Implementing PES within public watershed management structures: A case of Sasumua watershed in Kenya

The ICRAF PRESA project has been operating in Sasumua watershed since September 2008 and has so far spent US$ 159,864 in it. Sasumua is located in Central Kenya, about 90 km northwest of Nairobi, at an altitude of 2200-3850 m asl, characterised by steep slopes. Mean annual rainfall is 1000-1600 mm, peaking March-May and October-December in a binomial pattern (Gathenya et al., 2009).

The catchment of the Sasumua reservoir operated by Nairobi City Water and Sewerage Company (NWSC) is 107 km2 and comprises three sub-catchments: Sasumua (67.44 km2) Chania (20.23 km2) and Kiburu (19.30 km2) (Figure 2).

The Sasumua sub-catchment, is heavily populated with smallholder farmlands (average 1 ha per household) and generates most of the sediment, nutrients and other pollutants that flow into the Sasumua reservoir (Figure 3).

Overview

In Kenya, watersheds are managed through a public structure involving the Water Resources Management Authority (WRMA), which builds the capacity of land owners organised in Water Resources Users' Associations (WRUA) to develop and implement Catchment Management Plans (CMPs). This structure, mainly financed by the Water Services Trust Fund (WSTF), has achieved community organisation and restoration of publically owned land, but its potential to reverse land degradation trends on privately owned land is low. The World Agroforestry Centre (ICRAF) in partnership with and the Jomo Kenyatta University of Agriculture and Technology (JKUAT) sought to explore the potential of using Payment for Ecosystems Services (PES) to address this gap through its program, Propoor Rewards for Environmental Services in Africa (PRESA).

The research involved development of a business case for the private sector company, downstream, to engage in PES. This entailed mapping of sources of sediments, use of hydrological models to determine effectiveness of land use practices to reduce sedimentation and improve water flows, and conjoint analysis of willingness of communities to accept payment and willingness of water users to pay higher water tariffs. Similar research was also conducted in six other sites in east and western Africa. The research work presented here focused on a heavily populated Sasumua sub-catchment, where unsustainable land use practices by smallholder farmlands (1 ha per household) generate most of the sediment, nutrients and other pollutants that flow into the Sasumua reservoir managed by the Nairobi City Water and Sewerage Company (NWSC).

The major (63%) source of funds for PRESA work is the International Fund for Agricultural Development (IFAD). In Sasumua, funding sources included IFAD (13%); European Commission EC/IFAD (16%); International Bank for Reconstruction and Development (53%), Macaulay Land Use Research Institute (9%) and CGIAR Consortium Research funds (8%).

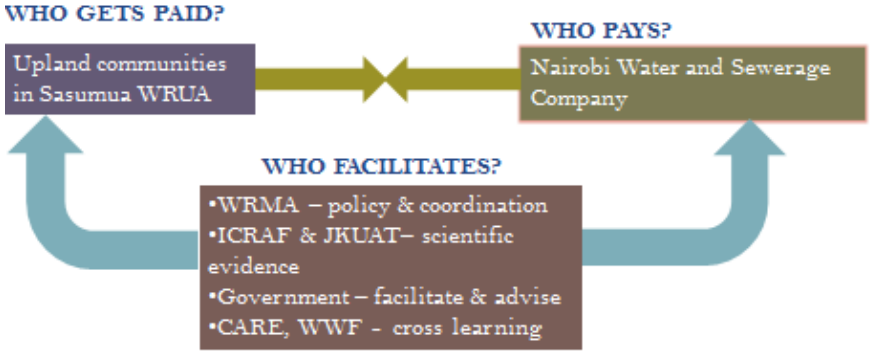

Figure 1 Schematic structure of potential PES scheme in Sasumua

Background

The programme for 'Pro-poor Rewards for Environmental Services in Africa (PRESA)' advances rewards or incentives-based mechanisms for integrating environmental management with human use of watersheds. It is implemented across seven watersheds within the highlands of Kenya, Tanzania, Uganda and Guinea (Figure 2).

