Valuing investments in sustainable land management using an integrated modelling framework to support a watershed conservation scheme in the Upper Tana River, Kenya
Land and water in Upper Tana, Kenya
Timeline

2005
First scoping study Green Water Credits, led by ISRIC

2010
Start on-the ground activities

Business case development

2015
Steering Committee

Official launch

Board of trustees

2020
Fully operational

2025
How a water fund works

Our goal
Harness nature's ability to capture, filter, store and deliver clean and reliable water

Improved water quality and quantity

Landholders
Upstream communities and NGOs "at the top" protect the watershed

Monitors project impacts

WATER FUND GOVERNANCE BOARD
Selects projects and distributes funds

Contributors
Donors and downstream users "at the tap" fund watershed protection

Endowment fund

Impact
A cost-effective solution where the water supply is naturally replenished and filtered, and rural livelihoods are improved
Business case, modeling framework

RIOS: where to invest?

SWAT: how much impact?

ROI: how much return?
What and where to invest

- Investment portfolios for (total budget over 10 yrs):
  - $2.5 million USD
  - $5 million USD
  - $10 million USD
  - $15 million USD

<table>
<thead>
<tr>
<th>Activity</th>
<th>Allowed on</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riparian</td>
<td>15m buffer alongside streams, except urban, agroforestry, roads, and natural areas. Not allowed within the border of Kenya Forest Service lands.</td>
</tr>
<tr>
<td>management</td>
<td></td>
</tr>
<tr>
<td>Agroforestry</td>
<td>Bare soil, grassland, and croplands (except pineapple)</td>
</tr>
<tr>
<td>Terracing</td>
<td>Bare soil, croplands (except tea), and agroforestry lands with &gt;12% slope and &gt;15m from stream channel.</td>
</tr>
<tr>
<td>Reforestation</td>
<td>Grassland, shrub, and croplands (except pineapple) located within 500m inside the border of Kenya Forest Service lands (anti-encroachment strategy)</td>
</tr>
<tr>
<td>Grass strips</td>
<td>Bare soil, croplands (except tea), and agroforestry lands with &lt;12% slope</td>
</tr>
<tr>
<td>Road</td>
<td>Unpaved roads</td>
</tr>
<tr>
<td>mitigation</td>
<td></td>
</tr>
</tbody>
</table>
Impacts of investments

Businesss as usual

Investment portfolios

Figure 11  Average sediment concentration by month at the Mweugu intake (mg/kg), the water primary intake for Nairobi, showing sediment concentration reduced by 50-60% depending on the month.
Erosion reduction after investing

Current situation \[\rightarrow\] 10mUS$ investment \[\rightarrow\] Resulting erosion reduction

Baseline Erosion (ton/ha/yr):
- \(< 0.1\)
- \(0.1 - 0.5\)
- \(0.5 - 5\)
- \(5 - 30\)
- \(> 30\)

Erosion (ton/ha/yr):
- \(< 0.1\)
- \(0.1 - 0.5\)
- \(0.5 - 5\)
- \(5 - 30\)
- \(> 30\)

FutureWater
Downstream benefits

• For water supply, three main cost savings quantified in the Business Care are:
  – 1. Avoided use of flocculants
  – 2. Avoided electricity costs
  – 3. Greater water revenue from reducing use of processed water in backwashing

For hydropower, benefits quantified were:

• Increased power generation from increased water yield.
• Avoided interruptions in electricity generation.
Upstream agricultural benefits

- SWAT output for each calculation unit and scenario
  - Soil loss
  - Crop transpiration
- Soil maps
  - Water retention capacity
  - Organic matter content
- Economic Water Productivity based

Table 3  Annual increases in revenue by crop type

<table>
<thead>
<tr>
<th>Land use</th>
<th>Increase in revenue (US$m)</th>
<th>Total area with activities (ha)</th>
<th>Increase in revenue / ha (US$/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coffee</td>
<td>1.7</td>
<td>6,280</td>
<td>264</td>
</tr>
<tr>
<td>General agriculture</td>
<td>0.9</td>
<td>13,295</td>
<td>68</td>
</tr>
<tr>
<td>Tea</td>
<td>0.4</td>
<td>814</td>
<td>479</td>
</tr>
</tbody>
</table>
Conclusions

• An integrated modeling framework was used to identify key locations to implement a set of SLM measures and economic impact of these interventions was modelled for three key stakeholder groups (farmers, water supply, hydropower).

• Over 50% reduction in sediment concentration in rivers (varying by watershed and time of year); An 18% decrease in annual sedimentation in Masinga reservoir; Up to US$3 million per year in increased agricultural yields for smallholders and agricultural producers; Approximately US$250,000 in cost savings a year for water supply stemming from avoided filtration.

• Business case demonstrates a clear economic basis for the establishment of the Water Fund, and should boost support from donors, water users and local stakeholders – critical to a final “mature” water fund.