p4ges

can paying 4 global ecosystem services reduce poverty?

www.p4ges.org

The impacts of land uses change on hydrological ecosystem services: *communicating facts for sustainable land use*

Maafaka Ravelona

Presented by:

Maafaka Ravelona

mr667@cam.ac.uk

Co-authors:

Chandra Prasad Ghimire
Ilja van Meerveld
Julia Jones
Bob W. Zwartendijk
Jaona Lahitiana
Herintsitohaina Razakamanarivo

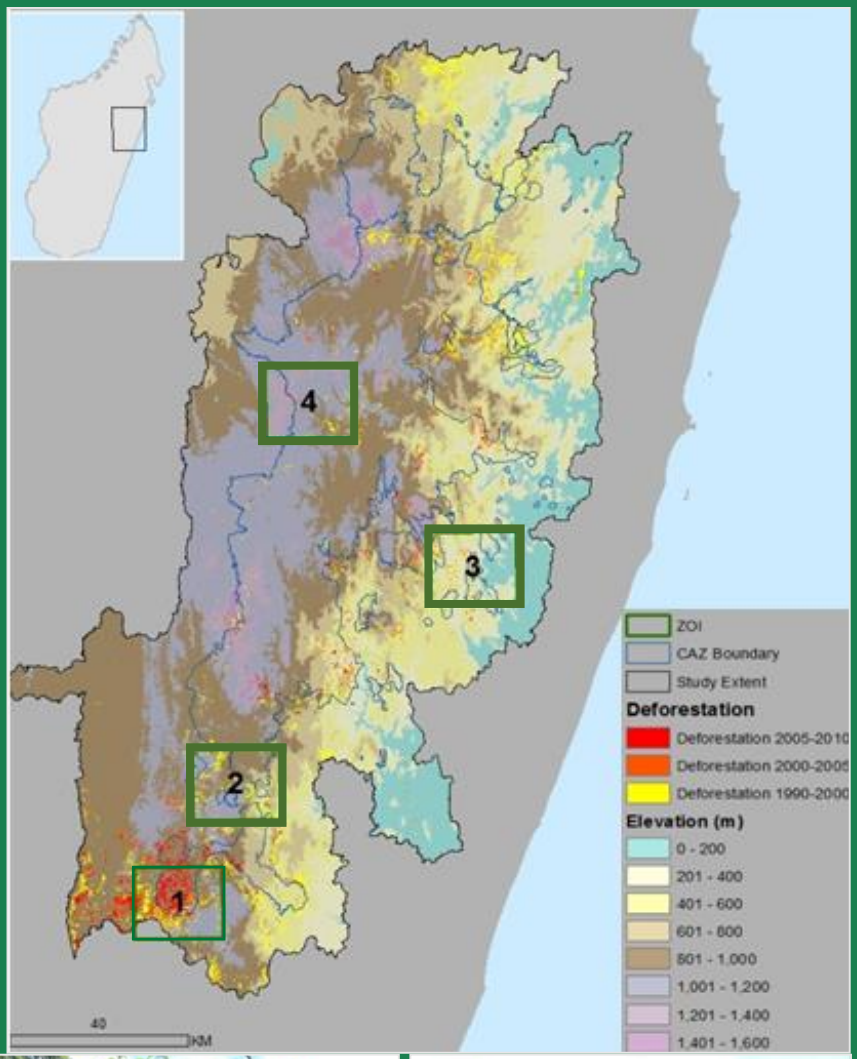
Presentation Overview

1. p4ges project
2. Context in Madagascar
3. Hydrological research
4. Engaging the community & policy makers
5. Conclusion

P4ges seeks poverty alleviation through ecosystem services

Biophysical integrated data collection:

- Hydrology
- Biodiversity
- Carbon
  - Closed canopy forest
  - Tree savoka (Tree fallow)
  - Shrub savoka (Shrurb fallow)
  - Tany maty (degraded land)
  - (Reforestation)



