



Adaptation and Performance Evaluation of WHT in Ethiopia

(WAHARA Project)

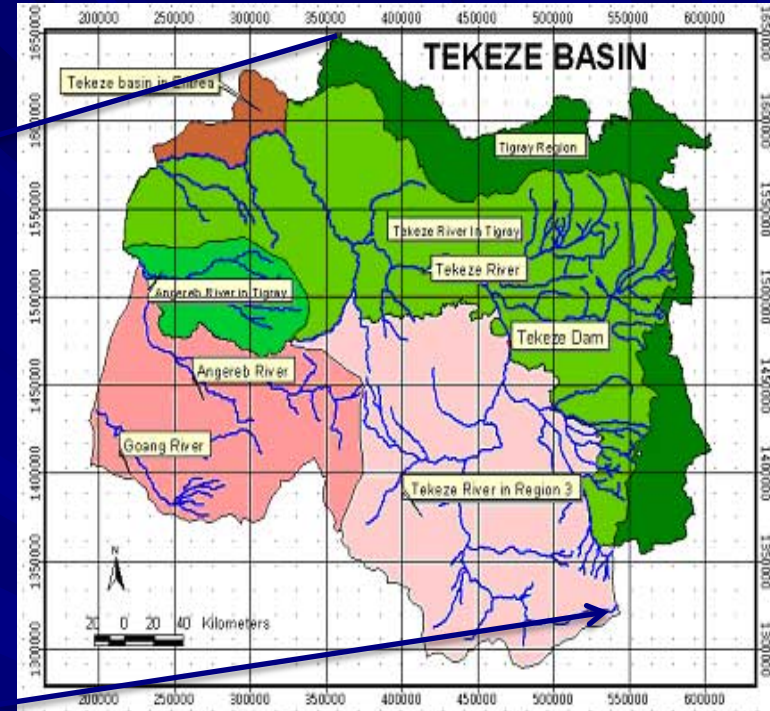
By: MU WAHARA Team, Ethiopia

Outline

1. Introduction
2. Objectives of the project
3. Activities carried out
4. Performance Monitoring and Evaluation
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1. Introduction: About Northern Ethiopia

Tekeze river basin



Population: about 5 Million

Area: 80,000 Km²

Topography:

30% < 1500 m asl

70% > 1500 m asl

(40% > 2000³ m asl)

Major challenges of the Tigray region:

Prior to 1990's

- Land degradation
 - High population growth (2.5%) and poor cultivation practices
 - Intense rainfall-Steep slope
- Small land size that rarely exceeds 0.5 ha per HH
- Limited and/or absence of irrigation practices
- ***All these factors contributed to food insecurity, droughts and even famine.***



Photos: TBoARD archive data.

To reverse the situation, a number of programs have been implemented in the last two decades which include:

- Watershed management, and
- Water harvesting (surface and groundwater).



2. Objectives of WAHARA Project

- **Develop innovative and appropriate WH technologies for different geographical regions of rainfed Africa.**
 - **Emphasis 1** on WH technology *design*: Design WH technologies that have synergies with existing rainfed farming systems.
 - **Emphasis 2** on WH technology *impact*: Assess at catchment scale the on-site and downstream impact (environmental services) of WH technologies.
 - **Emphasis 3** on WH technology *integration*: Develop criteria for sustainable impact on improving livelihoods with WH technologies under various pressures, considering economic development.
 - **Emphasis 4** on WH technology *learning and action*: Develop guidelines to facilitate stakeholder, learning and action about WH technologies in different (biophysical and socioeconomic) conditions.

