

Center for Global Trade Analysis Newsletter

Effects of US Maize Ethanol on Global Land Use and Greenhouse Gas Emissions: Estimating Market-mediated Responses

By Thomas W. Hertel, Alla A. Golub, Andrew D. Jones, Michael O'Hare, Richard J. Plevin and Daniel M. Kammen



Hertel



Golub

Releases of greenhouse gases (GHG) from indirect land-use change triggered by crop-based biofuels have taken center stage in the debate over the role of biofuels in climate policy and energy security. This article analyzes these releases for maize ethanol produced in the United States. Factoring market-mediated responses and by-product use into our analysis reduces cropland conversion by 72% from the land used for the ethanol feedstock. Consequently, the associated GHG release estimated in our framework is 800 grams of carbon dioxide per megajoule (MJ); 27 grams per MJ per year, over 30 years of ethanol production, or roughly a quarter of the only other published estimate of releases attributable to changes in indirect land use.

Nonetheless, 800 grams are enough to cancel out the benefits that corn ethanol has on global warming, thereby limiting its potential contribution in the context of California's Low Carbon Fuel Standard. [\[Read On\]](#)

Keywords: biofuels, ethanol, land-use change, greenhouse gas emissions, market-mediated effects

The NTM Network

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The NTM Network (<http://i4ide.org/NTMwiki/>) is designed to facilitate the exchange of information among researchers. The participants in NTM Network, especially the Core Group, do so in their capacity as individuals. None of the content on the NTM site represents the views of any of the organizations which currently employ, or in the past have employed, any of the members of the Core Group or other participants. The following individuals, comprising the Core Group, have made significant efforts to improve research and data on non-tariff measures and trade facilitation.

- Michael Ferrantino
- Lionel Fontagne
- Joseph Francois
- LeeAnn Jackson
- Aki Kuwahara
- Mariem Malouche
- Maria del Pilar Londoño-Kent
- Peter Minor
- Donna Roberts
- Frank van Tongeren
- Terrie Walmsley

GTAP Satellite Data and Utilities

The Center for Global Trade Analysis recently began offering a new package of data and utilities to subscribers of the GTAP 7 Data Base called the GTAP Satellite Data and Utilities. Currently, this package consists of two items, the GTAP 7 Non-CO₂ Emissions Dataset and the GMig2 Data Base: FlexAgg 6 package. Purchasers of the satellite data and utilities pay a one-time fee per version and gain access to all items in the package. As new items are added, subscribers will be notified. If you are a subscriber of the GTAP 7 Data Base and are interested in purchasing a subscription to the GTAP Satellite Data and Utilities, please visit www.gtap.agecon.purdue.edu/databases/Utilities/ for further details.

GTAP 7 Non-CO₂ Emissions Dataset

As part of the GTAP Satellite Data and Utilities package, the GTAP 7 Non-CO₂ Emissions Dataset was constructed by applying annual growth rates to the detailed year 2001 emissions data that was the input dataset for the GTAP version 6 non-CO₂ emissions. Two methodologies were applied: one for methane (CH₄) and nitrous oxide (N₂O), the other for fluorinated gases (F-gases).

For CH₄ and N₂O emissions, region and source specific annual growth rates for the period 2000 to 2005 were derived from USEPA projections.

For the F-gases, a different approach was used based on output growth between 2001 (GTAP version 6) and 2004 (GTAP version 7). Particularly, version 7 base data was mapped from 113 regions to the 87 regions of version 6, and the aggregated version 7 data were deflated to 2001 US dollars. Then, annual growth rates in regional output for the F-gas emitting sectors between 2001 and 2004 were computed. Finally, the growth rates for 87 regions were applied to the version 6 raw input emissions data. Note that the same growth rates were used for all countries within each of the 87 regions.

Given that version 7's base year (2004) is only three years later than version 6's base year (2001), growth rates based on near-term projections were considered a reasonable and practical alternative to fully reproducing the effort involved for version 6. However, as a result, the estimated version 7 emissions can differ from reported 2004 emissions for those countries reporting emissions.

For more information please refer to "[Development of the Preliminary Version 7 Non-CO₂ GHG Emissions Dataset](#)", GTAP Research Memorandum No. 17, by Steven Rose, Misak Avetisyan and Thomas Hertel.

University of Hohenheim Joins GTAP Consortium

The University of Hohenheim recently joined the GTAP Consortium. Prof. Dr. Martina Brockmeier, a longstanding and active member of the GTAP Network, serves as the representative to the GTAP Advisory Board. Dr. Brockmeier is a Professor and Head of the International Agricultural Trade and Food Security division at the university.

Thank you, Martina, for spearheading the initiative to bring the University of Hohenheim on board to the GTAP Consortium. We look forward to a bright future of collaboration with you and your university!

GTAP Events

Thirteenth Annual Conference on Global Economic Analysis

“Trade for Sustainable and Inclusive Growth and Development”

The Center for Global Trade Analysis and the GTAP Advisory Board conducted a teleconference on April 29, 2010 with the United Nations in Bangkok to discuss and receive a briefing on the current unrest in Bangkok, Thailand. In light of the complexities associated with international travel, including airfares and visas, we plan to reach a final decision on the status of the conference by May 7, 2010. For further information, please visit: www.gtap.agecon.purdue.edu/events/conferences/2010/.

