U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Modeling and Analysis Needs for Biofuels

DOE Bioenergy Technologies Office

Workshop on Biofuel Greenhouse Gas Modeling

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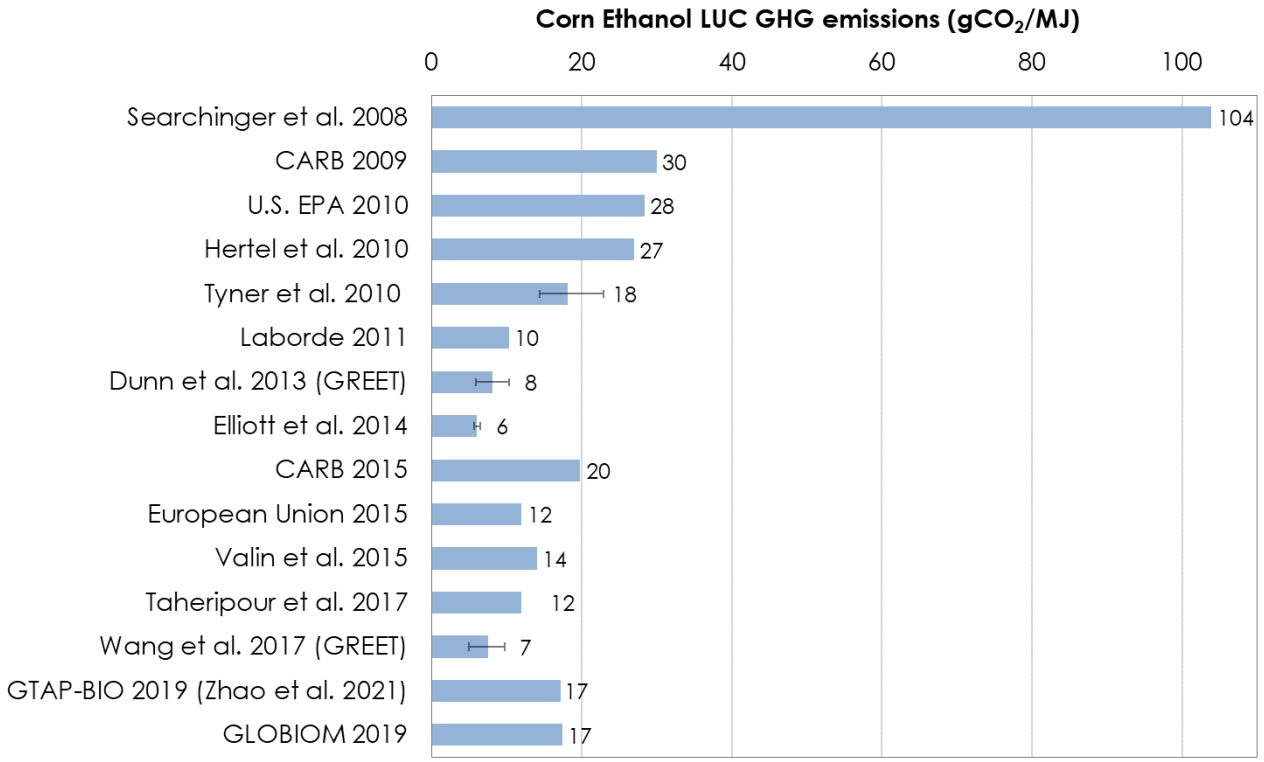
February 28, 2022

