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CLIMATE-CHANGE RESEARCH

Carbon Budget Woes

As atmospheric levels of CO_2 rise, forests and soils are absorbing less of it

Bette Hileman

New research is casting doubt on conventional thinking about the carbon budget. Each year, as fossil fuels are burned and tropical forests are cut, roughly one-third of the emitted carbon dioxide remains in the atmosphere, one-third dissolves in oceans, and the remainder goes into terrestrial ecosystems. On the basis of past findings, scientists have assumed that forest ecosystems would continue to absorb about one-third of the emitted CO_2, even as atmospheric levels increase.

James Heath, a biologist at Lancaster University, in the U.K., and his colleagues have found, however, that as the CO_2 concentration in the air rises, the potential of forest ecosystems to absorb CO_2 —and thereby slow global warming—may be much less than previously thought (*Science* 2005, *309,* 1711).

Heath and his coworkers cultivated 500 trees of six European species under four CO_2 levels: ambient (about 380 ppm) for control trees, and 480, 580, and 680 ppm. All species grew faster under elevated CO_2, but trees cultivated in 580- and 680-ppm CO_2 sequestered roughly 40% less carbon in the soil than did controls. “This is the first study using a wide range of tree species to show that, while trees may take up more CO_2 as levels in the atmosphere rise, less may end up being stored in soil” from various root processes, Heath says.

Related research led by Guy J. D. Kirk, a professor of soil systems at the U.K.’s Cranfield University, found that soils across England and Wales lost an average of 0.6% of their carbon content per year between 1978 and 2003 (*Nature* **2005,** 437, 245). Because the loss rate did not depend on land use, the decline probably results from climate change,

Kirk writes. Contrary to accepted wisdom, the findings indicate that most soil carbon is not inert and can escape.

COURTESY OF JAMES HEATH

GREENHOUSE Solar domes were used by Heath's group to cultivate trees under four levels of CO_2.

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