Sustaining the flow of ecosystem services under climate change in EA: Policy implications

Presentation made at the 4th Annual Project Meeting
2 June 2015, Moshi - Tanzania
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The East Africa sub-region is one of the most vulnerable regions to impacts of climate change, but with considerable potential to minimise the effects of such changes through the deployment of innovative approaches in sustaining the flow of ecosystem services.
About ASARECA


- **Mission**: To enhance regional collective action in adoption of climate smart technologies and innovations.
Key characteristics – justifying the need to enhanced investment in sustainable ecosystem management
Regional picture in the last 5 decades

- In the last five decades, ecosystems and the services they provide have changed more than in any previous period of human history.

- Drivers of change will intensify and feedbacks between social and ecological systems are expected to become stronger and more complex in the region over the next years.
Provisioning services
Regulating services
Cultural services
Supporting services
What makes ecosystems relevant to society?

- Ecosystem services underpin every facet of human life including:
  - food security and nutrition,
  - carbon and climate regulation,
  - livelihoods and cultural and spiritual enrichment

- Economies are highly dependent on ecosystem services, particularly in developing nations where both the formal and informal sectors rely on the products and services of natural ecosystems to generate value.
Ecosystems services categories

- **Provisioning services:** production of basic goods such as crops, livestock, water for drinking and irrigation, fodder, timber, biomass fuels, fibers (cotton and wool); building materials, and medicines.

- **Regulating services:** Benefits obtained from regulation of ecosystem processes - flood protection, coastal protection, regulation of air and water quality, regulation of water flow, absorption of wastes, absorption of carbon dioxide, control of disease vectors, and regulation of climate.
Ecosystems services categories

- **Cultural services**: Non-material benefits obtained from ecosystems - Encompass the non-material benefits that people derive from ecosystems through spiritual enrichment, recreation, tourism, outdoors-related sports, education, and aesthetic enjoyment. These services also include societies whose cultural identities are tied closely to particular habitats or wildlife.

- **Supporting services**: Services necessary for the production of all other ecosystem services - nutrient cycling, production of atmospheric oxygen, soil formation, and primary production of biomass through plant photosynthesis.
Global status of water resources
The chart illustrates the water scarcity and stress levels in various countries in Africa. The criterion for water scarcity is less than 1,000 m³/person/year, for water stress it is between 1,000 and 1,700 m³/person/year, and for vulnerability, it is between 1,700 and 2,500 m³/person/year.

Countries are listed horizontally, with bars indicating water availability per capita in 1990 and 2025. The chart shows that many countries are projected to face severe water scarcity and stress by 2025.

Effects of increasing seasonal variability
Accelerated loss of vegetation cover
Forest loss and hence loss of key ecosystem services

- **Ethiopia** - Between 1990 and 2005, the country lost 14% of its forests or 21,000 km²
- **Kenya** - in 1963, forest covered 10% of land in Kenya and by 2006 that dropped to 1.7%
- **Tanzania** - between 1990 and 2005 an estimated 412,000 ha/yr were cleared, i.e., about 1.1% of the total forest area
<table>
<thead>
<tr>
<th>Country</th>
<th>July 1, 2013 (Estimates)</th>
<th>Average relative annual growth (%)</th>
<th>Average absolute annual growth</th>
<th>Estimated doubling time (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia</td>
<td>86,614,000</td>
<td>2.67</td>
<td>2,253,000</td>
<td>26</td>
</tr>
<tr>
<td>D. R. Congo</td>
<td>74,618,000</td>
<td>3.23</td>
<td>2,334,000</td>
<td>22</td>
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<td>Tanzania</td>
<td>45,950,000</td>
<td>2.69</td>
<td>1,204,000</td>
<td>26</td>
</tr>
<tr>
<td>Kenya</td>
<td>43,291,000</td>
<td>3.01</td>
<td>1,266,000</td>
<td>23</td>
</tr>
<tr>
<td>Uganda</td>
<td>35,363,000</td>
<td>3.61</td>
<td>1,232,000</td>
<td>20</td>
</tr>
<tr>
<td>Sudan</td>
<td>35,150,000</td>
<td>2.52</td>
<td>863,000</td>
<td>28</td>
</tr>
<tr>
<td>Madagascar</td>
<td>21,852,000</td>
<td>2.75</td>
<td>585,000</td>
<td>26</td>
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<tr>
<td>Rwanda</td>
<td>10,780,000</td>
<td>2.63</td>
<td>276,000</td>
<td>27</td>
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<tr>
<td>South Sudan</td>
<td>10,334,000</td>
<td>4.40</td>
<td>436,000</td>
<td>16</td>
</tr>
<tr>
<td>Burundi</td>
<td>9,023,000</td>
<td>2.36</td>
<td>208,000</td>
<td>30</td>
</tr>
<tr>
<td>Eritrea</td>
<td>4,980,000</td>
<td>4.05</td>
<td>194,000</td>
<td>17</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>377,955,000</strong></td>
<td><strong>3.08</strong></td>
<td><strong>10,851,000</strong></td>
<td><strong>24</strong></td>
</tr>
</tbody>
</table>
Figure 4.1. People affected by acute food insecurity, 2009 (est)\textsuperscript{133134}