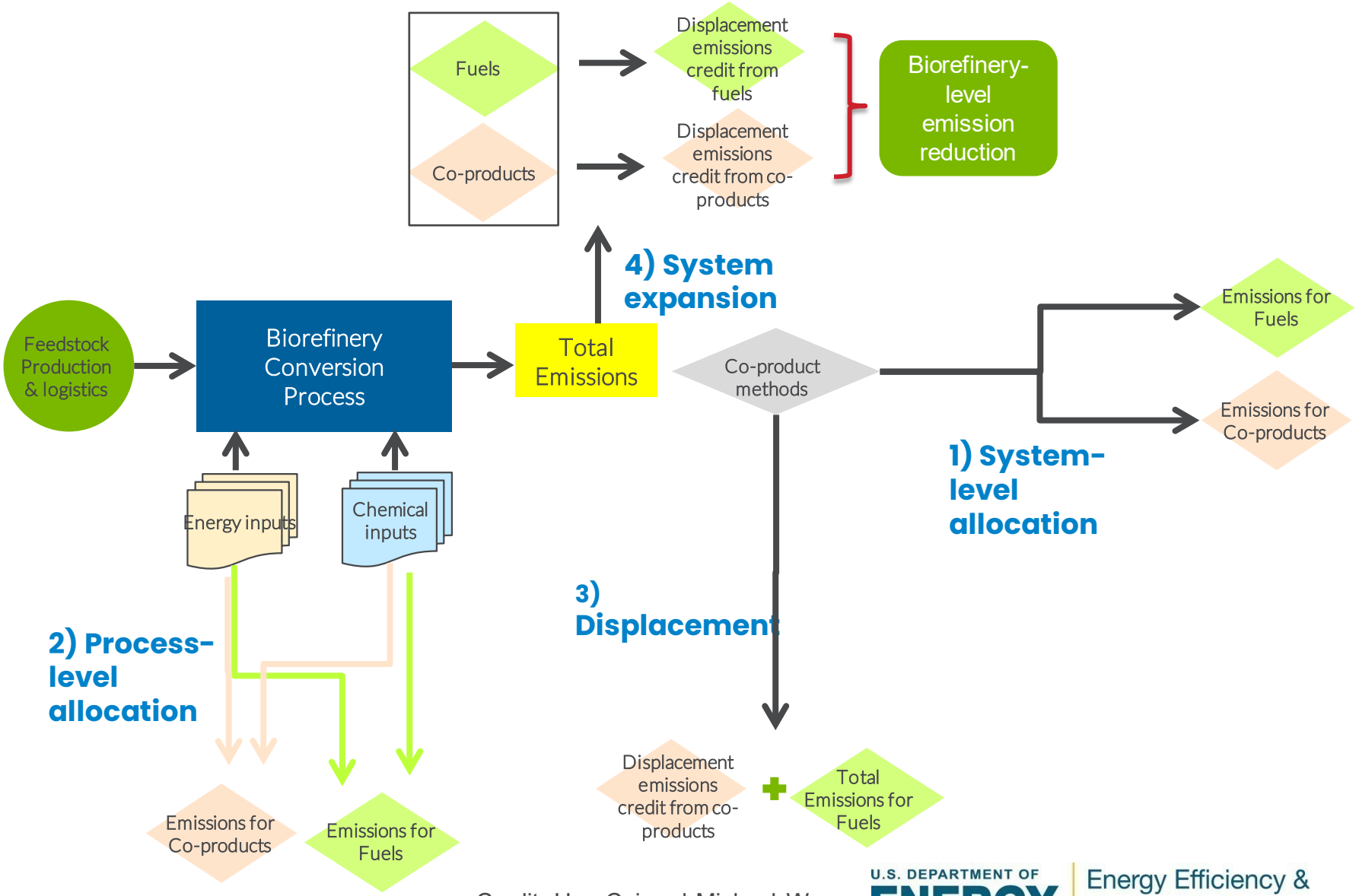
Corn ethanol land use change

The GHG emissions from LUC that could be induced from large-scale feedstock production for biofuels have been simulated for corn ethanol

- Reduction in estimated LUC emissions are a result of better developed and calibrated economic models to incorporate most recent data
- CCLUB has developed GHG emission results from GTAP by adopting detailed output with a process-based model of soil carbon changes implemented in GREET

