Taking –up and leaving behind knowledge; a history of irrigation design approaches for Smallholder farmers in Southern Africa

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Introduction

- Designing irrigation systems for smallholders continues to be problematic in delivering the expected results.

- In the past participatory design methodologies have been pushed as an approach towards sustainable irrigation development.
Introduction

- There seems to have been a standstill in the development and improved of approaches to designing smallholder irrigation systems
  - Coupled to a period of very low international investment in irrigation systems

- Interest and investment in irrigation has picked-up again – but technocratic design and implementation practices seem to have the upper hand, why?
  - This presentation tries to give a historical context in which designing approaches were developed to understand the current standing in this field and its interface with social sciences.
Some definitions

- Design is the end product of the designing process

- Design approaches are methods of making a design

- Irrigation system: the infrastructure needed to take, transport and deliver water to a plant

- An irrigation design is not only a technical design
A short history on irrigation design(ing)

- Colonial agriculture in the 19th century:
  - Shift from trading with colonies to active intervention and settlement by means of irrigation
    - It's about control of land and people on it
  - Study tours by engineers to build on existing knowledge and technologies
  - Development of irrigation schools, i.e. the Dutch, the French, the British
Example of two irrigation schools: Dutch, English

<table>
<thead>
<tr>
<th>Guiding principles</th>
<th>Dutch</th>
<th>English</th>
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<tbody>
<tr>
<td>Max value/land</td>
<td>Max value/water</td>
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<tr>
<td>Water gift based on crop</td>
<td>Water gift based on land</td>
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<tr>
<td>Design requirements</td>
<td>Adjustable and measurability</td>
<td>Functioning with variable canal flow</td>
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<tr>
<td>Control mechanism</td>
<td>Centralized daily control by official</td>
<td>Central but distant control by official</td>
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Different design for water control

Dutch school - adaptive

English school - fixed
After decolonization – 1950s & 1960s

- American based
  - In USA development of most advanced irrigation
  - Big boom in irrigation construction through development aid in the South
  - Irrigation as a means to do nation-building:
    - modernize agriculture, increase export earnings and improve food self-sufficiency,

- Blue print approach to design
End 1960s-1970s: disillusion around irrigation

- Low performance, siltation canals, salinization, negative gender effect

- Two reactions:
  1. **Tertiary block is where the problems manifest themselves**
     - On farm development
     - Introduction of water rotation schedules at tertiary level based on crop water requirements (FAO 1977)

  2. **More attention for institutional/organizational aspects**
     - Adjust the farmer to the technology by better organizing or training them to use the technology as envisaged
     - Establish Water Users Association (WUA) to improve farmer organization
1950s-1970s From Main system to Tertiary unit

Intake

Main canal

Secondary canal

Tertiary unit
1970s-1980s Experimenting with participatory design & farmer management

- Bottom up, grassroots approaches (Rondinelli 1983)
- Indigenous technical knowledge (Richards 1985)
- Rapid Rural Appraisal and Participatory rural appraisal (Chambers 1983)
- Farming system research (Chambers 1989)
- Actor oriented (Long and Long 1992)
In 1980 Chambers & Wade point at importance of main system management:
- Problems manifest themselves at tertiary level, but are caused upstream in the system, hence improve water supply to tertiary outlet though management change
- Disfunctioning bureaucracies, insecure water supplies cause hoarding

Attention shifts to irrigation management:
- IIMI (IWMI) started in 1985 as CGIAR institute
- Start of Irrigation Management Transfer
- Continued technical attention for modernization (automation) & rehabilitation of irrigation systems
1980s-1990s back to main system management and up to river and across disciplines

River basin management
Stakeholder platforms
Irrigation management transfer
Water users association
Land and water rights
Value chain
Gender
Migration
Power relations
Mechanization
Production economics
Farming systems
1990 – State of the art of participatory irrigation design

- Feb 1990 workshop on Sustainable design of FMIS in Sub-Saharan Africa
  - Interactive design as process
  - Design as more than a series of technical choices
  - 3 socio-economic levels – plot-system-wider environment
  - At each level – check between assumptions & African realities
  - Participation or negotiation? Adapt to existing situation/actor
Three socio-economic levels (Horst & Ubels 1993)

