# Promoting water productivity solutions in a development context

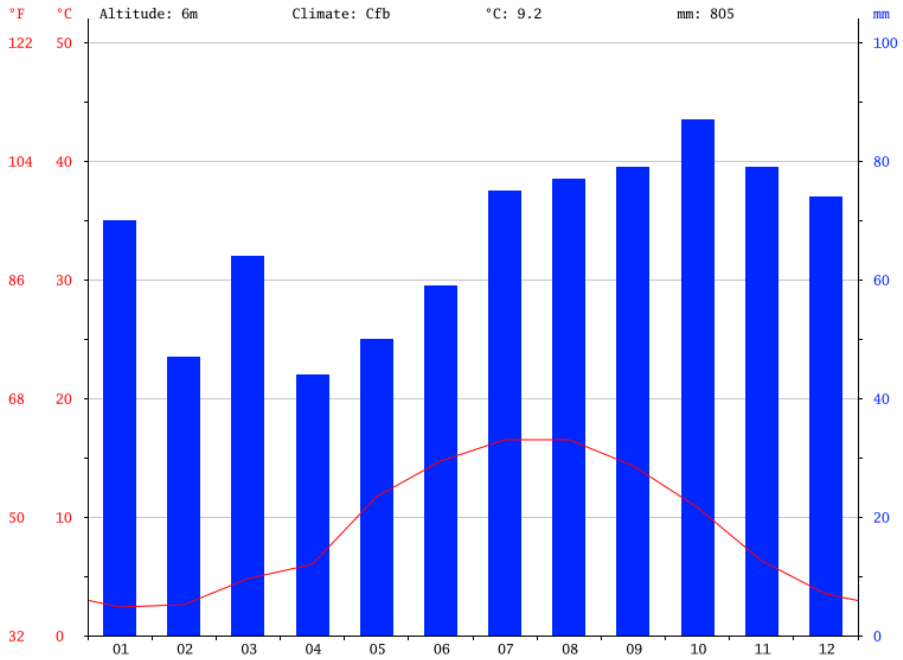

Water productivity in rain fed agriculture and horticulture workshop
10 may 2017 Amsterdam Maarten Onneweer

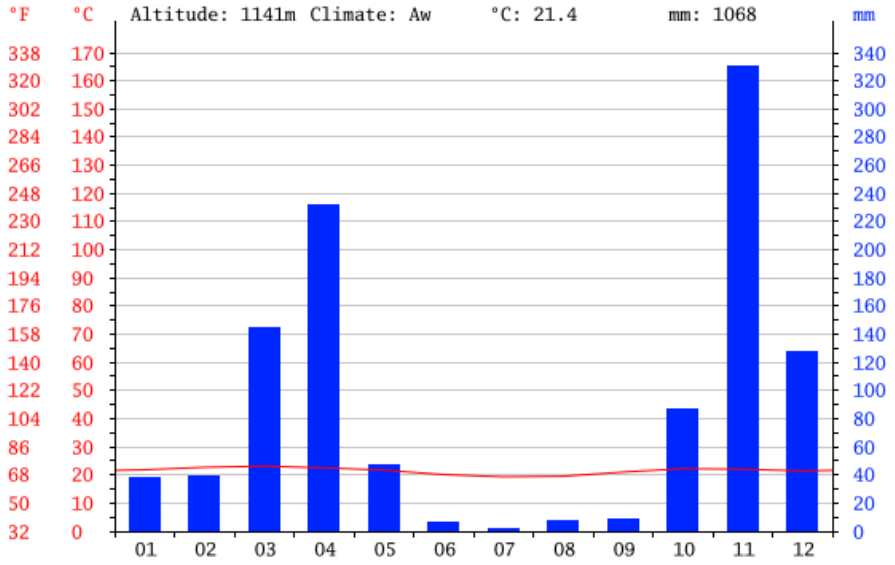
# Context of water productivity in Sub Sahara Africa: Social

- Subsistence farming without farm inputs
- Underappreciation of farm work as women's work
- Digital divide
- Rural/Urban linkages

Roughly 65 percent of sub-Saharan Africa's population relies on subsistence farming. The typical farmer in the region, however, is a woman with no fertilizer, no high-yield seeds, no irrigation, and no medication for her animals.
(New York Times)

