Scaling out Innovative Water harvesting Technologies and Approaches in Africa

Contribution of Water Harvesting Research to Building Climate Change Resilience in Africa and Beyond

Maimbo Malesu and Alex Oduor

1. Quantify performance of WH systems under various parameters
2. Establish impacts on livelihoods, especially of the poorest
3. Estimate the areal extent of specific practices
4. Study the impact of subsidies on water harvesting initiatives
5. Investigate the “triggers for adoption” of various WH practices
6. Assess the enabling environment that favours spread
7. Test improvements to specific, promising technologies
8. Monitor the downstream impacts of water harvesting
9. Investigate agronomic and soil fertility issues
10. Develop a common framework for assessment of WH schemes
SUSTAINABLE LAND AND WATER MANAGEMENT

- **Land degradation**
  - Siltation of water bodies, mining and loss of nutrients, loss of farm lands & productivity through soil erosion

- **Climate Change**
  - Impacts on frequencies and amounts of floods & drought cycles,

- **Land Use Planning**
  - Executed through the technological and enterprise Options by Context approach in GIS Environment

- **Focal Intervention Option**
  - **Water buffering** – lined and unlined ponds, sand dams, pans
  - **Groundwater recharge and reuse**
  - **Tree nurseries and establishment for Agroforestry production**

**INCREASE IN LAND AND WATER PRODUCTIVITY**
### Land Use Change & Water Partition – Kenya Case Study

<table>
<thead>
<tr>
<th>Class</th>
<th>Crops (km$^2$)</th>
<th>Forest (km$^2$)</th>
<th>Grasslands (km$^2$)</th>
<th>Wetlands (km$^2$)</th>
<th>Total (km$^2$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ewaso-Samburu System</td>
<td>5,650</td>
<td>3,850</td>
<td>54,790</td>
<td>3,347</td>
<td>69,127</td>
</tr>
<tr>
<td>Mt Kenya &amp; Abardere System</td>
<td>11,750</td>
<td>2,769</td>
<td>796</td>
<td>201</td>
<td>15,564</td>
</tr>
<tr>
<td>Mau and Western System</td>
<td>29,848</td>
<td>6,796</td>
<td>14,233</td>
<td>658</td>
<td>51,600</td>
</tr>
<tr>
<td>Coastal forest and Marine</td>
<td>9,626</td>
<td>16,758</td>
<td>23,520</td>
<td>2,811</td>
<td>52,873</td>
</tr>
<tr>
<td>Amboseli &amp; Chyulu System</td>
<td>5,983</td>
<td>4,513</td>
<td>14,133</td>
<td>1,774</td>
<td>26,412</td>
</tr>
<tr>
<td>Total</td>
<td>62,857</td>
<td>34,686</td>
<td>107,472</td>
<td>8,791</td>
<td>215,576</td>
</tr>
<tr>
<td>% Landcover within the five Ecosystems</td>
<td>29.16%</td>
<td>16.09%</td>
<td>49.85%</td>
<td>4.08%</td>
<td>99.18%</td>
</tr>
<tr>
<td>% Landcover within Kenya</td>
<td>11.03%</td>
<td>6.09%</td>
<td>18.85%</td>
<td>1.54%</td>
<td>37.51%</td>
</tr>
</tbody>
</table>

Within the focal ecosystems, grassland occupy the largest portion at about 19%, followed by crops at 11% and forest at 6%.
### Land Use and Cover Change IGEMBE NORTH 2000-2015

In 15 years Agriculture land has increased significantly with the open grassland and shrub land being converted to agriculture. Khat farming increased from 63 km² to 100 km².

<table>
<thead>
<tr>
<th>Landuse</th>
<th>Area difference (Km²)</th>
<th>% Area</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Closed Forest</td>
<td>(1.32)</td>
<td>-0.1%</td>
<td>Slight decrease</td>
</tr>
<tr>
<td>2 Khat Farms</td>
<td>37.27</td>
<td>3.5%</td>
<td>Increase</td>
</tr>
<tr>
<td>3 Other Agriculture Land</td>
<td>63.17</td>
<td>5.9%</td>
<td>Increase</td>
</tr>
<tr>
<td>4 Bushland</td>
<td>72.35</td>
<td>6.7%</td>
<td>Increase</td>
</tr>
<tr>
<td>5 Open Grassland</td>
<td>(155.03)</td>
<td>-14.4%</td>
<td>Decrease</td>
</tr>
<tr>
<td>6 Shrubland</td>
<td>(16.42)</td>
<td>-1.5%</td>
<td>Decrease</td>
</tr>
</tbody>
</table>
Rainwater partitioning – Case of Zanzibar

