



Integrated landscape management: Africa RISING R4D experiences in the Ethiopian highlands

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Land degradation is serious challenge in Ethiopia

Due to population pressure:

- Reduction in farm size
- Expansion to steep slopes and marginal areas
- More nutrient mining, degradation
- **Direct cost of soil loss and its essential nutrients reaches \$106 million a year.**
- Rainfall variability adds more pressure

Sustainable
Intensification





Sustainable land and water management should be integral component of SI

- Intensification at plot/farm level can not be sustainable if landscapes are degrading.
- Need to marry intensification at plot level with integrated land and water management at landscape level.
- Huge effort underway in Ethiopia: climate resilient green economy.
- Pledged to restore 15 Mha by 2030.



Getachew Engdayehu- ANRS BoA, NRi



Initiative 20x20

afr100



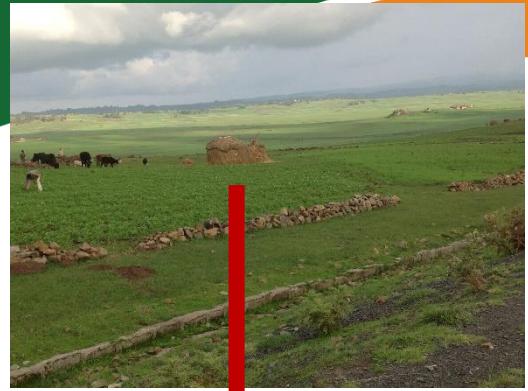
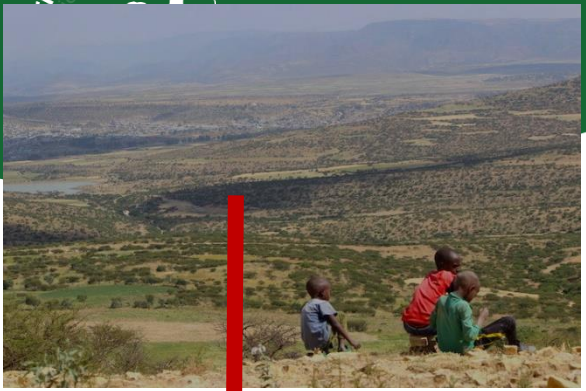
Problems facing the solutions

Great impact at different levels but with challenges

- ✓ Loose inter-sectoral integration undermining synergies
- ✓ No adequate strategies to manage trade-offs
- ✓ Limited incentives to encourage farmers as watershed management interventions have long-return period
- ✓ Incompatibility of options – restrict adoption
- ✓ Absence of adequate indicators and monitoring mechanism – thus no clear evidences of impacts especially at landscape level

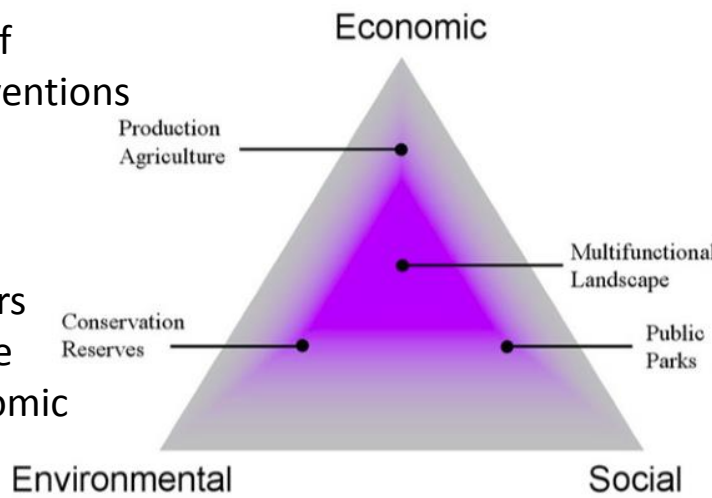


'Solutions' to tackle "problems of the solutions" - "multifunctional landscapes"



➤ Enhance the "economic value" of interventions - 'profitable' interventions while ecologically feasible.

➤ A multifunctional landscape offers opportunities to provide multiple environmental, social, and economic functions to different users.



Lovell and Johnston, 2009



Efforts under the Africa RISING project

1. Situation analysis

One of the reasons for lack of generating adequate evidences is absence of baseline data!