# Context of water productivity in Sub Sahara Africa: Climate

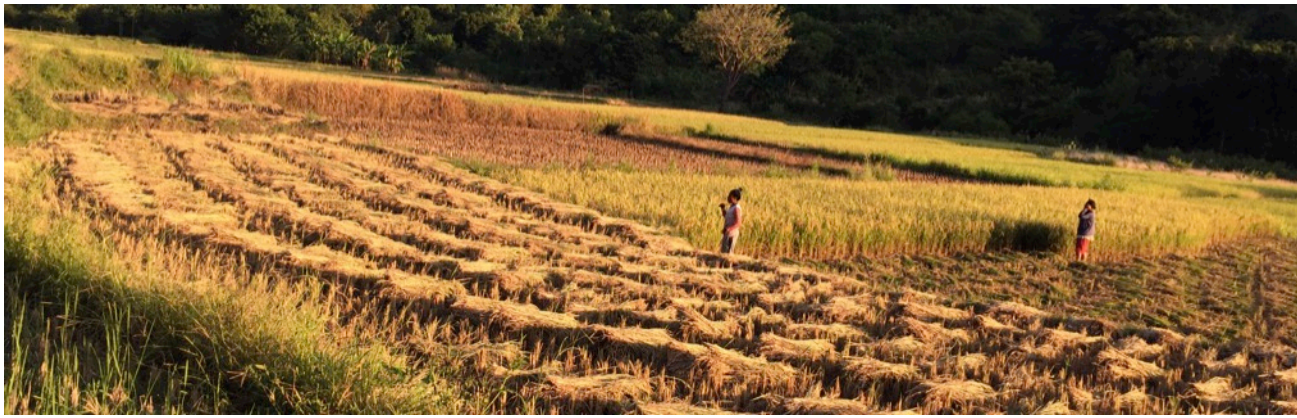


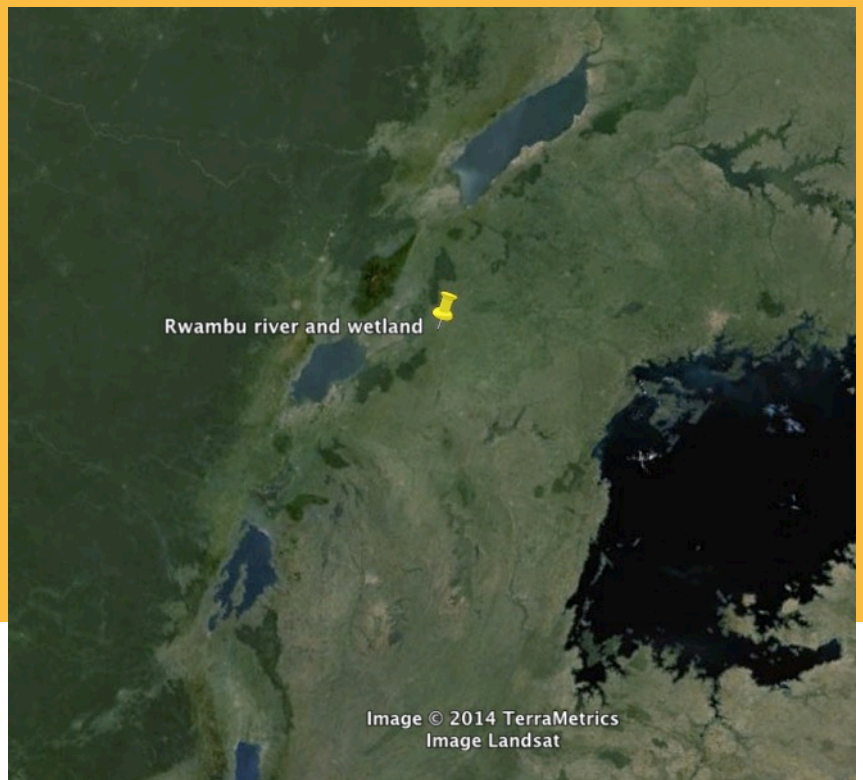
# Approaching water productivity from two angels

- Promoting and popularizing in situ measures

Working on Catchment based Water Resources Management (ex situ)

