

# Increased tropical forest growth could release carbon from the soil

14 August 2011



This is a view through the undergrowth in tropical forest at the study site in Panama. Credit: Dr. Emma Sayer

A new study shows that as climate change enhances tree growth in tropical forests, the resulting increase in litterfall could stimulate soil micro-organisms leading to a release of stored soil carbon.

The research was led by scientists from the Centre for Ecology & Hydrology and the University of Cambridge, UK. The results are published online today (14 August 2011) in the scientific journal *Nature Climate Change*.

The researchers used results from a six-year experiment in a rainforest at the Smithsonian Tropical Research Institute in Panama, Central America, to study how increases in litterfall - dead plant material such as leaves, bark and twigs which fall to the ground - might affect [carbon](#) storage in the soil. Their results show that extra litterfall triggers an effect called 'priming' where fresh carbon from plant litter provides much-needed energy to [micro-organisms](#), which then stimulates the decomposition of carbon stored in the soil.

Lead author Dr Emma Sayer from the UK's Centre for Ecology & Hydrology said, "Most estimates of the carbon sequestration capacity of [tropical forests](#) are based on measurements of tree growth. Our study demonstrates that interactions between plants and soil can have a massive impact on carbon cycling. Models of [climate change](#) must take these feedbacks into account to predict future atmospheric [carbon dioxide](#) levels."



This is leaf litter around the buttress roots of a tropical tree at the study site in Panama. Credit: Dr. Emma Sayer

The study concludes that a large proportion of the carbon sequestered by greater tree growth in tropical forests could be lost from the soil. The researchers estimate that a 30% increase in litterfall could release about 0.6 tonnes of carbon per hectare from lowland tropical forest soils each year. This amount of carbon is greater than estimates of the climate-induced increase in forest biomass carbon in Amazonia over recent decades. Given the vast land surface area covered by tropical forests and the large amount of carbon stored in the [soil](#), this could affect the global carbon balance.

Tropical forests play an essential role in regulating

the global carbon balance. Human activities have caused carbon dioxide levels to rise but it was thought that trees would respond to this by increasing their growth and taking up larger amounts of carbon. However, enhanced [tree growth](#) leads to more dead plant matter, especially leaf litter, returning to the forest floor and it is unclear what effect this has on the carbon cycle.

Provided by Centre for Ecology & Hydrology



Measuring CO<sub>2</sub> efflux from the soil in subplots where the forest floor has been replaced with litter with a distinct isotopic signature. A wire mesh tent excludes forest litter from the subplots. Credit: Dr. Emma Sayer

Dr Sayer added, "Soils are thought to be a long-term store for carbon but we have shown that these stores could be diminished if elevated carbon dioxide levels and nitrogen deposition boost plant growth."

Co-author Dr Edmund Tanner, from the University of Cambridge, said, "This priming effect essentially means that older, relatively stable [soil carbon](#) is being replaced by fresh carbon from dead plant matter, which is easily decomposed. We still don't know what consequences this will have for carbon cycling in the long term."

**More information:** 'Soil carbon release enhanced by increased tropical forest litterfall' will be published online in the journal *Nature Climate Change* on 14 August 2011. [DOI: 10.1038/nclimate1190](#)

APA citation: Increased tropical forest growth could release carbon from the soil (2011, August 14)  
retrieved 21 October 2020 from <https://phys.org/news/2011-08-tropical-forest-growth-carbon-soil.html>

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