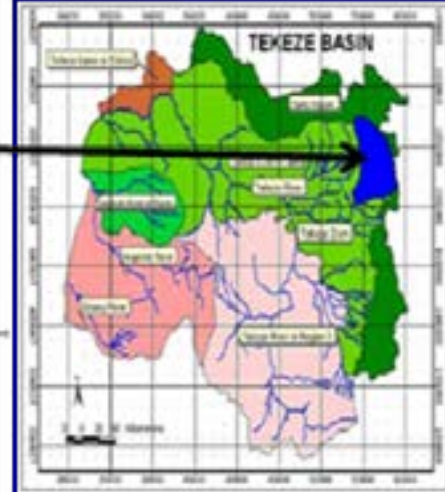
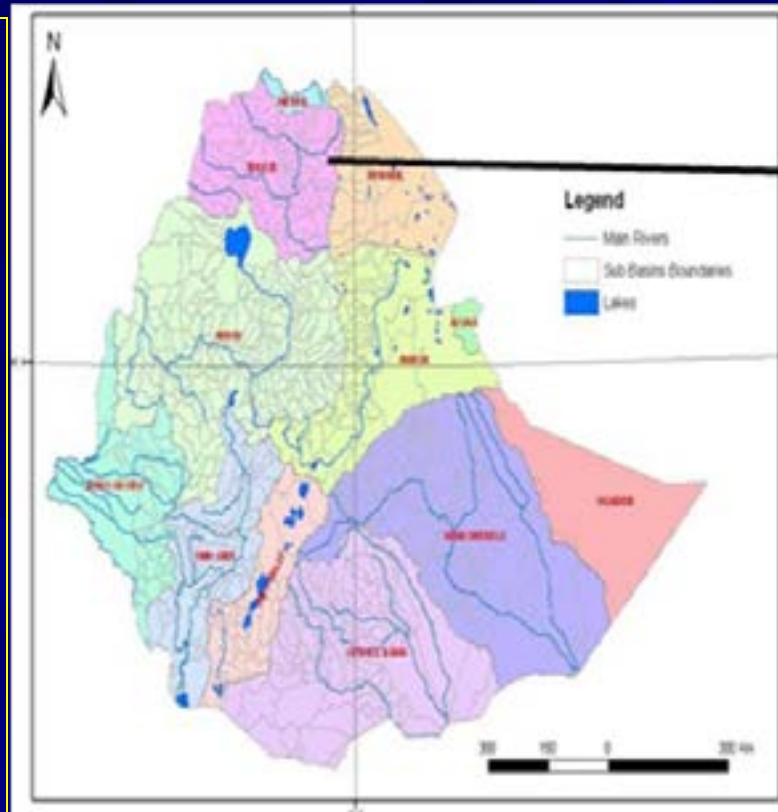
- In order to reach this objective, study sites are selected that are representative for rainfed Africa:

- **Tunisia** in the North,
- **Burkina Faso** in the West,
- **Zambia** in the South and
- **Ethiopia** in the East.



3. Activities carried out: Ethiopia

- Inventory of WHT in the study area.
- First stakeholder workshop: to identify major WH related problems.
- Second stakeholder workshop: to select WHT for adaptation.
- Adaptation and Monitoring.

