Investment model for agricultural development intervention in Eastern and Southern Africa: An application of Stochastic Impact Evaluation Technique on selected agricultural interventions

By: Negusse Yigzaw
PhD Student in Agricultural Economics
03-03-2016
Nairobi, Kenya
Outline

- Introduction
- Problem statement
- Objective
- Justification
- Methodology
Preliminary and incomplete incremental investment needs for the SDGs in developing countries (in constant 2010 $ billion)\(^3\)

<table>
<thead>
<tr>
<th>Investment Area</th>
<th>Incremental annual investment needs in developing</th>
<th>Corresponding pooled finance mechanisms</th>
<th>Current annual disbursements</th>
<th>Projected annual need</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total needs</td>
<td>Private, commercial financing</td>
<td>Public, non-commercial financing</td>
<td>Of which ODA/public climate finance</td>
</tr>
<tr>
<td>Health</td>
<td>51-80</td>
<td>~0</td>
<td>51-80</td>
<td>TBD</td>
</tr>
<tr>
<td>Education</td>
<td>[22]</td>
<td>~0</td>
<td>[22]</td>
<td>13,6</td>
</tr>
<tr>
<td>Food security</td>
<td>38</td>
<td>2</td>
<td>36</td>
<td>TBD</td>
</tr>
<tr>
<td>Access to modern energy (SE4All)</td>
<td>34</td>
<td>10,5</td>
<td>23,5</td>
<td>12,8</td>
</tr>
<tr>
<td>Access to water and sanitation</td>
<td>27</td>
<td>3-5</td>
<td>22-24</td>
<td>TBD</td>
</tr>
<tr>
<td>Data for the SDGs</td>
<td>[7.5]</td>
<td>~0</td>
<td>[4.5]</td>
<td>[3]</td>
</tr>
<tr>
<td>Ecosystems including biodiversity</td>
<td>[18-48]*</td>
<td>[3-7]</td>
<td>[15-41]</td>
<td>TBD</td>
</tr>
<tr>
<td>Other agriculture</td>
<td>210</td>
<td>195</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Large infrastructure (power, transport, telco, watsan)</td>
<td>689-1279</td>
<td>291-595</td>
<td>398-684</td>
<td>TBD</td>
</tr>
<tr>
<td>Climate change mitigation</td>
<td>[380-680]</td>
<td>[300-554]</td>
<td>[80-115]</td>
<td>TBD</td>
</tr>
<tr>
<td>Climate change adaptation</td>
<td>60-100</td>
<td>0</td>
<td>60-100</td>
<td>TBD</td>
</tr>
<tr>
<td>Total</td>
<td>[1535 - 2529]</td>
<td>[805 - 1379]</td>
<td>[728 - 1151]</td>
<td>TBD</td>
</tr>
</tbody>
</table>
Introduction

- Flood Based Farming system is a neglected sector
- Huge potential
- Needs an investment
  - Time
  - Financial (Schmidt-traub & Sachs, 2015)
  - Labour
Require a wise decision
Problem Statement

- Planning and implementation project
  - Point estimation
  - Doesn’t capture uncertainty
  - Neglect environmental, social and political costs, benefits and the associated risks
Objectives

- Estimating the total investment
- Determine the feasibility and success rates
- Assess and compute the costs, benefits and associated risks
- Describing uncertainties quantitatively,
- Identify highly uncertain variables
- Computing the net present value
Justification

- Range of values
- All costs, benefits and risks
  - Environmental
  - Social
  - Political
- Capture uncertainty
- Reduce costs related to measurement
- Provide an investment estimate
Methodology
Figure 1: Initial Outline of the Global Intervention Decision Model

Quantified Values
- System Level Outcomes
  (Poverty, food security, sustainability, health & nutrition)
- Certain Present Value Equivalent
- Distribution for Aggregate Present Value
- Forecasts converted to monetized net impact, by year, with uncertainty

Quantified Preferences
- Certain Value Curve
- Time Value Curve
- Marginal Income Value Curve

Objective Forecasts
- Intervention Cost
- Onsite & Offsite Impacts

Provisioning
- Supporting/Regulating Services

Behavioral Change (adoption, crop choices, practices, etc.)

Proposed Programmatic Interventions
Cost-Benefit analysis

- Stochastic Impact Evaluation (SIE)
  - Monte Carlo simulation
  - Partial least square regression model
  - Value of information Analysis
- Bayesian analysis
Decision support tool

- R-package
  - Eike Leudeling (ICRAF-Bonn)
  - Lutz Göhring (consultant)

- Bayesian analysis
  - AgenaRisk
  - BayesiaLab
Thank you