In these watersheds, unsustainable agricultural practices and deforestation are major contributors to land degradation in form of increased soil erosion and soil fertility loss, which affects quality and supply of water resources downstream. The program seeks to generate scientific evidence, analyse policies and at the same time engage with landowners (potential ES sellers), private sector companies (potential ES buyers) and policy makers to foster development and implementation of payments or rewards for environmental services (RES) agreements. This brief focuses on the Sasumua watershed where compilation of research evidence on various aspects of PES and dialogue with a downstream private sector company has not led to development of a PES agreement as had been envisaged. We analyse the underlying reasons for this and present the on-going actions to unlock this situation.

The ICRAF PRESA project has been operating in Sasumua watershed since September 2008 and has so far spent US$ 159,864 in it. Sasumua is located in Central Kenya, about 90 km northwest of Nairobi, at an altitude of 2200-3850 m asl, characterised by steep slopes. Mean annual rainfall is 1000-1600 mm, peaking March-May and October-December in a binomial pattern (Gathenya et al., 2009). The catchment of the Sasumua reservoir operated by Nairobi City Water and Sewerage Company (NWSC) is 107 km2 and comprises three sub-catchments: Sasumua (67.44 km2) Chania (20.23 km2) and Kiburu (19.30 km2) (Figure 2). The Sasumua sub-catchment, is heavily populated with smallholder farmlands (average 1 ha per household) and generates most of the sediment, nutrients and other pollutants that flow into the Sasumua reservoir (Figure 3).

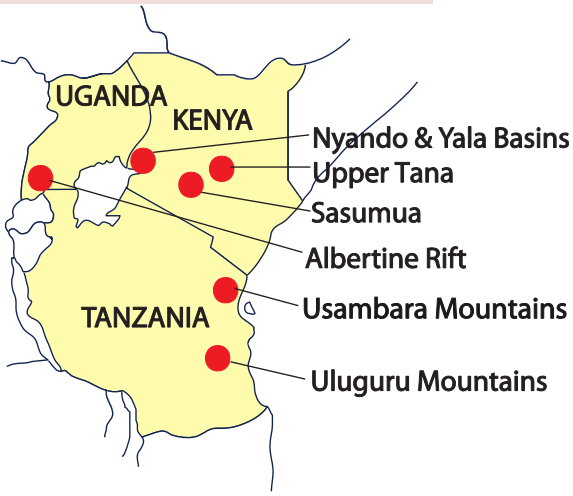

Figure 2: Location of the PRESA sites (left)

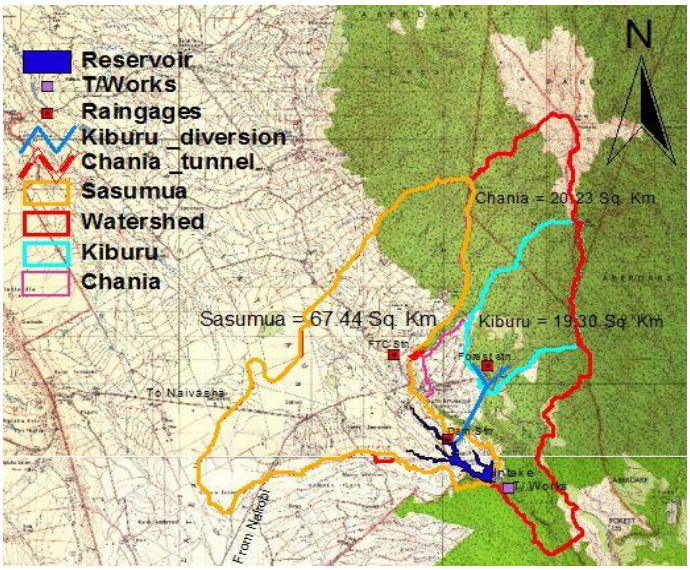

Figure 3: Location of Sasumua catchment (right)

The rationale for investing in Environmental Services

NWSC spends about US$50,000 a year for clearing silt and flushing the intake works and about US$187,500, on alum, a coagulant to clean water. The sediment flushed from filter backwashing is discharged downstream, causing problems at the Ng'ethu water treatment works, also managed by NWSC. These costs could be reduced substantially if partnerships are developed with upstream land owners to invest in sustainable land management practices that reduce sediment yield (Mwangi et al. 2011).