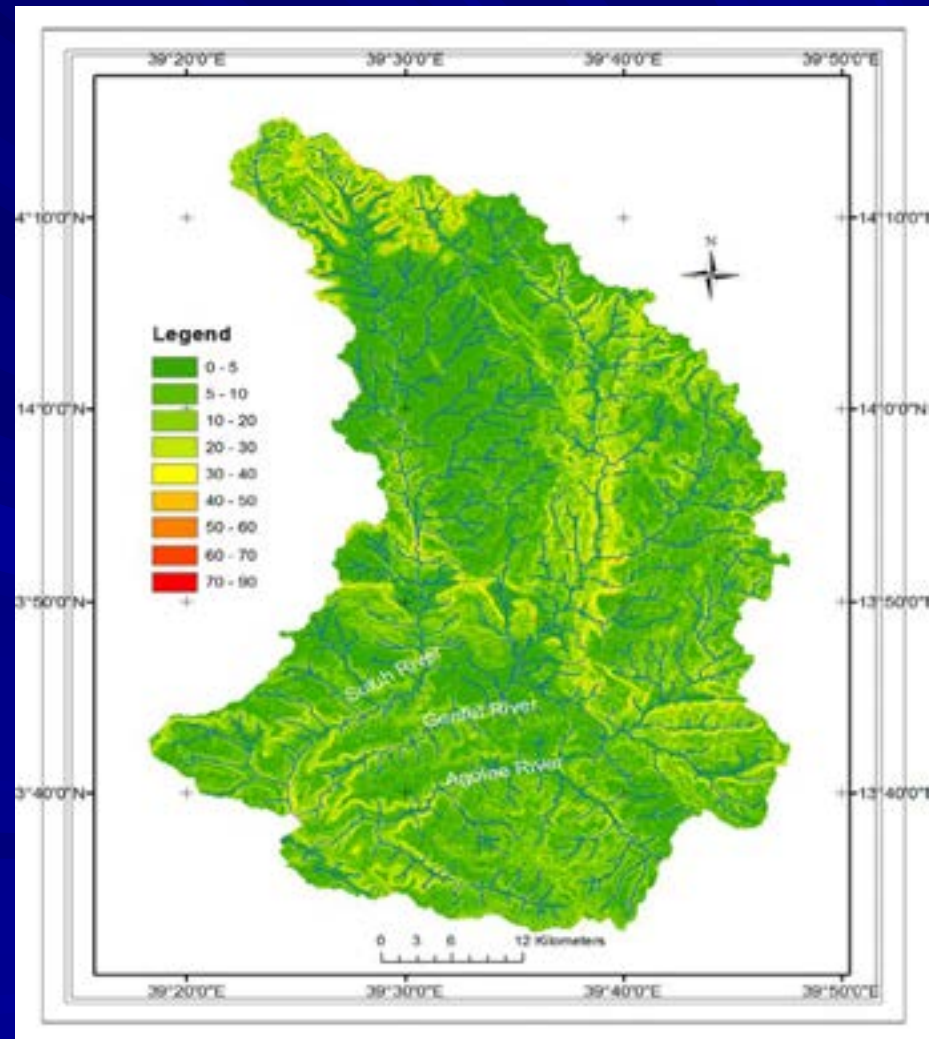
