



## LETTERS

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### Carbon Accounting a Tricky Business

THE POLICY FORUM “FIXING A CRITICAL CLIMATE accounting error” (23 October 2009, p. 527), in which T. D. Searchinger *et al.* describe the error of assigning biofuel carbon emissions as zero, is long overdue. The heat-trapping potential of carbon dioxide from a

modern carbon source is exactly the same as that from a fossil carbon source. The only way biofuel carbon emissions will have no net effect on the global energy balance is if the modern carbon released during biofuel combustion were removed from the atmosphere and quickly incorporated into a carbon sink. The need to count “changes in emissions from land use when biomass for energy is harvested or grown” is vital, but Searchinger *et al.* minimize the difficulty in determining what those emission changes are.

The land-use changes that may occur due to the widespread use of biofuels such as ethanol are highly variable (1–3). Both forest and abandoned or reclaimed agricultural land have potentially large stores of deep mineral soil carbon. We are just beginning to understand the extent of carbon release associated with conversion to bioenergy cultivation [e.g., (4–6)]. The state of the science related to soil carbon dynamics is not developed enough to allow proper carbon accounting of land-use change.

Furthermore, land-use decisions are a dynamic process based on a variety of factors, many unrelated to biofuels. To fully attribute land-use change emissions to biofuels would require determining what would

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have happened in the absence of biofuels. With the complex land-use transitions that may occur—perhaps from cultivation for crops to bioenergy to pasture—it will be exceedingly difficult to ascribe a given land-use history solely to agricultural or bioenergy production. Thus, the science of soil carbon and the difficulty of assigning land use are just two of the many complexities that will further confound adequate carbon accounting—pointing to a need for both further research and careful analysis.

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