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Environmental Impacts of the Production and Application of Biochar – EuroChar Project

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One of the potential benefits of biochar is carbon sequestration. To determine the overall net sequestration potential it is important to analyse the full supply chain, assessing both the direct and indirect emissions associated with the production and application of biochar. However, it is essential to also incorporate additional environmental impact categories to ensure the assessment of a more complete environmental impact profile.

This paper uses a full life-cycle assessment (LCA) methodology to evaluate the results from the EuroChar, 'biochar for carbon sequestration and large-scale removal of GHG from the atmosphere', project. This EU Seventh Framework Programme project aims to investigate and reduce uncertainties around the impacts of, and opportunities for, biochar, and in particular explore possible pathways for its introduction into modern agricultural systems in Europe. The LCA methodology, according to the ISO standards, is applied to the project-specific supply chains to analyse the environmental impacts of biochar production and application. Two conversion technologies for the production of biochar are assessed, gasification and hydrothermal carbonization (HTC), in order to provide conversion efficiencies and emission factors for the biochar production component of the supply chain. The selected feedstocks include those derived from waste residues and dedicated crops. For the end use stage, various forms and methods for biochar application are considered. In addition to the Global Warming Potential category, other environmental impact categories are also included in the analysis. The resulting 'feedstock * conversion technology' matrix provides nine pathways for the production and application of biochar, which are applied as a representative basis for the scenario modelling. These scenarios have been developed in order to assess the feedstock and land availability in Europe for the production and application of biochar and to give an order of magnitude assessment as to the potential role for biochar as a material climate mitigation option.

Preliminary results show net negative supply chain emissions, indicating biochar to be a carbon sink. Overall, the life cycle stage that contributes most significantly to the environmental impact profile is feedstock production. Feedstock selection is therefore expected to play a key role in determining the overall viability of biochar production and its use in land application. Further sensitivity analyses show that the allocation method of the attributional LCA has the greatest impact on the results, followed by the oxidation rate of the carbon in the biochar, and the transportation distances of the feedstock and biochar. Indirect impacts, such as avoided use of fossil fuel, can significantly alter the results.

As the EuroChar project comes to a completion at the end of May 2014, the near-final results are presented at the EGU 2014 General Assembly.