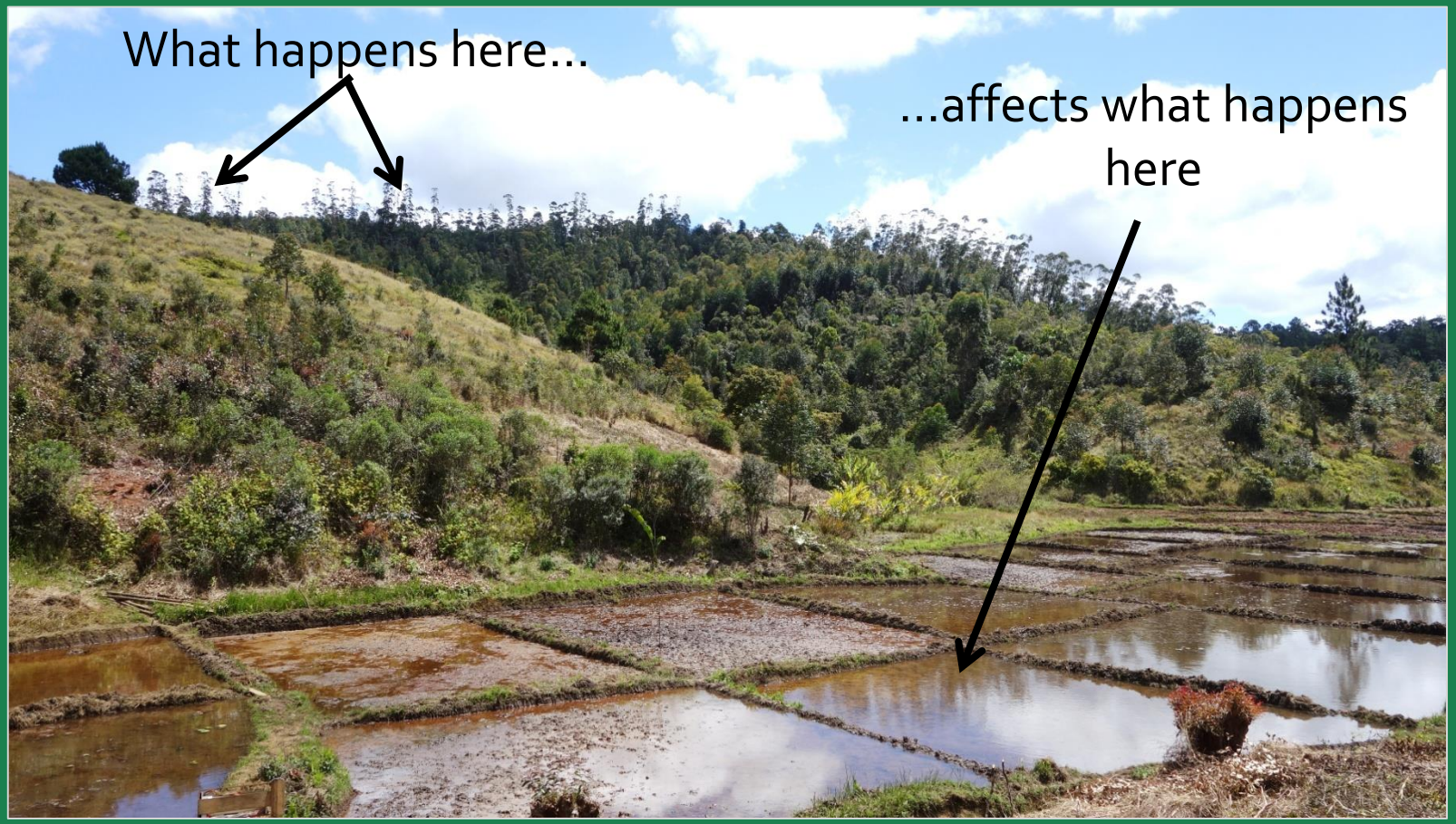
Streamflow affects our daily lives
low flow periods

Streamflow affects our daily lives
flooding

Local and regional water resources: Our daily reality

- Too much water – flooding and loss of crops
- Too little water – not enough water for irrigation and rice production