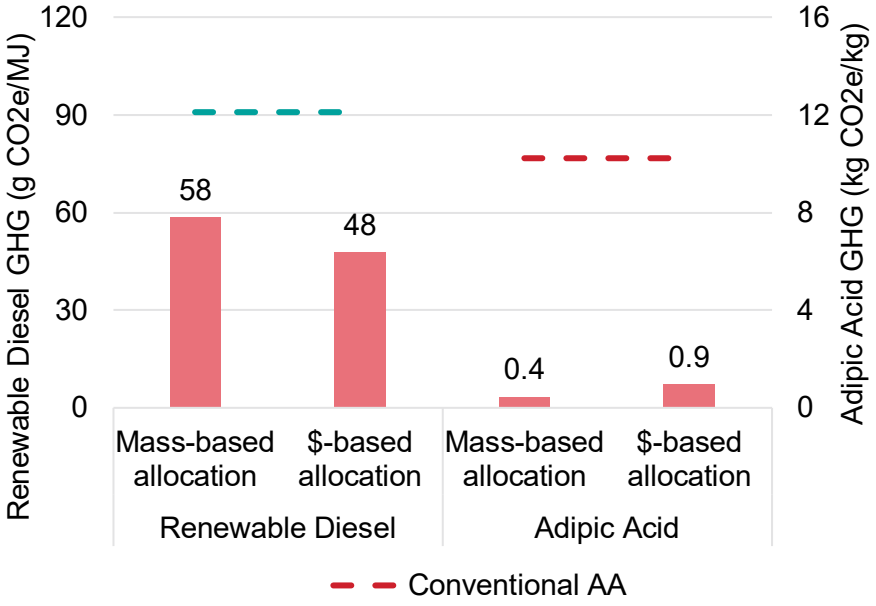


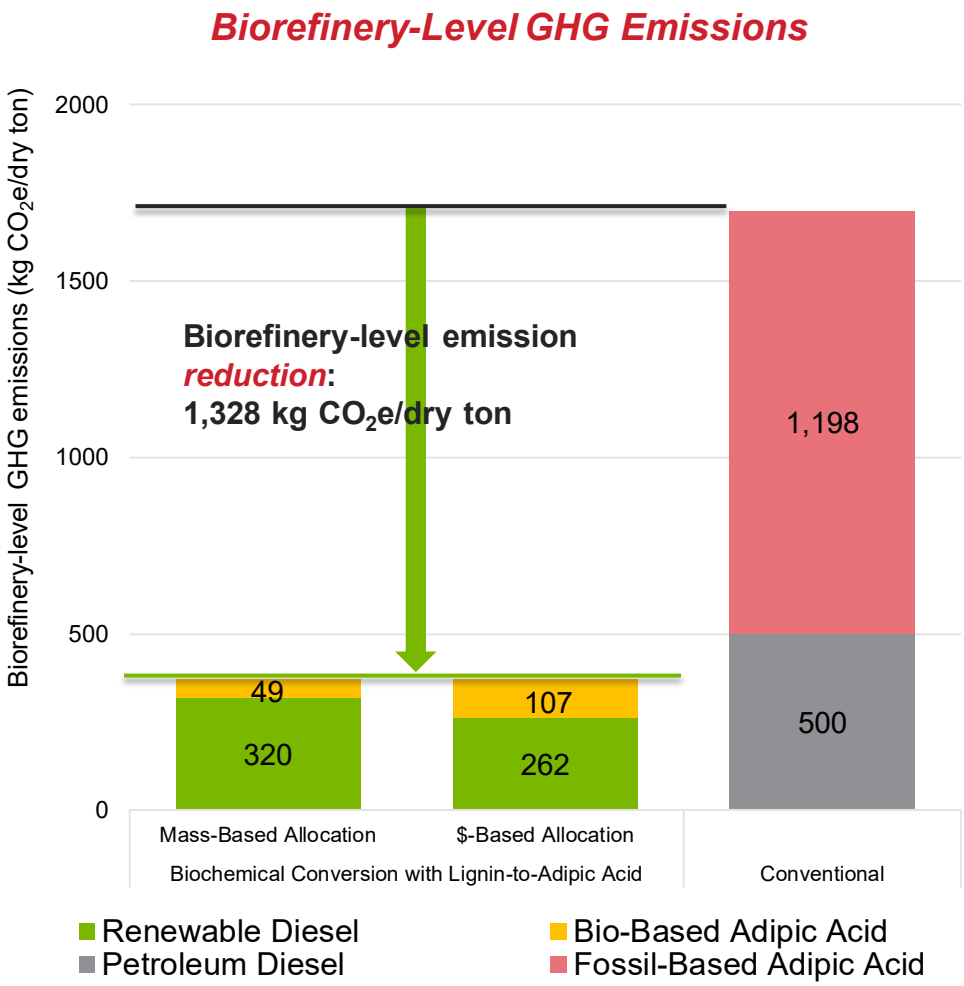
Several methods exist to account for co-products



