A novel methodology for ex ante assessment of climate change adaptation strategies

examples from East Africa

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International conference on crop improvement, ideotyping, and Modelling for African cropping systems under climate change
Backgrounds

- Current farming systems in Eastern Africa
  - Semi-subsistence
  - Close to threshold
  - Climate change
  - Sensitive to climate change
- Application for Vihiga
Objectives

- Assess the impacts of climate change
- Design a methodology to evaluate adaptation strategies
- Test this methodology to identify breeding targets
Methods

Δ Climate → Δ Production → Δ Technologies

Δ Management

Impacts
Tradeoff Analysis

Two versions

- **Full model**
  - Models management decisions at the field level (including *e.g.* crop allocation and fertilizer use).
  - Integrates crop growth models, econometric models, and environmental impact models.
  - Data intensive

- **Minimum data model**
  - Compares two systems
    - With and without climate change
    - With and without new technologies
Tradeoff Analysis - MD

Region

Farm type 1
Farm type 2
Farm type 3

Activity 1
Activity 2
Activity 3

Yield
Cost
Price
Climate change in Vihiga

1970-2000 | 2040-2060 | % change
---|---|---
Rainfall (mm) | 1701 | 1301 | -24
Tmin (°C) | 16.9 | 18.9 | 12
Tmax (°C) | 25.4 | 28.3 | 12

- 1 model: ECHAM4 (Max Planck)
- 1 scenario: A1B (Rapid economic growth)
- Yearly total (rainfall) and averages (temperature)
### Yield effects of climate change Vihiga district

<table>
<thead>
<tr>
<th>Year</th>
<th>Maize</th>
<th>Bean</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>3838</td>
<td>1479</td>
</tr>
<tr>
<td>2030</td>
<td>1786</td>
<td>1045</td>
</tr>
<tr>
<td>2050</td>
<td>1672</td>
<td>1052</td>
</tr>
</tbody>
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**Spatial variation of crop yield response to climate change in East Africa**

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February, 2011
Integrated analysis of climate change

Vihiga district

- Two groups of farmers (with and without livestock)
- Main activities: maize, beans, napier, livestock, sweet potatoes
- Analysis comparing situation with and without climate change
- Evaluate various adaptation strategies
Impact of climate change on farming systems

Seasonal loss (000 KSh/ha) vs. Percentage of farmer population

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Integrated analysis of adaptation strategies

- Base

% of farmers negatively affected

0 25 50 75 100
Crop varieties and adaptation

Tuber yield (t/ha)

Sweet potato variety

- NK259L
- NK1081L
- NK103M
- NK102M
- NASPOT 1
- New Kawogo
- NK318L
- Dimbuka
- BND145L
- Magabari

Site 1
Site 2

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Drought resistant varieties in Vihiga

Farmers negatively impacted

Adoption of improved variety

% Drought tolerance sweet potato
Discussion

- A large percentage of the farms in Vihiga will be negatively impacted by climate change.
- Introduction of dual purpose sweet potato offsets climate change impacts
- Uncertainties in climate change projections
- The MD-TOA approach offers a rapid integrative analysis for exploring options
Vielen Dank