Land use affects local and regional water resources

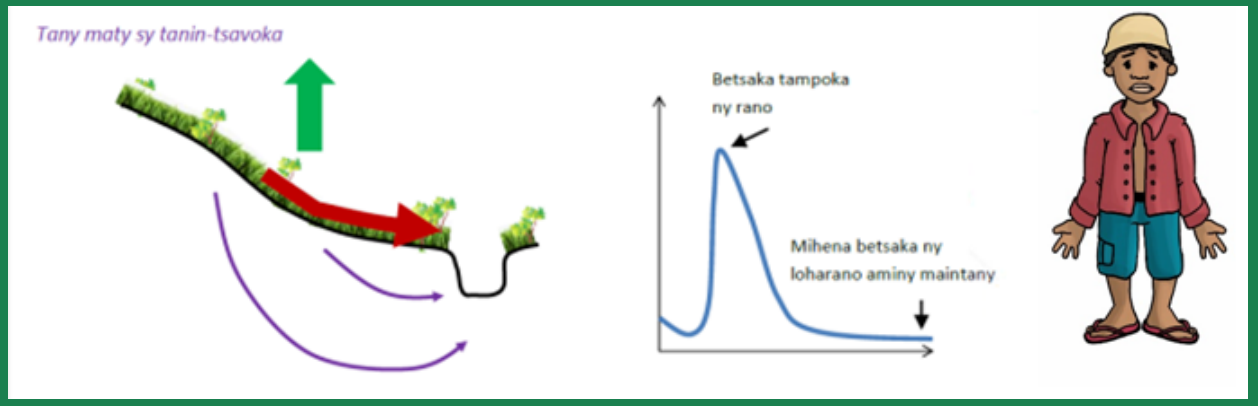


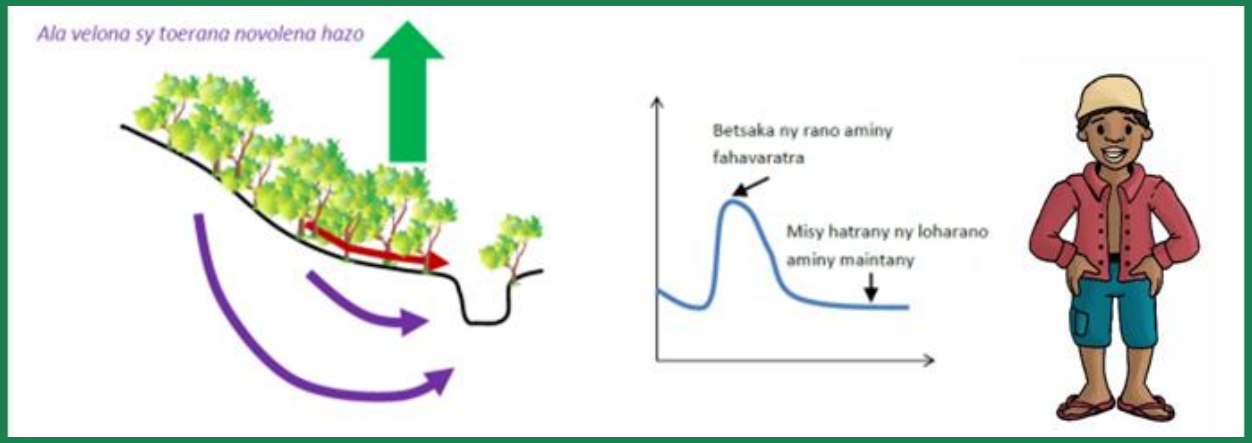
P4GES Hydrological Research: Objective

- To determine hydrological impacts of land-use changes on dry season flows

Hydrological research: Hypotheses

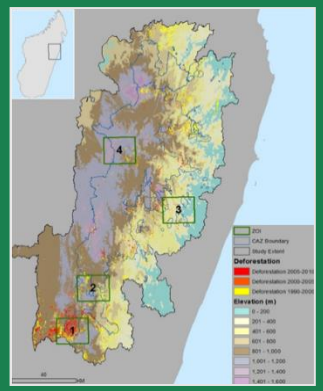
1. Land degradation leads to more surface runoff, higher peak flows and lower dry season flows
2. Reforestation can reverse this trend



