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The Challenges for Biochar to Contribute Significantly to Greenhouse Gas Removal: A UK Perspective

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Abstract To limit the increase in global mean temperatures to ca. 1.5℃ above pre-industrial levels, the Royal Society and Royal Academy of Engineering integrated assessment models (DES5563-1, ISBN: 978-1-78252-349-9) estimate that Greenhouse Gas Removal (GGR) by 2100 must equate to 230 Gtonnes of carbon (GtC), corresponding to a ca. 0.4℃ temperature reduction. All GGR approaches for CO_2 should sequester carbon over centennial to millennial timescales, together with being economically viable within global and national frameworks for carbon pricing. The quantity of atmospheric carbon of ca. 890 Gt is smaller than the terrestrial soil organic carbon (SOC) of 1500±230 Gt (first meter depth, Quéré et al. 2016. Earth Syst. Sci. Data, 8, 605) indicating the potentially significant contribution that biochar can make to GGR. Considering the UK, to achieve net carbon neutrality by 2050, it is estimated that the mix of GGR technologies required will equate to ca. 35 M tonnes of carbon (MtC) p.a. Biochar can potentially make a major contribution both to this target, but there is limited availability of virgin wood to produce biochar and there are no large-scale production plants operating in the UK. Further, as well as economic viability and societal acceptability, there are concerns over biochar stability with initial degradation occurring over relatively short timescales. This presentation will focus on the Biochar Demonstrator programme which is the most ambitious and comprehensive deployment programme to date in the UK involving arable and grassland, woodland and contaminated land. The aim of the Demonstrator is to address uncertainties regarding the extent and scope of deployment and its stability with respect to carbon sequestration, together with quantifying effects on ecosystem services. It will provide the first comprehensive assessment of biochar stability in the UK and its impact on greenhouse gas soil emissions, with our international leading biological science and analytical capabilities. This will enable robust policy to be developed in which payments are based on the amount of carbon sequestered over extended timescales. Integrated life cycle and techno-economic analysis are providing a framework for evaluating carbon sequestration and the climatic impacts of carbon not permanently sequestered. Engaging a wide range of stakeholder groups will ensure that robust business models will emerge, supported by manufacturing, farming, civil society and finance. identifying the carbon prices required to make deployment feasible and incorporating co-benefits of biochar in agriculture.

Keyword(s)
Biochar, Feedstocks, Production, Applications, Stability

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