Automated weather station



Soil moisture measurement



Infiltration measurement



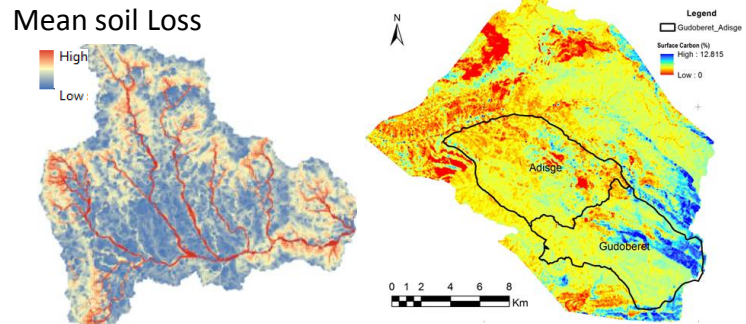
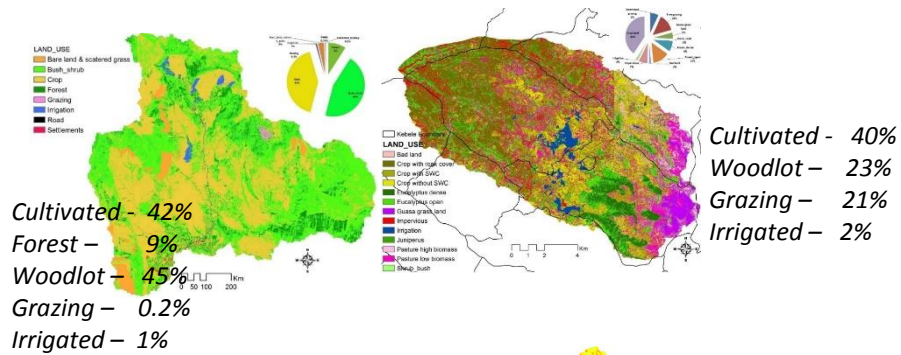
Interview - what farmers perceive of interventions



Soil sample



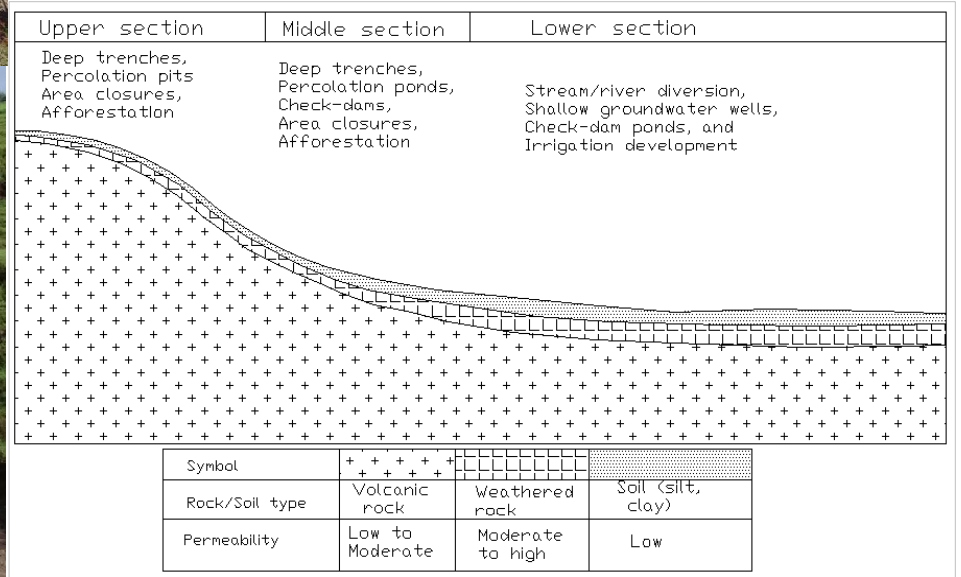
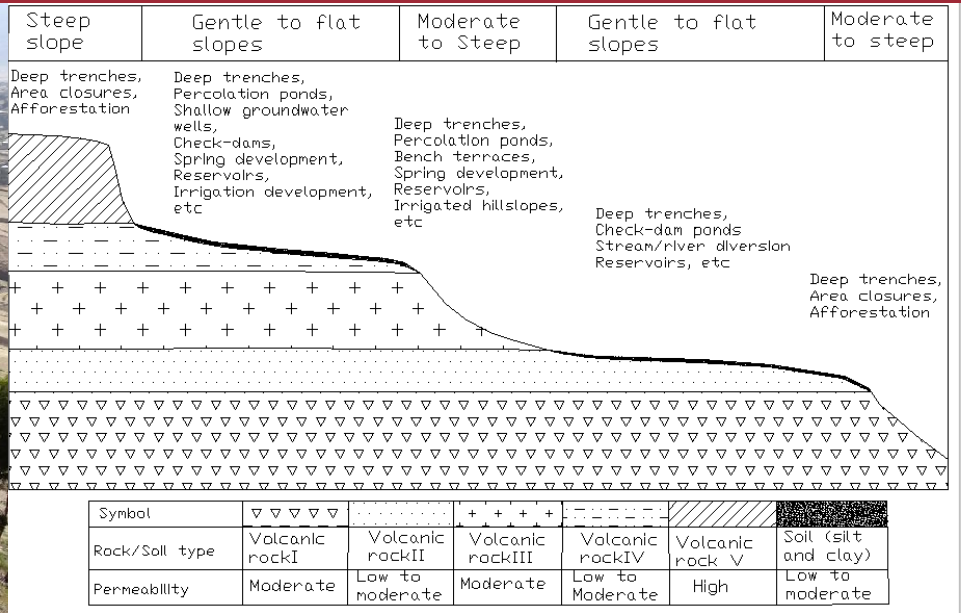
Hydrological stations