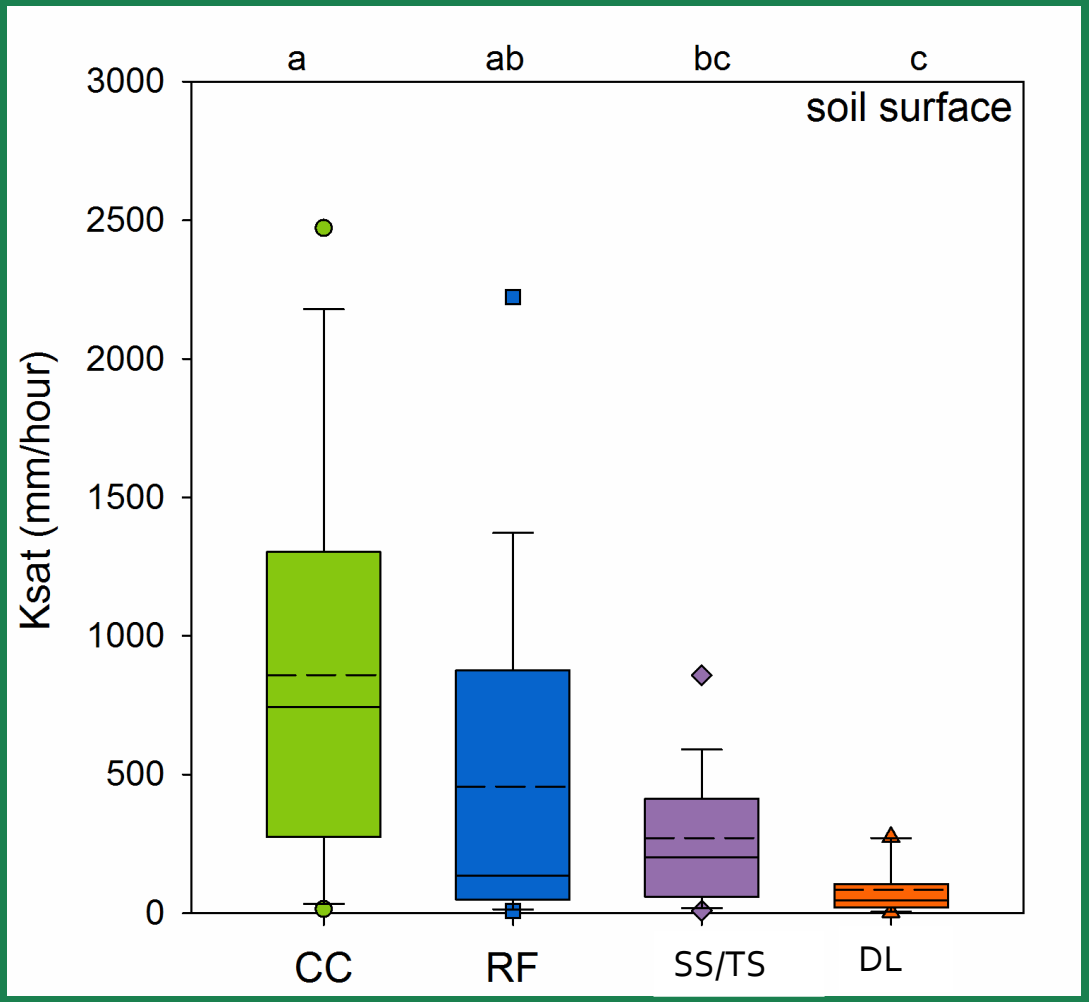


Landscape scale measurements

- Soil properties: texture & structure
- Soil infiltration rates (at 3 depths)
- Preferential flow pathways



