Innovation in Irrigation for rural development - the Green Wheel approach

Jochen Froebrich, Philippe Ker Rault for the EAU4Food Consortium
EAU₄Food

European Union and African Union cooperative research to increase Food production in irrigated farming systems in Africa

Duration:
June 2011 – May 2015
(4 years)
Total value: 5.2M €
<table>
<thead>
<tr>
<th>No.</th>
<th>Institution</th>
<th>Abbreviation</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stichting Dienst Landbouwkundig Onderzoek</td>
<td>Alterra</td>
<td>NI</td>
</tr>
<tr>
<td>2</td>
<td>Institut d’Economie Rurale du Mali</td>
<td>IER</td>
<td>Mali</td>
</tr>
<tr>
<td>3</td>
<td>University of Zambia</td>
<td>UZAM</td>
<td>Zambia</td>
</tr>
<tr>
<td>4</td>
<td>Council for Scientific and Industrial Research</td>
<td>CSIR</td>
<td>RSA</td>
</tr>
<tr>
<td>5</td>
<td>Institut National de Recherches en Génie Rural Eaux et Forêts</td>
<td>INRGREF</td>
<td>Tunisia</td>
</tr>
<tr>
<td>6</td>
<td>Mekelle University</td>
<td>MU</td>
<td>Ethiopia</td>
</tr>
<tr>
<td>7</td>
<td>International Water Management Institute</td>
<td>IWMI</td>
<td>Ghana</td>
</tr>
<tr>
<td>8</td>
<td>Centre de Cooperation International en Recherche Agronomique pour le Developpement</td>
<td>CIRAD</td>
<td>France</td>
</tr>
<tr>
<td>9</td>
<td>Overseas Development Institute</td>
<td>ODI</td>
<td>UK</td>
</tr>
<tr>
<td>10</td>
<td>Lisode</td>
<td>Lisode</td>
<td>France</td>
</tr>
<tr>
<td>11</td>
<td>Consejo Supoerior de Investigaciones Científicas</td>
<td>CEBAS-CSIC</td>
<td>Spain</td>
</tr>
<tr>
<td>12</td>
<td>University Eduardo Mondlane</td>
<td>UEM-FAEF</td>
<td>Mozambique</td>
</tr>
<tr>
<td>13</td>
<td>Stellenbosch University</td>
<td>SU</td>
<td>RSA</td>
</tr>
<tr>
<td>14</td>
<td>IRSTEA (former CEMAGREF)</td>
<td>CEMAGREF</td>
<td>France</td>
</tr>
</tbody>
</table>
The project

**Tunisia**
(Medjerda/Merguelil)

**Ethiopia**
(Gumselassa and Korir)

**Mali**
(Kimbirila/Tissana and Kamaka)

**South Africa**
(Giyani)

**Mozambique**
(Chókwè)

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Core objectives EAU4Food

- Innovation in irrigated farming systems
- To quantify specific limits for intensification of irrigated agriculture within given environmental and socio-economic conditions
EAU4Food transdisciplinary approach

Innovation

Biodiversity

Socio-economy

Water

Soil

Farmers

Extension service

Policy maker

Business people
The EAU4Food Green Wheel Approach

- Increase access to markets
- Participative planning for rural development
- Define *Green Principle* water needs
- Optimize yield and water use and productivity
- Co-creating local ownership in research and innovation
- Initiating the “Story of change”
Initiating the “Story of change”

Setting up
• a community of practice (COP) AND
• a learning practice alliance (LPA)

Monitoring of engagement
Innovation platforms

LPA = Learning & Practice Alliance

CoP = Community of Practice

Linking up the local level (where research takes place) with the sub national/ national arena (where decisions are made & policies formulated)
Stories of change

Goytoytum, an Agricultural Extension Worker at Gumselassa irrigation scheme (Ethiopia), explains how the project and the innovative approach of research has given her confidence to promote innovations among farmers

“Previously, I used to be challenged by the farmers while trying to promote practices such as application of compost and manure at Gumselassa (my current target area)... the farmers at Gumselassa repeatedly refused to practice them as they used to say use of compost and manure specifically on onion fields favor occurrence of worms that affect the crop growth. Considering their resistance and lack of previous action research, I used to be hesitant.”

N. Oates, E. Ludi, N. Mason, 2014
Stories of change

“Now, thanks to the action (practical) research carried out by EAU4Food project for the last two years, I am able to debate with and convince the farmers on the workability of these innovations based on the obtained and practically demonstrated results by the project. The farmers are also quite convinced that they can get higher yields through practicing scheduled and measured irrigation water, use of botanicals for crop protection, and use of dam silt.