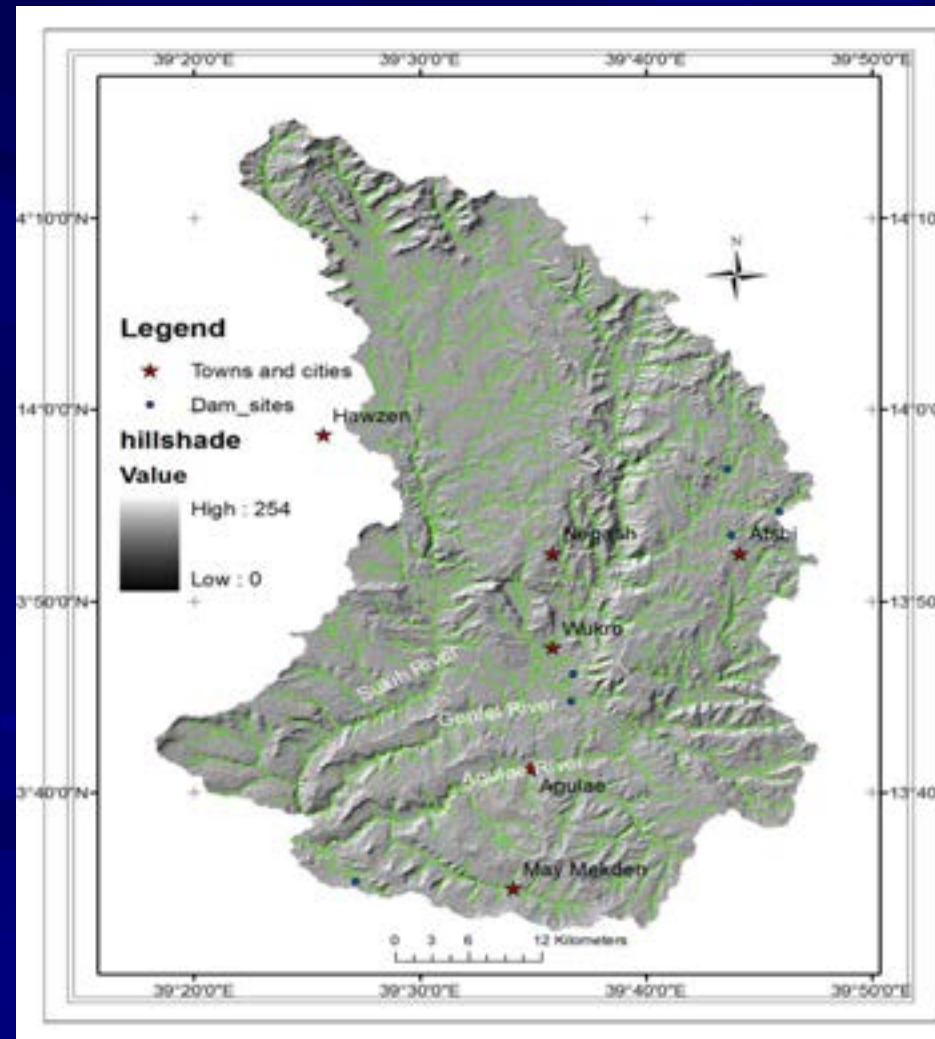


