



CASE STUDY

Rewarding farmers for reducing sedimentation, Indonesia

Farmers adapt and diversify land-use, based on PES scheme with hydro-power company in Sumberjaya

In a nutshell

Removing sediment from reservoirs is an important part of the costs of hydro-power generation. Under the “Rewarding Upland Poor for Environmental Services” project (RUPES), an initiative by ICRAF, upstream farmers changed land-use practices for reducing soil erosion and sedimentation load in streams. The sedimentation rate was used as an indicator to measure the effectiveness of the agreed activities. Clarifying land tenure and diversifying land use were important success factors, improving both, environmental condition and local livelihoods.

1. Background of the ecosystem services assessment

The Way Besai watershed is part of Sumberjaya, a sub-district in the Bukit Barisan mountains at the west coast of Sumatra, Indonesia. Although 40% of the area is classified as protected forest and 10% as national park, coffee plantations make up 70% of the area (ICRAF Sumberjaya Brief No. 1). Small-scale farmers often used land belonging to the government for a short-term, thus illegally.

To establish coffee plantations small-scale farmers deforested the land and often used the land intensively for short-term gains. They had little incentives to invest in tree planting or even establish agroforestry with a greater diversity of trees. Unsustainable land management practices and the insecure land tenure situation contributed to the degradation and erosion of soil. In order to improve this situation the Indonesian Community Forestry Programme was adopted in 1998. The programme was designed to provide financial incentives for reforestation and forest conservation.

The unsustainable land use situation upstream led to increased sedimentation in the Way Besai River, which reduced the capacity for hydro-power production. The PLTA Way Besai hydro-power company needed up to USD 1 million a year to remove sediment from the reservoir of the hydro-power dam (World Agroforestry Centre 2013).

In Sumberjaya the Community Forestry Programme did not have the desired impact and therefore the site was selected by the RUPES project (“Rewarding Upland Poor for Environmental Services”). The project was initiated by The International Center for Research in Agroforestry (ICRAF) and coordinated by the World Agroforestry Centre. RUPES supported local communities in gaining access to the Community Forestry Programme and to develop a reward mechanism for environmental services provided the upstream communities. The project used the need for improved water quality by the hydro-power company as an entry point and aimed at increasing forest cover to reduce soil erosion.

With assistance given to local communities to master administrative barriers, the Community Forestry Programme had some more impact than before, but the financial support available in the programme was limited and control mechanisms scarce. To substantially improve forest conservation and to enhance soil conservation a “rewards for environmental services” mechanism was developed between local communities and the hydro-power company.

2. Design and assessment of water-related ecosystem services

The target groups of the project were indigenous forest dwellers and smallholding farmers in environments with very low productivity, highly vulnerable to environmental degradation and climate change (FAO case study 2013). Together with local communities ICRAF analysed the causes of



sedimentation and assessed the land-use. A set of strategies was developed, including (ICRAF Sumberjaya Brief No. 1):

- To develop accurate, scientifically validated information on sources of erosion and sediment and on the dynamics of river flow;
- To work with the farmers to develop skills and understanding in management practices that reduce erosion and sedimentation;
- To empower farmer communities to use the factual information generated to improve their credibility and status when negotiating and disclosing their needs.

ICRAF also facilitated negotiations between the hydro-power company, upstream farmers and local government to identify possible solutions. The following reward mechanism was negotiated: The PLTA Way Besai hydro-power company would provide payments to farmers, if they achieved a 30% reduction in sedimentation. Payments would be given in form of micro-hydro-power units for electricity production in villages and in form of cash payments. Farmers were given support for soil conservation practices including the construction and maintenance of check dams to retain sediments from the river, planting of grass strips along potential landslide hotspots, weekly removal of sediment from the check dam. Farmers would also gain conditional land tenure for 25 years, if they planted trees and protected the remaining forest.

To monitor the effectiveness of these activities, the sediment content in the river was measured over the course of one year (FAO case study 2013; Pasha et al. 2012). A simple but relatively rigorous community-based monitoring of sedimentation was implemented. Four river observation locations were recommended by the ICRAF scientists at each sub-watershed and each location was monitored by two observers. Water samples were collected after every rainfall. The collected water samples were dried and the sediment weighed and analysed in a simple laboratory. The measured data had to be interpreted in the context of catchment hydrology, land use, and climate (precipitation) among others.

Measuring sedimentation load can help identifying sources of soil erosion and identifying alternative options for land and water management with less sedimentation. It can also help monitoring the effectiveness of alternative land-use practices and policies that are targeted at reducing sedimentation. Soil conservation through agroforestry, intercropping of grassland, hedges, reforestation, or buffer zones along rivers for the conservation of natural riparian vegetation can be effective measures for reducing sediment load in rivers and enhancing water quality.

3. Reflections on the process and outcomes

The negotiation process, facilitated by RUPES, between upstream farmers, hydro-power company and the local government was very important for building trust among all parties and for identifying strategies to reduce sedimentation that all stakeholders would benefit from. Monitoring sedimentation rate as an indicator for the positive impact of improving land-use practices made the success of the changes in land-use practices transparent and motivated all participants to contribute to the scheme.



The measurement showed that the change in land-use practices led to a reduction in sedimentation rates by 20%. Although this was less than the previously agreed 30% reduction in sedimentation, the hydropower company was positive about the outcome and appreciated the efforts by communities. The hydropower company (ES beneficiary) paid land user and communities (ES provider) for changing their management practices: it provided a micro-hydropower plant to the community (access to electricity) and payments in cash. Furthermore, communities benefited from being granted land tenure by the forest department of the local government. The mix of incentives meets the needs of local communities and strengthens their role of being part of the solution rather than being part of the problem.

Other benefits included improved knowledge, particularly in soil and water conservation techniques and organizational skills. It was possible to increase productivity of coffee gardens and even to generate additional income by planting high economic value trees in riparian areas (FAO case study 2013).

The project started in 2006 funded by the International Fund for Agriculture Development (IFAD) under RUPES Phase 1, continued from 2008-2012 under RUPES Phase 2. The scheme is now being directly and entirely funded by the PLTA Way Besai hydropower company with a Community-based organization (the Community Forestry Farmers' Groups Communication Forum) as the intermediary.

4. Further reading/References

["RUPES mud to power"](#) video on the use of the methodology [last accessed July 10, 2014]

FAO case study 2013: [Co-investment in protecting watershed functions of Sumberjaya](#), Way Besai, Indonesia. Case Study Summary. Prepared for the Multi-stakeholder dialogue 12–13 September 2013 FAO, Rome.

[ICRAF Sumberjaya Brief No. 1](#)

Pasha, R., T. Asmawan, B. Leimona, E. Setiawan and C. I. Wijaya, 2012: [Commoditized or co-invested environmental services?](#). Working paper No. 148. World Agroforestry Centre - ICRAF, SEA Regional Office, Bogor, Indonesia.

World Agroforestry Centre, 2013: [Rewards for, Use of, and Shared Investment in Pro-poor Environmental Services \(RUPES\) project, phase 2](#). Research sites in Asia 2008–2012. Editor: R. F. Finlayson; Compiled by: C. I. Wijaya; Contributors: A. Wilkes, Z. Yi, S. Yufang, B. Leimona, R. Pasha, R. Kumar, L. Joshi, A. Florece, C. Duque-Pinon, and V. B. Dam.

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