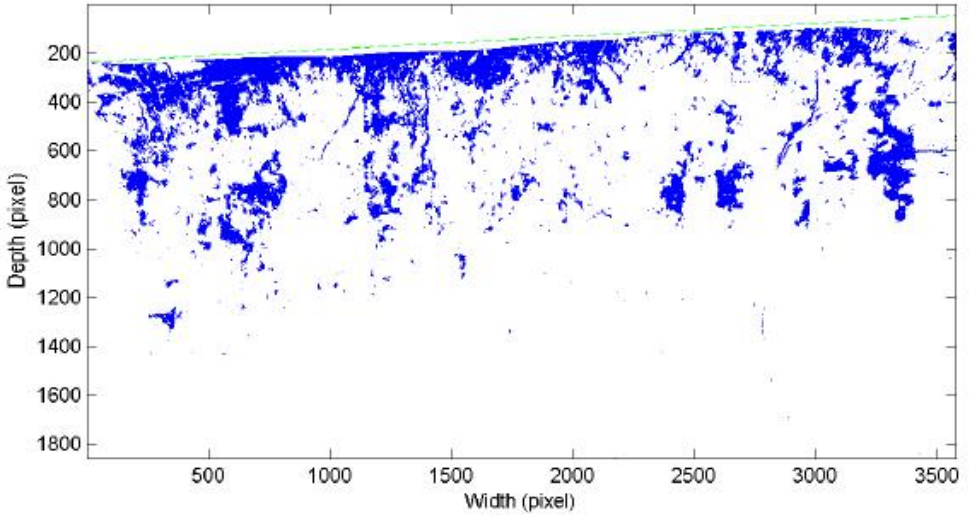
Infiltration results



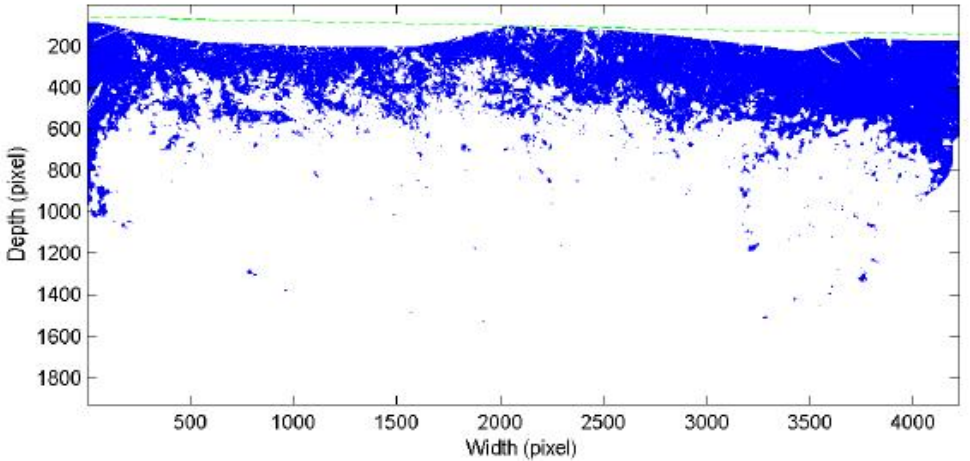
Blue dye experiment
to determine how water flows into the soil

