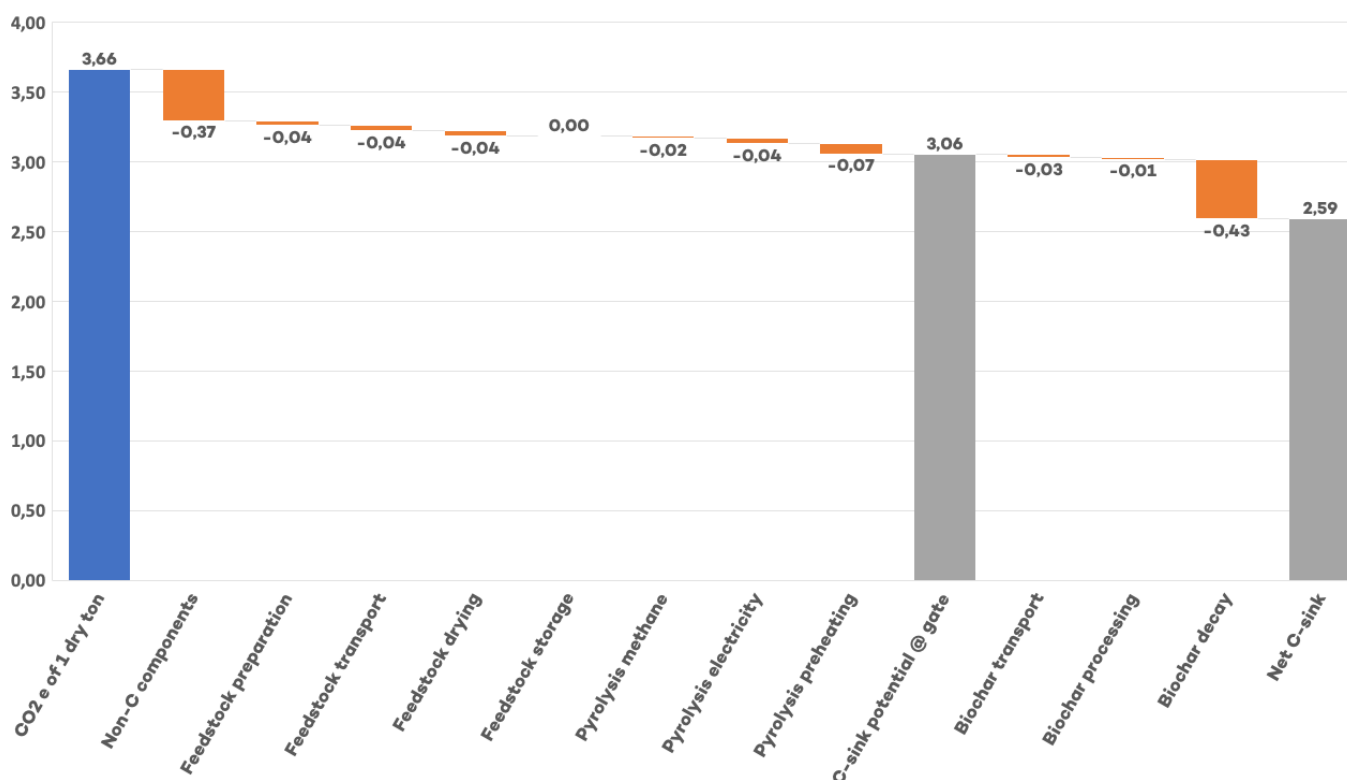
- All deductions based on dry mass biochar which are made to come up with the net CO₂ sink value after pyrolysis (i.e., at production site), are provided by the (EBC) production certificate, namely the non-carbon part of the biochar and the production emissions.
- The conversion of the gross weight of a unit biochar into dry mass needs to be provided by the sink registrar, either based on individual measurement of moisture content (the protocols must be stored and disclosed upon request) or based on bulk density measurements.
- Further deductions for transport and processing are based on data provided by the sink registrar on the Carbonfuture platform. The respective calculations are performed by Carbonfuture. The annual decay is determined to be 0.3% provided the production certificate asserts $H/C_{org} < 0.4$.⁷

Figure 1 shows an example for the calculation of the net C-Sink value, as employed by Carbonfuture. More detailed information about the methodology and its scientific basis can be found in the [EBI Whitepaper](#)⁸.

