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World-first carbon sequestration field trial launches in UK

A world-first carbon sequestration field trial was unveiled today by **The Carbon Community**. The landmark project aims to uncover a new reforestation approach, rooted in science, to accelerate and enhance the sequestration of carbon dioxide (CO₂) in trees and soil to tackle the climate crisis.

The study is designed and run in partnership with leading scientists from **ETH Zürich Crowther Lab**; **Leverhulme Centre for Climate Change Mitigation at the University of Sheffield**; **The Grantham Institute on Climate Change and the Environment, Imperial College London**; and **The Royal Botanic Gardens, Kew**.

In May, more than 25,000 new trees have been planted on 11 hectares (28 acres) in Carmarthenshire, near the Brecon Beacons, Wales, in a field trial combining two nature-based climate solutions never previously deployed together at scale. The project will assess the combined effects of forest microbiome inoculation and the deployment of enhanced rock weathering, and their ability to accelerate and enhance forest carbon sequestration in conifer monoculture and mixed broadleaf forests.

Charles Nicholls, co-founder of The Carbon Community, commented: “Reforestation is one of the most powerful tools we have to combat climate breakdown, much of which will happen on agricultural land. Intensively farmed land is often stripped of the native biodiversity and minerals needed for optimal tree establishment. With this unique project we aim to restore biodiversity, enhance tree survival and unlock huge potential to accelerate and enhance the carbon stored in trees and soil.”

Over the first two years, the project will measure the carbon stored in the trees and soil, and the results will identify the combination of treatments where the most carbon has been sequestered. The Carbon Community aims to scale up this reforestation method to accelerate and enhance carbon removal from the atmosphere.

The Carbon Community field trial is the first of its kind and the results will be made freely available to other tree planting projects and environmental scientists. The 72 test cell trial will study two types of forests: the first is comprised of native broadleaf species from Wales, including Birch, Alder, Cherry, Oak, Aspen and Rowan. The second type is a monoculture conifer forest comprising Sitka Spruce, typical of commercial forestry plantations.

In the design of this experiment **ETH Zürich's Crowther Lab** is intentionally reintroducing soil microbial and mycorrhizal communities sourced from established forest ecosystems in an effort to jump start reforestation. For this field trial, **The Carbon Community** sourced live soils from nearby forest ecosystems, which will be used as microbial inocula at the time of planting.

Dr Colin Averill, Senior Scientist at the Crowther Lab, commented: “This is an important world-first field trial which will measure carbon sequestered in trees and soil on a scope and scale not seen before. Studies continue to find that introduction of native soil communities can dramatically increase plant survival.¹ How these fungi may in turn affect tree seedling growth and survival rates and ecosystem carbon sequestration at scale remains unknown, and is one example of how The Carbon Community is pushing the frontiers of nature-based climate solutions.”

Professor David Beerling, University of Sheffield, commented: “Our recent research revealed that applying basalt to croplands could absorb up to 2 billion tonnes of CO₂ from the atmosphere. This exciting new partnership with The Carbon Community enables us to understand basalt addition in a reforestation project, including the potential carbon sequestration when co-deployed with forest microbiome restoration. To avoid catastrophic climate change we need to urgently scale-up carbon removal strategies, alongside deep emissions cuts.”

The project builds on recent studies, which continue to find that soil microbiome inoculation with native mycorrhizal fungi from established ecosystems can dramatically increase plant survival². Basalt also contains nutrients that stimulates mycorrhizal fungi and can support tree growth³. Enhanced rock weathering takes crushed basalt, a mining by-product, and applies it to the soil to capture CO₂ and provide essential nutrients to fertilize trees. This method, proven in sugarbeet and pea crops, was recently hailed as one of the best near-term ways to remove carbon dioxide from the atmosphere⁴.

Tree planting will be high on the agenda at the upcoming UN Biodiversity Summit and COP26, with countries across the world pledging ambitious reforestation targets to tackle the climate crisis and biodiversity decline.