Dye experiments

Reforestation



Degraded land



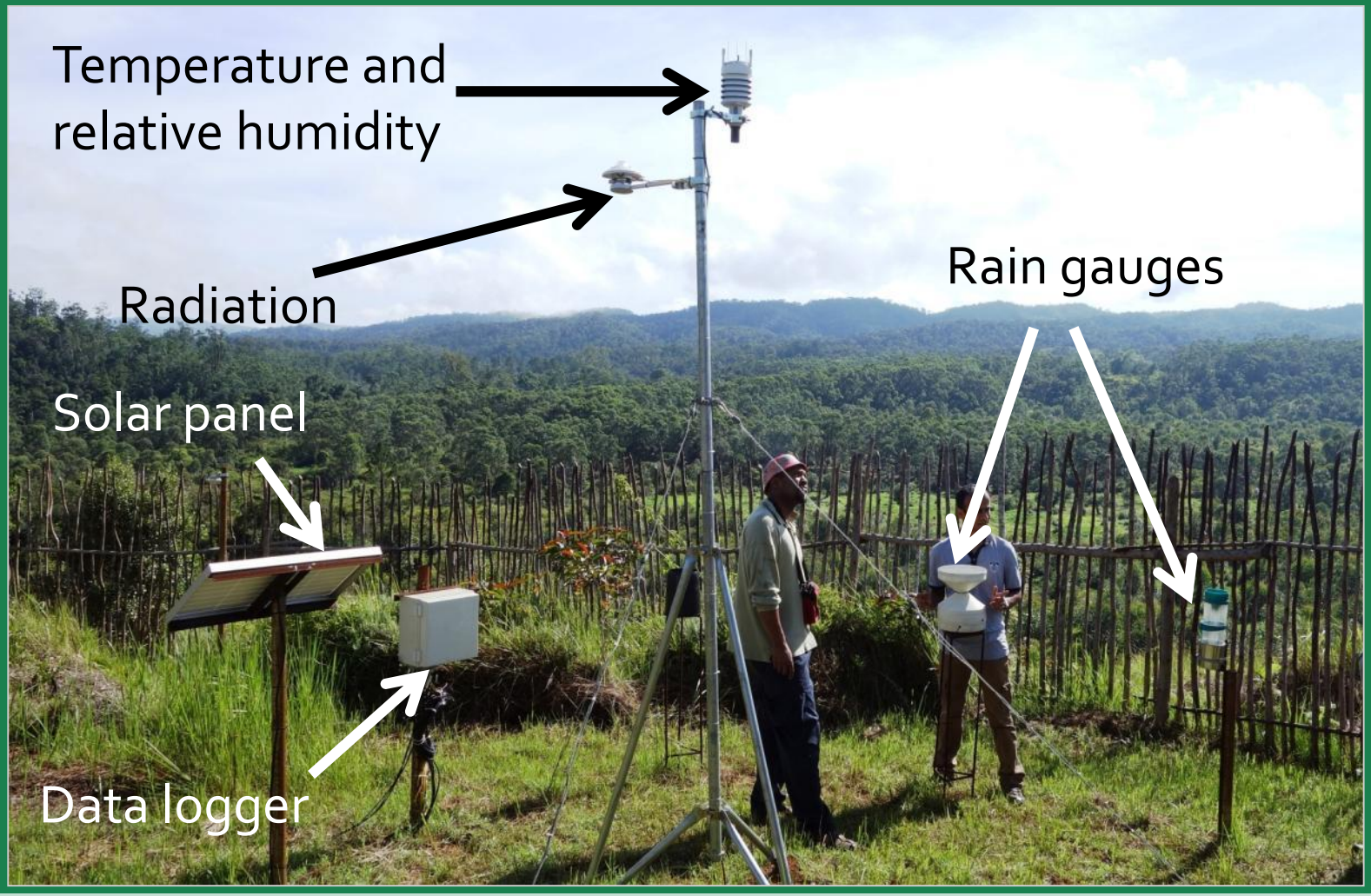
Plot scale measurements

Three plots (forest, tree fallow and degraded land):

- Hydrological fluxes (precipitation, interception, transpiration, surface runoff)
- Changes in soil moisture and groundwater