⁷ This decay rate is a conservative estimation based on Lehmann, Johannes & Abiven, Samuel & Kleber, Markus & Pan, Gen-Xing & Singh, Bhupinder Pal & Sohi, Saran & Zimmerman, Andrew. (2015). Persistence of biochar in soil. Biochar for Environmental Management: Science, Technology and Implementation. 235-282. (see Figure 10.5).

⁸ EBI stands for European Biochar Industry Consortium e.V.

Figure 1: Calculation of the net C-Sink value of the soil application of 1 dry metric ton of biochar



4 Detailed Manual for the Carbonfuture Platform


This chapter provides a pictorial manual for suppliers who wish to list their production certificate and to register biochar-based carbon sinks on the Carbonfuture platform. An additional manual, outlining the application for the EBC-Sink production certificate at the Ithaka institute can be found in Appendix B.

4.1 Registering a new (EBC) Production Certificate on the Carbonfuture Platform

Once the Biochar Producer has been certified and a carbon sink potential has been calculated for their biochar production facility as above, an account can be set up on the Carbonfuture platform (<https://platform.Carbonfuture.earth/>). Production certificates can be registered in a simple web-form on the Carbonfuture platform where the relevant values are entered, most importantly the **C-sink potential**, and the pdf certificate will be uploaded. This has to be done only once for each production certificate. The current EBC⁹ production certificates are typically valid for the duration of one year.

⁹ Currently, the EBC sink certificate is the only eligible production certificate on Carbonfuture

Step 1: Registering a new (EBC) Production Certificate


 **Carbonfuture**

Registered Production Certificates


Creation Timestamp
↓

Demo EBC Kohlau	
Certificate ID	4468936d-ac79-4751-97c1-d030cc51a5b5
External ID	AT2020.00001
Status	Expired
Start Date	September 1, 2019
End Date	August 31, 2020

Press + to register a new certificate



+



Register Production Certificate

Summary

Production Certificate Name*

Production Certificate Issuer*


External ID*

Batch Start Number*

Batch End Number*

In order to register a sink based on the biochar produced under your production certificate, the ID of your production certificate will be needed. This ID is generated automatically by the Carbonfuture platform. Accordingly, you need to provide this information to the wholesaler of your biochar. Clicking on the ID (top of detail view) on copies it into your clipboard and you can just paste it into an email.¹⁰

Example for a registered (EBC) Production Certificate

 **Carbonfuture**
Prody User

Registered Production Certificates

Creation Timestamp
↓

Demo EBC Kohlau	
Certificate ID	4468936d-ac79-4751-97c1-d030cc51a5b5
External ID	AT2020.00001
Status	Expired
Start Date	September 1, 2019
End Date	August 31, 2020

+
↺

Demo EBC Kohlau

Summary

Certificate ID 4468936d-ac79-4751-97c1-d030cc51a5b5

The Certificate ID is needed for the Sink Registrar to refer to your Production Certificate. Click on the ID to copy the value to your clipboard.

