PhD Project Advertisement

Project title: The impacts of regenerative farming on soil carbon, structure and biodiversity across spatio-temporal scales
Project No: FBS2023-18-Girkin-cr

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Project description:

UK agriculture is a significant source of rising concentrations of greenhouse gas emissions, including nitrous oxide, a particularly potent greenhouse gas. Emissions are driven by a combination of intensive soil management practice (for example soil tillage), and high fertiliser inputs which are required to maintain crop yields. Ambitious Net Zero targets are in place for reducing agricultural emissions, but farmers require support in order to meet these targets.
Regenerative agriculture (which describes a range of soil and crop management practices, including zero-tillage, cover-cropping and diversified rotations) offers multiple potential benefits to farmers. These can include increasing soil carbon sequestration and improving soil health, including soil biological activity, and soil physical structure. These changes to soil properties can maintain and support crop yields. However, many significant knowledge gaps remain. Many regenerative farming practices are studied in isolation, but in order to meet Net Zero emissions targets and decarbonise UK food production systems, farmers will need to adopt multiple practices at one. More information is needed to demonstrate impacts on soil health, biodiversity, and carbon stocks in order to inform farmer and policymaker decision-making, and support accelerated transitions to more sustainable practices. This project addresses this challenge.

The overarching aim of this project is to assess how combined regenerative farming practices impact soil health (including measures of soil chemistry and biology), and soil carbon sequestration. This will be achieved by undertaking measurements of soil properties across a network of fields across the Midlands, UK. The focus will be on comparing paired regeneratively managed fields versus conventionally managed ones, investigating from 40 pairs of fields and looking at impacts in surface and sub-surface soils. This large number of sites will allow us to have a series of sites where regenerative practices have been implemented for different periods of time, allowing us to use statistical modelling to understand long-term trends. Alongside measuring changes in soil carbon storage and soil health, we will apply DNA sequencing to understand how time under regenerative practices is affecting soil microbial communities and test the idea that more biologically diverse soils can sequester and store more carbon.
Throughout this project, we will seek to engage farmers in explaining the underlying science and sharing project outcomes, and engage with policymakers due to the significant potential impact of this work, to inform the future direction of environmental land management schemes in the UK.

Training opportunities:

You will receive tailored training in a range of established field and laboratory techniques for characterizing plants, soils, statistics and in environmental modelling from a experienced, diverse and supportive supervisory team across Cranfield and Reading, with additional support from Rothamsted Research, the oldest agricutural research institute in the world. Depending on previous experience, you will be able to join training courses in plant and soil sciences, and global

environmental change, statistics, modelling approaches, and environmental policy. You will join a group of over 50 PhD students across the Cranfield Environment and Agrifood Theme, and attend training provided by the Cranfield Doctoral training network, providing you with essential transferable skills in academic writing, presentation, data management and public engagement. This project will have extensive opportunities for fieldwork, measuring and sampling UK soils, and opportunities for attending international conferences to share key project findings. There will be opportunities for industry or academic placements with the supervisors' wider collaborative network.

Student profile:

We seek a student with an interest in soil and plant sciences, with a minimum BSc (upper second class or equivalent) in agriculture, biology, plant, soil science, environmental science, physical geography, or a closely related subject.

Stipend (Salary):

FoodBioSystems DTP students receive an annual tax free stipend (salary) that is paid in instalments throughout the year. For 2022/23 this will be £17,668 and this will increase slightly each year at rate set by UKRI.

Equality Diversity and Inclusion:

The FoodBioSystems DTP is committed to equality, diversity and inclusion (EDI), to building a doctoral researcher(DR) and staff body that reflects the diversity of society, and to encourage applications from under-represented and disadvantaged groups. Our actions to promote diversity and inclusion are detailed on the FoodBioSystems DTP website.

In accordance with UKRI guidelines, our studentships are offered on a part time basis in addition to full time registration. The minimum registration is 50% FT and the studentship end date will be extended to reflect the part-time registration.

References:

Cooper, et al. 2021. Long-term zero-tillage enhances the protection of soil carbon in tropical agriculture. European Journal of Soil Science, 72(6), pp.2477-2492. https://doi.org/10.1111/ejss.13111

Cooper et al. 2021. To till or not to till in a temperate ecosystem? Implications for climate change mitigation. Environmental Research Letters, 16(5), 054022.

For up to date information on funding eligibility, studentship rates and part time registration, please visit the FoodBioSystems website.