Weather stations

Determine evaporation and precipitation rates



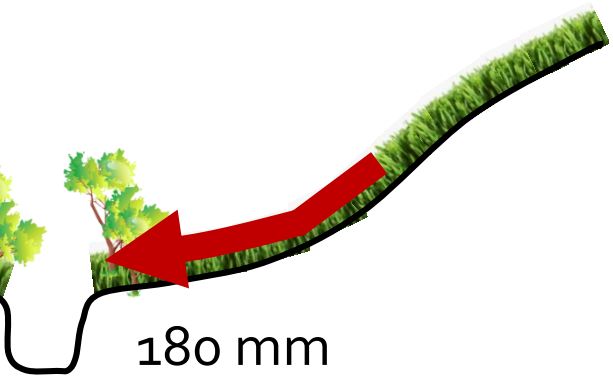
Runoff plots

Determine how much water flows over the surface

Surface runoff 1 year period: Oct 2014-Sep 2015

degraded

1650 mm

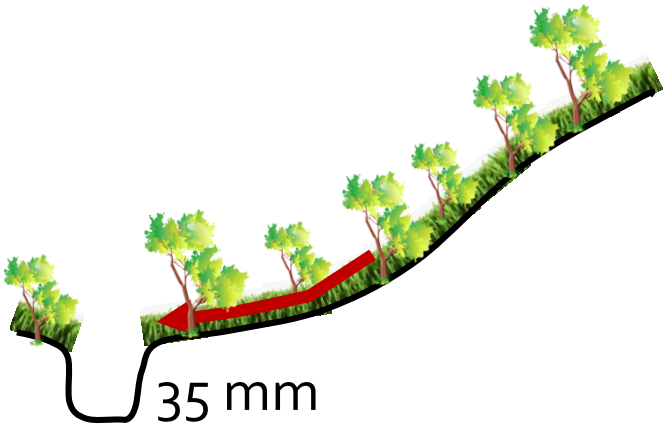


180 mm

11%

reforested tree fallow

1630 mm

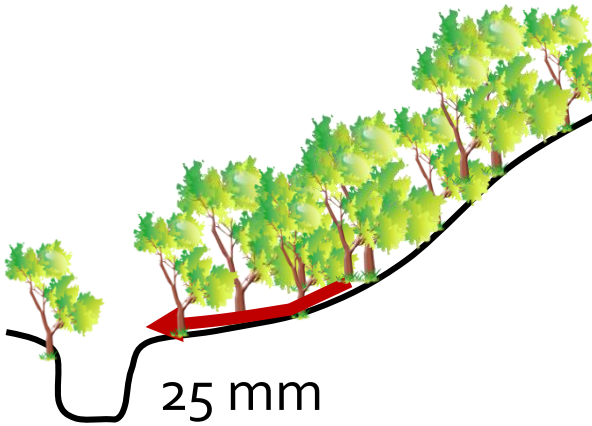


35 mm

2.1%

closed canopy forest

1750 mm



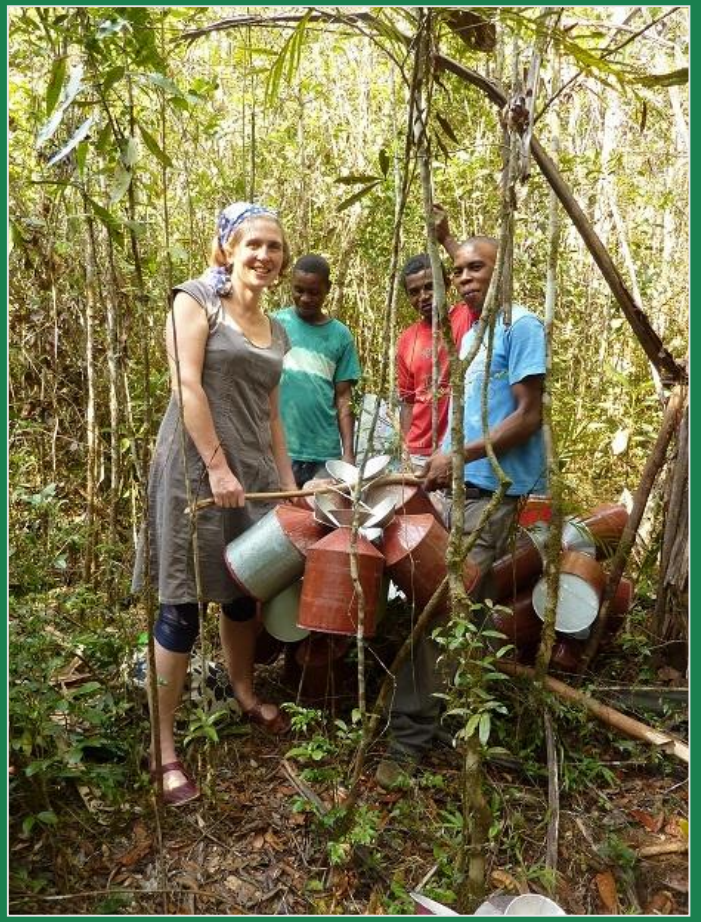
25 mm

2%

Additional measurements in forest

Rainfall measurements under the forest canopy

Measurements of tree water use



Throughfall: Nov 2014-May 2015

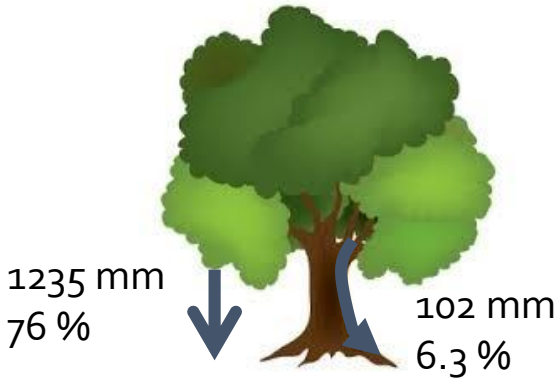
degraded

1650 mm

1650mm
100%

reforested tree fallow

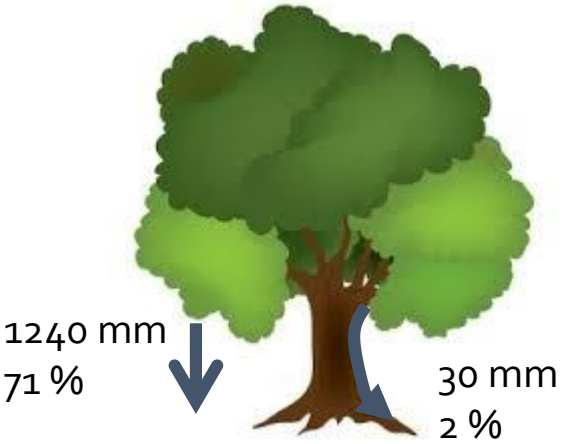
1630 mm



1337mm
82.3%

closed canopy forest

1750 mm



1270mm
73%

Fieldwork summary

Results suggests that

- Infiltration rates are lowest under degraded land and increase after reforestation or natural regeneration to tree fallow
- Surface runoff is highest for degraded land and lower for reforestation and forest sites
- Differences in interception losses between forest and reforestation sites are small

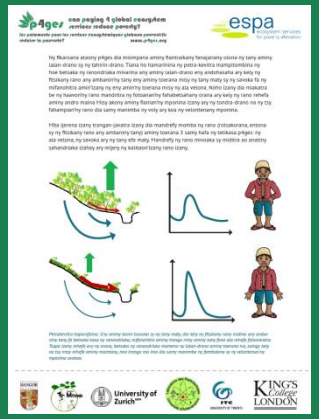
Researcher and local workers explaining their observations

Engaging the community

- Strong partnership with Mitsinjo Association (facilitated work on 2 field sites owned by the Association)
- Capacity building, including training and in field experience
- Strong cooperation with local workers
    - Local project ownership, participation, discussion and feedback on results and impacts on livelihoods

Engaging the local community

- How can we help them make good decisions around land use?
- First step: communicating and explaining the project results
- Understanding how results impact their daily life and supporting communication between neighbours
  - Same language
  - Same perception
  - Same status
- Encourage feedback to P4ges



Engaging policy makers

- Events (including field visits) to showcase the measurements and the results
- Facilitated national /regional media opportunities
- Asked for impressions, feedback and likely land use change scenarios.

"This work is extremely interesting and it is so good to visit it and see the equipment in the field. If you just watch a presentation you don't get the full understanding"
Dimby Razafimpahanana - Rebioma

"…our wish is that the final report of this project won't just fill the scientific shelves but will be communicated to the local people and have a real sustainable impact on their livelihood, indeed for poverty alleviation".
Former President of Mitsinjo Association.

In conclusion

- A better understanding of the result stimulates local solutions and empowers communities to make decisions that affect their livelihoods.
- Beyond local communities, we need to communicate the research results to policy makers.
- Next step: December 2015 - Restitution led by the local workers to:

  - further showcase the results

  - share knowledge to promote understanding of the effects of land use decision.

ACKNOWLEDGMENTS