

Renewable fuels may have hidden costs, study says

New analysis shows that without proper regulation, biofuels programs aimed at curbing greenhouse gases could do just the opposite

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A global push toward production of biofuels, advocated by many as a measure to curb greenhouse gas emissions, could have exactly the opposite effect unless adequate controls are put in place, a new study has found. Because forests, which remove carbon dioxide from the atmosphere, could end up being cut down to create new cropland as a result of intensive agriculture for fuels, a gallon of biofuel could ironically end up being responsible for twice as much greenhouse gas emission as a gallon of gasoline.



Graphic: Christine Daniloff

This indirect impact from biofuels production is "an inescapable effect" unless regulations control it, but it cannot directly be measured, says John Reilly, associate director of the MIT Joint Program on the Science and Policy of Global Change. Reilly, along with five other MIT researchers, is a co-author of the new study, being published Oct. 23 in *Science*. The lead author is Jerry Melillo of the Marine Biological Laboratory in Woods Hole, Mass.

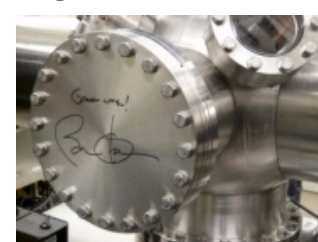
The study found that a massive campaign to substitute biofuels for petroleum could result in a net doubling of the amount of land devoted to agriculture worldwide - and that, perhaps surprisingly, there is enough land available to sustain that. But this change in land use, unless coupled to regulations that either specifically protect forestland, or that tax the destruction of forest sufficiently to render that uneconomic, would lead to a net increase in carbon emissions. In addition, the increase in intensive agriculture would require an enormous addition of nitrogen fertilizers to the soil, producing emissions of nitrous oxide, a much more potent greenhouse gas than carbon dioxide.

Together, these two effects could double the overall emissions attributable to land use. However, with proper controls in place, the use of biofuels instead of petroleum could reduce carbon emission by almost four-fifths, Reilly says.

The effects are often indirect and hard to measure, because typically the growing of crops for biofuels - whether traditional food crops such as corn and soy, or new cellulosic crops intended specifically for fuel production - may not be on forestland freshly cleared for that purpose, but on existing agricultural land. But, because of resulting pressures on food supplies and prices, the result may be that forests, perhaps in an entirely different region, are cleared to grow food crops displaced by the fuel production.

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Although such indirect effects can't be directly measured, "you need statistical techniques to estimate the land-use change and other factors," Reilly says. And that is what the new study attempted to do.

Currently, in many parts of the world there is little protection of large natural forests, and that which exists is often ineffective. Absent effective protection, if an international push toward biofuels production were put in place now, "you would probably get this increase in deforestation," Reilly says, and the net result could end up being an increase in net greenhouse gas emissions. That increase, for each gallon of biofuel produced, could be "two to three times worse than a gallon of gasoline," he says. "It's a hugely negative effect."

Still, the study's findings don't necessarily mean that increased biofuel production would be a bad idea, only that it needs to be done in the right way. "In order to make this efficient, we need to control deforestation," Reilly says. But with sufficient regulations to control the changes in land use and to limit the use of nitrogen fertilizers, he says, "it would not have these negative effects, and might have positive effects."

Matt Hartwig, communications director for the Renewable Fuels Association, a Washington trade group representing the vast majority of U.S. ethanol producers, counters that regulations are already in place to require greenhouse gas emissions reductions for biofuels.

In a statement in response to the Science paper, the association says it "strongly agrees with the authors that natural ecosystems with high carbon storage - such as rainforest, peat soils, and other native lands - absolutely should not be converted to produce biofuel feedstocks. Those who directly convert these land types for biofuel crop production or any other purpose should be severely penalized and every effort should be taken locally to prevent this type of direct action."

As the world prepares to negotiate new agreements to control global warming in Copenhagen later this year, Reilly says, it's important that there be "an awareness that this is an issue to look at. It's not clear that there's a full awareness of how crucial this is." It will be essential to figure out how to treat biofuels correctly in any proposed cap-and-trade system, he says.

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