

Title: Estimation of parameters for the SIMPLE model using a maximum entropy approach

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This study builds on previous work around the topic of climate change impacts on agricultural systems and extends that work to analyze the short-term resilience of US agroecosystems to environmental stressors. The long-term impacts of climate change on agricultural systems around the world are the subject of many recent studies. However, the resilience of agroecosystems to year-to-year variations in environmental conditions has received less attention in the literature. Since extreme weather events such as heats or droughts are expected to become more frequent and severe in the future, it is useful to develop a framework that can analyze agroecosystems' resilience if extreme events occur multiple years in a row.

This research uses the SIMPLE model, which is a global, partial equilibrium model and has been used in a variety of applications related to the long-run effects of climate change. It has been used to analyze topics such as long-run trends in crop land use, trends in food prices, food security and its connection to international trade, adaptation to climate change, and agricultural productivity (Baldos and Hertel, 2013; 2014; 2015). Three key economic responses are captured in the model: supply across the extensive margin, the intensive margin, and demand response.

To make the model suitable for short-run analyses, several aspects of the model need to be modified. Model parameters will have to be re-estimated to reflect short-run responses. Demand responses from consumers, the livestock sector, and international trade are likely less elastic in the short-run. On the supply side, farmers are limited in the degree to which they can adapt to weather shocks once they have made planting decisions in the beginning of the growing period. Arndt et al. (2002) propose a maximum entropy approach to parameter estimation for computable general equilibrium models. We use a maximum entropy approach to estimate the short-run parameters for the SIMPLE model.