Published on *Science 2.0* (http://www.science20.com)

Fight Global Warming By Boosting Calcium Silicates In Soil - Theory

By *News Staff*
Created *Mar 31 2008 - 11:52am*

Plants, crops and trees naturally absorb atmospheric carbon dioxide (CO2) during photosynthesis and then pump surplus carbon through their roots into the earth around them. In most soils, this carbon can escape back to the atmosphere or enters groundwater.

Knowing this, a team from Newcastle University aims to design soils that can remove carbon from the atmosphere, permanently and cost-effectively using soils containing calcium-bearing silicates.

Calcium silicates are minerals that occur naturally in many different rocks and also in artificial materials such as concrete.

The team believe the carbon that oozes out of a plant's roots may react with the calcium to form the harmless mineral calcium carbonate**(1).** The carbon then stays securely locked in the calcium carbonate, which simply remains in the soil, close to the plant's roots, in the form of a coating on pebbles or as grains.

The scientists are investigating whether this process occurs as it may encourage the growing of more plants, crops, etc., in places where calcium-rich soils already exist. It would also open up the prospect that bespoke soils can be designed (i.e., with added calcium silicates, or specific plants) which optimize the carbon-capture process. Such soils could play a valuable role in carbon abatement all over the globe.

The team will first try to detect calcium carbonate in natural soils that have developed on top of calcium-rich rocks or been exposed to concrete dust (which contains man-made calcium silicates). They will then study artificial soils made at the University from a mixture of compost and calcium-rich rock. Finally, they will grow plants in purpose-made soils containing a high level of calcium silicates and monitor accumulation of calcium carbonate there.

The multi-disciplinary research team, including civil engineers, geologists, biologists and soil scientists, is led by David Manning, Professor of Soil Science at Newcastle University. “Scientists have known about the possibility of using soil as a carbon ‘sink’(2) for some time,” says Professor Manning. ”But no-one else has tried to design soils expressly for the purpose of removing and permanently locking up carbon. Once we’ve confirmed the feasibility of this method of carbon sequestration, we can develop a computer model that predicts how much calcium carbonate will form in specific types of soil, and how quickly. That will help us engineer soils with optimum qualities from a carbon abatement perspective. A key benefit is that combating climate change in this way promises to be cheap compared with other processes.”

Significant scope could exist to incorporate calcium-rich, carbon-locking soils in land restoration, land remediation and other development projects. Growing bioenergy crops on these soils could be one attractive option.

“The process we’re exploring might be able to contribute around 5-10% of the UK’s carbon reduction targets in the future,” says Professor Manning. “We could potentially see applications in 2-3 years, including a number of ‘quick wins’ in the land restoration sector.”

The 18-month research project “Engineering the Soil Carbon Sink: A Novel Approach to Carbon Emission Abatement” began in September 2007. It is receiving total EPSRC funding of just under £240,000.

Tarmac is providing the research team with access to a number of sites in order to carry out soil assessments. Renew Tees Valley is helping to link the team’s work to bioenergy crop production. The team will also work with Defra (the Department for Environment, Food and Rural Affairs) and a number of farmers/landowners to identify sites for study.

NOTES:

1. Calcium carbonate is a common, naturally occurring, completely stable mineral that would not be eroded by rain filtering through the soil. In many soils calcium carbonate occurs as coatings on pebbles and grains, and as grains associated with roots.

2. A carbon ‘sink’ is any natural or human activity or mechanism that absorbs carbon dioxide and removes it from the atmosphere. Soils are the most significant sink for terrestrial carbon, containing twice as much as in the atmosphere and three times as much as is held in land plants. Soils can act as ‘sinks’ for carbon in more than one way – carbon is held as organic matter derived from plants, and held as inorganic carbonate minerals whose carbon is derived from what are called plant root exudates. These exudates are the juices that plants ooze from their roots to corrode minerals and mobilise the nutrients they need – and it is this process which the current project aims to exploit.

The potential use of soil to remove atmospheric carbon is analogous in many ways to the use of reed beds to clean up contaminated water.

Applied Physics

ION Publications LLC

Source URL:
http://www.science20.com/news_releases/fight_global_warming_by_boosting_calcium_silicates_in_soil_theory