Certificate Name **Demo EBC Kohlau**

Certificate Issuer **Zerti fier**

External ID **AT2020.00001**

Batch Start Number **35 2019**

Batch End Number **36 2020**

Start Date **September 1, 2019**

End Date **August 31, 2020**

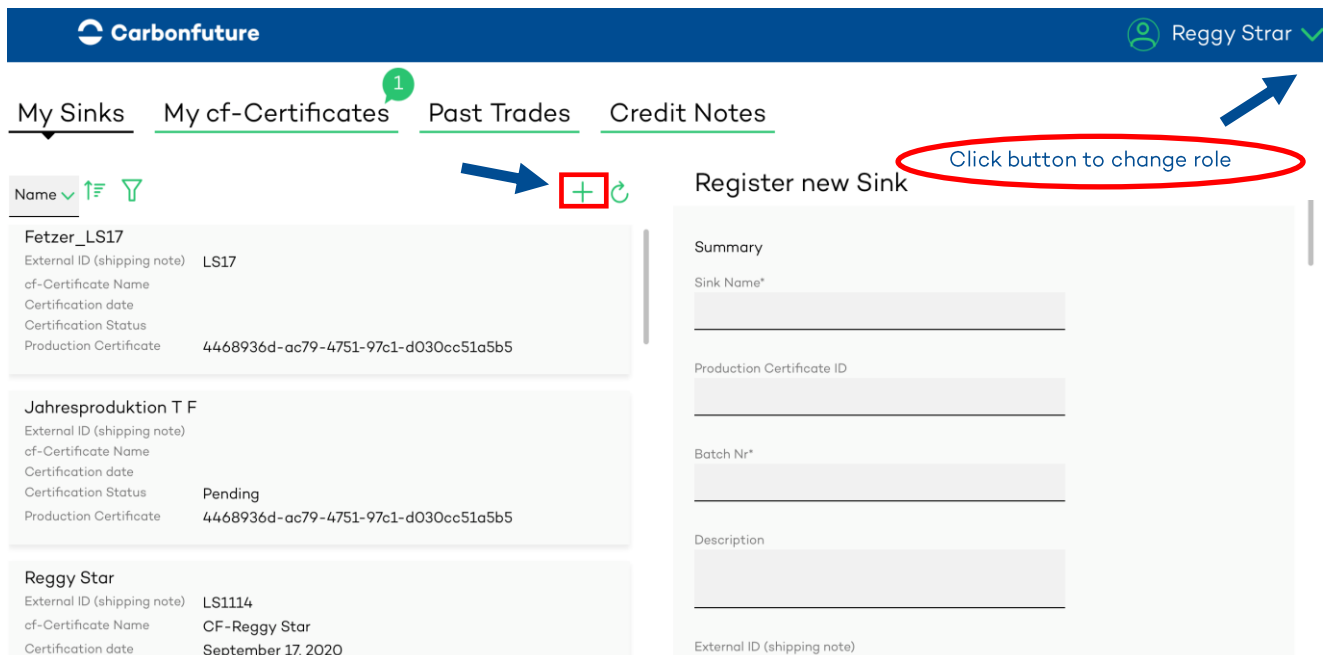
Carbon Sink Value (per mass unit in %) **84.5**

¹⁰ This will be simplified and more automated using QR codes printed on shipping notes and big bag labels soon

4.2 Wholesaler / Sink Registrar

Enlisted producers and wholesaler who sold the certified biochar for the use in soils, feed additives, building materials or other uses that will sequester carbon, can proceed to the next step in the cf-process, namely registering a carbon sink. To proceed with this registration, you have to change your role to “registrar” by clicking on the button next to your account name (see *picture below*). Once you are logged in as a “registrar” you may press the + sign and register a new carbon sink.

Step 2: Registering a new Carbon Sink



The screenshot shows the Carbonfuture user interface. At the top, the user is logged in as 'Reggy Star'. The 'My Sinks' tab is active, displaying a list of sinks. A red circle highlights the user profile 'Reggy Star' with the text 'Click button to change role'. A red box highlights a '+' button with an arrow pointing to it. The 'Register new Sink' form is visible on the right, with fields for Sink Name*, Production Certificate ID, Batch Nr*, Description, and External ID (shipping note).

