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# From forest waste to biochar

**Farming and forestry** offer a unique and valuable opportunity to reduce greenhouse gas (GHG) emissions, according to a new study. Agricultural and forest waste can be turned into the carbon-rich biochar, or charcoal, and used to sequester carbon, increase soil productivity or even as an alternative source of energy.

**Biochar holds great promise.** It not only improves agricultural yields, but also locks away carbon in the soil, which can contribute to a net reduction in carbon emissions. As well as being a renewable energy source itself, the production of biochar can also be used to generate other forms of renewable energy such as liquid and gas biofuels.

Biochar is made by heating woody-plant matter to many hundreds of degrees, without burning it, in a process called pyrolysis. Gases produced by the pyrolysis process can be captured as a source of energy for use in a turbine or internal combustion engine, or for heating. Currently, 41 million tonnes of charcoal are produced each year for cooking and industrial purposes worldwide, but inefficient production methods can lead to excessive deforestation, emissions of GHGs and other pollutants.

The study analyses several trial projects designed to offer environmentally sound ways to produce biochar, by using farming and forestry waste as wood sources. The study concludes that provided these methods are used, the problems associated with conventional production methods can be avoided. For example, the study claims that up to 12 per cent of global anthropogenic GHG emissions arising from land use change could be offset each year by replacing 'slash-and-burn' agriculture with 'slash-and-char' systems.

Biochar also offers financial opportunities for agricultural business, including energy generation. For example, it could provide farmers with the opportunity to invest in a plant on their own farm. It can also be used to produce biofuels or activated carbon – a highly absorptive material with many commercial uses, including water and gas treatment.

Incentives for farmers could be built into environmental and agricultural policy, the study suggests. They could be compensated for the carbon they sequester, based on the market price for carbon emissions. Any associated gains in productivity from soil treatment would be a direct benefit. Additionally, farmers who owned a share in biochar and renewable energy production facilities could profit from their investment.

However, there are issues surrounding the use of biochar which need to be carefully considered. Biochar is only suitable for improving soil if it is produced under the right conditions. For example, if pyrolysis is carried out at a higher temperature, more carbon and nutrients will be retained. However, this advantage must be offset against the energy and financial cost of generating such heat. Additionally, not all agricultural waste is suitable for biochar production, such as wet vegetable waste. Biochar is best made from woody materials, such as mill off-cuts, olive stones and nutshells.

Energy efficient pyrolysis methods need to be used. The study suggests that heat produced during pyrolysis can be harnessed to sustain the pyrolysis process by continuing to heat incoming waste, for example. Industrial scale biochar production also produces GHGs itself, for example, via the transport emissions to the bioenergy plant and the application of the biochar to the soil. Thus, ways of making carbon savings need to be considered throughout biochar's life-cycle.

In addition, further research is needed into the safe levels and methods of biochar application to the soil. Biochar can contain contaminants, which must be applied to soils in limited quantities. Furthermore, some methods to insert the biochar into soils risk disturbing organisms and exposing buried surfaces to decomposition and erosion.

**Source:** McHenry, M.P. (2009). Agricultural bio-char production, renewable energy generation and farm carbon sequestration in Western Australia: Certainty, uncertainty and risk. *Agriculture, Ecosystems and Environment*. 129(1-3): 1-7.
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