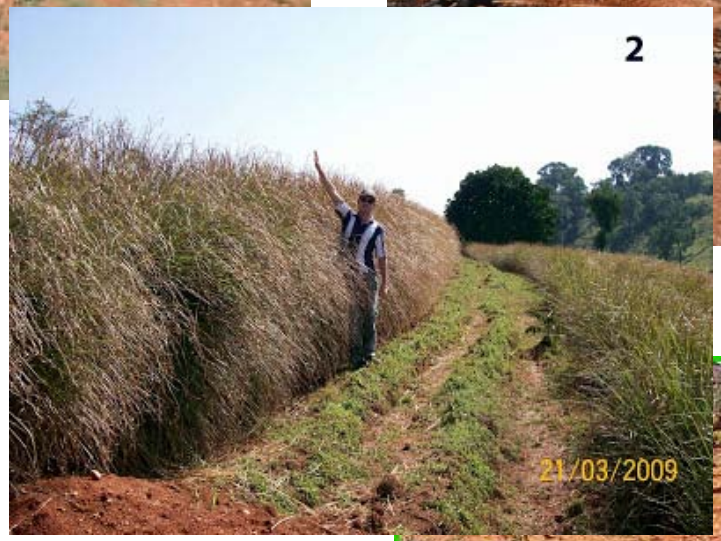


# Promoting and popularizing in-situ measures



# Technologies for water productivity

# And others




# Choices depend on slope, crops, soil, climate, available material and of course the kind of crop

| N° | Technology | Land use | Slope | Soil | Material of construction | Distance b/n bunds | Technologies that need to be incorporated / integrated with | Limitations | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| 1 | **Level soil bunds**<br><br>Could also be called Fanya chini which means "throw down"; "Fanya" means "Throw" and "Chini" means "Down" | Usually cultivated | Maximum 20% | All soils not common on heavy black cotton soils – this is b/c of swelling on wetting and cracking on drying. | Where stone is not available; stone-faced-soil bund | Depends on the vertical interval; on gently slope they are wide; on steep slope they are close each other. | Trenches if moisture and soil conservation is needed; need stabilized with suitable grass / legume for forage – also making it productive; cut and carry of the grass/legume than free grazing; maintenance according to fanya juu principle for quick benching | Compared to stone bunds they take more land; requires regular maintenance; the benching speed is low b/c deposited soil in the upper channel is removed for maintaining and upgrading the bund; too close spacing takes up land | **Vertical intervals**: flexible and quality oriented approach:<br>. Slope 3-8% VI = 1-1.5 m<br>. Slope 8-15% VI = 1-2 m<br>. Slope 15-20% VI = 1.5-2.5 m (only exceptional cases - reinforced)<br>(**Caution**: soil bunds > 15% to max 20% only if space reduced and with trench, short bunds - above 15% better apply stone faced or stone bunds).Layout along the contours using line level - discuss<br>spacing with farmers and in case of lateral slopes try to maintain lines as straight as possible by applying<br>reinforcements on depression points (to avoid curving a lot or cutting the plough line. Make bund length max 50-80m (the > the slope the < the length). For vertical interval determination see page 39 Part II of the guideline (a) to (d). |
| 2 | **Graded soil bund**; (the grade can vary from 0.5 to 1% i.e. 5 to 10 cm vertical drop for every 10m terrace length) | Cultivated land | Maximum 20% | Same as above | Where stone is not available | Same as above; | Graded is in high rainfall areas or for soils with poor infiltration; need stabilized with suitable grass / legume for forage – also making it productive; cut and carry of the grass/legume than free grazing; | The gradient is sensitive and difficult to maintain it. When small there is water logging and when large erosion / scouring occurs. Integration with waterways is a must | See page 39 the brown Guideline Part II); By the way terraces or bunds are like contours on the map. If you see the contour on a map in steeper areas they become closer while on gently slope they become far apart i.e. for a fixed vertical interval. |
| 3 | **Level Fanya Juu**; it means "Throw up" | Cultivated the slope should not be too steep | Maximum 15% | Deep soil | Only by soil need to be stabilized | Same as above | Trenches if moisture and soil conservation is needed; need stabilized with suitable grass / legume for forage – also making it productive; cut and carry of the grass/legume than free grazing; | Not possible on steep slopes; can not be crossed by livestock; more labor b/c throwing the soil up; close spacing takes up land. | Compared to conventional soil bunds mentioned above they take less land; see page 37 (Part II) of the watershed guideline on how to make contour Fanya juu i.e "level" |
| 4 | Graded Fanya Juu – | Same as above | Maximum 15% | Deep soil | Only by soil bund need to | Same as above | Biological stabilization; fodder | Same as above | with a maximum gradient of 1% discharges excess runoff generated from |

Table courtesy of F. Sambalino

# What people say:
# Testimonies from the field

David Rukyiloru:

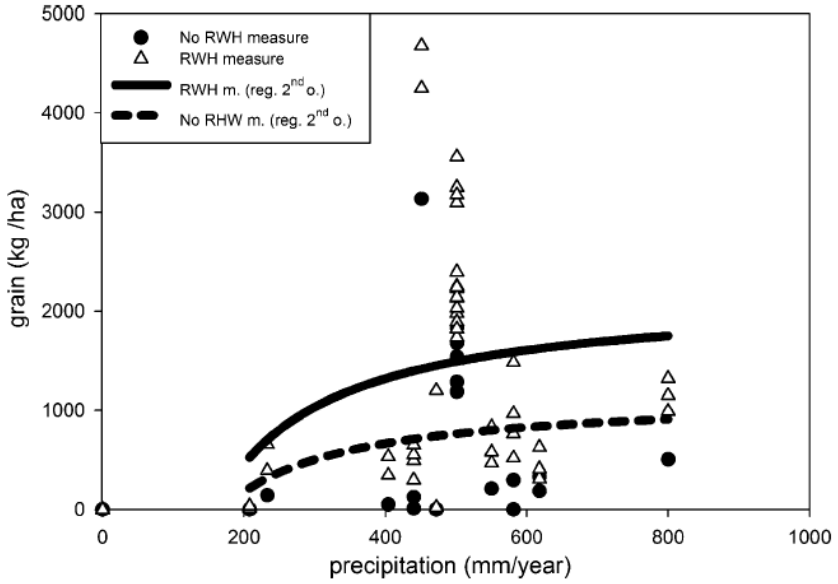
"I had sold off the productive portion of the land to pay the tuition fees for my children. The only choice I had was to start cultivating the land on the hill, but the soils were becoming continuously less productive due to erosion. I could barely harvest any crop."

