

Comparing methods and improving the empirical foundations of agricultural impacts An inter-method comparison exercise

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Comparing methods and improving the empirical foundations of agricultural impacts

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Purpose:

- To improve the empirical foundations of climate damages: Empirically validated ranges of computed yield changes for various climate futures
- With that aim in mind, we seek to improve the understanding of climate impacts in the agricultural sector by comparing the available methodologies (crop models, statistical models, IAMs) to assess them

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Questions to pursue:

1. How are the results across alternative methods similar and how are they different? What explains these differences? How are water resources incorporated (if at all)?
2. Who are the consumers of these studies? Which approaches are better for certain uses? How do we address downscaling and aggregation issues?
3. From this initial examination, what are some key messages that emerge?
4. Is there a need to compare these results for a given set of crops and regions via a scenario protocol? Can we compare using existing studies or do new results need to be generated? Is there a need for more systematic comparison across methods for some case studies?

Two Workshops

First workshop: Brainstorming Workshop—Dec 16, 2015—Stanford University.

- ~30 participants (international and domestic): crop modelers, econometricians, IAMers, agency representatives (DOE, EPA, NASA).
- Set of papers and authors identified—drafts to be presented at second workshop at JRC in June 2016

Second workshop: Draft papers discussion —June 6-7, 2016—Joint Research Centre (JRC), European Commission, Seville.

- ~20 participants
- First draft of papers were presented

Focus Issue of Environmental Research Letters

- Proposal accepted by ERL in March 2016. Open to outside submissions.
- Co-editors: Ciscar, Fisher-Vanden, Lobell
- Required for consideration: must involve an inter-method comparison—not an inter-model comparison— of crop models, statistical models, IAMs, emulators, etc.
- Deadline for submissions: November 1, 2016
- Select 'Special Issue Article' and select 'Focus on An Inter-method Comparison of Climate Change Impacts on Agriculture' in the 'Select Special Issue' drop down box

Papers—Part 1: Overview

1. Overview paper (Ciscar, Fisher-Vanden, Lobell, others?):
 - How do the methodologies compare (differences in underlying assumptions; what is captured and what is not)
 - Inputs/outputs of each method; data sources
 - Critical assessment of strengths/weaknesses of each method
 - Differences in uses by IAMs and economic models
 - Roadmap for future research: What holes exist? E.g., what currently cannot be answered with current methodologies? What new methodologies need to be developed? What can be accomplished by blending different methods?
2. Conducting an inter-method comparison: Lessons from the EMF process (Weyant)
 - Can lessons from inter-model comparison exercises be applied to an inter-method comparison exercise?
 - How to design an inter-method comparison protocol

Papers—Part 2: Comparisons of Process-based and Statistical models

3. Comparing estimates of climate change impacts from crop simulation and statistical models (David Lobell, Senthod Asseng)
4. Comparison of ISI-MIP responses and empirical models (Katja Frieler)
5. Comparing and combining statistical models and crop models with implications for climate change (Michael J. Roberts, Noah Braun, Thomas Sinclair, David Lobell, Wolfram Schlenker)
6. Economic Impacts of Climate Change on Agriculture: A Comparison of Process-Based and Empirical Yield Models (Frances C. Moore, Uris Baldos, Thomas Hertel)
7. Comparing emulators based on GGCM output versus observational data (Ian Sue Wing, Enrica De Cian, Malcolm Mistry)

Papers—Part 3: Comparisons of IAMs with Process-based and Statistical models

8. Climate Change Impacts on Agriculture: the role of IAMs (Kate Calvin, Karen Fisher-Vanden)

Papers—Part 4: Special topics (possible papers)

- Interacting Sensitivities of Wheat Yield Response to Mean Temperature Change and Interannual Temperature Variability (Alex C. Ruane, Cynthia Rosenzweig, Sonali McDermid, Senthil Asseng)
- Perspectives on methods for estimating agricultural impacts and adaptation in IAMs (Steve Rose)
- The role of water in agriculture impacts: how is water treated in the different methods (Michael Hanemann)
- Farmer Adaptation to Climate Change, with a focus on crop switching (Rob Mendelsohn)
- Comparison of partial and general equilibrium models (Juan-Carlos Ciscar and Ignacio Pérez-Domínguez)