Credit: Hao Cai and Michael Wang

Co-product methodology can have a large effect on CI

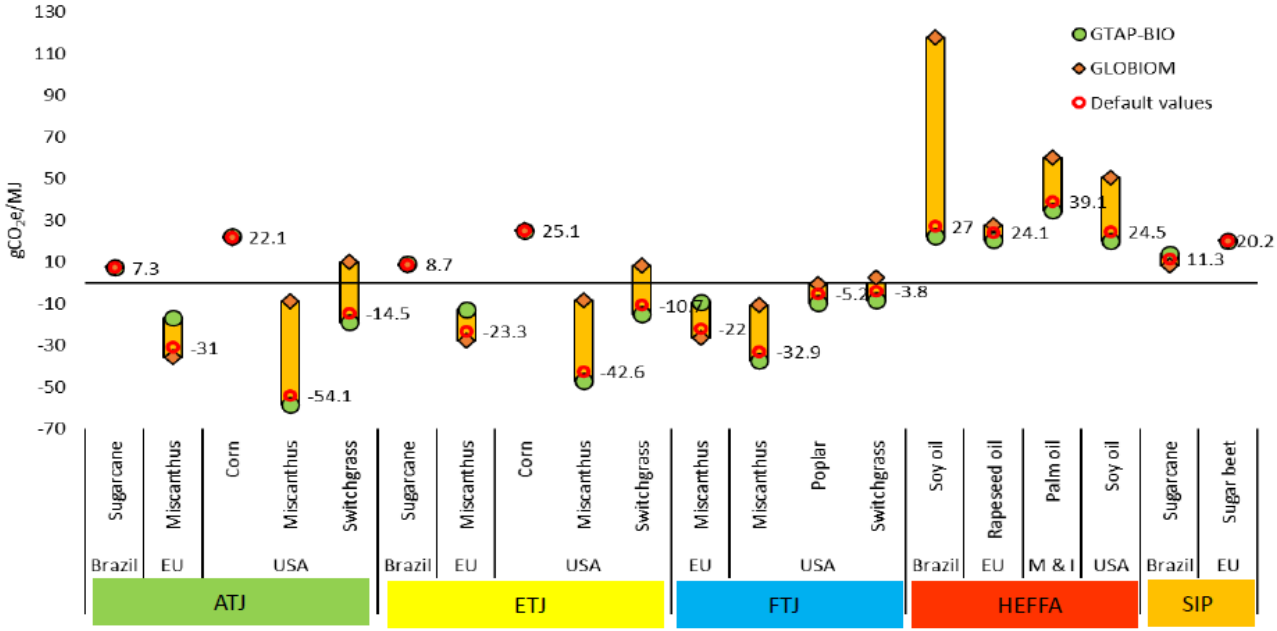




Credit: Hao Cai and Michael Wang

Differences Between Models

Estimated ILUC values for SAF pathways in CAPE11



Work in progress on ILUC

- Pathways using dedicated energy crops based on ETJ technologies,
- Pathways using second oil crops: carinata, camelina, pennycress, jatropha,
- Estimating global ILUC values for unexamined regions,
- A major model improvement is in progress to update the GTAP-BIO data base and assess ILUC values for more disaggregated geographical regions.

5

Source: Farzad Taheripour, Purdue University, presentation at ASCENT Conference, April 27, 2021

Life-Cycle Analysis Key Issues for DOE/BETO

Land use and harmonization:

- Should the differences between models due to induced land use change and allocation methodology remain or be reconciled?
- Should an attempt be made to harmonize results (EPA, CARB, CORSIA)?
- How should countries be encouraged to adopt best land management practices?

Data issues:

- Should data for LCA be updated periodically to reflect temporal improvements? Should data have enough regional fidelity to reflect regional variations?
- How can more data be provided? Satellite imagery analysis, LIDAR, other tools to globally map real-time land management practices.
- How can the quantification of cause-and-effect relationships be improved?

Co-product methodologies:

- How should co-products be treated in biorefineries?