Newsletter – February 2021

Biochar & Carbon Credits

2021 — The year of biochar

Biochar

Biochar is a carbon-rich, charcoal-like powdery material. It is made from renewable biomass (e.g. unused agricultural or forestry residues) using a high-heat, low-oxygen burn process called pyrolysis. **Biochar offers compelling agronomic, climate, and environmental benefits**:

- It **dramatically improves soil fertility**. — Mixed with soil, biochar acts as catalyst for soil metabolism that improves nutrient and water retention capacity, mycorrhizal fungi development, and pH of acidic soils. Most importantly, it works as a one-off, permanent soil amendment that can dramatically increase agricultural yields, especially in degraded soils (from 20 to 200%).
- It **removes, for centuries, carbon from the atmosphere**. — The carbon captured by plants via photosynthesis is transformed with pyrolysis into a solid, stable form that won't return into the atmosphere, thus fighting global warming.
- It helps **avoid greenhouse gas emissions**. — When pelleted, biochar can be used as a sustainable alternative to charcoal made from deforestation wood, thus protecting biodiversity and the natural carbon sinks formed by forests.

These benefits and more, have been validated by over 20,000 published studies, including ones by prestigious international institutions like the Food and Agriculture Organisation (**FAO**), the Intergovernmental Panel on Climate Change (**IPCC**), and the United Nations Framework Convention on Climate Change (**UNFCCC**).

Until now, projects have almost exclusively been focused on the agronomic benefits of biochar given the absence of recognised methodologies to quantify biochar's climate impact, leading to either low-profitability projects or high selling prices for biochar. But recent evolutions in the voluntary carbon markets could make things change.

Voluntary carbon markets

Voluntary carbon markets allow private investors, governments and companies to offset their greenhouse gas emissions by financing climate-positive projects and receiving carbon credits in exchange. The largest category of buyers includes private companies driven by considerations such as safeguarding their reputation, ethics, and corporate social responsibility. These **markets are expected to grow 30+ times by 2030** given the massive recent pledges made by companies to become net-zero (i.e. reaching carbon neutrality) in the next decades.

Biochar for permanent carbon removal

In 2018 and 2019, the IPCC published two reports examining biochar's potential for permanent[1] carbon removal. It **estimated biochar's annual offset potential to 1–2 billion tonnes of CO_2** were it to be deployed at a massive, global scale. This definitive scientific recognition is therefore turning biochar into a credible means to mitigate our climate crisis.

In 2020, the first methodology for quantifying biochar-based carbon credits was created by Puro, the Scandinavian offset-trading platform. Some of these credits where notably **purchased by Microsoft**, who has pledged to offset by 2050 all greenhouse gases it has emitted since its creation. **Verra, the world's largest and most renowned carbon-credit certification body, will have its own methodology ready by autumn 2021**. This is the first time Verra is self-financing the development of a methodology, reflecting biochar's growing strategic importance. For now, **estimates range from 1.5 to 3 tonnes of CO_2 removed per tonne of biochar**, depending on the quantification assumptions and the feedstock used.

Carbon credits based on permanent carbon removal can be sold on the voluntary carbon market at a much higher price than average. Some biochar credits produced from forestry waste are **sold around 150 € / tonne of CO_2 removed**. This high price reflects how carbon-removal strategies have much more effective and quantifiable results fighting climate change than emission-avoidance solutions. Moreover, a growing number of scientists and climate initiatives are recommending permanent removal solutions as the only acceptable method for offsetting companies' unavoidable emissions — those that can't currently be reduced by switching to more sustainable production processes.

Biochar is uniquely positioned, as it is "**one of only a few [permanent carbon removal] technologies**, and the one at highest technology readiness level" (O. Mašek et al., *Nature*, 2019). Pro-Natura International has pioneered the use and development of biochar-production technologies, spending the past 20 years building and refining CarboChar, a set of pyrolysis machines optimised for developing countries and producing 0.5–5 tonnes of biochar per day (depending on their size). **Pro-Natura was awarded Altran's 1st Prize of Technological Innovation** for the prototype that set the standard for the CarboChar technology.

CarboChar-1 is the smallest model of the biochar production machines developed by Pro-Natura

This convergence of **high-quality methodologies**, **massive incoming demand** for removal credits (with major corporations leading the way), and **high market prices** for such credits make the future of biochar projects very bright.

For small-scale, non-industrial biochar projects, where it is difficult to apply the stringent methodologies mentioned above, the International Biochar Initiative (IBI) is considering working on a simplified methodology that would allow small projects to also benefit from the additional revenues from carbon credits. IBI is the leading platform for fostering stakeholder collaboration, good industry practices, and environmental and ethical standards to support biochar systems.

[1] Removal is considered permanent when carbon will remain out of the atmosphere for at least hundreds of years.

Biochar for avoided emissions

Green charcoal briquettes

Biochar is not limited to agriculture. It can also be used as a sustainable fuel to replace charcoal made from deforestation wood in developing countries. This **green charcoal not only avoids emissions from burning a non-renewable fuel, but also avoids the large quantities of methane (CH_4) emissions** generated by the artisanal production of charcoal. CH_4 is a greenhouse gas with a global warming potential roughly 35 times greater than CO_2 (considering a 100-year timeframe), making it particularly harmful.

Charcoal use in developing countries, and especially in Africa, is a major source of deforestation. When considering the avoided-deforestation and methane-avoidance effects, we estimate (based on a UNFCCC methodology) that **1 tonne of green charcoal is equivalent to 4 tonnes of avoided CO_2**.

Avoidance carbon credits can also be sold on the voluntary carbon market. Their value is lesser than the one of removal credits, but the co-benefits associated to it (protecting biodiversity and offering a high-quality, fume-free, sustainable fuel to local populations) make them worth more than the average emission-avoidance credits.

Biochar's time has finally arrived!

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