- **Djibouti**: Number of people affected by acute food insecurity (in millions)
- **Eritrea**: Percentage of population affected by acute food insecurity
- **Ethiopia**: Number of people affected by acute food insecurity (in millions)
- **Kenya**: Number of people affected by acute food insecurity (in millions)
- **Somalia**: Number of people affected by acute food insecurity (in millions)
- **Sudan**: Number of people affected by acute food insecurity (in millions)

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of people affected (in millions)</th>
<th>Percentage of population affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Djibouti</td>
<td>0.1</td>
<td>0%</td>
</tr>
<tr>
<td>Eritrea</td>
<td>1.5</td>
<td>10%</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>6.0</td>
<td>35%</td>
</tr>
<tr>
<td>Kenya</td>
<td>3.5</td>
<td>20%</td>
</tr>
<tr>
<td>Somalia</td>
<td>5.0</td>
<td>25%</td>
</tr>
<tr>
<td>Sudan</td>
<td>2.0</td>
<td>15%</td>
</tr>
</tbody>
</table>
Nutrition status at a glance

- Stuntedness
- Underweight
- Wasted
- Low birth weight

Percentage severity

Eritrea  |  Ethiopia  |  Kenya  |  Burundi  |  Madagascar  |  Uganda

Association for Strengthening Agricultural Research in Eastern and Central Africa
Documented impacts of climate variability and change
Climate Change Will Reduce Crop Yields in Africa

By 2050...

Maize - 22%
Groundnuts - 18%
Sorghum - 17%
Millet - 17%
Cassava - 8%
Major drought years and changes in GDP in the EAC countries
(Source: Seitz and Nyangena (2009))

<table>
<thead>
<tr>
<th>Drought years</th>
<th>Rainfall deficiency in %</th>
<th>Agricultural GDP loss in %</th>
<th>GDP loss in %</th>
<th>Loss in export earnings in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970/71</td>
<td>15.2</td>
<td>0.50</td>
<td>0.07</td>
<td>17.00</td>
</tr>
<tr>
<td>1978/79</td>
<td>22.0</td>
<td>1.58</td>
<td>1.13</td>
<td>7.98</td>
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<tr>
<td>1980–1983</td>
<td>29.0</td>
<td>27.0</td>
<td>10.00</td>
<td>20.00</td>
</tr>
<tr>
<td>1990/91</td>
<td>10.2</td>
<td>0.22</td>
<td>0.43</td>
<td>17.50</td>
</tr>
<tr>
<td>1992–1994</td>
<td>11.9</td>
<td>3.64</td>
<td>1.60</td>
<td>9.00)</td>
</tr>
<tr>
<td>1999/2000</td>
<td>7.0</td>
<td>11.18</td>
<td>1.44</td>
<td>8.48</td>
</tr>
</tbody>
</table>
Rainfall Trends in Kericho (Source: Tea Research Foundation)

There is a rainfall decrease of 65mm ($R^2 = 0.803$) for every ten-year period average.
Total tea production and average yields in Kenya (Source: TRF)

Source: Tea Board of Kenya (TBK) Statistics
ASARECA Interventions in the sub-region in respect to enhancing ecosystems functioning (landscape and farm levels)
Community-Based Integrated Watershed Management

Afforestation with multi-purpose trees

Community mobilization

Trenches to control runoff
Enhancing the functionality of agricultural-based ecosystems at farm level

Moisture management – crop residue

Use of ridges

Rehabilitation-fodder spp

Use of micro-pits

Use of tie-ridges

Water dams

Use of terraces
Road side ponds to recharge groundwater and enhance in-situ moisture in soils
Agricultural landscape transformation through IWM

Pits with animal manure
Potential researchable areas in CC-ecosystems interactions
Potential researchable areas in CC-ecosystems interactions

- **Regional characterization of climate induced risks for key ecosystems**

- **Climate modeling and scenario development for critical regional ecosystems**

- **Climate change impact assessment for various ecosystems and implications on community livelihoods and national economies**

- **Climate change vulnerability assessment and hot spot ecosystem mapping**

- **Evidence for planning and policy formulation**
Policy recommendations

- Regional promotion of **ecosystem-based** adaptation to climate change
- Consideration of ecosystem services in National Accounting Systems – assessment of benefits and costs of ecosystems management and hence provision of services
- Integration of ecosystems management into national planning processes and budgeting
- Adoption of **Integrated Watershed Management** as viable approach to safeguarding provision of ES
Policy recommendations

Promote ways of managing ecosystems for the provision of services that help reducing vulnerability and increasing resilience of socio-ecological systems to both climatic and non-climatic risks, while providing multiple benefits to society and the environment – Climate Smart Agriculture (CSA) at landscape level.
Thank you