US Biochar Initiative

BIOCHAR REMOVES CARBON

Carbon markets offer a new opportunity for biochar

The buildup of greenhouse gases in the atmosphere, including carbon dioxide (CO_2), contributes to climate change. As a result, governments, international agencies, and major corporations are prioritizing its removal from the atmosphere. There are two options for carbon removal: one uses technology (such as "direct air carbon capture") and the other method includes "nature-based strategies," which are the focus of this fact sheet.

Research shows that biochar, a nature-based strategy, has enormous potential to remove CO_2 from the atmosphere as part of an overall climate change mitigation strategy (Lehmann et al. 2006[1]). In 2022, the International Panel on Climate Change (IPCC) highlighted a variety of promising strategies to remove CO_2 from the atmosphere[2] with biochar cited as a very important pathway[3].

Made from waste biomass such as crop residues, sawdust, or forest slash piles, biochar removes carbon at a significantly lower cost than technology-based options.

Current interest in carbon markets

Though some governments are following a compliance model, investment through the voluntary market is on the rise, which is the focus of this document.

Companies like Microsoft[4] have ambitious goals to become "carbon negative" by 2030. In addition, the company has pledged to further offset all CO_2 emissions dating back to the organization's founding by 2050. To achieve this goal, Microsoft established a $1 billion dollar "Climate Innovation Fund"[5] to "accelerate technology development and deployment of new climate innovations through equity and debt capital."

Google, Facebook, Shopify, Stripe, and McKinsey recently created a joint venture called Frontier and committed nearly $1 billion to pay for carbon removal[6] through 2030.

Companies are also purchasing biochar carbon credits as part of their strategies to become carbon neutral. This relatively new interest in biochar carbon credits is driving new investments in biochar companies.

How are biochar carbon credits sold in the voluntary market?

Currently, biochar producers have two options to sell into the voluntary market: Puro.Earth[7] or Carbon Future[8]. Other voluntary carbon programs are under development through Verra and the Climate Action Reserve.

In general, voluntary carbon programs share some similarities with "organic certification." You may grow vegetables and not use any pesticides or herbicides during cultivation. At the end of the growing season, you may be 100% confident that you grew the crop organically. And you are probably correct.

However, if you want to sell your vegetables and use an organic label, you cannot get that stamp of approval unless you have followed rules, procedures and protocols established by an outside, third-party organic certification program.

To become organically certified, you must register your product with a recognized organic certification body and pay the required product listing and administrative costs of setting up an account. The next step in the organic certification process will involve paying for a third-party certifier to visit your farm to make sure you have followed all the rules and procedures of organic production.

When you can demonstrate that you meet all the organic certification requirements, you are given the approval to label your products as organic. Then you can sell your organic produce in the marketplace.

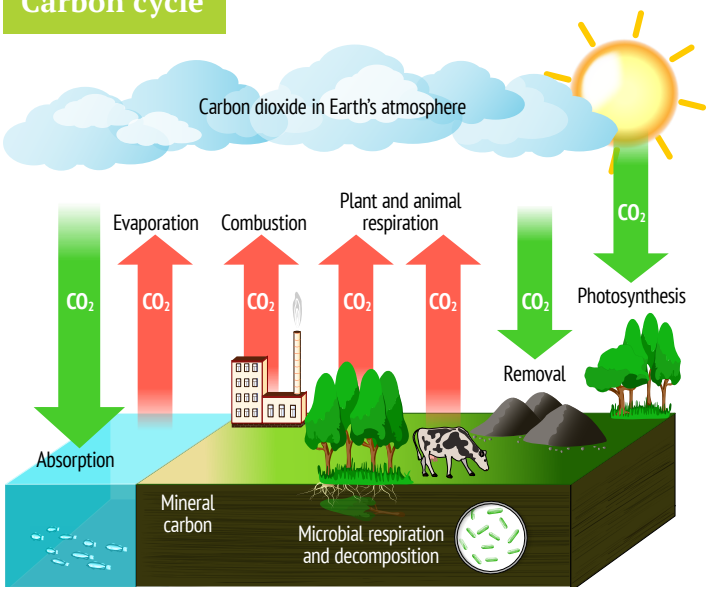
Carbon credit certification is very similar. To sell your biochar carbon removal credits to interested buyers in the voluntary carbon market, a biochar producer must enroll in a recognized third-party certification system.

