منتدى التغيرات المناخية
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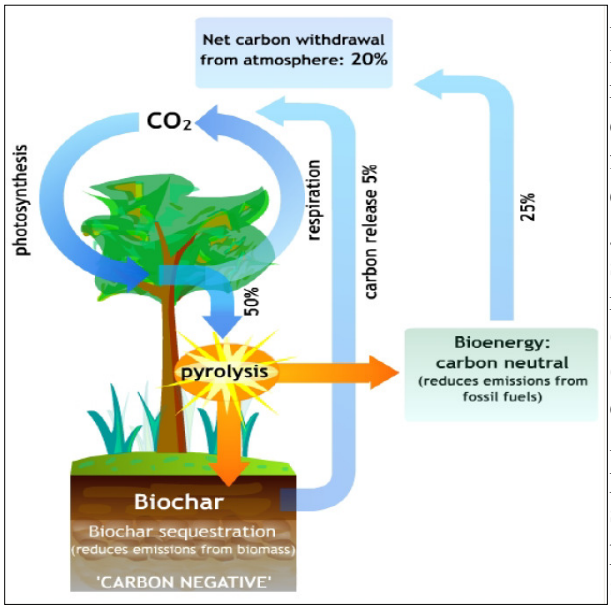
Biochar – A Strategy to Adapt/Mitigate Climate Change?

Biochar is presented by some institutions, such as the UNCCD Secretariat, as a promising technology for reducing emissions from agriculture and energy supply in rural areas, while at the same time improving soil properties. This note examines the potential of its use in the context of the NENA region.

Biochar is a by-product of a cellulosic matter thermal treatment under an/low-oxygenic regime (Pyrolisis, Gasification or Hydrothermal Carbonization). The combustion process releases gas or oil that can be used for energy or heat supply, leaving about 25 percent of the carbon content under a non bio-degradable structure, the Biochar. Incorporated into the soil, it can remain under this stable form for hundreds to thousands of years. The feedstock should be from biomass waste material such as field residues and processing residues (nut shells, fruit pits, bagasse, etc), as well as yard, food, human and forestry wastes, and animal manures. The properties of the Biochar produced depend on the feedstock nature (N/C content) and the baking conditions. Production units vary in technologies, size, cost and mobility, which allow a wide scope of implementation. It can be produced directly from modified energy efficient stoves that provide heating and cooking supply at the same time that they reduce health problems and slow down deforestation.

Figure1. Biochar Carbon-balance (UNCCD)



Applied on low-fertility soils, Biochar would improve nutrients availability, the soil water retention capacity, and was also proven in some cases to absorb azote residues from chemical fertilizers and to lower soil NO_2 and CH_4 emissions. Thus this technology could have great mitigation potential in agriculture by: (i) sequestrating durably CO_2 from atmosphere; (ii) reducing the NO_2 emissions from fertilizer use; (iii) reducing soil NO_2 and CH_4 emissions and; (iv) and potentially reducing emissions from deforestation and household emissions. According to the UNCCD Secretariat, about 20 percent of the original matter carbon could be sequestrated in the soil (see figure 1). However, precise estimates of carbon amounts sequestered as a result of biochar application are scarce.

In the NENA region, Biochar projects and research programmes are just emerging. In Egypt, researchers from the University of Mansura and the University of Copenhagen are working on a rice straw gasifier project involving five villages. The gas will power flatbread baking ovens and the biochar will be returned to the fields to increase soil fertility and water retention.

Although Biochar may appear as an opportunity for the region to restore soil fertility and fight ongoing land degradation, two cautions must be borne in mind. First, the behavior of Biochar once incorporated into the soil and its interaction with the soil organic matter (SOM) are still poorly understood. A study suggests that Biochar can accelerate the depletion of SOM in some cases, partially offsetting its benefit as a long-term carbon sink and its effect on doping soil fertility. The soil moisture and aeration would be two factors involved in that reaction. Secondly, to respect the carbon-balance and avoid trade-offs with food or other productions, feedstock should be chosen carefully. This is particularly true in the region, where crop residues can be used for practices, such as mulching, that have a significant potential of adaptation to climate change.

Whether to use or not to use Biochar in a specific location requires adopting an integrated approach to the current socio-economic system (see figure 2) in order to ensure its sustainability. Since the environmental and socio-economic benefits of this technology highly rely on the soil and feedstock properties, it should involve numerous field-tests on a batch-by-batch basis.

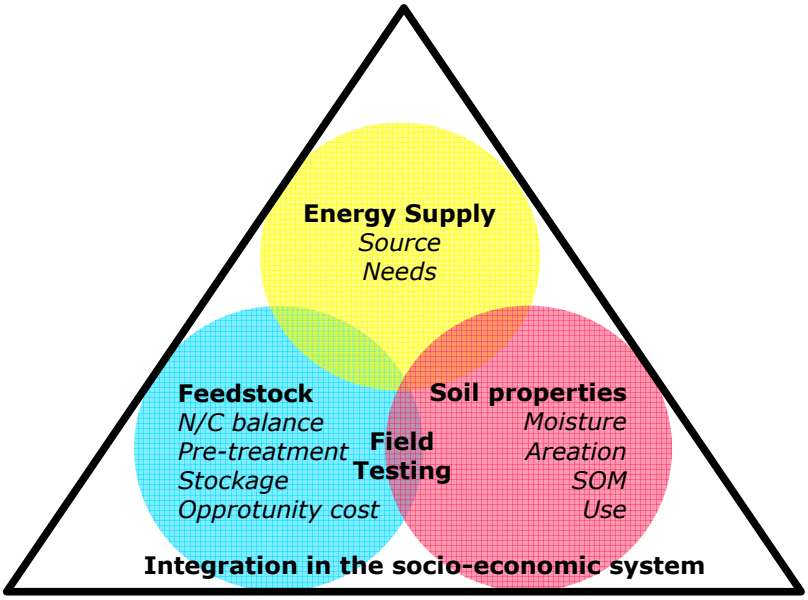


Figure2. Fields to take into consideration in a biochar project

Used carefully, Biochar could represent a real opportunity for the NENA region, both for adaptation to and mitigation of climate change. One methodology already allows Biochar projects to access carbon credits from the Voluntary Market - General Methodology for Quantifying the Greenhouse Gas Emission Reductions from the Production and Incorporation of Soil of Biochar in Agricultural and Forest Management Systems – Carbon Gold. Research on this technology potential in the region should be emphasized to fully include it in countries adaptation and mitigation strategies.

References and further reading about Biochar:

The International Biochar Initiative, www.biochar-international.org/projectsandprograms/9countryprojects.html
UNCCD - Sustainable land management for adaptation to climate change
UNCCD - Charcoal as Soil Amendment: Research and Prospects
Ernsting A, Smolker R. Feb., 2009. Biochar for Climate Change Mitigation: Fact or Fiction?