

*What have we learned
about combining global
socio-economic models
with crop and hydrology
models?*

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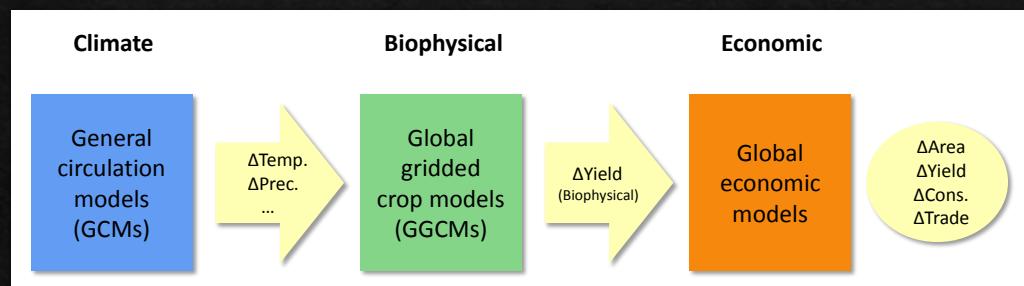
We need tools to provide timely guidance for decisions on critical questions (Food security as an example)

- ❖ Do the earth system models embody what we know about human impacts on climate change?
- ❖ How severe will the impacts of climate change be on food security? Where, when, and how bad?
- ❖ What processes do we have for quickly incorporating changes in physical, biological and socioeconomic knowledge?

An early attempt: model integration and results comparison

Nelson, G. C., Valin, H., Sands, R. D., Havlík, P., Ahammad, H., Deryng, D., et al. (2014). Climate change effects on agriculture: Economic responses to biophysical shocks. *Proc. Natl. Acad. Sci.* 111, 3274–3279. doi:10.1073/pnas.1222465110.

9 socioeconomic models, 5 crop models, 2 GCMs,
1 RCP, **2 years to complete**



Or this?

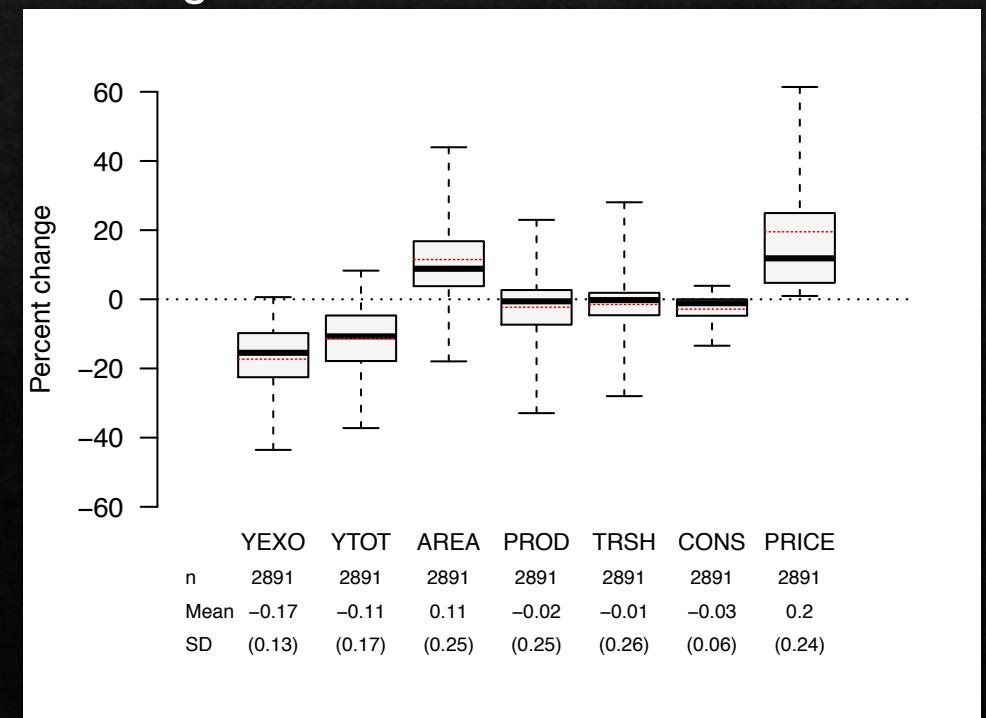


But what about



Who is this useful for?

Spatial results from country to region;
temporal results from 1 to 5 year
averages



Why did it take 2 years?

- ❖ Socioeconomic model types – CGE, multimarket equilibrium – widely varying spatial and temporal resolution, optimization techniques, degree of disaggregation
- ❖ Crop model types – process based, with varying assumptions about human inputs
- ❖ Approaches to scenario implementation
- ❖ Units!!!!

All (socioeconomic) models are agent based

- ❖ Key issues
 - ❖ How many agents are needed?
 - ❖ Where are they located?
 - ❖ What is exogenous/endogenous?
 - ❖ What behavioral assumptions are used?
 - ❖ How do they integrate with biophysical models/data?