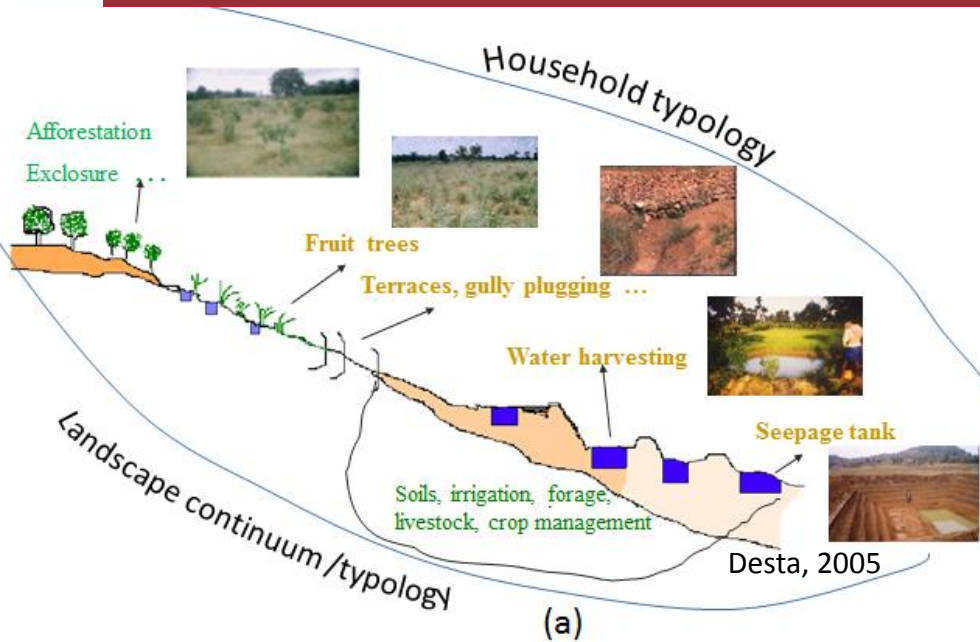
Data collection sites are co-located



2. Model/framework to match option with context to facilitate implementation and out-scaling



3. Co-identify integrated interventions following the landscape continuum



Develop 'recommendation domain' to facilitate implementing site- and context-specific interventions to enhance synergy

Complementary interventions across the landscape can help generate multiple services that benefit multiple users/stakeholders which can also minimize competition/conflict, etc.) and enhance sustainability





4. Capacity development

Trainings and exchange visits to successful sites



Seeing is believing!

