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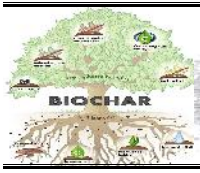

Biochar : A natural soil amendment

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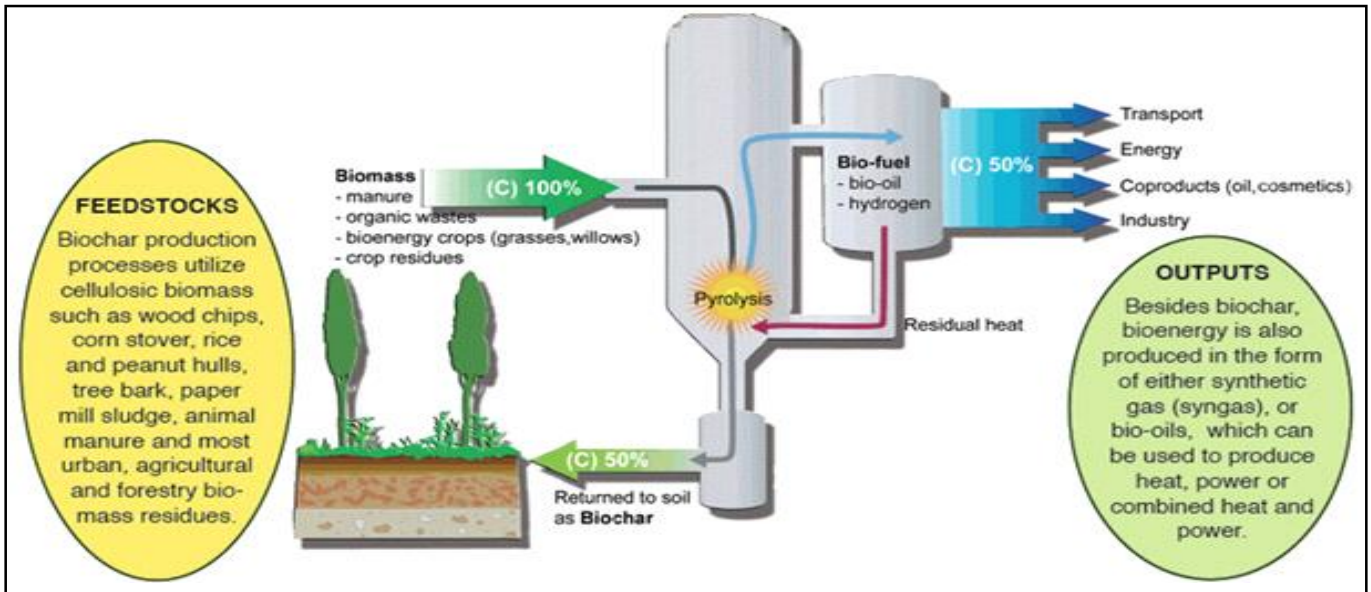
Biochar can be a simple yet powerful tool to combat climate change. Biochar promotes plant growth and soil fertility and limits the necessity for fertilizer and decreases soil erosion. Soil biochar can influence a number of biogeochemical processes, and serves as a sink for atmospheric CO_2 in soil.

Biochar is a carbon-rich solid derived by heating biomass in the absence of oxygen (pyrolysis).It is a fine grained, highly porous substance used as a soil amendment. It is a combustion product of waste biomass having large surface area and low amount of residual resins. Biochar can be produced from a wide range of organic feedstocks under different pyrolysis conditions and at a range of scales. Many different materials have been proposed as biomass feedstocks for biochar. The suitability of each biomass type for such an application is dependent on a number of chemical, physical, environmental, as well as economic and logistical factors Biochar promotes plant growth with its high degree of porosity and high surface area enables it to retain nutrient and water and also provide a habitat for beneficial microorganisms. Biochar also stabilizes the pH in the favorable range of 5-6.4 pH. Research has demonstrated that soil amended with biochar reduces greenhouse gas (GHG) production, specifically CO_2, N_2O and CH_4.

Formation : Biochar is produced from thermal decomposition of organic material under a limited supply of oxygen and at relatively low temperatures. Pyrolysis is a form of baking biomass in the form of gas and oil, along with the biochar. This energy can be recoverable and used as a renewable fuel. Biochar and its byproducts can be produced from a wide variety of feedstock such as organic farm waste, waste treatment plant slurry, and woods with high cellulose/lignin content. After pyrolysis, the solid byproduct is a porous network of carbonates and/or aromatic carbon. Different pyrolysis conditions lead to different proportions of each end product (liquid, char or gas, Table 1).

How is biochar applied to soil? : The optimum application rate for biochar depends on the specific soil type and crop management. Biochar is most commonly incorporated into the soil. First, evenly spread the desired amount onto the soil, then till it in with machinery or by hand.

– In fruit orchards and other perennial crops where tilling is not an option, biochar can be applied to the soil



Source : International biochar initiative

Fig. 1 : Biochar

Table 1 : The mean post-pyrolysis feedstock residues under different temperatures and residence times

Mode	Conditions	Liquid	Biochar	Syngas
Fast pyrolysis	Moderate temperature, ~500°C, short hot vapour residence time of ~ 1 s	75%	12%	13%
Intermediate pyrolysis	Moderate temperature ~500°C, moderate hot vapour residence time of 10 – 20 s	50%	20%	30%
Slow pyrolysis (Carbonisation)	Low temperature ~400°C, very long solids residence time	30%	35%	35%
Gasification	High temperature ~800°C, long vapour residence time	5%	10%	85%

International Energy Agency, 2007

surface and, preferably, covered with other organic materials.

– For topsoil incorporation biochar can be applied on its own or mixed with compost or mulch.

– Applied as a liquid slurry if finely ground.

– The placement of the biochar directly into the rhizosphere is thought to be more beneficial for crop growth and less susceptible to erosion. Deep banding can also be been used under appropriate conditions.

Benefits :

– Improvement of the productivity of soil.

– Porous solid with high surface area and porosity.

– Sequesteration of carbon in the soil that will reduce atmospheric carbon dioxide.

– High temperature biochar can be very stable in soil.

– Management of waste, bioenergy production, and sustainable soil management.

– As a soil enhancer, biochar makes soil more fertile, boosts food security, and reduces the need for some chemical and fertilizer inputs.

– Biochar improves water quality by helping to retain nutrients and agrochemicals in soils for use by plants and crops.

– By converting agricultural waste into a powerful soil enhancer with sustainable biochar, we can preserve cropland diversity and discourage deforestation.

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