Eighteenth Annual Short Course in Global Trade Analysis

“Introduction to Applied General Equilibrium Analysis in a Multi-Region Framework”

The 18th Annual Short Course in Global Trade Analysis will be held August 7-13, 2010 on the campus of Purdue University in West Lafayette, Indiana, USA. For further information, please visit: www.gtap.agecon.purdue.edu/events/Short_Courses/2010/.



Purdue University
West Lafayette, USA

2010 Short Course in Dynamic Global Trade Analysis

“Dynamic Modeling and Applications in Global Economic Analysis”

The 2010 Short Course in Dynamic Global Trade Analysis will be held October 8-13, 2010 on the campus of Purdue University in West Lafayette, Indiana, USA. For further information, please visit: www.gtap.agecon.purdue.edu/events/Dynamic_Courses/2010/.

GTAP Resource Center Highlights

GTAP Technical Paper Series

[“Linking Partial and General Equilibrium Models: A GTAP Application Using TASTE”](#)

by Narayanan, Badri, Thomas Hertel and Mark Horridge
GTAP Technical Paper No. 29

GTAP Working Paper Series

[“Implications of the Biofuels Boom for the Global Livestock Industry: A Computable General Equilibrium Analysis”](#)

by Taheripour, Farzad, Thomas Hertel and Wally Tyner
GTAP Working Paper No. 58

[“The Poverty Implications of Climate-Induced Crop Yield Changes by 2030”](#)

by Hertel, Thomas, Marshall Burke and David Lobell
GTAP Working Paper No. 59

[“Commodity Price Volatility in the Biofuel Era: An Examination of the Linkage between Energy and Agricultural Markets”](#)

by Hertel, Thomas and Jayson Beckman
GTAP Working Paper No. 60

GTAP Research Memoranda Series

[“Development of the Preliminary Version 7 Non-CO2 GHG Emissions Dataset”](#)

by Rose, Steven, Misak Avetisyan and Thomas Hertel
GTAP Research Memorandum No. 17

[“A Global Multi-sector Multi-region Foreign Direct Investment Database for GTAP”](#)

by Lakatos, Csilla and Terrie Walmsley
GTAP Research Memorandum No. 18

Center for Global Trade Analysis Activity

The Center for Global Trade Analysis staff and graduate students have been busy presenting and publishing the following:

Presentations

Hertel, T.W. and J. Beckman “Implications of Biofuels for Commodity Market Price Volatility”, presented to NBER Agricultural Economics Workshop, Cambridge, Mass., March 5, 2010.

Hertel, T.W. “Climate Change, Agriculture and Poverty”, presented to Conference on the Future of Agriculture in Tanzania, Dar es Salaam, Tanzania, February 24, 2010.

Hertel, T.W. “The Distributional Impact of Climate Policy: Discussion”, Conference on Climate Policy Impacts, Resources for the Future, January 20-21, 2010.

Publications

Hertel, T., A. Golub, A. Jones, M. O’Hare, R. Plevin and D. Kammen (2010) “Global Land Use and Greenhouse Gas Emissions Impacts of US Maize Ethanol: Estimating Market-Mediated Responses”, *BioScience* 60(3):223-231.

Tyner, Wallace E., and Daniela Viteri. “Implications of Blending Limits on the US Ethanol and Biofuels Markets.” *Biofuels* 1(2) (2010), pp.251-53.

Narayanan, Badri G., Hertel, Thomas W. and Horridge, J. Mark (2010). “Disaggregated Data and Trade Policy Analysis: The Value of Linking Partial and General Equilibrium Models”. *Economic Modeling* 27(2):755-766.

Awards

Amanda Leister has been awarded a fellowship from the National Science Foundation to participate in the 2010 East Asia and Pacific Summer Institute. Amanda will work on her PhD Dissertation from June through August at Nagoya City University in Japan under the direction of Dr. Ken Itakura. The fellowship is co-administered by the Japanese Society for the Promotion of Science and was established to help U.S. graduate students in science and engineering gain international research experience and foster collaboration with foreign counterparts. Amanda is a third year PhD Candidate in the Department of Agricultural Economics. Her advisor is Dr. Thomas Hertel, and her research focuses on the potential implications of the Special Safeguard Mechanism in the Doha Round of the WTO. Amanda has been active in the Center since she began graduate studies at Purdue University in 2007, and she successfully completed the 16th Annual Short Course in Global Trade Analysis.

Amanda would like to thank Dr. Hertel, Dr. Itakura, Dr. Terrie Walmsley, Dr. Donald MacLaren and Dr. Gerald Shively for their support of her NSF proposal.

About GTAP



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The Global Trade Analysis Project is coordinated by the Center for Global Trade Analysis, which is housed in the Department of Agricultural Economics at Purdue University.

The Center for Global Trade Analysis’ mission is to provide leadership in economic policy analysis through better data, fostering collaboration, and research.

Guidance and financial support for the project is provided by the GTAP Consortium, which consists of national and international agencies, with further support provided by sales of the GTAP Data Base.

If you are interested in learning more about GTAP and the Center for Global Trade Analysis, please visit our website: www.gtap.agecon.purdue.edu.

