**International Land Use Spillovers from US Agricultural and Environmental Policies**

Uris L.C. Baldos and Thomas Hertel

Along with other collaborators, as needed

(This abstract was prompted by a comment by Eileen McClellan at the 12/19 Board Meeting)

**Introduction**

Over the past two decades, awareness of international land use change spillovers from domestic policies and methods for their analysis have dramatically increased (Hertel et al. 2019). Much of this was spurred the demand for estimates of the international impacts of the US biofuels program (Searchinger et al. 2008; Hertel et al. 2010). But such analyses have also extended to domestic set asides for biodiversity (Pelikan, Britz, and Hertel 2015). With discussion of set asides once again entering the policy debate in the US due to depressed prices (<https://farmdocdaily.illinois.edu/2020/07/land-retirement-part-ii-us-role-in-world-crop-markets-and-effectiveness-of-retiring-us-land.html>) and with the potential for increased environmental set asides under future US administrations, it is a useful time to return to this topic. We plan to consider the implications of US actions to alter patterns of land use for global environmental quality, including terrestrial carbon emissions, habitat for pollinators, biodiversity and other important metrics.

**Method**

We plan to use the GTAP-AEZ model (Ramankutty et al. 2007; Hertel et al. 2008)which was originally developed for analysis of land-based climate mitigation policies, but has been primarily used for analysis of induced land use change related to biofuels policies. It distinguishes land endowments according to 141 countries x 18 Agro-ecological zones (3 climatic zones x 6 length of growing period intervals). Importantly, it incorporates bilateral trade patterns with econometrically estimated trade elasticities. This geography of trade is critical to understanding the way in which policies in the US are transmitted abroad (Villoria and Hertel 2011). We will be using available environmental spatial data including biodiversity hotspot maps by Jenkins et al (2013) and carbon stock maps from West et al (2010). We will confer with members of the Advisory Board to determine the most relevant domestic policies to be considered.

**References**

Hertel, Thomas, Huey-Lin Lee, Steven Rose, and Brent Sohngen. 2008. *Modeling Land-Use Related Greenhouse Gas Sources and Sinks and Their Mitigation Potential*. GTAP Working Paper No. 44. http://www.gtap.agecon.purdue.edu/resources/res\_display.asp?RecordID=2605.

Hertel, Thomas W., Thales A. P. West, Jan Börner, and Nelson B. Villoria. 2019. “A Review of Global-Local-Global Linkages in Economic Land-Use/Cover Change Models.” *Environmental Research Letters* 14 (5): 053003. https://doi.org/10.1088/1748-9326/ab0d33.

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

Jenkins, Clinton N., Stuart L. Pimm, and Lucas N. Joppa. “Global Patterns of Terrestrial Vertebrate Diversity and Conservation.” Proceedings of the National Academy of Sciences 110, no. 28 (July 9, 2013): E2602–10. https://doi.org/10.1073/pnas.1302251110.

Pelikan, Janine, Wolfgang Britz, and Thomas W. Hertel. 2015. “Green Light for Green Agricultural Policies? An Analysis at Regional and Global Scales.” *Journal of Agricultural Economics* 66 (1): 1–19. https://doi.org/10.1111/1477-9552.12065.

Ramankutty, Navin, Thomas Hertel, Huey-Lin Lee, and Steven Rose. 2007. *Global Spatial Data of 18 Agro-Ecological Zones (AEZs)*. Ramankutty, N., T. Hertel, H.-L. Lee, and S. K. Rose, Global Agricultural Land Use Data for Integrated Assessment Modeling, in Human-Induced Climate Change: An Interdisciplinary Assessment, Edited By. http://www.gtap.agecon.purdue.edu/resources/res\_display.asp?RecordID=3184.

Searchinger, Timothy, Ralph Heimlich, R. A. Houghton, Fengxia Dong, Amani Elobeid, Jacinto Fabiosa, Simla Tokgoz, Dermot Hayes, and Tun-Hsiang Yu. 2008. “Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change.” *Science* 319 (5867): 1238–40. https://doi.org/10.1126/science.1151861.

West, Paul C., Holly K. Gibbs, Chad Monfreda, John Wagner, Carol C. Barford, Stephen R. Carpenter, and Jonathan A. Foley. “Trading Carbon for Food: Global Comparison of Carbon Stocks vs. Crop Yields on Agricultural Land.” Proceedings of the National Academy of Sciences, November 1, 2010. https://doi.org/10.1073/pnas.1011078107.

Villoria, Nelson B., and Thomas W. Hertel. 2011. “Geography Matters: International Trade Patterns and the Indirect Land Use Effects of Biofuels.” *American Journal of Agricultural Economics* 93 (4): 919–35. https://doi.org/10.1093/ajae/aar025.