Name	External ID (shipping note)	cf-Certificate Name	Certification date	Certification Status	Production Certificate
Fetzer_LS17	LS17				4468936d-ac79-4751-97c1-d030cc51a5b5
Jahresproduktion T F				Pending	4468936d-ac79-4751-97c1-d030cc51a5b5
Reggy Star	LS1114	CF-Reggy Star	September 17, 2020		

Required information includes:

- Production certificate ID number
- Relevant post-production data including gross and dry weight of the material, transport means (e.g. truck, train) and transport distance
- Upload the Carbonfuture Coupon, which is filled out and signed by the end-user; with this document, the end-user confirms the application of the biochar in a carbon preserving manner, and the client confirms to transfer all rights related to the climate service provided by the biochar application (including but not limited to getting public or private funding for the same climate service, or using it for the own sustainability report¹¹)

¹¹ For the avoidance of doubt: Referencing to participation in Carbonfuture climate services in own marketing activities is possible, provided it is clear that the carbon balance is sold and the claim on it is made by a third-party. This is to prevent explicit and implicit double counting.

The Coupon can be generated automatically based on the data entered into the sink registration form. Alternatively, a template can be downloaded from the [Carbonfuture website](#).

Once the sink registration is complete, it is eligible for purchase by the Broker. For this, the sink registrar must request cf-Certification by Carbonfuture as outlined in the picture below.

Step 3: Request the cf-Certification

Biochar Delivery February



Summary

Sink Id	b0507510-46bf-42b6-bc58-b858f2c3e1c4
Sink Name	Biochar Delivery February
Batch Number	21.04.2021
External ID (shipping note)	LS00003
Coupon Number	1008
Sink Type	Biochar
Gross Weight (t)	3
Transport	100km by means of Truck


Sink Location

Street	Musterstr. 1
City	12345 Musterstadt
Country	Germany

Responsible Person

Name	Beert Vingaard
Company Name	Beerwein AG
Email	Michael.beerwein@beerwein.ag
Street	Musterstr. 1
City	12345 Musterstadt
Country	Germany

Attached Documents

Document name	uploaded on
 Demo_Coupon_21.02.2021.pdf	22 Feb 2021, 14:32

Add document


Request cf-Certification



Carbonfuture will then validate the information and issue a **cf-Certificate**. This cf-Certificate represents the rights on the climate service provided. Accordingly, this is the certificate which actually has value.

The owner of the cf-Certificate can offer this certificate for sale to a broker on the Carbonfuture platform. Once the broker has ordered your cf-Certificate, you see the open order.

Step 4: Accept Order of the cf-Certificate


Carbonfuture

[My Sinks](#)
[My cf-Certificates ¹](#)
[Past Trades](#)
[Credit Notes](#)

Certification timestamp

CF-Reggy Star

Sink
cf-Certifier
Certification date
Amount (ta)
Open Orders

Reggy Star
Certy Fiar
17 Sep 2020, 12:48
423

2020 - 2119

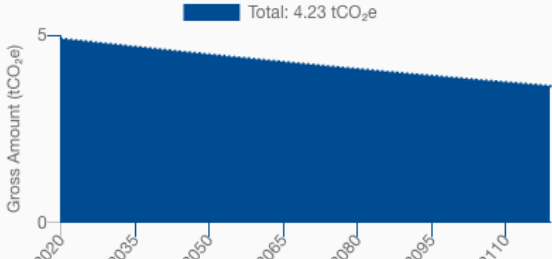
Sink

Summary
Sink Id
8a1fa387-3c1b-4460-8803-beef5ae19381
Sink Name
Reggy Star
Batch Number
1 2020
External ID (shipping note)
LS1114
Sink Type
Biochar
Moisture (%)
30
Volume (m³)
10
Certification Status
Certified
Transport
10km by means of LKW
Description
verschiedene stabile Anwendungen
Production Chain
Direkte Lieferung

cf-certificate

Summary
Certificate ID
dac41f8d-ee5c-4837-9aa1-d2234a0338bd
Certificate Name
CF-Reggy Star
Certification date
17 Sep 2020, 12:48
Start Year
2020
End Year
2119
Sink
Reggy Star
Amount (ta)
423

cf-Certifier
Name
Certy Fiar
Email
certifier@carbonfuture.earth

Sequestration Curve


Open Orders

Brock R
17 Sep 2020, 12:48

Transaction Id
Oad2cdc0-ae2c-4e73-a0ae-b691924ff7ef
Amount (ta)
Price per tonne and year
€ 0.55
Price Net
€ 233.20

☒ ☐ [Read our Terms and Conditions](#)

After you accepted the broker's buy order, ownership of the cf-Certificate will be transferred to the broker¹².