Study area for WAHARA Project :

- *A region with frequent droughts and associated food insecurity.*

a. Inventory of WHT

- *All the WHT used/introduced in the area were documented.*



b. First Stakeholder workshop

Objectives:

- Inform and introduce the “**WAHARA**” project to partners to generate interest;
- Learn about the main WH technologies used (**advantages, importance for livelihood, problems, potential for improvement and expected impacts**); and
- Set-up stakeholder platform.



c. Second Stakeholder Workshop: WHT Selection Workshop

Technologies selected:

- Series of Hillside Cisterns with bench terraces.
- Percolation/sediment storage ponds with hand dug wells.
- Check-dams.
- Soil improvement.



d. Adaptation of the WHT

The adaptation process involved:

- Selection of specific sites for the detailed experimentation of the selected WHT.
- Identifying key partners and creating stakeholder platform:
 - *Funding*
 - *Knowledge*
 - *Implementing*
- Final Design and Implementation of the adaptation process.
- Evaluation of the WHT with stakeholders.

There was little WHT intervention prior to WAHARA



Gule sub-watershed: Site for adaptation of WHT

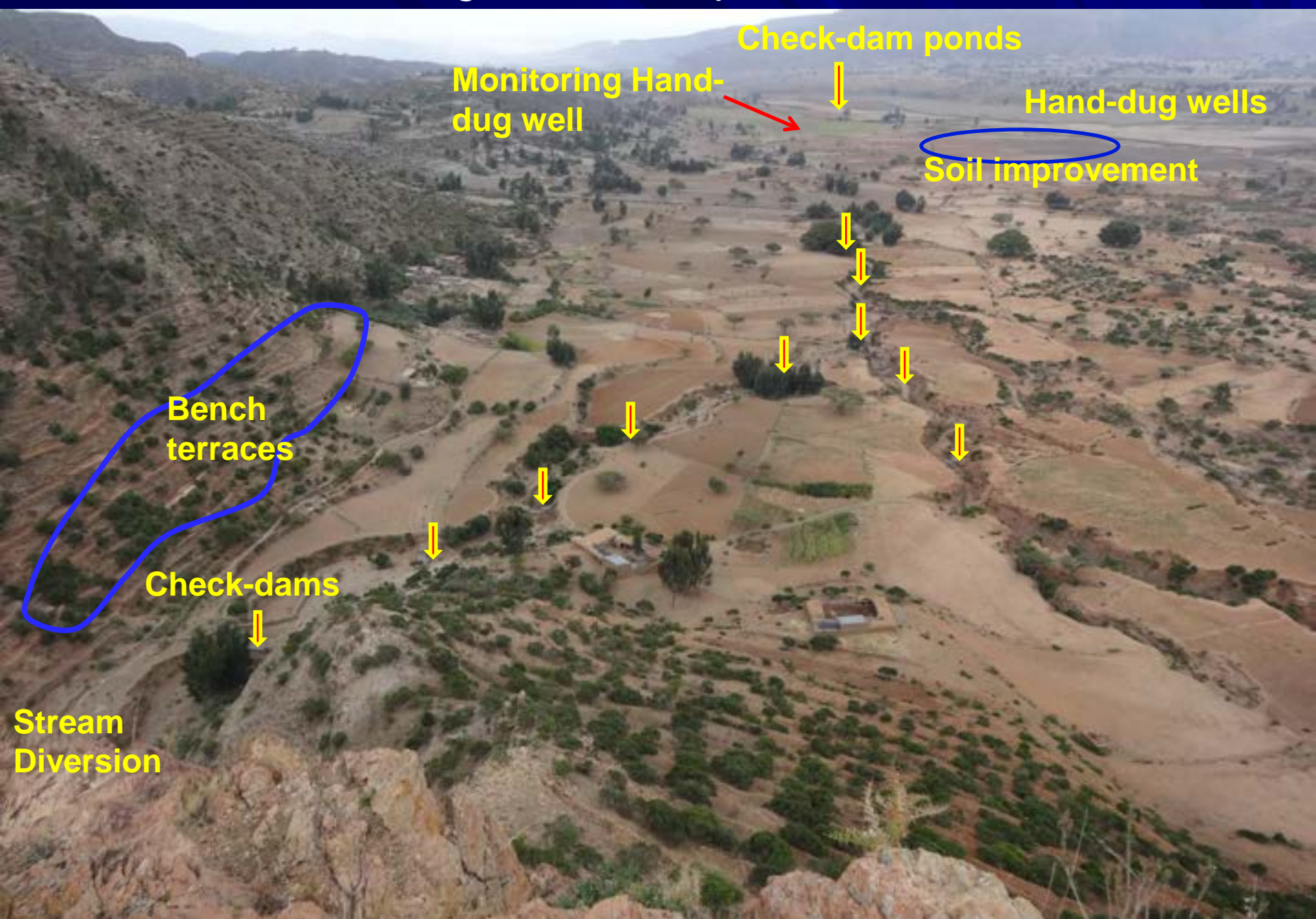
4. Performance Monitoring and Evaluation