In Kenya, the public structure for watershed management is presided over by the Water Resources Management Authority (WRMA), which regulates water abstraction and builds the capacity of land owners organised in Water Resources Users' Associations (WRUA) to develop and implement Catchment Management Plans (CMPs). To implement these CMPs, WRUAs follow an established financing cycle by submitting proposals to either of the two publically managed funds: the Water Services Trust Fund or the Capacity Building Fund.

The WRUAs' capacity to access and manage these funds is rather low, but even when obtained, WRUAs' landuse interventions are limited to only publically owned land, and not private farmlands where most soil erosion and land degradation occurs. A rewards/payments for environmental services scheme has the potential to contribute to these catchment management efforts by promoting appropriate land management practices that reduce soil erosion from privately owned farmlands.

ICRAF (PRESA) in partnership with Jomo Kenyatta University of Agriculture and Technology (JKUAT) and WRMA investigated the potential for structuring a rewards/payments for environmental services scheme (Figure 4) to address these challenges in the Sasumua watershed.

Environmental services that could be provided through PES are water quality improvement and regulated flow of water in the dry season. To establish a baseline for water quality status, total suspended sediment load was measured during wet and dry seasons at 13 selected points on the streams in the watershed and also at the inlets of the Sasumua reservoir. Hotspots for sediment generation were identified to be mainly the privately owned smallholder farmlands. Water quality tests also determined turbidity, heavy metals and microbial pathogens. Water quantity parameters of surface runoff, base flow and water yield were determined using the Soil Water Assessment Tool (SWAT) model based on land cover, soil and relief information. Potential impacts of various soil and water conservation (SWC) interventions scenarios on water quality and quantity were also estimated using SWAT (Table 1).

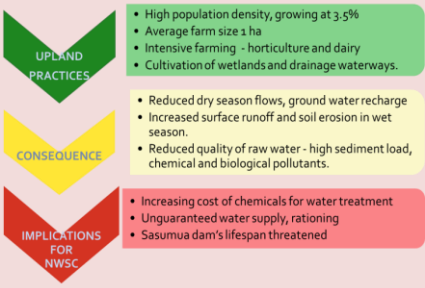

Figure 4. Impact of upland farm practices on operational costs of Nairobi Water and Sewerage Company in the catchment of the Sasumua Reservoir.

Most (61%) community members in Sasumua watershed were willing to accept payments of about US$ 938/ha/year and 40% of water users in the City of Nairobi were willing to pay an incremental US$ 1.25 over their tariffs for watershed management.

Using one of the scenarios for land use interventions, PES was demonstrated to generate a net reduction in the costs the company incurs in sediment treatment.

Table 1. Baseline hydrological status and potential impact of various soil and water conservation interventions on environmental services in Sasumua Watershed

Indicator	Baseline status	With terracing	With contour farming	Contour Farming + grass strips	With grassed waterway
Sediment (tons/year)	32,600	4,930	16,600	5.43	25,070
Surface runoff (mm)	193	151	162	NS	NS
Base flow (mm)	488	525	514	NS	NS
Water yield (mm)	680	674	675	NS	NS

Negotiation

Research evidence on the business case for PES was presented to the leadership of NWSC.

For the company, however, the saving from PES was still too low to motivate any major changes in their business approach.

Sediment treatment costs were not a major problem for the company compared to its other challenges such as unaccounted for water in its distribution pipework.

The future PES agreement

Potential sellers of these environmental services are mostly small scale farmers on privately owned land who are already organized in a formal Water Resource Users' Association (WRUA). ICRAF conducted community meetings to present the evidence of land degradation in uplands, its downstream implications and potential for PES to address these. Surveys were conducted to establish what interventions upland farmers preferred and reverse auctions were used to determine how much payment they were willing to accept (WTA). One hundred of the WRUA members are willing to engage in PES and have signed a memorandum of understanding with ICRAF for technical support. Average, WTA was US$ 938 per hectare per year. Since the actions of the WRUA are guided by the CMP, ICRAF is assisting the WRUA in including PES (performance-based rewarding of farmers implementing SWC) in their CMPs. Through consultation with the WRUA members, costs of some of the SWC interventions were estimated (Table 2). Policy makers were also engaged mostly through workshops, meetings and publications such as policy briefs. The management of the scheme especially in ensuring and enforcing conditionality will depend heavily on the lessons from the nearby Equitable Payments for Environmental Services scheme ran by WWF around Lake Naivasha.

