Managing UK agriculture with rock dust could absorb up to 45% the atmospheric carbon dioxide needed for net-zero

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Adding rock dust to UK agricultural soils could absorb up to 45% of the atmospheric carbon dioxide needed to reach net zero, according to a

major new study led by scientists at the University of Sheffield.

The study, led by the Leverhulme Centre for Climate Change Mitigation at the University, provides the first detailed analysis of the potential and costs of greenhouse gas removal by enhanced weathering in the UK over the next 50 years.

The authors show this technique could make a major overlooked contribution to the UK's requirement for greenhouse gas removal in the coming decades with a removal potential of 6–30 million tons of carbon dioxide annually by 2050. This represents up to 45% of the atmospheric carbon removal required nationally to meet net-zero greenhouse gas emissions alongside emissions reductions.

Deployment could be straightforward because the approach uses existing infrastructure and has costs of carbon removal lower than other Carbon Dioxide Removal (CDR) strategies, such as direct air capture with carbon capture storage, and bioenergy crops with carbon capture and storage.

A clear advantage of this approach to CDR is the potential to deliver major wins for agriculture in terms of lowering emissions of nitrous oxide, reversing soil acidification that limits yields and reducing demands for imported fertilizers.

The advantages of reducing reliance on imported food and fertilizers have been highlighted by the war in Ukraine that has caused the price of food and fertilizers to spike worldwide as exports of both are interrupted.

The authors of the study highlight that societal acceptance is required from national politics through to local community and farm scales. While mining operations for producing the basalt rock dust will generate

additional employment and could contribute to the UK government's leveling up agenda; however this will need to be done in ways which are both fair and respectful of local community concerns.

This new study provides much needed detail of what enhanced rock weathering as a carbon dioxide removal strategy could deliver for the UK's net-zero commitment by 2050. The Committee on Climate Change, which provides independent advice to the government on climate change and carbon budgets, overlooked enhanced weathering in their recent net-zero report because it required further research. The new study now indicates enhanced weathering is comparable to other options on the table and has considerable co-benefits to UK food production and soil health.

Professor David Beerling, Director of the Leverhulme Centre for Climate Change Mitigation at the University of Sheffield and senior author of the study, says that their "analysis highlights the potential of UK agriculture to deliver substantial carbon drawdown by transitioning to managing arable farms with rock dust, with added benefits for soil health and food security."

Dr. Euripides Kantzas of the Leverhulme Centre for Climate Change Mitigation at the University of Sheffield and lead author, says that "by quantifying the carbon removal potential and co-benefits of amending crops with crushed rock in the UK, we provide a blueprint for deploying enhanced rock weathering on a national level, adding to the toolbox of solutions for carbon-neutral economies."

Professor Nick Pidgeon, a partner in the study and Director of the Understanding Risk Group at Cardiff University, says that "meeting our net zero targets will need widespread changes to the way UK agriculture and land is managed. For this transformation to succeed we will need to fully engage rural communities and farmers in this important journey."

The research was published in *Nature Geoscience*.

More information: David Beerling, Substantial carbon drawdown potential from enhanced rock weathering in the United Kingdom, *Nature Geoscience* (2022). DOI: 10.1038/s41561-022-00925-2.
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