¹² In the currently established workflow with Carbonfuture acting as broker, we are reimbursing the selling party through a self-billing note (so we need the selling party's bank details and VAT-Reg. No. as applicable).

5 Appendix

Appendix A: Carbonfuture Coupon

In general, the coupon will be issued with the Carbonfuture logo. However, it is possible to customize the coupons for our suppliers if needed.



CO₂-Senken Zertifikat carbonfuture Coupon

To be filled out by the biochar wholesaler / sink registrar		Return coupons to
Name / firm		Email: registrar@carbonfuture.earth
Date	2021-02-22	
Shipping note (external ID)	LS00003	
Batch-No. ¹	21.04.2021	
Quantity ²	Gross weight 3.0 t	Volume n/a m ³
Optional Information	Coupon-No. 1008	Sealing-Nr

¹ Alternatively, the production date may be provided

² Either gross weight or volume must be provided

To be filled out by the end client / biochar user			
Name / firm		Beerwein AG	
Address		Head Office	Address / location of sink if different
Street		Musterstr. 1	Musterstr. 1
City, ZIP		12345 Musterstadt	12345 Musterstadt
Country		Germany	Germany
Type of application (please tick as appropriate)	<input type="checkbox"/> Direct soil application	<input type="checkbox"/> Silage additive	
	<input type="checkbox"/> Compost additive	<input type="checkbox"/> Additive for anaerobic digestion (biogas facility)	
	<input type="checkbox"/> Liquid manure treatment	<input type="checkbox"/> Biochar-based organic fertilizer	
	<input type="checkbox"/> Bedding for farm animals		
	<input type="checkbox"/> Feeding of farm animals		

By signing this document, the biochar user confirms and agrees:

- The biochar and the manure (in case of biochar application as bedding or feeding) and the digestate (in case of anaerobic digestion) will be brought into soil and will **not be burnt or pyrolyzed**.
- He or she explicitly warrants that **the claim on the carbon sink service provided is transferred** to the wholesaler / sink registrar indicated above. He or she will not claim any rights related to this service. In particular, he or she will not claim any such rights in relation to any private or public subsidy or support program in the context of soil organic carbon or as part of the CO₂ accounting in his or her own sustainability report.
- He or she explicitly agrees that his or her **data** which is registered and stored in relation to the referenced sink may be used by carbonfuture. They will be made public in an anonymized way, e.g. as part of statistics on the carbonfuture platform. In addition, they will be disclosed in complete and not anonymized form for control and audit purposes to persons who are authorized for this by carbonfuture or under the EBC certificate.

Optional:

- ☐ I consent to the **publication of the exact sink location** on the carbonfuture platform

Place and date

Signature biochar user

Appendix B: Application for the EBC-Sink Certificate


The EBC-sink certificate is issued by the Ithaka institute, Arbaz, Switzerland. The Ithaka institute is a third party and completely independent from Carbonfuture. The EBC-sink certificate is currently issued exclusively for EBC- or IBI-certified biochar producers. You may apply for EBC certification at <https://www.european-biochar.org/en/registration>. You will receive an account for your company on the EBC system and request C-sink certification as follows:

Login into the EBC company site:



The screenshot shows the EBC company site interface. At the top, there is a dark blue header bar with the text "Company - admin" on the left, and three buttons labeled "edit", "Admin", and "logout" on the right. Below the header, there is a navigation bar with the text "Overview Company". The main content area displays a table with two rows. The first row has a header "C-sink" and a timestamp "2020-09-07 19:12:41". The second row has a header "ba-de-30-1-1" and a timestamp "2020-09-07 20:45:55". To the right of the second row, there is a link "Download Scenario-PDF [pdf]".