- Hydrological effects and design considerations for **Check-dams**.
- Effects of **soil improvement** on crop yield.
- Hydrological effects and design considerations of **percolation ponds**.
- New cultivable land creation and design considerations of **bench terraces**.



Gule sub-watershed: Site for adaptation of WHT

Different WHT along the landscape in Gule watershed



Different WHT implemented

Photo taken in August 2013 before biological treatment but after the construction of the check-dams which have stored sediment.



Photo taken in June 2014 only about 9 months since biological treatment of the check-dams.





Gabion check-dams which are constructed to rehabilitate degraded streams and to enhance groundwater recharge in Gule watershed, Northern Ethiopia (project is funded by WFP through TBoARD). (a) Before, and (b) After.



Check-dam pond which is constructed to store stream flow for irrigation and shallow groundwater recharge in Gule Watershed, Northern Ethiopia (project is funded by Relief Society of Tigray).



Percolation pond (20m long, 15m wide and 2.5m deep) constructed to recharge the shallow groundwater system and enhance spring discharge at downstream areas which could be used for small-scale irrigation.

Shallow wells: before the rainy season.



Shallow wells: after rainy season and after check-dam construction at upstream areas.

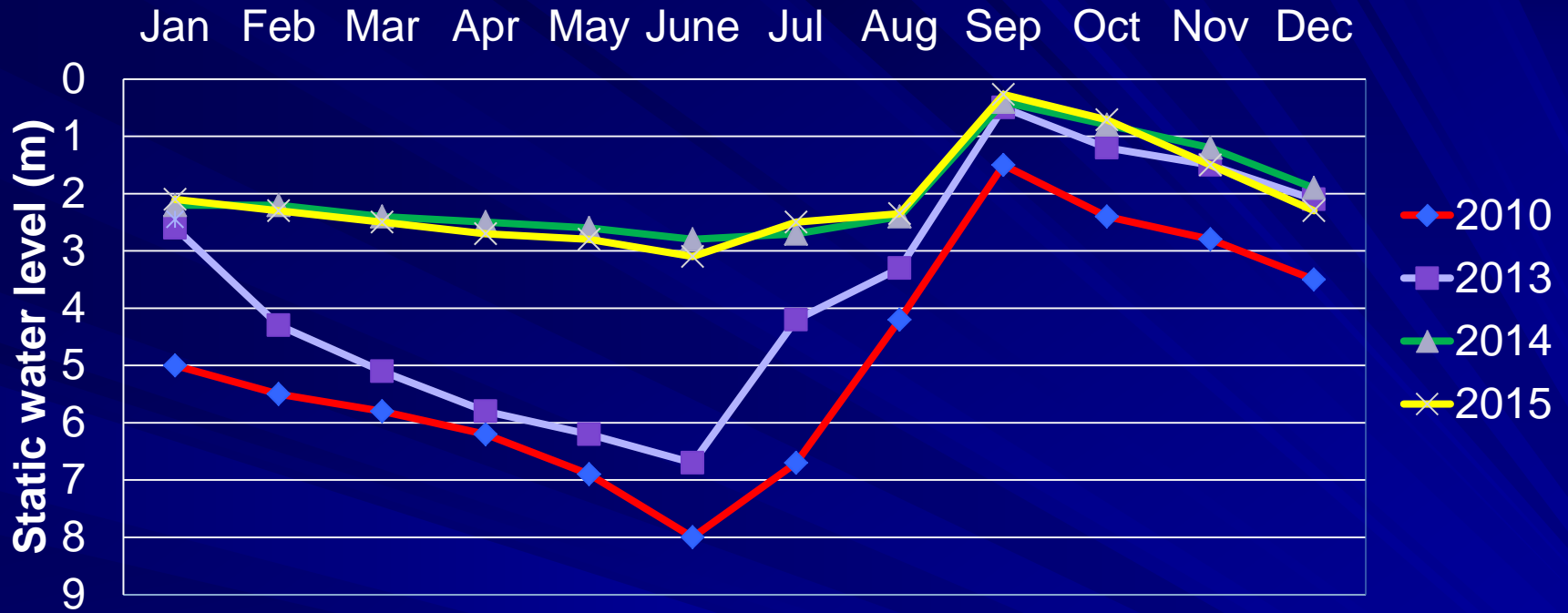


Productive shallow well developed for water supply.

