iCASE Project / AY 2025 -2026

Developing a soil microbiome map for the United Kingdom

Project Reference: ICS-PAT-AE

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Industrial Partner: Chuckling Goat Limited

BBSRC DTP main strategic theme: Bioscience for sustainable agriculture and food

BBSRC DTP secondary strategic theme: Bioscience for an integrated understanding of health

Project outline:

Our Research Laboratory has an ongoing interest in microbiome sequencing and analysis. We provide 16S and 18S microbiome sequencing and analysis for a commercial company (Chuckling Goat) in Wales who work with their customers to explore gut health with direct to consumer testing. There is increasing interest in the microbiome and how it impacts our lives and health. Recently, the Royal Horticultural society has approached Chuckling Goat, who are leaders in direct-to-consumer gut microbiome testing about the possibility of working with them to develop a low-cost soil microbiome testing kit for UK gardeners.

This project seeks to extend our previous collaboration by exploring the microbiome of soil around the United Kingdom. In partnership with the Royal Horticultural Society, Chucking goat and our laboratory seek to develop a low-cost soil testing kit that can be ordered by gardeners or farmers across the United Kingdom. This would be promoted by RHS and Chuckling Goat and enable a low-cost microbiome map of UK soil for further research and analysis as well as promoting public understanding of soil health and the microbiome.

The Ph.D. student will work with our collaborators at the John Innes Centre in Norwich (Jacob Malone Lab) and Chuckling Goat (Wales) to design and test a low-cost soil collection kit. They will then work at Cambridge (Pathology) to select the most efficient DNA extraction methodology and explore downstream sequencing options and simple chemical tests (e.g. soil acidity, mineral content). An initial pilot study will be performed where soil from 20 local sites will be tested where existing soil data are available from the John Innes centre. This will validate both the collection kit and DNA extraction methods.

Once the soil collection kit has been designed and tested, Chuckling goat will offer this kit to UK gardeners who will collect a sample to be shipped back to Cambridge. Soil samples will be processed at the genomics facility according to protocols developed by the student by the team of technicians under guidance from the Ph.D. student and supervisor.

Once microbiome data starts to be produced from around the UK. The Ph.D. student will pivot into a data analysis phase of the project and work to assemble a simple online interface to make the microbiome data available to the scientific community and general public. It is envisaged they will coordinate with the European Bioinformatics Institute (Dr. Rob Finn) to ensure these data are consistent. We will provide comprehensive training in bioinformatics and microbiome analysis and large-scale data handling.

The Ph.D. candidate will develop skills in industry, working with Chuckling Goat to see how they develop direct-to-consumer testing. They will develop a solid knowledge of the soil microbiome working with the John Innes centre and the RHS. Finally, they will develop strong genomics and laboratory skills bring this together in Cambridge to analyse and build a soil microbiome map across the United Kingdom. We would envisage that a low-cost large-scale map of soil microbiome constituents and diversity, correlated with other soil features would be of significant interest for future research and eminently publishable.

We believe the Ph.D. student would develop strong skills and a foundation to be a future leader in this transformative technology.