Before investing time on biochar carbon revenue potential in voluntary carbon markets, consider the following:

- **Participating in the carbon market has fixed costs associated with the certification process. Biochar must be of sufficient scale to cover those ongoing costs. In general, an annual production of at least 100 tons of biochar makes the carbon market feasible.**
- **Current programs require biochar producers to report air emissions (including methane), operating temperature, and proof that up to 70% of the heat energy is for a productive use, e.g., displacing the need for fossil fuel. Hence small scale biochar production systems are typically not eligible.**
- **Most feedstocks used for biochar are eligible for carbon crediting. However, the raw feedstocks must be "biogenic" like forestry residues, wood chips, agricultural residues, and straw. Non-biogenic materials like tires, plastics, or municipal solid waste are not eligible.**

Photo by Marcus Kauffman, Oregon Dept. of Forestry

Carbon cycle



What is the value of biochar carbon credits in the marketplace?

Puro.Earth has various price indices for different types of carbon credits or "CORCs" on their web site[9].

Carbon Future does not currently have a publicly available price index for biochar carbon credits on their web site. However, they do provide individual project volumes available from biochar projects[10].

Puro.Earth has a price index instrument called "CORCHAR" (see graph below). The index provides up-to-date information on the price of biochar carbon removal credits. The Puro CORCHAR index is updated every 30 days. If interested, you can check the index periodically to understand the prices for CORCHAR.

As of May 1st, 2022, the CORCHAR index price was 100 Euros per ton of biochar (about $105 US Dollars).

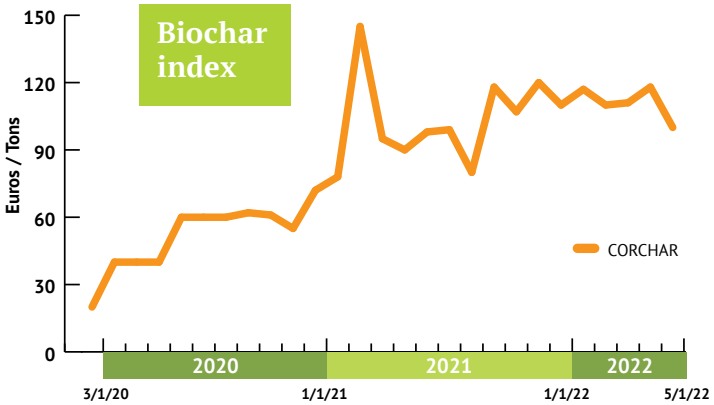


Photo by Marcus Kauffman, Oregon Dept. of Forestry

How many carbon credits can be generated from one ton of biochar?

According to Puro.Earth publicly available biochar project records[11], the number of CORCs per ton of biochar produced varies by biochar type and company. One CORC is equivalent to one ton of CO2. For wood feedstocks, the range of carbon credits per ton of biochar is 2.57 to 3.26, with an average of 2.83.

Other factors that influence the amount of carbon credits per ton of biochar are:

- **The gas or diesel used to process the biomass (e.g., woodchippers)**
- **Biochar composition: % carbon, % ash, bulk density, dry weight**
- **The amount of propane or other fossil fuels used during biochar machine start up and shut down**
- **How much fossil fuel-based electricity was used during biochar operation, for example running fans and augers and other equipment used during biochar production.**