<table>
<thead>
<tr>
<th>Technical system</th>
<th>Forms of use</th>
<th>Social aspect</th>
<th>Social systems</th>
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</thead>
<tbody>
<tr>
<td>Irrigation system</td>
<td>agricultural use</td>
<td>– production rationale</td>
<td>Farming system</td>
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<td>– intra-household organization</td>
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<td></td>
<td></td>
<td>– access to resources</td>
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<td>irrigation organization</td>
<td>– organizational structure</td>
<td>Local community</td>
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<td>– processes and skills</td>
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<td>– objectives and norms</td>
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<td>external relations</td>
<td>– types of external needs</td>
<td>Institutional and commercial environment</td>
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<td></td>
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<td>– accessibility</td>
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<td>– conditions posed</td>
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Figure 6.4: Linkages between forms of use and social environment.
Assumptions vs reality: examples

- **Farming systems**
  - Who is the smallholder? Blue printing the farmer, full time/part time, multiple income strategies

- **Local community**
  - Existing organisational structures and boundaries vs required organisational structures and boundaries of the irrigation system

- **Institutional environment**
  - Marketing
  - Extension services
1990s Getting stuck – Participation tyranny

The international workshop on Design of sustainable farmer-managed irrigation in SSA

- Results in the publication of the State-of-the-Art book “Irrigation design in Africa, towards an interactive method (Ubels and Horst 1993)

- Irrigation tainted, investments dropped
- Participation elevated from method to goal
2000s – Reinventing Wheel

- Revival in investment in irrigation
  - Blair’s commission for Africa (2005)
  - New model – Public Private Partnerships

- Re-invention of the wheel:
  - Plethora of participatory design projects, is still dominant discourse on how to address irrigation design
  - But it appears to re-start with the practices of the 60’s and 70’s
    - Blue printing drip systems
    - PROIRRI
**PROIRRI - Site development path**

<table>
<thead>
<tr>
<th>Pathway quick overview</th>
<th>Infrastructure development</th>
<th>Water mgmt support (IO)</th>
<th>Production support (PA)</th>
<th>Value Chain development</th>
<th>Financial services</th>
</tr>
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<tbody>
<tr>
<td><strong>Phase 1</strong></td>
<td>Technical pre-feasibility and hydrology assessment</td>
<td>Quick scan on current water users &amp; water use in area</td>
<td>Quick scan on membership, farming systems, willingness to engage in project</td>
<td>Quick scan on markets and market players along value chain</td>
<td>Quick scan on credit access, local savings mechanisms, financial literacy of PA.</td>
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<td><strong>Phase 2</strong></td>
<td>Topographical Survey, Participatory Preliminary Design</td>
<td>Establishment of interim IO + drafting of constitution, prep. for water right, land right</td>
<td>Farmer survey + farming systems analysis + PA establishment support + rainfall support</td>
<td>Joint market identification &amp; business plan devt.</td>
<td>Financial literacy training, establishment of local savings groups</td>
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<tr>
<td><strong>Phase 3</strong></td>
<td>Detailed design, Infrastructure construction (incl. support infrastructure)</td>
<td>IO strengthening on O&amp;M, M&amp;E, financial mgmt. Training of operators, PPP, farmer water mgmt training</td>
<td>Prod. extension on irrigated production, specific rice and horticulture support, matching grants, PA cap. Building</td>
<td>Matching grants for value addition.</td>
<td>Credit access facilitated through strategic partner</td>
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<td><strong>Phase 4</strong></td>
<td>Support to IO pump operation, efficient scheme operation, repair &amp; maintenance</td>
<td>Cont. training + ‘graduation’ of IO for full O&amp;M (incl. with local service providers, or professional staff)</td>
<td>PA cap. building continued and follow up matching grants + ‘graduation’</td>
<td>Matching grants for value addition.</td>
<td>Credit access facilitated through strategic partner</td>
</tr>
<tr>
<td><strong>Transition</strong></td>
<td><strong>Agreed scheme development plan + Signed Performance Agreement</strong></td>
<td><strong>Infrastructure transfer agreement + renewal of Performance Agreement after evaluation + gradual phase out plan</strong></td>
<td><strong>Joint market identification &amp; business plan devt.</strong></td>
<td><strong>Financial literacy training, establishment of local savings groups.</strong></td>
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Conclusions

- Interest and investment in irrigation has picked-up again – but technocratic design and implementation practices seem to have the upper hand, why?

- Disincentives against a shift from blueprint to interactive:
  - Accountability problem – accountable to whom?
  - Blueprints result in more efficient construction & higher profits
  - Vicious cycle – farmers blamed for low performance, so why involve them in design? – next unsustainable technology is designed – for which farmers are blamed
For a irrigation design to work it needs to reflect the local socio economical context:

- Change from ‘adapt user to system’ to ‘adapt system to user’

Social-economic sciences need to take the lead in explaining social economical context in terms of (irrigation) infrastructural design requirements to engineers