Newsletter – May 2022

Greening the Sahel and the Sahara with biochar

To fight poverty and malnutrition
while creating a gigantic carbon sink

In the Sahel, our experience shows that biochar is an effective way to tackle the causes and consequences of desertification. Pro-Natura proposes to change scale, in particular by integrating biochar into the construction of the Great Green Wall. This would maximize carbon sequestration and greatly improve the standard of living of local populations, while ensuring a large part of the project's self-financing through the sale of carbon credits.

Soil revitalization with biochar is the basis of the fight against food insecurity, malnutrition and climate change

Biochar

In Africa, two-thirds of the continent's land area is classified as desert or dryland, with 75% degraded. In the Sahel, food insecurity and malnutrition are endemic and affect more than 20 million people. Recurring droughts lead to a dramatic drop in agricultural production, and severe fodder shortages lead to early transhumance and changes in livestock routes, heightening tensions between communities.

Biochar significantly improves soil quality. As plants grow, they absorb CO_2, producing carbon-containing biomass. Rather than leaving some unused biomass to decompose and release this carbon, pyrolysis (high temperature heating in the absence of oxygen) can be used to convert about half of the carbon it contains into a solid form. The resulting product, called "biochar" applied once by mixing it with the soil, can sustainably improve soil fertility while sequestering significant amounts of carbon.

This amendment can, in a single definitive application, very significantly increase crop yields, in particular on degraded soils (+20% to +200%). It also allows

trees to grow much faster as well as saving a lot of water.

On the climate front, the 2018 special report of the IPCC (www.ipcc.ch/report/sr15) cites biochar as a very promising technology for large-scale carbon sequestration to fight climate change, since it makes it possible to permanently store carbon initially captured by plants from the atmosphere.

Biochar could self-finance much of the Great Green Wall while accelerating reforestation and maximizing carbon sequestration

The Great Green Wall is intended to prevent the advance of the desert in the Sudano-Sahelian zone, which crosses 11 African countries. The project is 8,000 km long and 15 km wide, from Senegal to Djibouti.

The very high cost of this project could be largely self-funded through biochar. Indeed, the long-term carbon sequestration obtained with biochar makes it possible to generate high-quality carbon credits, the market value of which is very high (currently around €100 per ton of CO_2-equivalent). All this by producing biochar from wild biomass from protected areas as well as agricultural residues from areas further south.

Biochar would allow trees to grow much faster and maximize survival rate by saving 80% of water used after plantation. Indeed, the effectiveness of biochar on trees is very significant: the main meta-analysis by Thomas and Gale (2015) shows an average increase of 41% in tree biomass on a variety of temperate and tropical trees, with a much higher impact on tropical trees, where the increase can reach 300%.

Example of using biochar in extreme conditions

Dr. Mohamed Bouchentouf is a pioneer in Africa of the development of biochar in the Sahelian and Saharan zones, having been director of the innovation and development program at Pro-Natura International. On his retirement he created the agro-ecological farm *Clé des Oasis* www.la-cle-des-oasis.fr in Timimoun, which he manages in the Algerian Sahara.

The objective is to build, from the current oasis production system, an agronomic system that makes it possible to anticipate climate change and overcome food crises. It is planned to spread this model throughout the Sahara by producing the biochar locally from dry palms and other residues of date palms. The multi-storey cropping system with biochar allows the optimal use of agricultural land. It promotes complementarities between cultivated plants aimed at saving water, protecting the soil and crops.

It is a model that makes it possible to fight climate change, providing a bulwark against food crises with innovative solutions.

The casuarina has a very good resistance to high temperatures, winds and sandstorms.

Dr. Mohamed Bouchentouf planting casuarinas

14 months after plantation with biochar

Moringa Oleifera

Without biochar

With biochar

Pear tree

Without biochar

With biochar

Very good resistance to high temperatures, winds and sandstorms.
Dose used of biochar: 150 g/plant at planting with a depth of 20 cm.

Date palm

Young palm variety Takerbucht - planted with biochar

15 year old palm tree

Local variety "Hmira", Dose of biochar: 2 kg
Yield 200 kg/palm compared to the average of 70 kg without any amendment.

Comparative yields on some annual crops with and without biochar

Potato/m2: without biochar 6 kg/m^2 - with biochar 12 kg/m^2

Local variety barley: without biochar 0,50 kg/m^2 - with biochar 1,2 kg/m^2 - 2 cycles per year

Local variety durum wheat/m^2: without biochar 0,40 kg/m^2 - with biochar 0,9 kg/m^2

Beans: without biochar 4,50 kg/m^2 - with biochar 9 kg/m^2

Turnip: without biochar: 3,50 kg/m^2 - with biochar: 10 kg/m^2

Celery branch: without biochar 25 celery/m^2 - with biochar: 60 celery/m^2

Courgette: without biochar: 5,5/plant - with biochar: 8 kg/plant

Adding biochar to the sand

Five weeks later

Fortunately, oasis dwellers skilfully preserve their seeds to this day, a source of resilience in the face of climatic conditions in arid zones.

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