Project title: Enhanced rock weathering: quantifying co-benefits for agricultural productivity and the environment of crushed basalt rock application

Supervisory team: Gillian MacKinnon (SUERC), Valerie Olive (SUERC), John MacDonald (GES), XinRan Liu (Industrial Supervisor, UNDO).

Short project background and outline:

Spreading finely ground rock on soil accelerates the chemical reactions between rocks, water and air in a process known as enhanced rock weathering (ERW). Importantly this reaction removes carbon dioxide (CO2) from the atmosphere and it has huge potential for large-scale atmospheric CO2 removal. Spreading ground basaltic rocks on agricultural soils has the added benefits of reducing excess soil acidity (pH) which could increase nutrient uptake and boost crop yields on underperforming croplands, supplying fertilizer-based macronutrients Phosphorous and Potassium (P&K) which could reduce reliance on expensive fertilizers and fortifying staple crops such as cereals and fodder crops with important micronutrients for human and animal health. These benefits go some way toward supporting the increased agricultural production that is required in the UK and globally, to meet the demands of a growing human population whilst contributing to our Net-Zero Emissions by 2050 target and mitigating climate change.

The project aims to:
- investigate the change in soil elemental composition, with and without ERW
- evidence the enhanced weathering process
- quantify the release of elements from basalt to the soil and determine the bioavailability of these elements in the soil and to plants
• assess whether ERW may have negative impacts such as potentially toxic element (PTE) contamination

The successful applicant will work with supervisors in SUERC and the School of Geographical & Earth Sciences, in addition to collaboration with UNDO, an ambitious company at the forefront of technological innovation specialising in enhanced weathering removal of CO₂.

The project will provide the empirical evidence that could prove transformative in acceptance of ERW technology in mitigating climate change and allow refinement of carbon cycling/climate change modelling, whilst delivering practical benefits to UNDO and the agricultural sector more broadly.

**Desired skills/knowledge background of the applicant:**

All applicants should have (or expect to obtain) a high-class Honours degree (equivalent to 2:1 or above) in a relevant science discipline and/or an excellent postgraduate qualification in a relevant subject. The project will suit candidates with an environmental/analytical chemistry, geochemistry or agricultural science background who are passionate to solve climate change and sustainable agriculture challenges.

**Career prospects:**

This studentship provides a unique training opportunity in a transdisciplinary research environment whilst gaining technical experience in the use of state-of-the-art instrumentation. Partnering with UNDO offers the student invaluable industry experience in translating research for practical application and access to fieldwork and field trials on a larger scale than would otherwise be available.

**Funding Notes:**

The studentship is fully funded for 42 months and covers tuition fees and an annual stipend for a candidate at the UKRI recommended level.