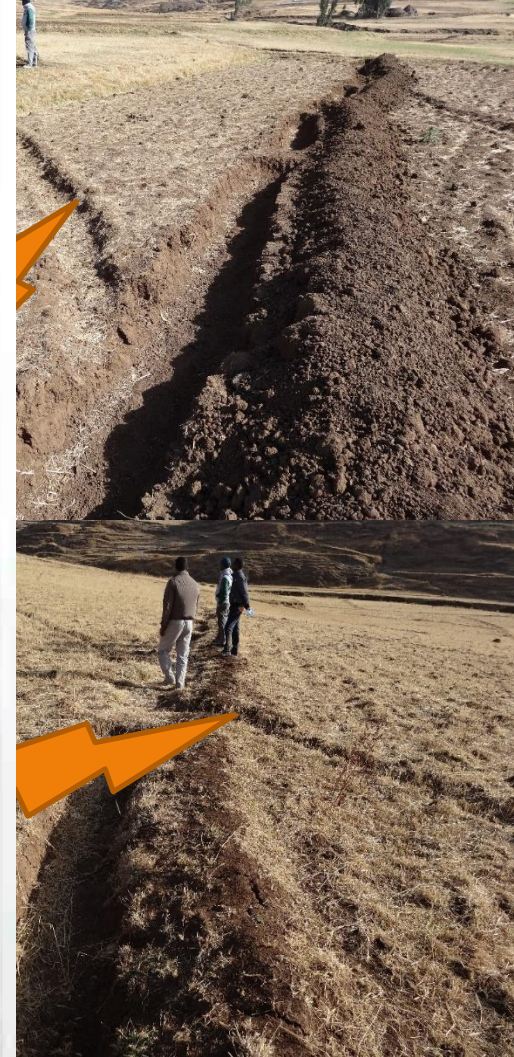
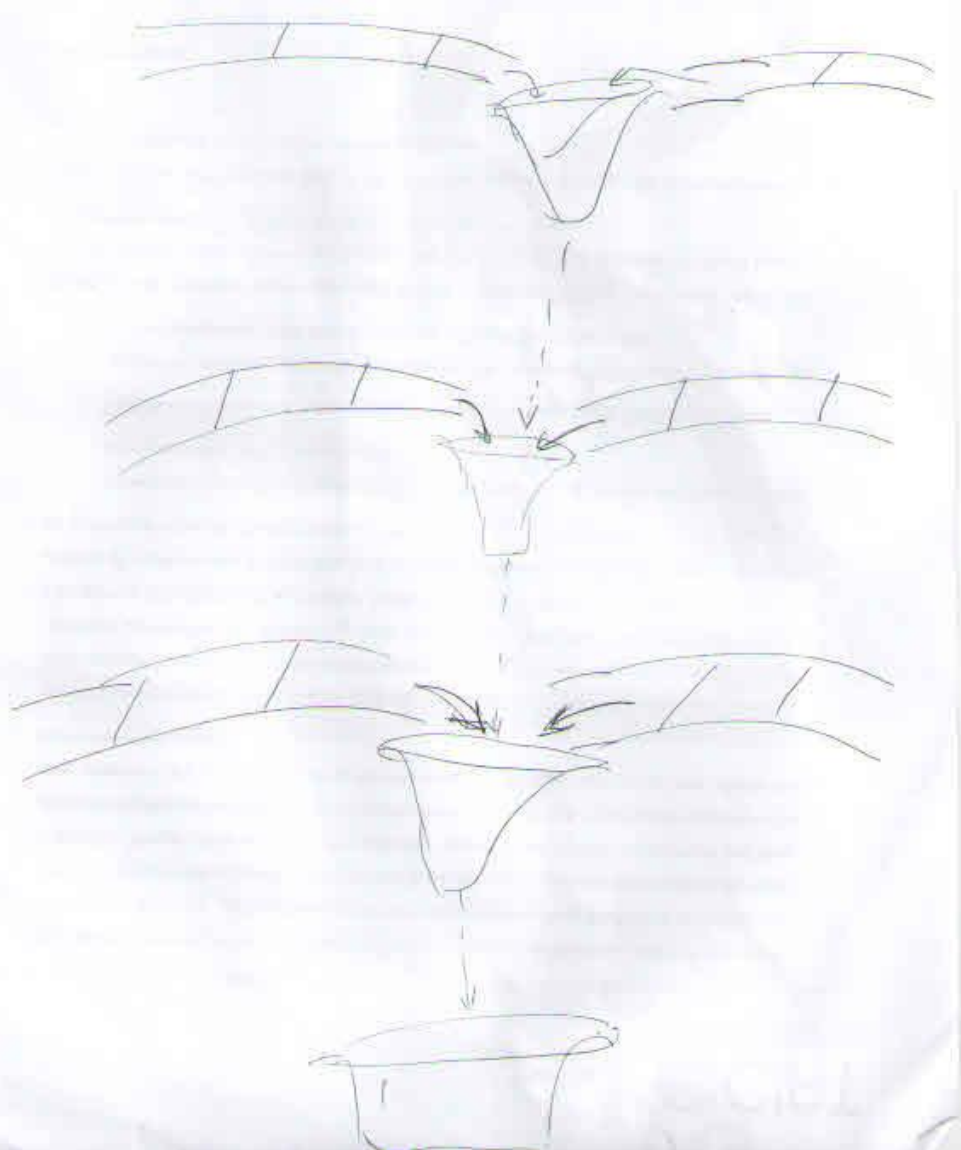