The direct beneficiary of improved water quality and flow services is the NWSC downstream. A business case for NWSC's engagement in PES was estimated based on a scenario of establishing a grassed waterway of 3 m width and 20 km length. This could reduce sediment yield by 20%, and reduction in alum cost by about US$ 23,256 per year. Through PES, the company would only need to spend US$ 20,349 of this amount to support upland farmers with the establishment of the grassed water way in the first year and subsequently pay only US$ 3,290 a year towards maintenance. A survey among water consumers in Nairobi indicated that over 40% were willing to pay an extra US$1.25 above their monthly water bill to finance conservation of Sasumua watershed (Mwangi et al. 2011). The area occupied by such a grassed waterway would be on land owned by about 500 farmers resulting in earning of only about US$ 9/household /year. Nonetheless farmers are willing to engage because of the potential benefit from reduced soil erosion and fodder.

No contractual agreement between the buyer and seller has been developed. Besides the weak business case reflected in the above scenario, NWSC's other challenge for adopting PES is the legal and institutional framework. As outlined in Mwangi et al. (2011), the company pays multiple levies including 20% of proceeds from sales of water to Athi Water Services Board, which owns the dam and associated infrastructure, 9% to the Nairobi City Council, its main shareholder and annual abstraction fees of US$144,000 to the Water Resources Management Authority (WRMA). Even though water users expressed willingness to pay extra, the authority to increase water tariffs does not rest with the company, but with the Water Services Regulatory Board (WSREB).

Public financing of PES from the WSTF, is currently inaccessible because of legal restrictions. Private-sector-like actions, such as direct reward of farmers for improved watershed management, are outside its mandate of capacity building as stipulated in the Kenya Water Act No. 8 (2002). Alternative private funding opportunities were explored through a bi-annual stakeholder consultation. KENGEN (Kenya Energy Generation company) expressed interest in financing PES in its hydro-electric dam catchment.

Monitoring can be at two levels: the extent to which landuse interventions are being implemented and the effectiveness of these landuses in delivering the desired reduction in sediment flow and increase in dry season water flows. The effectiveness of SWC practices to deliver improved water quality and dry-season water flows can be verified through occasional measurement of sediment entering inlets. This can be done by ICRAF and JKUAT through continued engagement with all stakeholders.

References to the project

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Lessons learned

Negotiation with private sector
The strongest driving force for a successful PES scheme is the existence of demand for the ES by beneficiaries who also have the capacity to pay. Willingness of private sector engagement is partly driven by strength of a business case, but most importantly by how flexibly PES can be implemented within the public institutional and legal framework for catchment management.

It is important to ensure that information reaches the decision-making level of the company. For NWSC, the opportunity to achieve this has been elusive. The technical officers met were not at decision making level.

Public support mainly through legislation is essential to drive the demand for ES. For example, obligatory public fees or tariffs (e.g., Costa Rica – Pagiola 2006) can generate the finances to distribute to farmers on conditional ES delivery. Enforcement of a minimum standard with sanctions for non-compliance can also help to drive demand for ES.

Low cost monitoring of environmental and social impacts
Strategic partnerships are essential to reducing monitoring costs. In the Sasumua case, ICRAF and JKUAT will potentially ensure evidence-based PES agreements and generation of low cost tools while NGOs and public systems support capacity building. One of the ways of increasing performance is through guaranteeing regular payments. This motivates participants to self-regulate especially if the payments are made at a time of need. Targeting interventions in hotspot areas from which the highest impact can be expected rather than spreading them across the watershed may reduce the monitoring costs by reducing travel costs. Also choosing the inlets of the reservoir for testing effectiveness of interventions may reduce costs and these are borne as part of the company's regular operational costs. Technical measurements of actual ES delivery are necessary, but often very expensive. They can be used to create realistic proxies that are cheaper and less knowledge intensive to monitor. Occasionally technical measurements may be repeated for verification.