David had already abandoned cultivating uphill, but became inspired again seeing how well his crops are doing. "Now that I have learnt how to restore my degraded land and to protect it from erosion, I plan to open up more land on the hill for cultivation

*Rainwater champions - Stories from Ethiopia, Kenya and Uganda*. Available from: https://www.researchgate.net/publication/281559836_Rainwater_champions_-

# Some statistics

| Intervention | Crop | farmers (n=27) | % of farmers (n=27) | Increase in yields (%) |
|---|---|---|---|---|
| Fanya chini | Banana | 10 | 37 | 59 |
| | Coffee | 13 | 48 | 56 |
| Stone Bunds | Beans | 1 | 4 | 60 |
| Grass strips | Coffee | 2 | 7 | 41 |
| | Beans | 1 | 4 | 0 |




Sources:


Kisekka et al. (in press) *Impact and constraints to adoption of in-situ rainwater harvesting: Experience from the Rwambu, Western Uganda.* Springer

Vohland, K., & Barry, B. (2009). A review of in situ rainwater harvesting (RWH) practices modifying landscape functions in African drylands. *Agriculture, Ecosystems & Environment, 131*(3), 119-127

. Mekdaschi, R., & Liniger, H. (2013). Water harvesting: Guidelines to good practice. Centre for Development and Environment.


## Production benefits

### Yield increase with MacroWH

| Crop | MacroWH | Country | Yield without MacroWH[1] (t/ha) | Yield with MacroWH[1] (t/ha) | Yield gain (%) |
|---|---|---|---|---|---|
| Maize (grain yield) [1] | Earth dam | Kenya | 1.38 | 1.80 | 30 |
| Sorghum [2] | Contour bunds and trenches | India | 1.75 | 2.40 | 137 |
| Vegetables [2] | Contour bunds and trenches | India | 5.00 | 7.00 | 140 |
| Cotton [2] | Contour bunds and trenches | India | 0.70 | 1.13 | 160 |

[1] For both treatments 30/80 kg N/ha fertilizer was applied. Without fertilizers, irrigation from the earth dam did not significantly increase crop yield (Barron and Okwach, 2005; WOCAT, 2012); [2] (WOTR, not dated).

# Challenges/opportunities

Labour availability

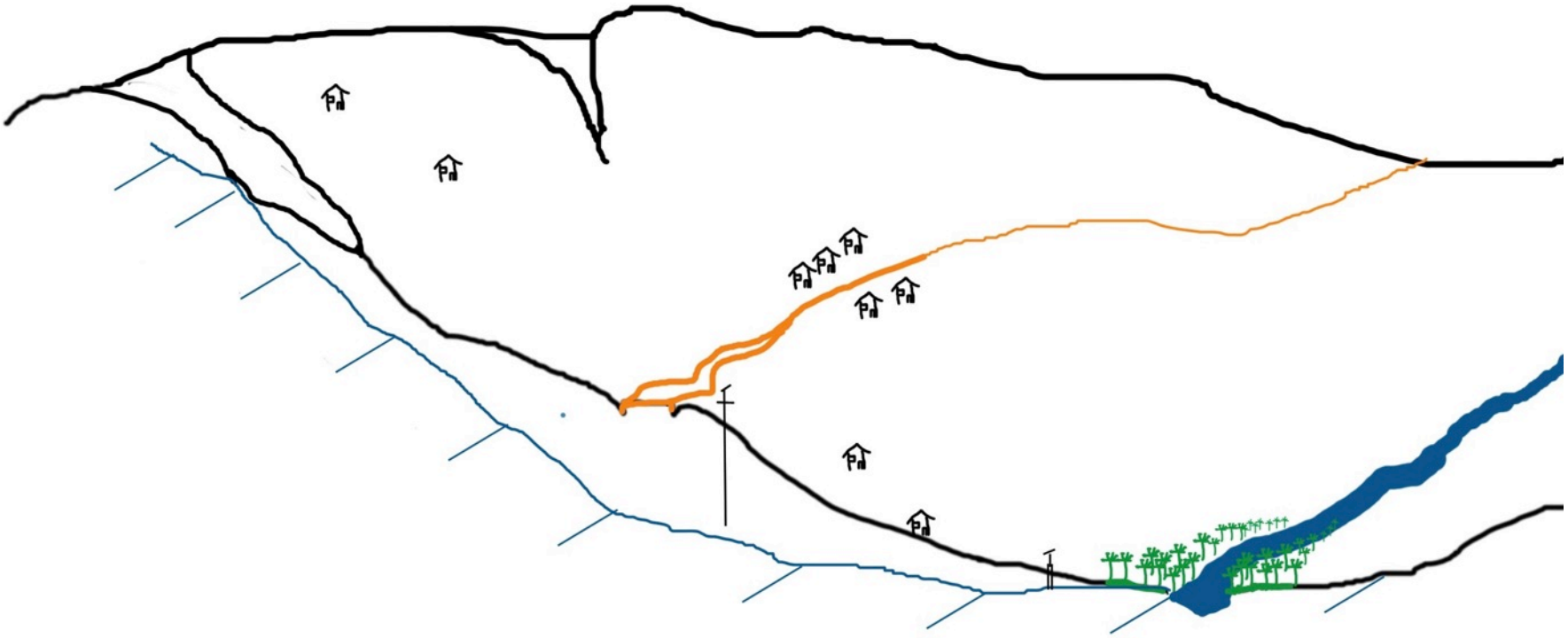
Maintenance

Incentives/motivation

And? Or what to do?