Hand-dug wells for irrigation

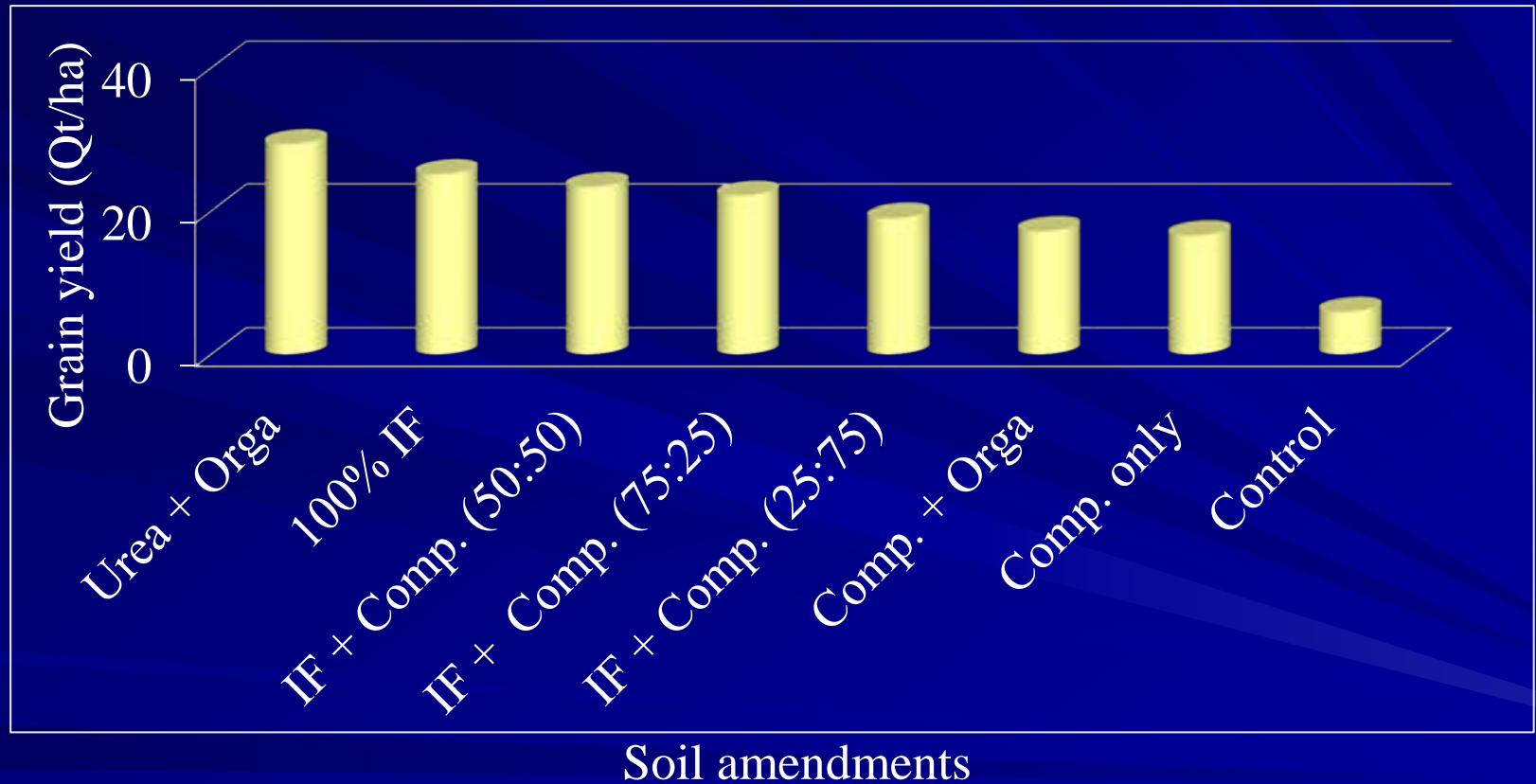


(a) Effects on groundwater level (m)