5a. Co-implement interventions and monitor



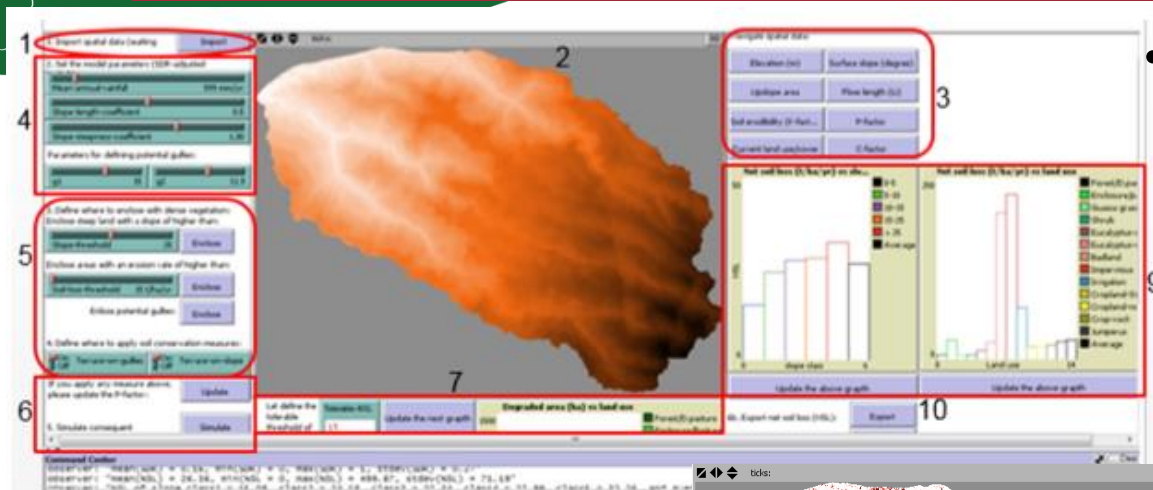


5b. Monitor to assess status and identify gaps/issues for improvement



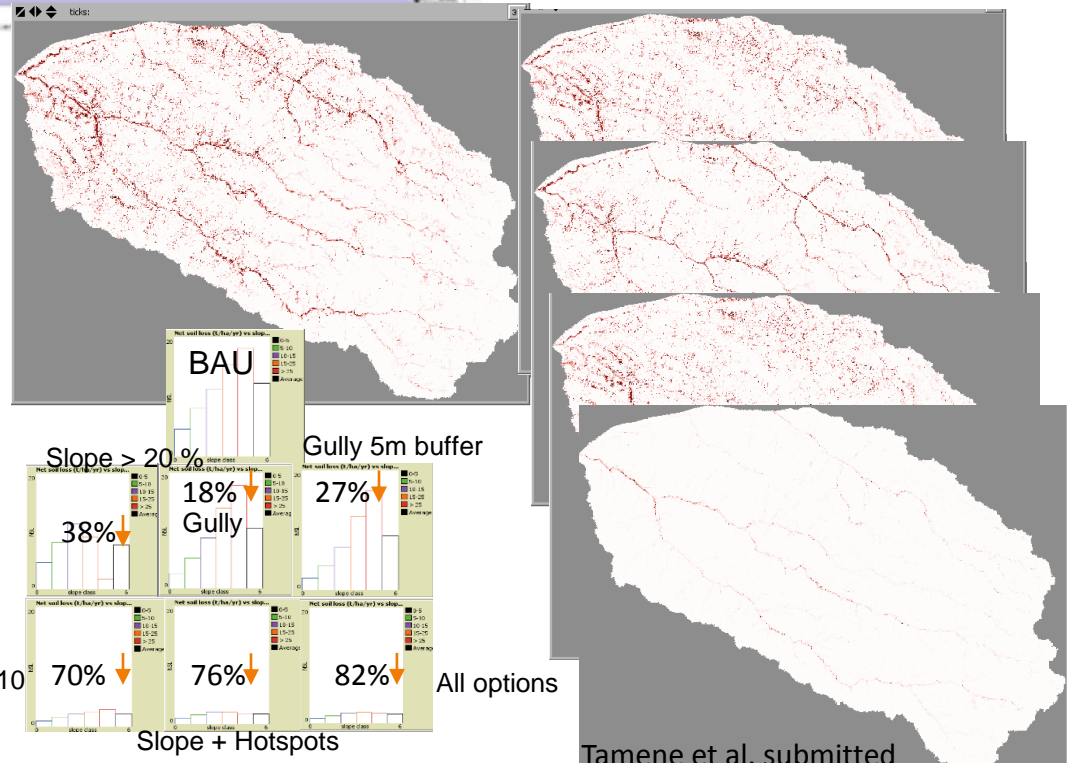


6a. Generate evidence - develop tools to assess the potential impacts of interventions