After login with the company password, press “edit”



The screenshot shows the EBC company site interface after clicking the "edit" button. The header bar is the same as the previous screenshot. Below the header, there is a form with three dropdown menus. The first dropdown menu is labeled "template" and has the value "Company". The second dropdown menu is labeled "root scenario" and has the value "C-sink [20]". The third dropdown menu is labeled "scenario" and has the value "ba-de-30-1-1 [41]". To the right of the dropdown menus, there is a button labeled "load scenario".

Select under “scenario” the batch number you want to register for C-sink certification and press “load scenario”.

Complete then the different sections of the form sheet and save it:

Section 2: Biomass feedstock

Biomass feedstock production and preparation

ID	name	unit	value	result
C010	Type of feedstock		please select	
C020	Feedstock ID from EBC positive list			n/a
C030	Type of wood		please select	
C040	PEFC Forest Certification		please select	
C050 / H2C	Average water content of feedstock	%		n/a
C060 / ann	Amount of feedstock (DM) processed for the certified b	t		n/a
C070 / dies	Diesel consumption for feedstock preparation (chipping	liter		n/a
C080 / E_B	Energy consumption in KW for feedstock preparation (c	kWh		n/a
C090	How is the electricity used in the production generated		please select	
C100 / dist	Average transport distance of feedstock from source to	km		n/a
C110	Do you dry the feedstock before the pyrolysis?		please select	
C120	How do you dry the feedstock?		please select	
C125 / dies	How much diesel equivalent is used for drying per t (DM	liter		n/a
C130	Duration of biomass storage before pyrolysis or drying	days		n/a
C140 / CO2	C-consumption per t of processed feedstock	kg	0.0	0 kg

[save](#)

Section 3: Pyrolysis

Pyrolysis

ID	name	unit	value	result
D010	Type of pyrolysis		Please select	null
D020 / htt	Highest Treatment Temperature	°C		n/a
D030 / gas	Carrier gas			
D040 / BC_	Average biochar yield in relation to feedstock DM	%		n/a
D050	Type of quenching or post pyrolytic treatment		please select	
D060	Use of pyrolytic gases		please select	
D080	Storage of freshly produced biochar		please select	
D100	Who issued the emission certificate?			
D110 / CH_	CH ₄ emissions per t of feedstock (DM)	kg		n/a
D120 / PM_	Particulate matter emission per t of feedstock (DM)	kg		n/a
D130 / E_p	Electric energy consumption of pyrolysis unit per year	kWh		n/a
D135 / E_r	Electricity generated that is used for the pyrolysis plant?		please select	
D136 / CO_	CO ₂ eq of electricity used for the pyrolysis plant	g CO ₂ eq / kWh		n/a
D137	What fuel is used to preheat the pyrolysis			
D139 / prel	How much fuel is used to preheat the pyrolysis in t per	t/year		n/a
D140 / CO_	CO ₂ -expenditures due to methane emissions per t of biochar	kg	NaN	◆ kg
D143 / CO_	CO ₂ -expenditures due to electricity consumption per t of biochar	kg	NaN	◆ kg
D146 / CO_	CO ₂ -expenditures due to preheating of pyrolysis per t of biochar	kg	NaN	◆ kg
D148 / CO_	CO ₂ -expenditures due to pyrolysis per t of biochar	kg	NaN	◆ kg
D150 / C_k	C-consumption due to pyrolysis per t of biochar	kg	NaN	◆ kg
D160 / C_k	C-consumption of feedstock preparation per t of biochar	kg	NaN	◆ kg

save

Section 4: Biochar characterization

Biochar analysis

ID	name	unit	value	result
E010 / BC_	C-content	%		n/a
E020 / HCc	H/Corg			n/a
E030 / H ₂ C	Water content	%		n/a
E040 / bulk	Bulk density	kg / l		n/a

save

Once completed, the formsheet will calculate the C-sink potential of the biochar at the factory gate. This is the key value determining the quantification of the C-sink values of the C-sinks created through carbon preserving application of the material.

Section 5: C-Sink

Carbon Sink

id	name	unit	value	result	
F010 / c_sii	Total C-Sink per unit	%	NaN	↕ %	reference
					save