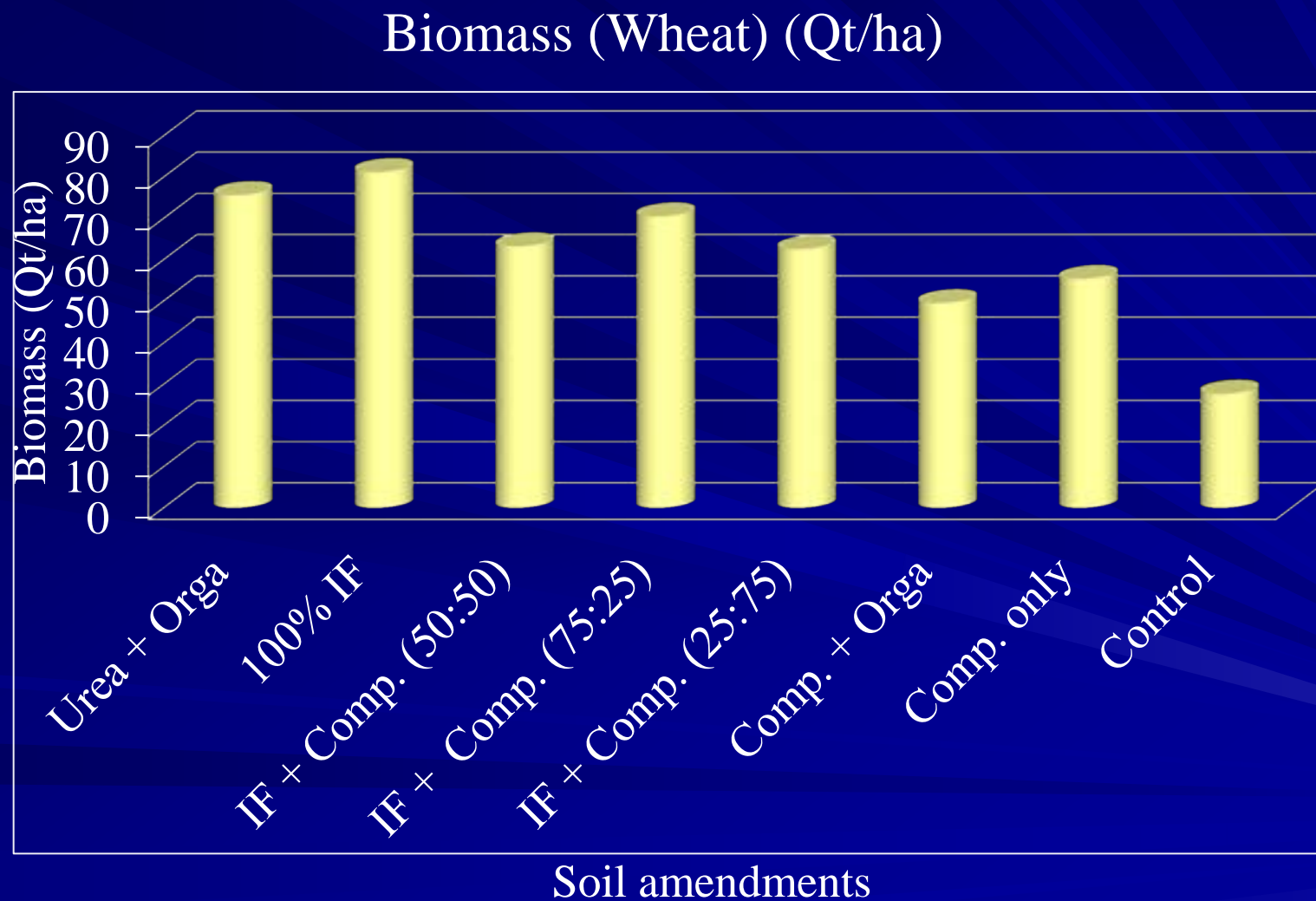


(b) Effects of soil improvement on grain yield, Gule watershed, Ethiopia

Grain yield (Wheat) for various soil amendments



(c) Effects of soil improvement on biomass yield, Gule watershed, Ethiopia





d. Bench Terraces: Design considerations

Definition:

- Bench terrace is an artificial land terrace with flat top and often nearly vertical side and used especially in series to convert mountainous slopes to arable land (as in certain Old World vineyards).

First Bench Terrace in Tigray (Zata area, Tigray, Ethiopia)



Second Bench Terrace in Tigray (Maychew area, Tigray, Ethiopia)

Typical Example of Bench Terraces, Ethiopia

Before (Photo: TBoARD, 2012)

After (Photo: Kifle Woldearegay, 2013)



Bench Terrace in Maychew, Tigray, Ethiopia



Some of the bench terraces developed in Tigray, Ethiopia



Most terraces are inward slopping with some level BT

5. Key findings and lessons learned

- **Bench terraces** are becoming among the highly accepted technologies used for creating land and enhancing food security.
 - **Implemented in 35 woredas**
 - **4300ha of cultivable land created until 2015.**
 - **17200 landless youth got land (0.25 ha each); 50% are women.**
 - **REST allocated 51 million Birr (2.5 million USD) in 2015/2016**
 - **Plan to introduce small machinery for constructing bench terraces**
- **Check-dams** have great contribution in: (a) reducing gully erosion, (b) enhancing groundwater recharge, (c) storing sediments and buffering moisture and enhancing moisture availability at landscapes.

Key findings

- ***Implementing IWSM/WHT at landscape level*** (afforestation, trenches, bench terraces, check-dams) has improved groundwater availability (from dry to water level upto 3m below surface) and created a landscape which is resilient to rainfall variability.
- ***Soil improvement*** with Effective Micro-organisms (EM) has proved to have a good potential for enhancing productivity.
- ***Involvement and mobilization of stakeholders*** is key for successfully implementing WHT.
- ***Linking research to government development agenda*** is key for success.

6. Acknowledgement

The project received funding from the European Union's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 265570 (WAHARA project).

Mekelle University would like to acknowledge EU for the financial support, and the whole consortium members for all the support.

A photograph of a terraced hillside covered in lush green vegetation, likely a coffee plantation. The terraces are visible as dark, stepped lines across the slope. In the background, more hills and a valley are visible under a clear sky. The image is framed by a dark blue border.

**Small-scale WHT bringing
large-scale impact**

Thank You