<table>
<thead>
<tr>
<th></th>
<th>Pemba</th>
<th>Unguja</th>
<th>Zanzibar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Rainwater</td>
<td>1,400</td>
<td>2,424</td>
<td>3,824</td>
</tr>
<tr>
<td>Evapotranspiration</td>
<td>560</td>
<td>970</td>
<td>1,530</td>
</tr>
<tr>
<td>Runoff</td>
<td>443</td>
<td>785</td>
<td>1,229</td>
</tr>
<tr>
<td>Groundwater</td>
<td>108</td>
<td>582</td>
<td>690</td>
</tr>
<tr>
<td>Current Use</td>
<td>8</td>
<td>32</td>
<td>40</td>
</tr>
</tbody>
</table>
Technological Options

**RWH System**

- In-situ RWH Systems
  - Zai pits
  - Cons. Tillage
  - Terraces
  - Level Bunds
  - Ditches
  - Drainage
  - SWC

- Runoff Catchment Systems
  - Check Dams
  - Weirs
  - Irrigations Canal
  - Ponds – Lined / unlined
  - Underground tanks
  - Infiltration ditches
  - Groundwater recharge
  - Sand/Subsurface dams

- Roof Catchment Systems
  - Ferro-cement tanks
  - Masonry tanks
  - Spherical tanks
  - Underground tanks
  - Recharge wells

**Technology**

**Storage**

- Soil Storage

**Application**

**GREEN WATER**
- Crop and Livestock production
- Upgraded rain-fed farming
- Agroforestry
- Full and Supplementary irrigation

**BLUE WATER**
- Domestic water
- Groundwater recharge
- Livestock production
Adaption to climate change with Run-off Catchment Systems

9 ponds/Km² in Lare, Kenya
Water Buffering in Lined Ponds
Billion Dollar Business Alliance Launch July 2015
Scaling-Up Rainwater Harvesting with Farm Ponds

The Billion Dollar Business Plan

The SearNet Billion Dollar Business Plan for Massive Upscaling of Rainwater Harvesting Ponds

- **Investment Capital**
  - Financiers/Donors

- **Insurance Underwriting**
  - Insurance Companies/Donors

- **Credit Provision**
  - Banks
  - MCIs NGOs

- **Pond Liner**
  - Liner Company

- **Tree Nurseries in the Dry Season**
  - Fruit Trees
  - Fertilizer Trees
  - Fodder Trees
  - Timber Trees

- **National + Local Government Support**

- **Technical Support**
  - Pond Siting and Overflow
  - Liner Installation

- **Farm Household**
  - Farm Pond Construction & Operation

- **Livestock Enterprises**
  - Poultry
  - Goats & Sheep
  - Cattle & Camels
  - Dairy Cows

- **Community Mobilization**
  - Producer Groups
  - Women’s Groups
  - Farmer Groups

- **Drought Relief**
  - Food/Cash for Work (WFP, etc)

- **Crop Production**
  - High-value vegetables for sale, vegetable garden for nutrition, supplementary irrigation for refined crops
STATUS OF INITIATIVE: N/A

PROGRESS REPORTS

Cut-off date each year: 1 May

SMART

This initiative fulfills the SMART criteria.

SDGs

INFORMATION

Location: Nairobi, Kenya
Date of completion: on-going
Website

OPERATING IN COUNTRIES

Kenya

PARTNER CONNECTIONS

Equity Bank
G-North
International Centre for Research in Agroforestry (ICRAF)
Kenya Climate Innovation Center
Kenya Rainwater Harvesting Association
United Nations World Food Programme (WFP)
World Vision International

Description/achievement of initiative

WFP and ICRAF and partners envision building an integrated farm pond support system capable of expanding and sustaining the massive upscaling of farm pond technology. The business plan addresses the sustainability factors that comprise a success upscaling system: financial, institutional, environmental, technical, and social. The plan embodies a support system that centers around the farm household and what it needs to take advantage of the technology. Outcomes: responsive financing system; increased access to water for horticultural and livestock production; enhanced policy support for rainwater harvesting governance; enhanced sustainable drylands farming systems and ecosystem services; improved farmer incomes, livelihoods and climate resilience.

Implementation methodologies

Kenya Stakeholders during the Workshop 21-22 October 2015
2015 Stockholm Water Prize Laureate
Mr Rajendra Singh
Groundwater Recharge and Reuse
THANK YOU