

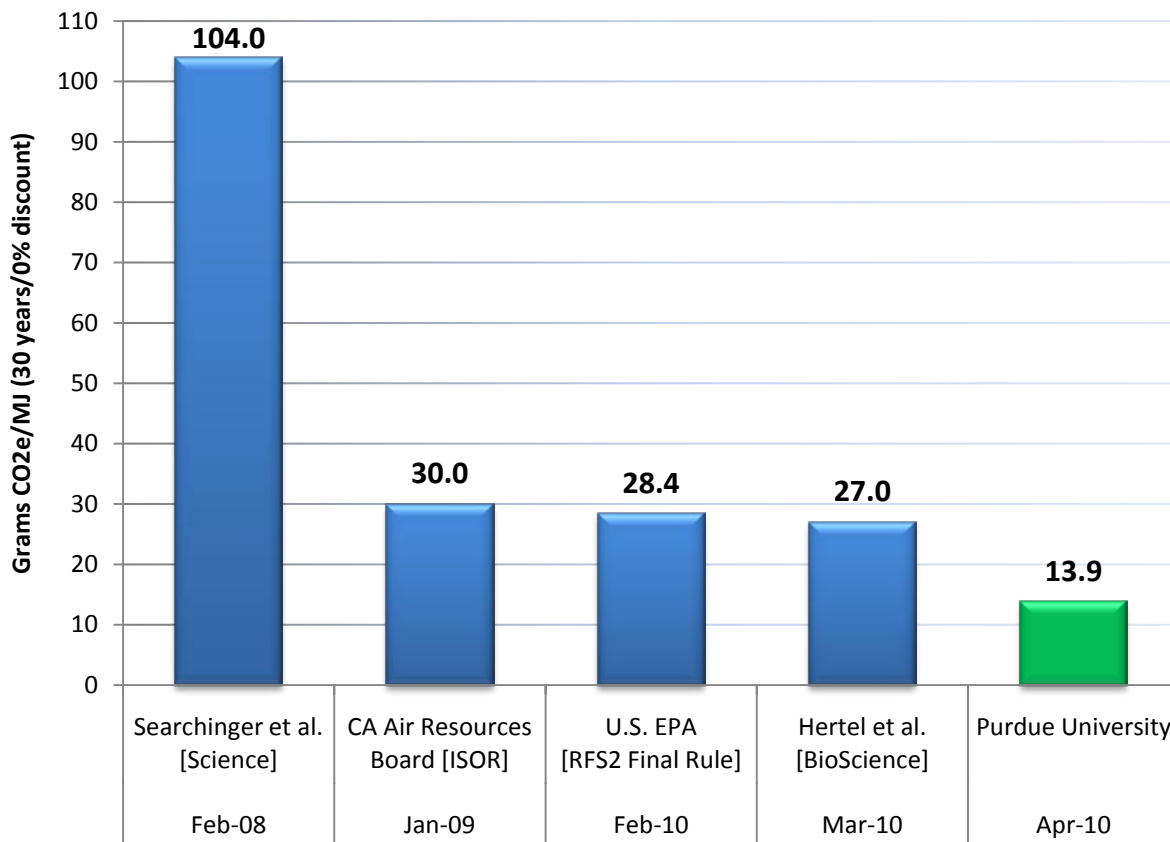
NEW PURDUE UNIVERSITY RESEARCH CUTS INDIRECT LAND USE CHANGE ESTIMATE IN HALF

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New research published in April 2010 by Purdue University concludes that land use change (LUC) emissions potentially associated with corn ethanol expansion are likely *less than half* of the level estimated by the California Air Resources Board (ARB) staff for the Low Carbon Fuels Standard (LCFS). Further, the new Purdue estimate is just 13% of the level originally estimated by lawyer Timothy Searchinger in a 2008 *Science* article.

The new Purdue University research, which was funded in part by the U.S. Department of Energy, clearly shows that ARB significantly overestimated corn ethanol LUC emissions under the LCFS. In Global Trade Analysis Project (GTAP) model simulations where the most recent available global economic database was employed and future crop yield increases and population growth were considered, Purdue economists estimated average corn ethanol LUC emissions at 13.9 grams CO₂-equivalent per mega joule (g/MJ). These results are less than half of the ILUC value of 30 g/MJ adopted by ARB for the LCFS and 13% of the 104 g/MJ estimate by Searchinger.

Corn Ethanol Indirect Land Use Change (ILUC) Published Estimates



According to the Purdue research, average corn ethanol reduces GHG emissions by approximately 20% compared to gasoline *even when ILUC emissions are included*.¹ If gasoline and other fuel sources were also penalized for their own indirect emissions, the GHG benefits of grain ethanol would be even greater.

Purdue's new results stem from many structural improvements that were made to the GTAP model, as well as improved input data and assumptions. The following are among the major improvements that were made to GTAP:

- *The model's global economic database was updated from 2001 to 2006.* ARB's analysis for the LCFS used the old (2001) GTAP database, while the new Purdue research draws from a recently integrated 2006 database. The authors of the new Purdue paper state, "The global economy changed significantly over the 2001-2006 period..." and there were changes to "...important factors which could alter the land use implications of biofuels."
- *Cropland pasture in the U.S. and Brazil has been added to the model.* These lands were absent from the model when it was used by ARB for the LCFS analysis. Excluding these lands from the model, as ARB did, constrains the amounts and types of land that are available for conversion to crops, which ultimately results in artificially inflated ILUC estimates.
- *According to the Purdue authors, the model's treatment of corn ethanol animal feed co-products (called distillers dried grains, or DDG) is "significantly improved" over the version of model used by ARB for the LCFS.*
- *The model's method for estimating crop yields on newly converted(i.e., marginal) lands is much more sophisticated and detailed than previous versions of the model, including the version used by ARB for the LCFS.*
- *For the new analysis, Purdue took into account crop yield growth and population growth over the period of the simulation.* The new model conservatively assumed growth in crop yields of 1% annually from 2006 to 2015. To account for increased food demand, the Purdue authors also assumed global population will grow at a rate consistent with recent trends.
- *The new Purdue analysis also assumes that some portion of the carbon stored in trees is not immediately released into the atmosphere when the forest is converted to cropland.* Rather, it is assumed in the new version of the model that a fraction of the carbon in harvested trees will be stored long term in furniture, buildings and other wood products.

The new Purdue results represent an important advancement in the science of indirect emissions. Without a doubt, the Purdue research represents the most robust effort to date to estimate LUC emissions and should be considered the best available science. *However, the ethanol industry continues to object to the asymmetrical application of LUC emissions to corn ethanol's carbon intensity score in regulations such as the LCFS and EPA's Renewable Fuels Standard.* Other fuels—including petroleum—are not being penalized for their own indirect emissions, which creates an unlevel playing field for biofuels.

¹ The Purdue paper estimates total lifecycle GHG emissions (including LUC) of 77.5 g/MJ for corn ethanol. ARB's estimate for gasoline is 95.9 g/MJ, meaning ethanol offers a 19.2% GHG reduction even with LUC emissions.