



The Global Warming and Land Use Impact of Corn Ethanol Produced at the Illinois River Energy Center

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This study conducted by the University of Illinois at Chicago Energy Resources Center assessed the global warming impact (GWI) of ethanol produced at the Illinois River Energy ethanol plant (IRE) on a life cycle basis.

IRE is located 80 miles west of Chicago. The plant currently produces 58 million gallon per year of ethanol with an expansion underway to double capacity. The ethanol plant design is fairly typical of a modern biorefinery constructed over the last four years with a natural gas fired boiler, optimized heat recovery systems, and direct fired dryers.

The life cycle assessment includes the GWI contributions from corn agriculture, corn to ethanol conversion at the IRE biorefinery, distribution to the terminal, and combustion.

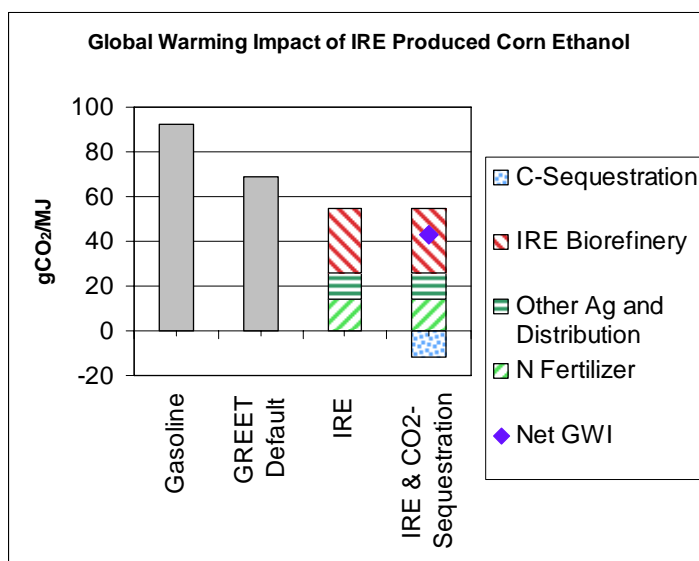
The analysis was performed using Argonne National Laboratory's GREET model with customizations based on different data sets:

- We collected detailed data on agricultural practices within the corn draw area around IRE. A survey was conducted with 29 corn growers supplying 2,528,850 bushels of corn to IRE or 12% of all delivered bushels. The survey assessed key agricultural variables including fertilizer application, tractor fuel use, other on-farm energy use, and yields.
- Using the USDA NASS Cropland Data Layer (developed from satellite imagery) combined with the National Land Cover Dataset we determined the crop rotations and land use changes (including land conversions from non agricultural uses) within the IRE corn draw area.
- From a literature survey we determined different methodologies that account for the nitrogen and carbon adjustments from land use changes. Based on these methodologies we determined nitrogen emissions and carbon sequestration rates for the IRE corn draw area.

The three data sets were used to parameterize GREET. The results show that IRE produced corn ethanol has a substantially lower GWI of 54.8 gCO₂e/MJ than the current GREET default value for corn ethanol of 69.1 gCO₂e/MJ (a 21% reduction). Compared to gasoline, the GWI of IRE corn ethanol is 40% lower (54.8 gCO₂e/MJ vs. 92.1 gCO₂e/MJ for gasoline).

This reduction is primarily due to:

- High corn yields
- Low on-farm energy consumption
- Low energy use at the biorefinery



IRE is currently exploring advanced technologies that may further reduce the GWI of its ethanol product including corn fractionation and a digester to offset natural gas consumption with biogas.

The results also indicate that if carbon sequestration from advanced agricultural management practices could be considered, the GWI of IRE corn ethanol could drop to 41.4 g CO₂e/MJ or a 55% reduction from gasoline.

For further information, please contact Steffen Mueller, PhD at 312-355-3982 or muellers@uic.edu.

The study report can be downloaded at: http://www.erc.uic.edu/PDF/mueller/IRE_GWI_study.pdf