- Graphical interface to help generate evidences related to the potential impacts of interventions and evaluate results

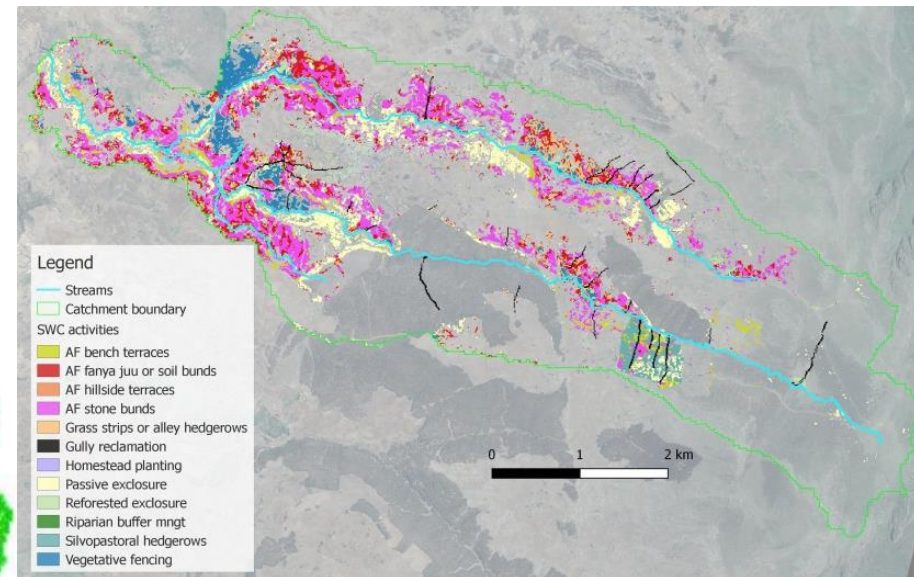
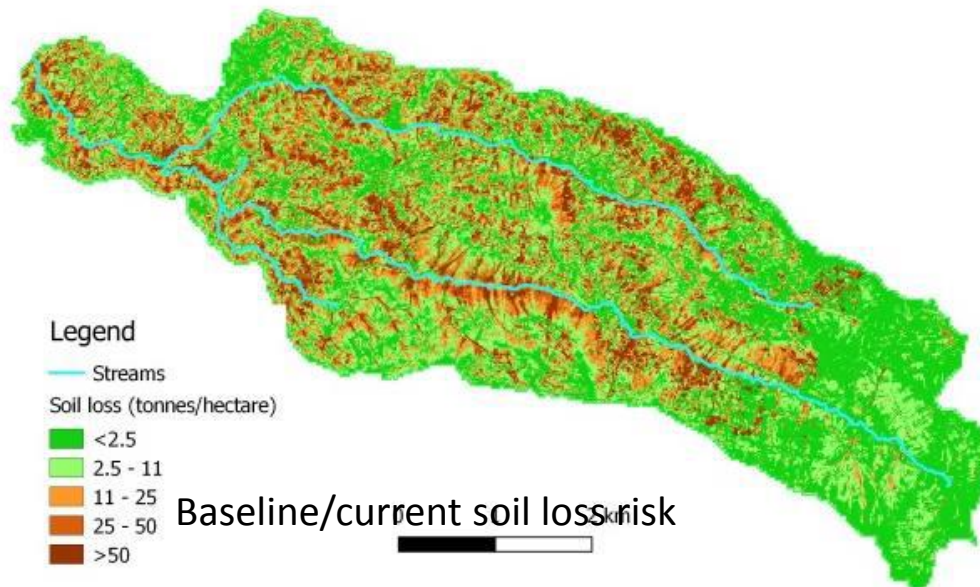
- Through integrated SWC options, sediment yield can reduce by over 80%.
- Impacts on the possible extents of cultivated/grazing areas to be foregone discussed!