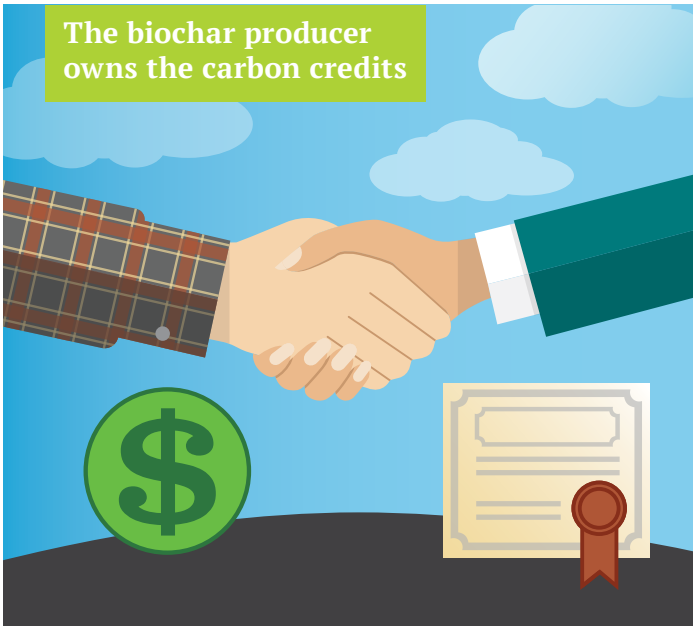
Various factors influence the carbon credits from one ton of biochar produced, including the amount of fossil fuel inputs via fertilizers used to grow the feedstocks. Fertilizer inputs are typically associated with agricultural residue feedstocks but are not typically a factor for forest or mill residues.

If a biochar producer listed on the Puro.Earth web site is credited with 2.5 tons of CORCS per ton of biochar produced, and each CORCHAR credit sells for $100 per ton, then a third party approved seller can generate $250 of CORC revenue per ton of biochar produced.

Carbon credits are in addition to revenue from selling the biochar

CORC buyers are purchasing the "carbon removal" benefit associated with the biochar product only. In other words, the CORC buyer is not physically taking possession of the biochar product itself. The biochar producer can still sell their product into the market (for example to a farmer as a soil amendment). So CORC sales are an additional source of revenue for biochar producers above revenue from selling the biochar product.

Certified biochar producers must provide documentation that the biochar they sell is going to an approved use (such as being added to compost or sold as an agricultural product). Biochar suppliers cannot sell CORCs if the biochar is diverted for use as a charcoal or other energy production purpose (fired in a biomass boiler).



Reference Guide

1 Lehmann, J., Gaunt, J. & Rondon, M. Bio-char Sequestration in Terrestrial Ecosystems – A Review. 2006. Mitigation and Adaptation Strategies for Global Change. Chapter 11, 403–427 (2006).

2 UN climate report: Carbon removal is now "essential". 2022. MIT Technology Review. https://www.technologyreview.com/2022/04/04/1048832/un-climate-report-carbon-removal-is-now-essential/

3 UN IPCC. Working Group 3. https://www.ipcc.ch/report/sixth-assessment-report-working-group-3/

4 Microsoft. Carbon negative pledge. https://blogs.microsoft.com/blog/2020/01/16/microsoft-will-be-carbon-negative-by-2030/

5 Microsoft. Climate Innovation Fund. https://www.microsoft.com/en-us/corporate-responsibility/sustainability/climate-innovation-fund?activetab=pivot1%3aprimaryr6

6 Carbon removal industry draws billions to fight climate change. June 2022. Wall Street Journal. https://www.wsj.com/articles/carbon-removal-industry-draws-billions-to-fight-climate-change-11654640329

7 Puro.Earth CORC marketplace. https://puro.earth/CORC-co2-removal-certificate/

8 CarbonFuture. How it works. https://www.carbonfuture.earth/how-it-works

9 Puro.Earth CORC index. https://puro.earth/carbon-removal-index-price/

10 Carbon Future project portfolio. https://platform.carbonfuture.earth/balancer/portfolios

11 Puro marketplace project records. https://puro.earth/CORC-co2-removal-certificate/

USBI
Building the future from the ground up.™

NEBRASKA FOREST SERVICE
University of Nebraska-Lincoln

Scan to visit the US Biochar Initiative Learning Center

For more information, please visit US Biochar Initiative: **biochar-us.org**

Published by USBI in partnership with Nebraska Forest Service. The work upon which this project is based was funded in whole or in part through a grant awarded by USDA Forest Service Wood Innovations.