# Water productivity in Catchment based Water Resources Management

# In situ as part of a landscape approach: Rwambu Uganda



**Uphill issues**

Long walking distance to water-source
Few opportunities for agricultural expansion without possible soil erosion

**Slope issues**

Drop or of ground-water table, loss of soil moisture
Relativerly long walking distacne to watersources

**Village issues**

Existing watersources such as boreholes dried due to dropping watertable.
People suffer from waterborne diseases such as cholera/typhoid

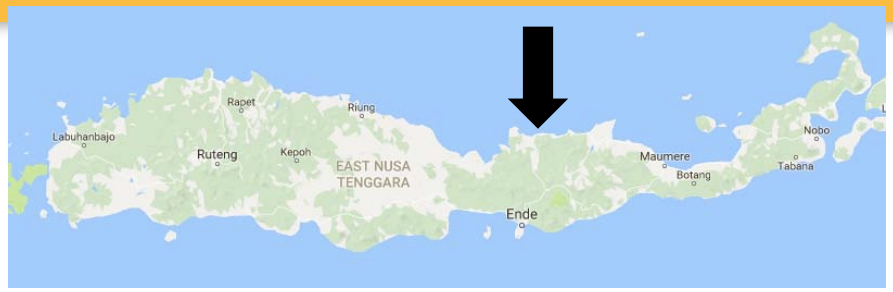
**Downhill issues**

Poluted watersources due to latrine infiltration or surface runoff off into open watersources

**Wetland issues**

Encroachment into the wetland, drainage of parts of the wetland

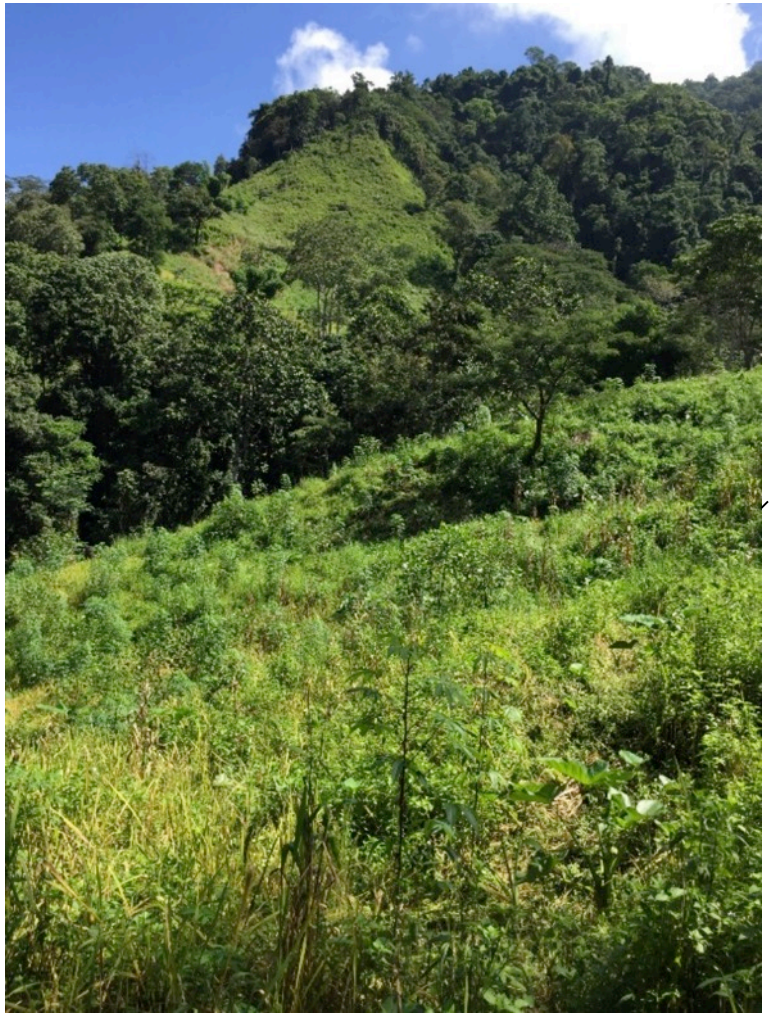
# Catchment level planning for water productivity: Flores Magepanda

