

# Regulating the indirect land use carbon emissions from biofuels imposes high hidden costs on fuel consumers

June 27 2017

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Farmers earn more profits when there is demand for corn for biofuel instead of for food only. This can lead some to convert grasslands and forests to cropland. This conversion, also called indirect land use change, can have large-scale environmental consequences, including releasing stored carbon into the atmosphere. To penalize the carbon emissions from this so-called indirect land use change, the USEPA and California Air Resources Board include an indirect land use change factor when considering the carbon savings with biofuels for their compliance with the federal Renewable Fuel Standard or California's Low-Carbon Fuel Standard.

"Biofuel policies like the Low-Carbon Fuel Standard in California are trying to minimize the indirect land use change related emissions by accounting for the indirect land use change factor as part of the [carbon](#) emissions per gallon of biofuels. We examine the costs and benefits of using this approach at a national level," says University of Illinois agricultural economist Madhu Khanna.

A research paper on the subject by Khanna and her colleagues appears today in *Nature Communications* in which they ask: By how much would carbon emissions be reduced as a result of regulating indirect land use change like they are attempting to do in California? At what cost? And, who bears those costs?

Khanna says a low-carbon [fuel](#) standard creates incentives to switch to low-carbon advanced biofuels, but including the indirect effect makes compliance more costly and fuel more expensive for consumers.

Evan DeLucia, a U of I professor of plant biology and a co-author on the study, explains that biofuels differ in the carbon emissions they generate per gallon and their effect on use of land. Cellulosic biofuels, particularly from crop residues, or energy crops, like miscanthus and switchgrass, produced on low-quality marginal land lead to lower indirect land use change than corn ethanol.

"Inclusion of the indirect land use change factor makes it much more costly to achieve the Low Carbon Fuel Standard," Khanna says. "It penalizes all biofuels and increases their carbon emissions per gallon. It imposes a hidden tax on all fuels that is borne by fuel consumers and blenders."

"What we find is the inclusion of this indirect land use change factor leads to a relatively small reduction in emissions and this reduction comes at a very large cost to fuel consumers and fuel blenders," Khanna says. "The economic cost of reducing these carbon emissions is much higher than the value of the damages caused by those emissions, as measured by the social cost of carbon. What our findings suggest is that it's not optimal to regulate indirect land use change in the manner that it is currently done in California and of extending that to other parts of the country."

The social cost of carbon, Khanna says, is \$50 per ton of carbon dioxide on average. The economic cost of reducing [carbon emissions](#) by including California's indirect land use change factor at a national level is \$61 per ton of carbon dioxide.

The use of California's indirect land use change factors applied

nationally would imply that the cost of reducing a ton of carbon is 20 percent higher than the avoided damages from those emissions. "We find that it is just not worth reducing these indirect land use emissions using California's approach. It imposes a cost that is passed on to the consumer in the form of a higher cost for fuel," Khanna says. "These [costs](#) for fuel consumers could range from \$15 billion to \$131 billion nationally over a decade, depending on the indirect land use change factors applied."

"We need to think of better ways to prevent indirect land use change that would be more cost-effective," Khanna says.

Currently, there is no national low-carbon fuel standard. California has one, Oregon recently established a low-carbon fuel standard, and other states are considering it. Khanna says this study provides useful information as states move forward to determine whether or not they should continue this policy of including an indirect land use change factor when they implement a low-carbon fuel standard.

"A lot of effort has been made and continues to be made to calculate the indirect land use change factor so they can be included in implementing low-carbon fuel policies," Khanna says. "The presence of indirect land use change due to biofuels has in fact dominated the whole debate about the climate benefits of biofuels. We may be more productive if we focus more on the direct carbon saving with biofuels and incorporating those in trying to encourage the move toward lower carbon biofuels rather than regulating the indirect effects. Estimates of the indirect effects of biofuels have also become much smaller over time and it's time to re-evaluate the benefits of continuing the policy of regulating indirect emissions," Khanna says.

The paper, "The social inefficiency of regulating indirect land use change due to biofuels," is written by Madhu Khanna, Weiwei Wang,

Tara W. Hudiburg, and Evan H. DeLucia and is published in *Nature Communications*.

**More information:** Madhu Khanna et al. The social inefficiency of regulating indirect land use change due to biofuels, *Nature Communications* (2017). [DOI: 10.1038/ncomms15513](https://doi.org/10.1038/ncomms15513)

Provided by University of Illinois at Urbana-Champaign

Citation: Regulating the indirect land use carbon emissions from biofuels imposes high hidden costs on fuel consumers (2017, June 27) retrieved 12 May 2024 from <https://phys.org/news/2017-06-indirect-carbon-emissions-biofuels-imposes.html>

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