

Targeting agricultural innovations and ecosystem services in the Volta Basin

SUMMARY

The CGIAR Water, Land and Ecosystems research project on **Targeting Agricultural Innovations and Ecosystem Services in the northern Volta basin (TAI)** is a two year project (2014-2016) led by **Bioversity International** in collaboration with 11 institutes: **CIAT, CIRAD, International Water Management Institute (IWMI), King's College London (KCL), SNV World Burkina Faso (SNV), Stanford University, Stockholm Resilience Centre (SRC), University of Development Studies Ghana (UDS), University of Minnesota, University of Washington,** and the **World Agroforestry Institute**. We are working with communities across Centre-Est Burkina Faso and Upper-East Ghana to gather empirical data, test research methodologies and co-develop knowledge on solutions to ecosystem service management challenges. Results from the project are still emerging and will continue to do so into 2017 as the team finish analysing the data and writing up their findings. This summary document presents the **main activities accomplished and preliminary headline messages** from the first 18 months of the project. Final results from the project will be made available in 2017 on the WLE website: <https://wle.cgiar.org/project/targeting-agricultural-innovation-and-ecosystem-service-management-northern-volta-basin>.

Volta basin level: headline messages

- We identified six types of social-ecological system in the Volta basin, **differentiated mainly by their food production system including market access.**
- We identified **1184 small reservoirs in the Volta basin**. Dam watersheds are generally 1 to 5km².
- For the period of the study (2002:2009), and using data aggregated over large spatial extents, most of the provinces in Burkina Faso and a few districts in Ghana have been **positively impacted by the presence of water reservoirs** in terms of crop production and cropped area.
- We modelled the impact of a suite of stakeholder-driven intervention scenarios to manage soil erosion, including buffer protection and check dams, using **WaterWorld, Co\$ting Nature, InVEST, SWAT** and **NetLogo** tools
- Results show that active ecosystem service management (e.g. planting) to improve benefits to people (e.g. water available in reservoirs longer into the dry season) is **very expensive to scale**. Passive ecosystem service management (e.g. back to nature by leaving land uncultivated) is cheaper and more scalable, but still has **opportunity costs and social impact** (e.g. population displacement).
- Protection of stream buffers **throughout reservoir catchments** is more effective than protection of stream buffers **near the reservoir only**, for managing soil erosion and securing water-related ecosystem services.
- We are still exploring the biophysical and social potential for **on-farm ecosystem service management** (e.g. cover crops, agroforestry, fallow, semi-agricultural buffers). We have installed **five low-cost Freestation stations** across the Upper-East Ghana and Centre-Est Burkina Faso regions in collaboration with local schools, communities, and government institutes to improve weather data access. For more information see www.policysupport.org/freestation.
- Multi-stakeholder workshops aim to **identify synergies between multi-sector and multi-level approaches** to water and land management through stakeholder dialogue around ecosystem

service benefits, beneficiaries, and connectivity between management actions and changes in the locations or value of benefits to communities.

- In case study communities, farmers recognized the potential benefits of **incentive provision mechanisms** to: (i) reduce siltation and water shortages; (ii) increase incomes and reduce migration; (iii) foster unity among communities.
- In case study communities, the “basin game” (game-theory based upstream-downstream cooperation game) indicated that in the long run farmers realize that **conserving soil and water** (upstream users) and **paying for conservation** (downstream users) **pays off both individually and for the common good**. However, introducing a fine mechanism to punish non-cooperative behavior at random brings on cooperative behavior much faster.



Upper-East Ghana: headline messages

- The results of ecosystem service mapping with stakeholders at community and district level show that the **effects of small dams on ecosystem service use is highly dependent on their size, functioning and maintenance, but also on the spatial configuration of other available ecosystem services** used by the various communities sharing the same sub-catchment area (effects of activity and vulnerability transfer).
- **Ecosystems service characterization by land type and socioeconomic condition** in case study communities shows that the trade-offs identified by stakeholders between water related ecosystem services helps to separate those that are seasonal and those that are available year-round, and highlights the connectivity in time and space between stakeholders using these services.
- Considering **social values linked to ecosystem services** analysis deepens our knowledge of the interactions between ecosystem services. Synergies (e.g. bushfire), conflicts (e.g. graves vs irrigated lands) and double negative feedbacks (e.g. pollution and health) have been revealed.



Centre-Est Burkina Faso: headline messages

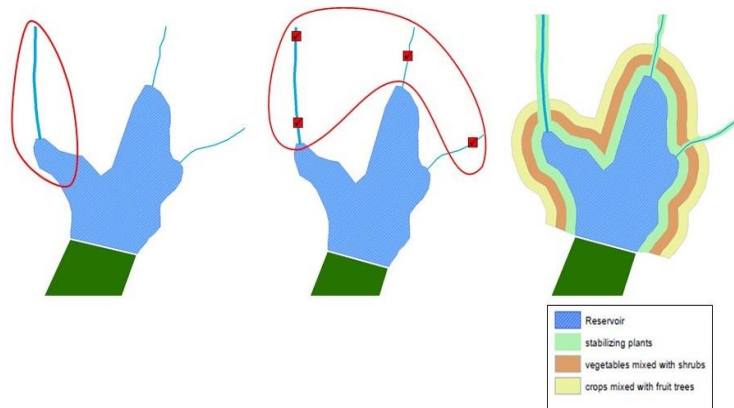
- For dams where the main target is managing sedimentation, modelling indicates **check dams** are not guaranteed to be effective and there are no obvious other benefits of these check dams meaning it seems a **less sensible investment** than other strategies that do have other benefits, like **buffer protection** with some fruit trees and agriculture allowed, or **dredging** where the nutrient-rich sediment can be used on farm plots.

- Multi-level stakeholders derived and debated ecosystem based management options and voiced acceptance of the idea of **establishing a buffer strip** of 100 meters around reservoirs and alongside streams, comprising several successive strips.
- At Ladwenda, local experts **co-designed three interventions to manage sedimentation** and, with stakeholder communities, we are analyzing the feasibility of implementing each:
- The work conducted with the Ladwenda community is **pioneering a decision analysis method** in ecosystem service management planning, using an approach commonly used for supporting business decisions under **risks and uncertainties**.

1. Dredging along the main stream inlet

2. Building permeable rock dams along the streams upstream

3. Implement a buffer protection scheme



For more information about the project, please contact f.declerck@cgiar.org.

Project team

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