6b. Evidence generation – what placed where provides multiple benefits

- Predict the “most responsive” sites and corresponding interventions that can provide multiple benefits (ecosystem services)– onsite and offsite.



The most “responsive” sites to SWC and the recommended activities

- By targeting those sites, soil loss can be reduced by 35% and dry season baseflow enhanced by 30%.



6c. Generate evidence: plot and landscape level erosion/runoff assessment and monitoring



Terraced woodlots experienced the least net soil loss

Grazing land shows 56% less soil loss compared to cultivated.



Runoff and soil loss reduced by 44% & 52% on croplands with SWC practices compared to without.



More water retained in the watershed with SWC measures than without

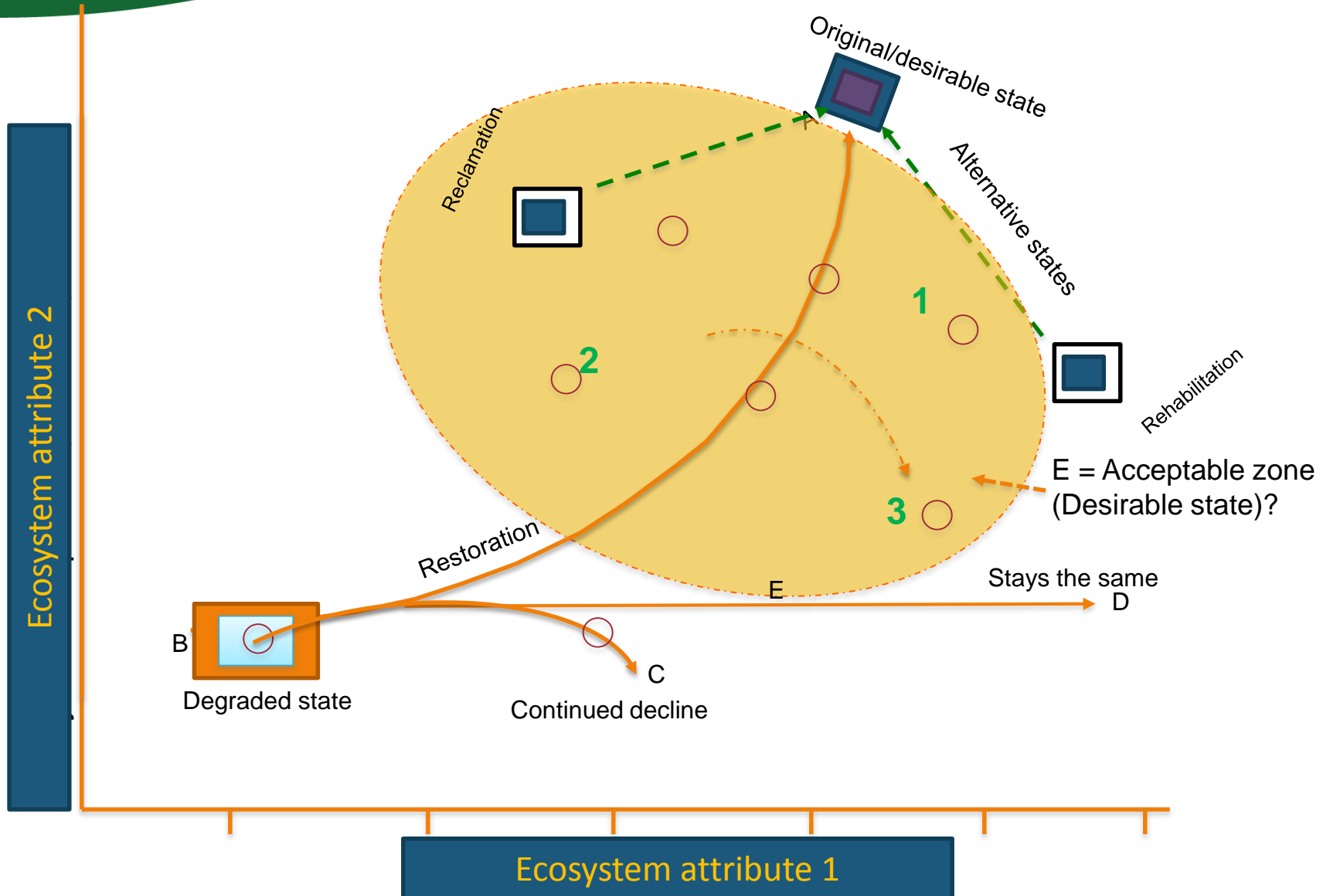


The sub-watershed with no significant SWC practices showed about three fold more sediment yield compared to that of with SWC measures.



