

Environmental Impacts

Climate change and land use (land markets specifically)

- Impacts of CC on LU
 - Crop productivity
 - Extreme events and sea-level rise
 - Water availability
- Impacts of LU on CC
 - CO₂ balance
- Farmers are already responding to climate change

Crop productivity

- Temperature
- Precipitation
- Variability
- Wind
- Extreme events

At Macaulay

- FEARLUS
 - Takes climate as one factor in farmer decision-making
 - Different approaches tried
 - Imitation and trial-and-error
 - Case-based reasoning
- Empirical evidence
 - Recent data on Scottish land-use change – but seems to be largely price-driven
 - Here, for crops it is barley or wheat
 - Use UKCIP scenarios for future climate

Risk and Responses

- Risk and risk awareness: risk awareness depends on experience
- .4% loss per year of agricultural land lost to climate change per annum
- Governments are responding, and this is affecting land values
- Governments constrain agricultural options (e.g. use of GMOs)

Water availability

- Relation between upstream and downstream farmers
- Melting of glaciers in the Himalayas India and China

Effects of CC on land markets

- Increased scarcity of agricultural land will increase prices
- Mitigation efforts may themselves affect land markets e.g use of deserts to exploit solar power

Impacts of LU on CC

- Amazonia:
 - Deforestation affects the climate even apart from global change
 - One of the unusual cases where local decisions affect the global balance

Land Markets Effects on CC

- The market selects the people who will be responsible for growing food while decreasing emissions
- No reason to believe the market will select for low emissions

Ecosystem services

- What kinds of ecosystem services are being modeled in ABM?
 - Water availability
 - Biodiversity
 - Coastal services
 - Waste treatment
 - Carbon balance
- Public vs private
 - Control mechanisms
 - Market mechanisms
- Role of government intervention
 - Problems with farmer resentment of transaction costs

FEARLUS-SPOMM

- Map land uses onto suitability for species
 - biodiversity depends on spatial pattern, particularly fragmentation
- How can policy influence biodiversity?
 - Effects of zones in which there is intervention currently being explored
- How can land market institutions affect biodiversity?

Coupling of ABMs, Biophysical Models

- Increasingly common
- Need governmental agents
- Common-pool resource models
- Cannot just take models off the shelf and couple them
 - Making spatial and temporal scales match
 - Need compatible agendas
- Whether there is feedback depends on the specific application
- As we learn more about how land management affects ecosystem services, this will affect value of land – as soon as ecosystem services have monetary value