BioEarth: Economics

Michael Brady, Assistant Professor, SES
Jon Yoder, Professor, SES
Bhagyam Chandrasekharan, PhD. Student, SES

Current Efforts

- Further development of "traditional" equilibrium optimization model of the regional economy.

- Quick reminder about this approach.
  - Has been the work horse in economics for many years.
    - Rich representation of substitution, dynamics, and decision making under uncertainty (stochastics).
    - Good at capturing welfare effects.
    - Good at capturing linkages between industries throughout the economy.

- However, aggregate significantly over time and space.

- At the first all-hands meeting we decided to take a two-pronged approach.
  - First, develop this type of model.
  - Second, develop a more innovative spatially explicit model.

Model 1 Status

- Crop aggregation: 10 groups that approximately match WSDA crop groups.
- Spatial aggregation: sub-regions that approximately match WRIAs.
  - Sub-regions are differentiated by model parameterization and constraints.
- Temporal aggregation: cropping and technology decisions are made on an annual basis.
  - Still need to determine sub-annual disaggregation for irrigation.

Model 1 Status

- Points of integration
  - Land and water constraints by sub-region → VIC/CropSyst.
  - Parameterization by crop/subregion.
    - Water/nitrogen production surface?
  - Process of aggregation and disaggregation between economics and VIC/CropSyst.
  - Future climate variability

Model 2 Status

- Agent Based Models
  - Grid cell based
  - In additional to capturing spatial heterogeneity, also model spatial dependency.
- Have been trying out some very basic Python scripts using Arcpy, SciPy, and NumPy that provide GIS based scripting and optimization tools for a grid cell based model.
- Seems promising!