

# **The effects of potential changes in United States beef production on global grazing systems and greenhouse gas emissions**

**Jerome Dumortier<sup>1</sup>, Dermot J Hayes<sup>2</sup>, Miguel Carriquiry<sup>2</sup>,  
Fengxia Dong<sup>3</sup>, Xiaodong Du<sup>3</sup>, Amani Elobeid<sup>2</sup>, Jacinto F Fabiosa<sup>2</sup>,  
Pamela A Martin<sup>4</sup> and Kranti Mulik<sup>5</sup>**

<sup>1</sup> School of Public and Environmental Affairs, Indiana University–Purdue University Indianapolis, Indianapolis, IN 46202, USA

<sup>2</sup> Department of Economics, Iowa State University, Ames, IA 50011, USA

<sup>3</sup> Department of Agricultural and Applied Economics, University of Wisconsin—Madison, Madison, WI 53706, USA

<sup>4</sup> Department of Earth Sciences and Department of Geography, Indiana University–Purdue University Indianapolis, Indianapolis, IN 46202, USA

<sup>5</sup> Food and Environment Program, Union of Concerned Scientists, Washington, DC 20006, USA  
Indiana University – Purdue University Indianapolis

## **Abstract**

With climate change becoming an increasingly pressing issue together with a world population of 7 billion people in 2011, significant pressure is put on global agriculture and forestry. Although treated separately in national GHG inventories, there is little doubt that both categories are closely linked and climate policies targeting agriculture will have spillover effects on forestry and vice versa. Hence, the implementation of large-scale agricultural policies is prone to unintended consequences. For this poster, we analyze the hypothesis that a reduction of cattle in the U.S. causes a net increase in GHG emissions on a global scale. We couple a global agricultural production and trade model with a greenhouse gas model to assess leakage associated with modified beef production in the United States. The effects on emissions from agricultural production (i.e., methane and nitrous oxide emissions from livestock and crop management) as well as from land-use change, especially grazing system, are assessed. We find that a reduction of U.S. beef production induces net carbon emissions from global land-use change ranging from 37 to 85 kg CO<sub>2</sub>-equivalent per kg of beef annualized over 20 years. The increase in emissions is caused by an inelastic domestic demand as well as more land-intensive cattle production systems internationally. Changes in livestock production systems such as increasing stocking rate could partially offset emission increases from pasture expansion. In addition, net emissions from enteric fermentation increase because methane emissions per kilogram of beef tend to be higher globally.