

PhD Project Advertisement

Project title: *Greenhouse gas removal using plants and soil: enhanced rock weathering on land*

Project No: FBS25-74-Kirk-cr

Lead supervisor: Professor Guy Kirk, FEAS, Cranfield University

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Co-supervisors:

Professor John Hammond, School of Agriculture, Policy and Development, University of Reading

Dr Chris McCloskey, FEAS, Cranfield University

Mr James Dingle, The Carbon Bank, Ecotricity

Project description: Achieving net zero emissions of greenhouse gases requires dramatic reductions in emissions, particularly of CO₂. But it also requires a global greenhouse gas removal to compensate for residual emissions from the most difficult sectors. A promising technology for this is enhanced rock weathering (ERW) on agricultural land. In ERW, crushed silicate rocks spread on land react with CO₂ fixed by plants and released in plant and soil respiration to form environmentally benign carbonates, either stored in the soil or leached to the deep ocean.

Commercial ERW projects are already underway in the US and Europe. However, widespread deployment is constrained by (a) incomplete understanding of the science of ERW, particularly regarding time lags between rock applications and effective CO₂ removal; and (b) the lack of robust but practicable measurement, reporting and verification (MRV) schemes, suitable for individual ERW projects. Various MRV schemes are currently under development. But there are currently no accepted standards.

We have recently begun a 3-year project with the green energy company Ecotricity to develop an ERW programme on farms in Shropshire using locally available basalt. This will assess the potential for CO₂ removal and co-benefits for soil health and food production. This PhD project will support the field work and advance the scientific understanding of ERW and MRV schemes more broadly. The specific objectives are:

1. To develop a simple, practically useful model simulating ERW processes in soils and the time lags between rock weathering and effective CO₂ removal.
2. To test the model against results from the Shropshire field experiments with the model input parameters measured independent of the model output to provide a robust test.
3. To use the model to carry out a Life Cycle Assessment of ERW on land across England and Wales with potentially available rock sources. This will include mapping areas potentially suitable for ERW using spatial data on soils and land use.
4. To draw conclusions for improved MRV schemes, combining simple modelling with field measurements that are fit for purpose but practicable.

Training opportunities: This is a great opportunity to work in a project at the cutting edge of bioscience for sustainable food systems and to gain expertise in greenhouse gas removal technologies, soil science, mathematical modelling, geospatial data analysis and life cycle assessment. There will also be training in commercial, ethical and practical aspects of implementing green technologies. Training will include interactions and extended lab and field visits with Prof John Hammond at Reading University and James Dingle at Ecotricity. You will join a group of over 50 PhD students in the Cranfield Environment and Agrifood Theme, including students from other UKRI-funded doctoral training centres. There will be access to a full range of generic training modules.

Project supervision style: The student and lead supervisor will meet in-person at a fixed time each week and the wider supervisory group will meet on-line monthly and at least bi-annually in person. Written records of the meetings will be kept. As far as possible, the student will be given feedback on written work within a week. As part of Cranfield University procedures for PhD students, a formal progress review team will be appointed from academics independent of the supervisory team, comprising a chair and a specialist in the subject area. The review team will meet the student annually and make a formal assessment of progress.

Stipend (Salary):

FoodBioSystems DTP students receive an annual tax free stipend (salary) that is paid in instalments throughout the year. For 2024/25 this is £19,237 (£21,237 at Brunel University) and it will increase slightly each year at rate set by UKRI.

Equity Diversity and Inclusion:

The FoodBioSystems DTP is committed to equity, 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](#) and include:

- Offering reasonable adjustments at interview for shortlisted candidates who have disclosed a disability or specific learning difference.
- [Guaranteed interview](#) and [applicant mentoring](#) schemes for applicants, with UK home fees status, from eligible under-represented ethnic groups.

These are opt-in processes.

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.

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