7. Next steps: monitor restoration process and level

When do we say our objective of 'restoration' is achieved?





8a. Next steps: 'ecosystem health index'

Quantify the overall impacts of integrated interventions at different scales: ecosystem services

Develop Ecosystem Health Index as a compound objective function considering the full range of key ecosystem services in a long-term perspective:

If specific Ecosystem Service i in year t (${}^t\text{ESS}_i$), we can have Ecosystem Health Index ${}^t\text{EHI}$ as a function that combines all key ecosystem services ${}^t\text{ESS}_i$ ($i=1,2,\dots,N$):

$${}^t\text{EHI} = f({}^t\text{ESS}_1, {}^t\text{ESS}_2, \dots, {}^t\text{ESS}_N)$$

For a long-term perspective, the objective function can be:

$$\text{EHI} = \sum_t ({}^t\text{EHI})$$

The form of function f can be defined after finalizing its concrete components (${}^t\text{ESS}_i$)

Example ESS_i components would include be:

Biomass productivity (ESS_{Veg})

Food productivity (ESS_{Food})

Water availability ($\text{ESS}_{\text{Water}}$)

Structural biodiversity ($\text{ESS}_{\text{Diversity}}$)

Cultural landscape ($\text{ESS}_{\text{Cultural}}$)

And others ...

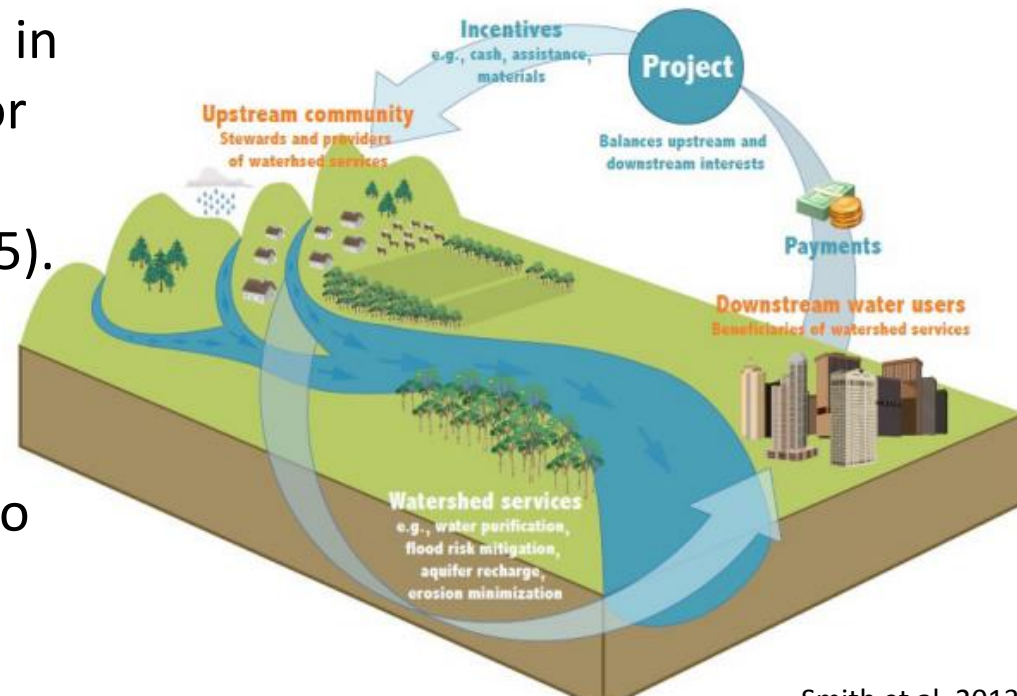


8b. Next steps: design framework and incentives to promote payment for ecosystem services

PES schemes involve payments in exchange for the provision of specified ecosystem services (or actions anticipated to deliver these services) over-and-above what would otherwise be provided in the absence of payment.

PES helps **motivate** landowners, communities, agencies etc. to invest in practices that lead to conservation or production of ecosystem services (Ferraro and Kiss 2002, Wunder 2005).

Requires mapping, quantifying, monitoring to incentivize those who generate multiple benefits in a sustainable manner!





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Africa Research in Sustainable Intensification for the Next Generation
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