

Biofuel Expansion

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Biofuels from land-rich tropical countries may help displace foreign petroleum imports for many industrialized nations, providing a possible solution to the twin challenges of energy security and climate change. But concern is mounting that crop-based biofuels will increase net greenhouse gas emissions if feedstocks are produced by expanding agricultural lands. Here we quantify the 'carbon payback time' for a range of biofuel crop expansion pathways in the tropics. We use a new, geographically detailed database of crop locations and yields, along with updated vegetation and soil biomass estimates, to provide carbon payback estimates that are more regionally specific than those in previous studies. Using this cropland database, we also estimate carbon payback times under different scenarios of future crop yields, biofuel technologies, and petroleum sources. Under current conditions, the expansion of biofuels into productive tropical ecosystems will always lead to net carbon emissions for decades to centuries, while expanding into degraded or already cultivated land will provide almost immediate carbon savings. Future crop yield improvements and technology advances, coupled with unconventional petroleum supplies, will increase biofuel carbon offsets, but clearing carbon-rich land still requires several decades or more for carbon payback. No foreseeable changes in agricultural or energy technology will be able to achieve meaningful carbon benefits if crop-based biofuels are produced at the expense of tropical forests.

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