

Spatial-temporal dynamics of biochar application as a climate tool in European agriculture: Economic insights

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Biochar application on agricultural land is suggested as a greenhouse gas emission mitigation strategy. It is advocated for the high permanence of biochar as a carbon sink compared to other sequestration measures. The purpose of this study is to identify the net benefit of biochar sequestration in agricultural soil in the European Union from the year 2020 to 2050. A discrete time dynamic partial equilibrium model, disaggregated at national level, is employed to examine the economic trade-offs between using agricultural residues to produce biochar and bioenergy, directly incorporating the residues in the soil, and cultivating cover crops for the purpose of increasing soil carbon stocks. The findings indicate that biochar becomes economically viable towards the end of the 2020s. By 2050, the optimal biochar carbon stock is between 0.6 and 6.8 tonnes per hectare, with larger stocks in countries that can produce large amounts of agricultural feedstock within a short range from the biochar plant, hence benefitting from economies of scale in production and low transportation costs. The optimal carbon sequestration strategy would generate a net present value of about 212 billion euro, where the utilization of biochar contributes with about 36 billion euro. Results are sensitive to assumptions about costs for biochar production and use, and the carbon price trajectory.