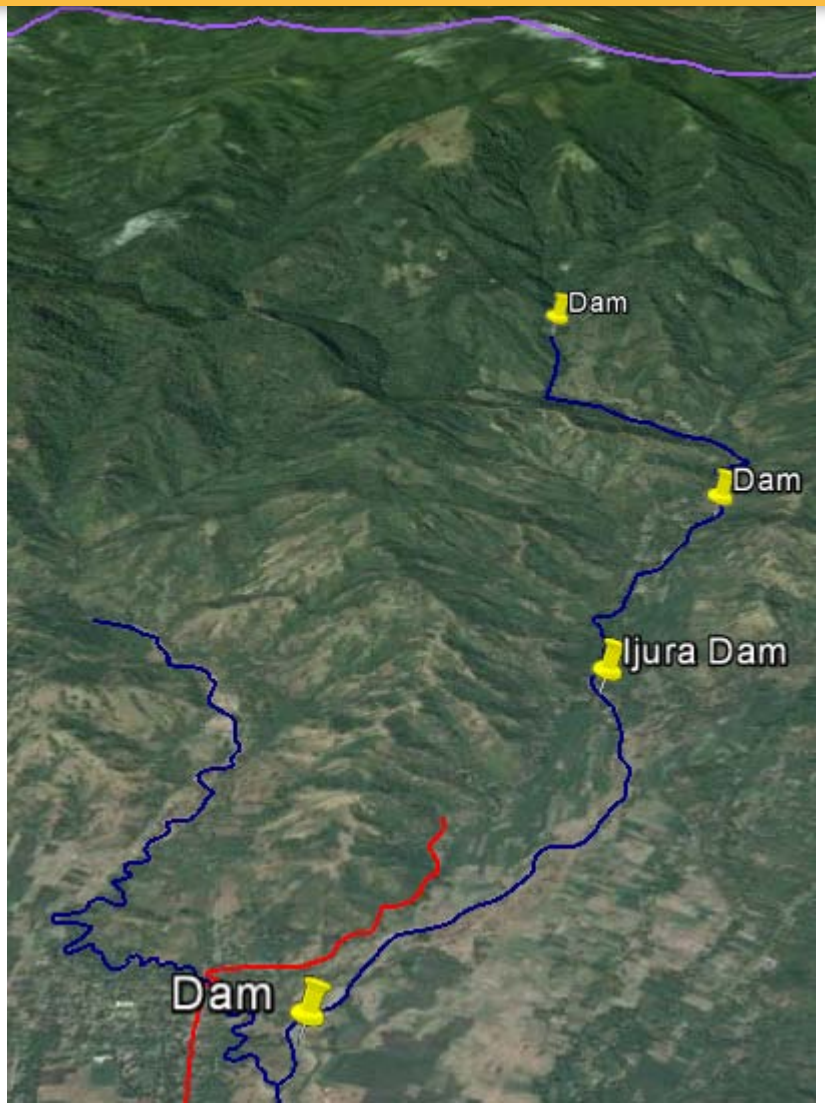



Problems:

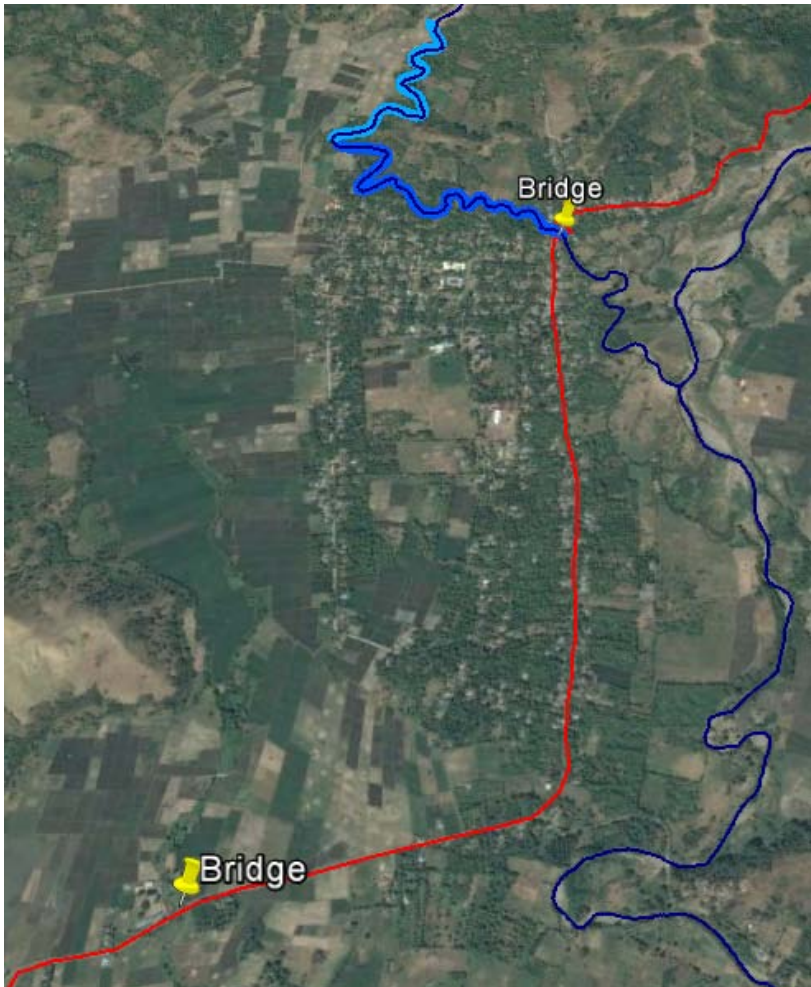
1. Upstream burning
2. Riverbank erosion
3. No regulation between dams
4. Over abstraction of ground water