Clare Pillman, Chief Executive of Natural Resources Wales, said: “This is a critical time for nature. If we are going to tackle the interconnected nature and climate crises and turn the tide on decades of biodiversity decline, we need to act now to ensure the resilience of our planet’s life support system. We all stand to benefit from committing to nature’s recovery, and woodland creation can play a significant role in long term carbon sequestration for future generations. NRW lends its full support to this exciting initiative as a key component to accelerating our approach to tackling the climate crisis.”

The Carbon Community is a new charity dedicated to creating forests and accelerating carbon removal, with breakthrough science. Its planting and restoration projects are designed, in partnership with world

¹ [Wubs, E., van der Putten, W., Bosch, M. et al. Soil inoculation steers restoration of terrestrial ecosystems. *Nature Plants* **2**, 16107 \(2016\).](#)

² [Wubs, E., van der Putten, W., Bosch, M. et al. Soil inoculation steers restoration of terrestrial ecosystems. *Nature Plants* **2**, 16107 \(2016\).](#)

³ [Battles, J.J., Fahey, T.J., Driscoll, C.T., Blum, J.D. & Johnson, C.E. Restoring Soil Calcium Reverses Forest Decline. *Environ. Sci. Technol. Lett.*, **1**, 15–19. \(2014\).](#)

⁴ [Beerling, D.J., Kantzas, E.P., Lomas, M.R. et al. Potential for large-scale CO₂ removal via enhanced rock weathering with croplands. *Nature* **583**, 242–248 \(2020\).](#)

leading scientists, to learn more about how to accelerate and enhance carbon sequestration. It is committed to sharing its findings as widely as possible to increase carbon sequestration in its own projects and beyond.

The Carbon Community creates new forest on its own land, to ensure the trees that are planted will be there for generations. The charity is looking for funders and partners to scale up tree planting and help advance the research on carbon in trees and soil.

ENDS

NOTES TO EDITORS

Forest microbiome / soil microbiome – Complex community of soil bacteria and fungi, integral to how trees obtain soil resources and grow. **Mycorrhizal fungi** form part of the soil microbiome. These extraordinary fungi live in a mutually beneficial partnership with trees – the trees provide carbohydrates from photosynthesis to the fungi, and the fungi provide soil nutrients to the trees. While mining the soil for nutrients like nitrogen and phosphorus, the fungi pump carbon into the soil and suppress decomposers that would release carbon back into the air.

Enhanced Rock Weathering – A natural geological process which removes carbon dioxide from the atmosphere. The addition of basalt to the soil has the potential to dramatically increase the carbon removal and accelerate the establishment of new forests.

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A recent study has called out the urgent need for real-world field trials on enhanced weathering and mycorrhizal fungi application. "Mitigating climate change and increasing agricultural sustainability are twin challenges society faces in the upcoming decades. One measure that can contribute to reducing atmospheric CO₂ is "enhanced weathering" through application of ground silicates. Here we propose that mycorrhizal fungi may critically contribute to the success of enhanced weathering in agricultural systems. Fundamental lab-based experiments now need to go hand in hand with real-world field trials, with the goal to optimize both decarbonization and environmental sustainability of agricultural ecosystems."⁵

Other studies have observed a combinatorial effect between enhanced weathering and mycorrhizal fungi, where the symbiotic relationship between tree and fungi accelerates mineral dissolution⁶.

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⁵ [Verbruggen, E., Struyf, E, Vicca, S. Can arbuscular mycorrhizal fungi speed up carbon sequestration by enhanced weathering? *Plants, People, Planet* \(2021\).](#)

⁶ [Quirk, J., Leake, J.R., Banwart, S.A., Taylor, L.L. & Beerling, D.J. \(2014\). Weathering by tree-root-associating fungi diminishes under simulated Cenozoic atmospheric CO₂ decline. *Biogeosciences*, 11, 321–331.](#)

About The Carbon Community (<https://www.carboncommunity.org/>)

The Carbon Community is a new charity dedicated to creating forests and accelerating carbon removal, with breakthrough science. Its planting and restoration projects are designed, together with world leading scientists, to learn more about how to accelerate carbon sequestration. It is committed to sharing findings as widely as possible to increase carbon sequestration capacity.

Scientific Project Leaders

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