Rainwater management for Sustainable Agricultural Intensification in the Ethiopian Highlands

Tilahun Amede
Scientist / Nile Basin Coordinator,
CGIAR Challenge Program Water for Food
CPWF Consortium Members
Outline

• NBDC and where we are working?
• The issues
• Sustainable intensification solution through:
  – Addressing Resource –Related Constraints
  – Addressing system level constraints
  – Properly Scaling up/down/out
• Key messages
Nile Basin Development Challenge (NBDC)

- NBD Focuses on the Ethiopian highlands and examining interrelated issues of rainwater management at Landscape and Sub-basin scales;

- Understanding causes and its consequences of low rainwater productivity;

- Innovations for improving rainwater management; addressing poverty, vulnerability and resources degradation;
  - Managing rainfall variability; increased water storage;
  - Crop and livestock water productivity;
  - Minimizing land degradation and downstream siltation of water storage infrastructure;
  - Creating capacity towards resilient communities and systems that will manage climatic and market shocks;
Where are we working?
The issues:

1. Water needs and competition is increasing
   - Between uses (sectors) and users
   - Yet, agriculture largest water user;
2. Future water need is even higher: Make Choices : Scenarios to 2050

Sustainable Intensification part of the menu of solutions
Sustainable Intensification solution through:

A. Addressing Resource–Related Constraints
1. Understanding systems and the clients: no single solution fits all
Various Drought States in SSA

Scenario I
Scenario II
Scenario III
Scenario IV

Soil water content (%)

Phenological stages

Amede et al, 2003
Understand the landscape

Zone-I, uplands, Rainfed

Zone-II, Midlands, Rainfed

Zone-III, Lowlands/Bottomlands, Irrigated+ Rainfed

Water availability, land/soil quality.
2. Improving water storage and productivity at farm, landscape and basin scales

<table>
<thead>
<tr>
<th>Countries</th>
<th>Per Capita Storage (m^3)</th>
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<tr>
<td>Kenya</td>
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<td>North America</td>
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Various storage and irrigation options

- WH Pond
- Micro dam
- Diversion
- Pits
If we apply micro dose?

Increasing water productivity by managing constraining factor e.g. plant nutrient
Improving water productivity through Zai pits (Amede et al., 2011)

Complementarity of moisture + nutrients
E.g. Watering Points for Improved livestock production

By reducing walking distance, milk production can increase;

Survey: milk production increased from 343 liter to 463 liter per lactation per cow

Milk water productivity per cow improves by 35% (survey)
Integrated Soil Nutrient Management includes micro-nutrients as well.

Application of 5kg/ha Zn could increase yield 50-500%.
Sensitivity index of grain yield

Adriewaalse
Aurora
Blaze
Irisa
Arista
Lünebureger
Tatranskij
Uran
Line7
Condor
ILB-2282
FAB 120
Chacha
China-15
BPL-229

0.0
0.4
0.8
1.2
1.6

Plant height (cm)
120
140
160
180
200

Germplasm is also key to sustainable intensification

Amede et al., 1999

This is a pot that may not be reality but excellent to show genetic variability
3. Reversing Biomass Scarcity

- Competing uses
  - Livestock feed
  - Cooking fuel
  - Soil fertility management
  - Construction and other

<table>
<thead>
<tr>
<th>Location</th>
<th>Requirement (ton)</th>
<th>Available (ton)</th>
<th>Deficit (ton)</th>
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Legend:
- Requirement (ton)
- Available (ton)
- Deficit (ton)
If we rehabilitate degraded lands and grow forages?
4. Landscape approaches for Intensification

- Linking farms with landscapes
- Upstream-downstream relationships
- Niches for different options
- Resource flows
- Collective action required
- Crop-Livestock integration
- More Biomass for Various uses
Sustainable Intensification through: B. Addressing Systemic Constraints
Functional Policies in Facilitating Incentive Mechanisms

- Market incentives – infrastructure is rudimentary; Input-output markets malfunctional; middle men, Market inconsistency

- Policy incentives; e.g. Tax free water pumps; energy subsidies (e.g. Gujarat);

- Safety-net options: Insurance schemes; other employment options
Market incentives contributing to adoption of interventions

Source: ICRISAT, 2010
Uncoordinated sectoral institutions

Large circles show increasing scales and levels while Bubbles show interventions at different scales (IIRR, 2000)
Enabling Local Institutions

- Incentives for local communities to take charge in NRM
- Strengthening bylaws to support NRM initiatives; Negotiating improved arrangements
- Facilitate effective use of available resource & innovations;
- Increased demand / pressure;
- Enhance collective action for sustainable impact at landscape and higher levels;
Creating Forums for interaction and dialogue

Other Districts

Regional

Local level

National

Sites within district

Non-project sites within district

Learning

Scaling out
Sustainable intensification: C. Scaling up / Scaling out/ Scaling down.

More diverse and intensive farming systems

Local people organized and using information to manage productive, sustainable landscapes

Decision-makers better informed to help farmers collectively manage landscapes and diversify/intensify their systems

Decision-makers and managers targeting policy and information
Similarity for RMS at landscape scale
**Key messages:**

1. Investing in water storage at landscape and higher scales (reservoirs, strategic dams, ground water etc.);

2. Improving rainwater management systems, from capturing to efficient utilization;

3. Identifying and addressing constraints other than water (critical inputs; fertilizers, seeds, pesticides and their efficient utilization);

4. Policy geared towards creating local capacity, particularly in climate-sensitive systems (Agriculture / wetlands / water towers/ vulnerable communities);
Thank you!