# Uphill burning and deforestation

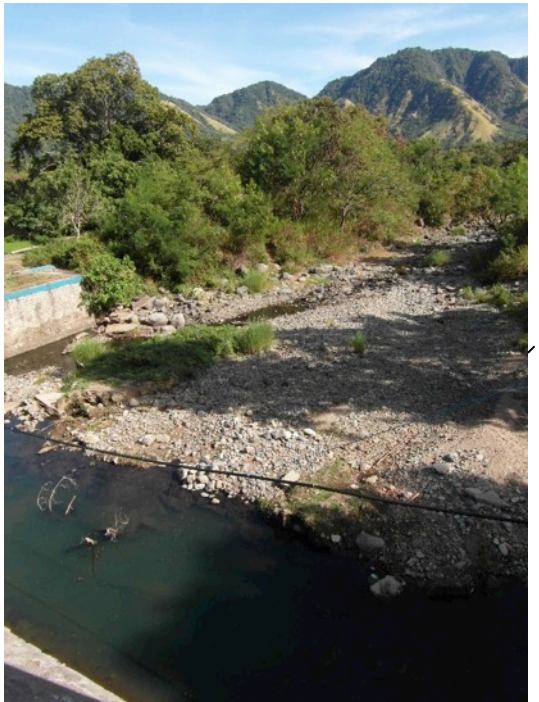


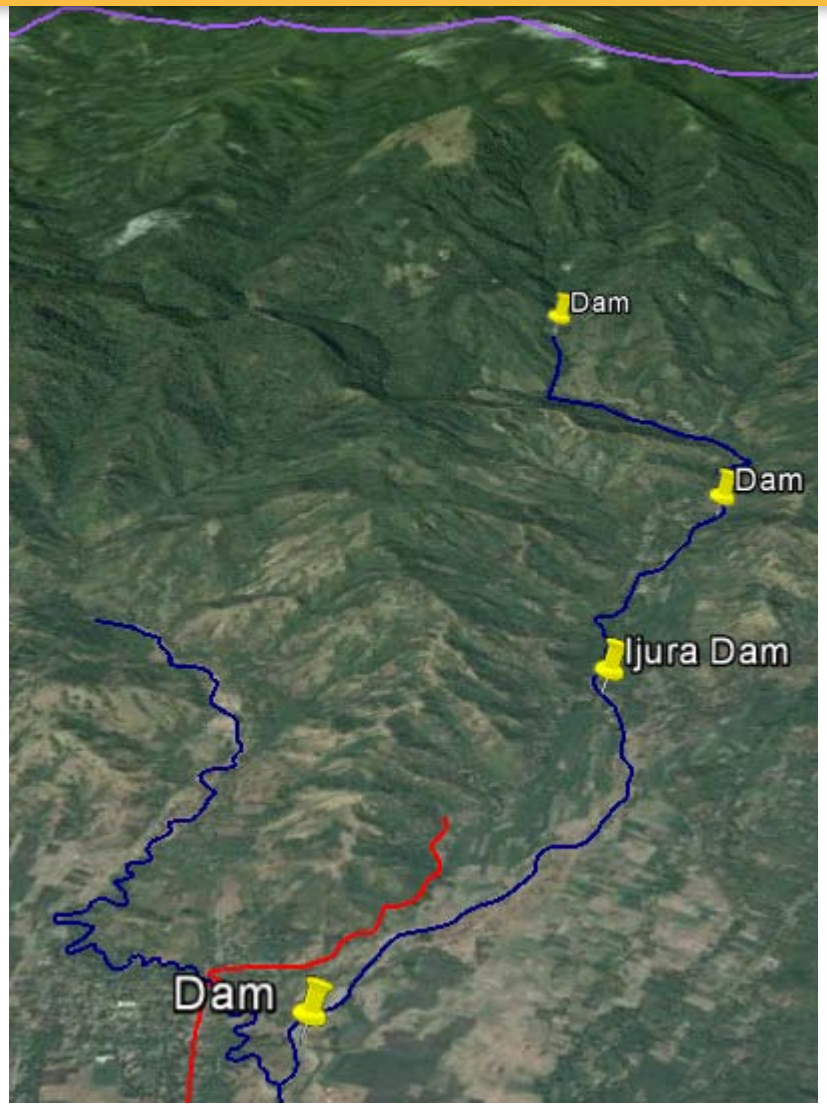


# Riverbank erosion

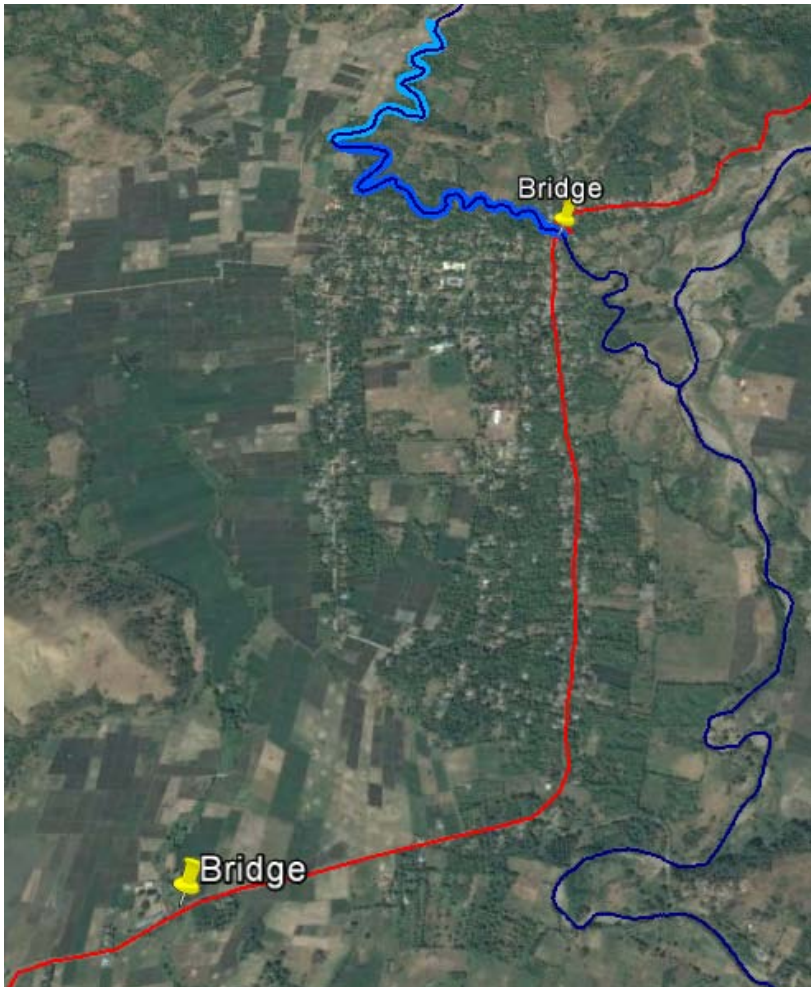


# No water governance

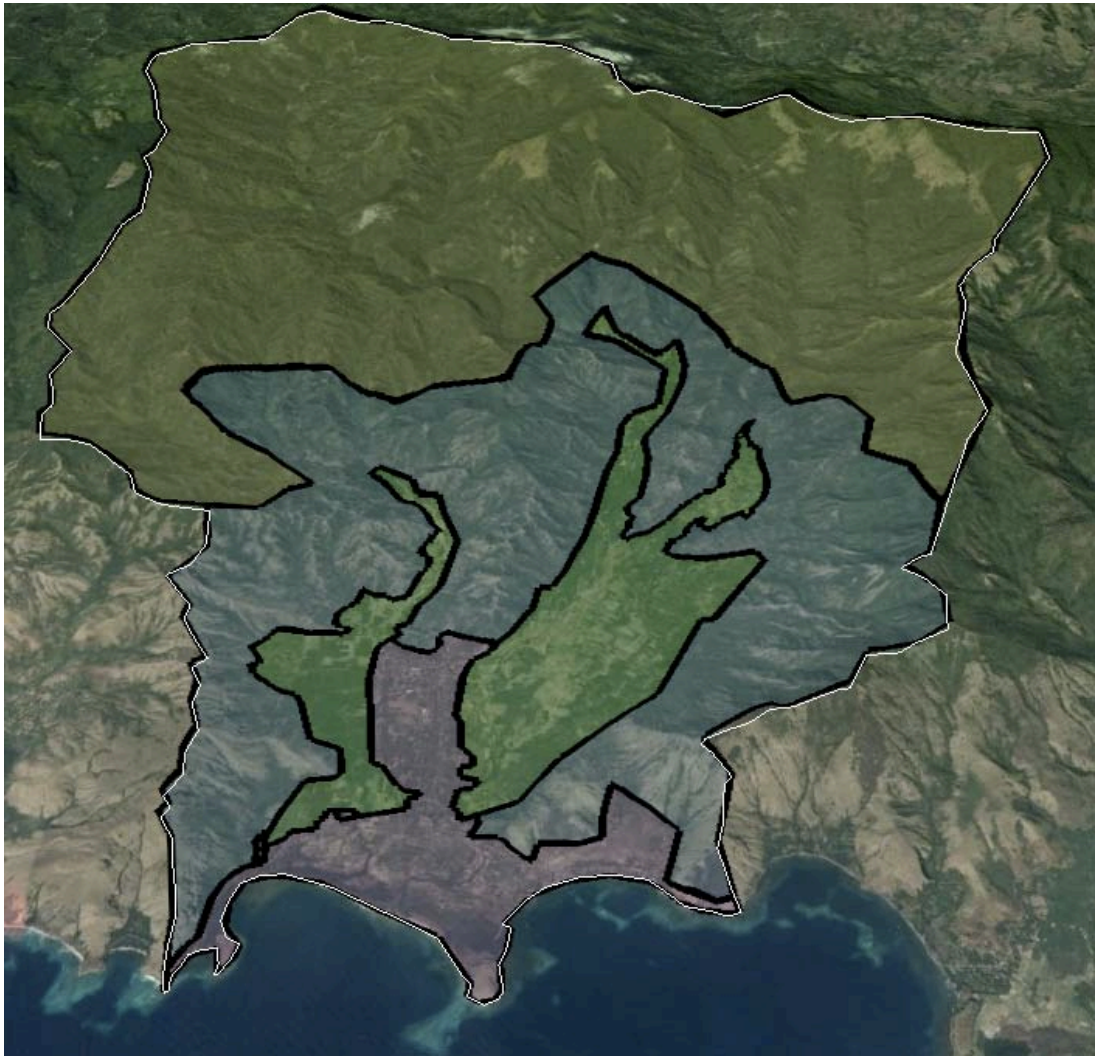




# Over abstraction of water



# Management through zoning



Water does not follow administrative/ethnic or country boundaries

Opportunities:
Catchment based water resources management
Higher water productivity in the catchment
3 rice harvests instead of 1,5

# Thank you