Payments informed by proxies or actions enables community participation in monitoring. This ensures farmers are rewarded even if actions outside their control obscure the impacts of their efforts to deliver ES downstream. This is especially a risk when PES is operating at a small scale or when the distance between the reservoir and farmers' actions is large. In the Uluguru CARE EPWS case for example, although the farmers had implemented the agreed SWC actions, the distance from the dams was too large and the reduced sediment flow was obscured by actions in-between. Payment of a negotiated and fair price for ES is likely to motivate self-monitoring.
Scale is important. Impacts are more observable and linked to actions when actions are implemented over a large proportion of the hotspot areas. A portfolio of businesses in a city like Nairobi can be more convinced to contribute to PES if its contribution is demonstrated to be influencing more than just the 20% of the water that Sasumua generates.

The business case for PES in uplands with high population density is not so strong, unless interventions also generate household level benefits. This mode of payment is what has been categorized by Van Noordwijk and Leimona (2010) as co-investment as opposed to the strict version of PES (commoditisation) where payment is only after the verification of quantifiable ES delivery.

Public-Private


Ownership


MRV


Incentives

References to other relevant projects

Equitable Payments for Watershed Services: Kenya Component.
http://www.solutionsforwater.org/solutions/payment-for-environmental-services-pes-an-integrated-approach-to-natural-resource-management-and-livelihood-improvement-a-case-of-lake-naivasha-malewa-river-basin-sub-catchment-kenya-2

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Pagiola Stefano (2008): Payments for Environmental Services in Costa Rica. *Ecological economics, Elsevier Volume 65 (4) 712-724*

Van Noordwijk and Leimona (2010): Principles for fairness and efficiency in enhancing Environmental Services in Asia. Payments, Compensation or Co-Investment. *Ecology and Society (In press)*

Future Outlook

Land use practices were found to be potentially effective in reducing sedimentation and to a lesser extent improving water flows. However, in spite of this potential, the company has not yet been convinced to engage in PES because reducing sediment treatment costs is not a key priority compared to other challenges it is addressing. Moreover, within the existing legal and institutional structure, the company pays levies and fees, and watershed management falls outside its mandate. Although water users are willing to pay more, the company does not have the mandate to increase water tariffs. This belongs to the Water Services Regulatory Board.

Unless these institutional barriers are addressed and a stronger business case is demonstrated, PES might be problematic to implement. Currently, ICRAF and its partners are using an Applied Information Economics model that allows inclusion of many parameters to re-evaluate the business case for PES. Through consultation with stakeholders from public, private and NGO sectors within the watershed, the potential for co-investment approaches such as use of a water fund is being explored. Research is also directed towards understanding the demand side of PES focusing mainly on private sector motivation and the potential for public financing of PES.

An Applied Information Economics model (by the Hubbard Institute) is being used to demonstrate a more persuasive business case going beyond just a scenario of a single intervention and reflecting saving from various other angles including increasing the lifetime of the reservoir and preventing loss of revenue from lost storage volume through siltation PES.
Research emphasis has shifted towards increasing understanding of the demand side of PES and motivation of private sector engagement (e.g., commodity certification, branding, ES bundling, cooperate social responsibility (CSR), environmental impact assessment etc).
We will be exploring the potential for broadening focus of PES beyond proximal beneficiaries by building a business case to show remote beneficiaries that PES can provide potential long-term gains beyond just CSR. This may provide the basis for co-investment in a fund. For example, other water users such as Coca cola, KENGEN and Kenya Breweries can be potential contributors. Proceeds from these funds can then be disbursed to land owners, conditional to implementation of appropriate performance towards ES delivery.

Landscape-scale lessons are being used to design national-scale research actions. For example, the trade-off between regulation and voluntary approaches will be investigated. A policy position paper was presented in the on-going policy review through public partnerships and has caused explicit mention of PES in the new policy. This then creates a more specific foundation for its consideration as a business approach for channelling public and private sector finances directly to farmers on a performance-based premise. Mechanisms can be identified in which PES can contribute to natural capital accounting in national planning.

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