I do hope many farmers will practice such innovations in the coming years.”
Co-creating local ownership in research and innovation

Initiating research by farmers

Actual involvement of the farmers in monitoring and research
### Involving Farmers in Problem Identification

<table>
<thead>
<tr>
<th>Case study</th>
<th>Gumsalasa (Ethiopia)</th>
<th>Chókwè (Mozambique)</th>
<th>Giyani (South Africa)</th>
<th>Niono KO2 (Mali)</th>
<th>Jendouba-Brahmi (Tunisia)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>Scheme design and construction</td>
<td>Irrigation and drainage infrastructure</td>
<td>No equipment (irrigation)</td>
<td>Decrease in soil fertility and canal maintenance</td>
<td>Water logging and drainage</td>
</tr>
<tr>
<td>P2</td>
<td>Canal maintenance</td>
<td>Lack of credit, Farm management</td>
<td>Crops pest and diseases</td>
<td>Lack of farmers’ organization</td>
<td></td>
</tr>
<tr>
<td>P3</td>
<td>Salinization</td>
<td>Drainage Problems resulting in salinity</td>
<td>Marketing – lack of exposure</td>
<td>Cropping techniques</td>
<td>Lack of Labor</td>
</tr>
</tbody>
</table>
Example Ethiopia
Simplified Irrigation scheduling at Gumsalasa
irrigation scheme

E. Yazew, S. Habtu 2014

Figure 2.1 Research design for the 2014 experiment
Example South Africa

W. De Clercq, N. Jovanovic,
C. Pienaars, 2014
Example Mali
Improved water management

Inefficient water use: 14,000-21,000 m³/ha

Major constraint of water management is related to the lack in canal maintenance

bef.

After negotiation

Dicko, M. et al., 2014
Example Mozambique

Low Pressure Drip Irrigation

- Flood resilient
- Higher water & nutrient use efficiency
- Reduced labor need

Famba, S. et al. 2014
Optimize yield and water use and productivity

Calculate yield gaps, optimal fertilizer application, salinization risks, and optimal irrigation scheduling.

Share findings in farmer field schools
## Crop yield

<table>
<thead>
<tr>
<th>Zava: Plot</th>
<th>Irrigation</th>
<th>Yield (t/ha) I season</th>
<th>Yield (t/ha) II season (mulching experiment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>drip</td>
<td>19</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>drip</td>
<td>18</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>furrow</td>
<td>10</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mzilela: Plot</th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>drip</td>
<td>22</td>
<td>&gt; 50</td>
</tr>
<tr>
<td>2</td>
<td>drip</td>
<td>25</td>
<td>&gt; 50</td>
</tr>
</tbody>
</table>

C. Pienaars, 2013
Define “Green Principle” land & water needs

In semi arid areas any water abstraction affects the remaining flow in rivers and the recharge of groundwater.

Water needs for nature and public health defines remaining water resources for agriculture

Compliance to legislative framework is key to avoid uncontrolled overconsumption
Allocation of water is subject to political decision making

<table>
<thead>
<tr>
<th>Water Supplies</th>
<th>million m³ a⁻¹</th>
</tr>
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<tbody>
<tr>
<td>Natural resources</td>
<td></td>
</tr>
<tr>
<td>Surface water</td>
<td></td>
</tr>
<tr>
<td>Subtract:</td>
<td></td>
</tr>
<tr>
<td>- ecological reserve</td>
<td>-29</td>
</tr>
<tr>
<td>- invasive alien pl.</td>
<td>-12</td>
</tr>
<tr>
<td>Groundwater</td>
<td>32</td>
</tr>
<tr>
<td>Usable return (flow irrigation and urban)</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>202</td>
</tr>
<tr>
<td>Water Requirements</td>
<td></td>
</tr>
<tr>
<td>Irrigation</td>
<td>158</td>
</tr>
<tr>
<td>Urban</td>
<td>6</td>
</tr>
<tr>
<td>Rural</td>
<td>18</td>
</tr>
<tr>
<td>Afforestation</td>
<td>36</td>
</tr>
<tr>
<td>Transfers outside the catchment</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>233</td>
</tr>
</tbody>
</table>

Water supplies and requirements in the Letaba catchment approximated for 2005 (DWAF, 2004)
Field scale

Basin Scale

Querner, 2012
Participative planning for rural development

Upcoming development in irrigated agriculture will increase the total water consumption.

Participative modelling and planning leads to more realistic scenarios and a better planning.
Participative Modelling

Querner, 2014
Participative strategy development
Increase access to markets

- Access to market need dedicated effort
- Use innovation cooperatives and value chain extension
Launching the InnoGiyani PPP
Improving access to markets

MANOMBE Cooperative Trust

Mopani Super SPAR
PPP InnoGiyani

- Lead **Manombe Cooperative Trust**
- Total: 6 Mio Euro (50% own contribution)
- Co-funded by the NL Ministry of Foreign affairs: 3 Mio €
- Duration +5 Years

**Targeted outcomes**

- Rehabilitate **600 ha former irrigation** area
- Reconstruction of the **maize mill** in Giyani
- Production of locally branded, **high quality maize flour**
- Re-invest profit for supporting the cooperative (small holder) farmers
- **Training facility**
- **Innovation platform** to diversify agribusiness opportunities
Agribusiness innovation and inclusive green growth
EAU4Food Outcome

• Capacity for transdisciplinary innovation is built
• Basis for Science-Policy-Business Interface created
• Large momentum is gained, attracting interest of industry, NGOs, government
  – Ethiopian Government is already supporting further implementation
  – Private companies in Moz. , South Africa supporting
Conclusion & Outlook

• **Opportunities to use the Green Wheel approach**

• **Outscale the implementation**
  – Further innovations
  – Further implementation to other farmers in the regions
  – Implementation at other countries
  – Extend the cooperation with non-agri stakeholders

• **Local Capacity could be used for developing a network of reference sites for transdisciplinary innovation**