

Paris soil carbon sequestration goals called unrealistic

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The goal to offset rises in atmospheric greenhouse gas concentrations by increasing soil carbon storage by 4 per mille (0.4%) per year is unrealistic, say scientists from The Netherlands, The United Kingdom and the United States in an opinion piece in the journal *Environmental Science and Technology*.

The plans to store more [carbon](#) in the [soil](#) ("4P1000") were launched at the 2015 United Nations Framework Convention on Climate Change (UNFCCC) in Paris. The soils of the world contain approximately three times the amount of carbon in organic matter as currently held in carbon dioxide in the atmosphere." Increasing this soil organic matter stock at a rate of 4 per mille per year could, in theory, fully compensate the rise in atmospheric CO₂. Such an increase could come about by e.g. changes in land management, or by using different crop rotations.

"In principle, the 4P1000 [goal](#) is great," says Jan Willem van Groenigen, Professor at Wageningen University & Research and lead author of the paper. "Generally speaking, more carbon is good for almost any soil. If we could combine that with slowing [climate change](#), that would be a double win. The problem is that the numbers don't add up."

Extra nitrogen needed

To store additional carbon in the soil, you need other nutrients, such as nitrogen. "You cannot build a house with only a pile of bricks but no

mortar. Similarly, you cannot produce soil organic matter with only carbon," explains Kees Jan van Groenigen, co-author of the paper and senior lecturer at the University of Exeter. "You need enormous amounts of nitrogen, and it is unclear where that nitrogen would come from. For example, to store the quantity of carbon mentioned in the 4p1000 goals, you would need extra nitrogen equivalent to 75% of current [nitrogen](#) fertilizer production, and for it to be in the right places. Practically speaking, that is just impossible."

Does that mean that we should abandon the 4p1000 goals? "Absolutely not," says Jan Willem van Groenigen: "Let's not throw away the baby with the bathwater. The 4p1000 goals are a great inspiration to do everything we can as farmers, soil scientists, agronomists and policy makers to help fight global warming and at the same time improve our soils." Instead, the authors appeal to the scientific community to think about the role of nutrients in reaching the 4p1000 goals. "For instance, this could mean that additional soil carbon should be stored in areas where nutrients are also available," van Groenigen explains. "In other soils the best approach might be to focus on minimizing emissions of other greenhouse gases such as nitrous oxide and methane."

More information: Jan Willem van Groenigen et al. Sequestering Soil Organic Carbon: A Nitrogen Dilemma, *Environmental Science & Technology* (2017). [DOI: 10.1021/acs.est.7b01427](https://doi.org/10.1021/acs.est.7b01427)

Provided by Wageningen University

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