BIOCHAR
NEW USES OF ANCIENT KNOWLEDGE

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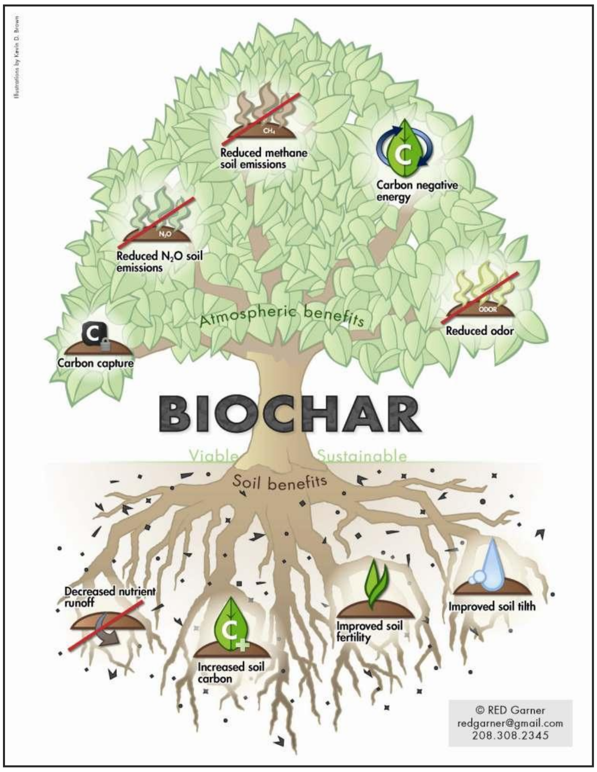
The global atmospheric concentrations of carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O) have increased substantially from the pre-industrial values as a result of human activity. The increase of the CO2 in the atmosphere is mainly a consequence of the use of fossil fuels and its damaging effects, even in commonly applied agricultural and forestry practices.



A globally applicable solution to this problem is the use of renewable bio-energy. Biochar has proved to be an extremely fruitful material that can be used as a natural fuel. After being blended to the soil, it allows to increase soil fertility and carbon sequestration, contributing in this way to climate change mitigation.

Biochar is the product of the thermal decomposition of wood material and similar. It is highly porous material and is used primarily as fuel for urban heating and cooking or as a soil fertilizer. Few decades ago it was just regarded as industrial waste, but in recent years the interest in this material has grown enormously again. Nevertheless, the addition of bio-char to soil is knowledge that we have inherited from the past.

The first discoveries regarding the effects of the carbon stored in soil derive from ancient agricultural practices carried out in the Brazilian Amazon. *Terra preta* was the name of this mixture of soil and biochar. In contrast to the typical red coloured soil of the Amazon forest, not very fertile because rich in kaolinite and aluminium, the soils called *Terra preta* have dark colours and a alkaline ph, home to endemic organisms therefore particularly fertile. These kind of soils are characterized by a high content of black carbon material (70 times more than the surrounding soil), produced by incomplete combustion of plant parts and consciously distributed into the soil by the local populations since thousands of years. These mixed dark soils have high levels of organic nutrients such as nitrogen, phosphorus, potassium and calcium, so they don't need external addition of fertilizers. This process shows that the application of bio-char to soils could be environmentally and economically beneficial.

The main method to produce bio-char is the pyrolysis, which consists in the biomass combustion under absence or limited presence of oxygen. Between the three different types of pyrolysis (slow, fast and gasification) the slow one is used to produce the biochar. The slow pyrolysis is the process that provides thermal conversion of biomass through slow heating (450-650° C) in absence of oxygen. The heating process may vary from few seconds up to entire days, depending on the type of product: syngas or biochar.

In agriculture, the use of bio-char may increase crops production, by improving soil fertility and increasing water retention. Thanks to its porous structure it eliminates contamination during the process of water and soil treatment, by absorbing pesticides or heavy metals.

The agricultural systems produce large amounts of vegetable waste with a low economic value and an expensive disposal management. These wastes may be used to produce bio-char, then applying it to agricultural soils to sequester carbon, and thus increase the production potential of the crops or even as an alternative source of energy.

When applied to soil, bio-char can retain large amounts of CO_2 for hundreds of years, reducing the emissions into the atmosphere. It also has an important role in the reduction of natural emissions of methane CH_4, which is a greenhouse gas that represents a global warming danger much higher than CO_2. Replacing the use of fossil fuels and sequestering carbon in stable soil reserves, bio-char and bio-energy production could partially but significantly contribute to the reduction of global climate change.

As every natural phenomenon also the pyrolysis for the production of biochar has some features that should be carefully considered. The effects of biochar on crop productivity depend on several different physical interactions which occur when applied to soils and that may disturb the organisms present. For these reasons, the biochar is to be applied to land in limited quantities and only after careful analysis.

An interesting example of the biochar applications is the work of the Carbon Roots International organization (CRI), which has the goal to produce green charcoal and biochar to reduce deforestation and increase agricultural productivity in Haiti. Carbon Roots International created in Haiti a char social enterprise employing a decentralized network of smallholder farmers and entrepreneurs to produce carbon-rich char from agricultural waste. They produce two different innovative products: renewable charcoal cooking briquettes called green charcoal, and biochar employing in this process over a dozen full-time staff members and over 60 char producers in the field.

Many initiatives are being realized in different countries of the world to spread the knowledge about the production and use of biochar. One of these initiatives is the 2nd Mediterranean biochar symposium which will take place in Palermo (Italy) in January 2014. It will be an important opportunity to discuss about environmental impact of biochar and its role in green remediation.

To know more

2nd Mediterranean Biochar Symposium _January 16-17th 2014 , Palermo, Italy

The Seattle BioChar Working Group

Italian biochar organization

Usbi (Us Biochar Initiative)

Northwest Biochar Working Group

Biochar Interest Group - South East Asia (BIG-SEA)

Japan Biochar Association

European Biochar Foundation

Australian and New Zealand Biochar Researchers Network

International Biochar initiative (Ibi)

Bioenergy Lists_discussion on biochar

Biochar.org

Carbon Roots International