

Challenges and opportunities for mitigation of agricultural soil greenhouse gas emissions through agronomic innovation

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Project outline:

We invite applications from outstanding and highly motivated students for the CENTA studentship in Plant-Soil-Atmosphere interaction.

In this exciting multidisciplinary PhD, the successful applicant will generate and synthesise data to inform agricultural greenhouse gas (GHG) emission factors and the GHG mitigation potential of selected novel innovative agronomic practices.

About the project:

Arable agricultural soil represents one of the most challenging sectors to reduce greenhouse emissions (GHG's) from. These reductions are crucial for supporting the UK's 2050 national GHG emission targets. Agricultural soils are major sources of nitrous oxide (N₂O) emission due to the extensive application of nitrogen (N) fertilisers to crops whilst management such as tillage has resulted in sustained decreases in soil organic carbon (C). It is estimated that agriculture is responsible for 68% of the UK's N₂O emissions, and 40-60% of arable topsoil organic C has been lost due to intensive agricultural practices in the UK. Over the last decade, significant effort has gone into developing UK specific GHG emission factors for agricultural soils encapsulating climate, land use and land management. Whilst this represents a step change for UK national GHG inventories, it does not capture emerging themes around regenerative agriculture or novel interventions such as using biochar or biofertiliser application to soils.

This studentship aims to address uncertainties around innovative agricultural practices through a mixture of field observations and experiments in combination with mechanistic modelling to predict wider outcomes. Following an initial synthesis of current knowledge, we will focus effort on reducing uncertainties on several novel and innovative approaches for mitigating agricultural GHG emissions. The supervisory team not only provide strong academic support but will also enrich the outcomes of the work through policy and industry engagement. The project will align to, and benefit from, on-going projects linked to the supervisory team including the UKRI Funded AgZero+ Project (<https://agzeroplus.org.uk/>).

The student will be based with the Plant-Soil Interactions Group at the UKCEH Lancaster and will also strongly engage with Warwick University. Together, we offer training and expertise in systematic reviews, experimental design, GHG and C emission studies and empirical modelling of biogeochemical processes. We offer placements with Advanced Bacterial Sciences, Lancashire, and Natural England, Cumbria, for industry and policy perspectives.

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