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CASE STUDY

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BETTER LAND MANAGEMENT IN THE MARA

How hundreds of farmers reduced soil erosion

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Map of the Mara river basin

Introduction

The Mara is a modest sized transboundary river which rises in the Mau forest of Kenya and flows through the rangelands of the famous Maasai Mara and Serengeti reserves before discharging into Lake Victoria in Tanzania. It is important for many socio-economic activities including small scale-farming to support livelihoods, tea and wheat production for export and safari tourism.

The Mara River and its wetlands are renowned for supporting a vast array of wildlife. Thousands of local communities also depend on the river basin; for many Mara river basin communities, agriculture is the chief source of livelihoods.

Although the Mara has plentiful water resources in the wet season, with population and economic growth there is increasing demand on water resources from livestock, agricultural irrigation and other industries. Increased abstraction is likely to severely degrade the riverine ecosystem, affecting the ability to meet peoples' basic needs as well as profoundly affecting the basin's economy.

The river is also threatened by pollution. A key pollution source is untreated sewage discharged from growing towns such as Bomet, as well as hotels and lodges in and around the game reserves. Poor farming practices are also a big culprit. The headwater Mau forests have historically enhanced rainwater infiltration, stabilised soils, and regulated flow. However, decades of encroachment, deforestation and poor agricultural practices have exposed soils. The farms are steep and when it rains, the fertile topsoil is washed into the rivers, choking them with sediment. In addition, deforestation of the Mau Forest headwaters is causing a change in flow regime: hydrological modelling indicates that depleting forest cover is making flows less stable, with higher peak flows.¹

Further downstream overgrazing has also led to increased soil erosion and increasing sediment in rivers. The sediment-laden waters are not only a problem for fish and aquatic species, but also cause problems for those using the water downstream for drinking and industrial processes. The sediment is quickly filling the Mara wetland, over 150km downstream in Tanzania.

Soil erosion is also a problem for the farms themselves. Each household has approximately three acres of land, of which only half is available to produce food to sustain an average family of seven. Soil erosion threatens farmers' incomes and food security by reducing the availability of fertile soil in which to grow crops. If these relatively small pieces of land are not well conserved, the farmers end up harvesting very little and cannot sustain their families, leading to food insecurity.

To tackle this issue, we have been working in collaboration with community-based Water Resources Users Associations (WRUAs – see box) to raise awareness about the need to protect riparian land and demonstrate how better farming practices can reduce soil erosion, increase fertility and ultimately increase income.

It was immediately apparent that, in order to achieve measurable and sustained impact on river condition, we would need to reach out to hundreds - if not thousands - of farmers. We've therefore been developing strategies for scaling up our interventions from the very beginning.

Given that a number of water users depend on the river and its water quality, we immediately saw an opportunity to reach out to a greater number of farmers by establishing a payment for ecosystem services (PES) scheme – whereby downstream private water users would contribute to the expansion and maintenance of improved farming practices upstream in return for improved river quality and flow.



The Mara's local water resource management institutions are legislatively-mandated groups of water users, riparian land owners and other stakeholders operating at sub-catchment level.

Kenyan legislation makes provision for Water Resource User Associations (WRUAs), while in Tanzania the equivalent are Water User Associations (WUAs).

What did we do and how did we do it?

IMPROVING FARMING PRACTICES

We decided to focus our efforts on the Nyangores tributary, where the steep slopes and loss of the Mau forest are clearly contributing to significant soil erosion, and where a strong WRUA, capable of sustaining the project, exists. This tributary is one of the red “high risk” areas in the map in the left hand margin.

To ensure best use of resources, we decided to target areas having (or at risk of having) the greatest impact on the river. Starting in June 2014, we therefore carried out a careful analysis of the sub-catchment. This involved conducting a number of sub-catchment transects (walkovers) to identify “hotspots” in terms of soil erosion – i.e. areas at most risk of erosion due to their steepness and lack of vegetation. In total 314 farms were selected around three villages in the Nyangores tributary: Bilelga, Keteremo and Matarmat.

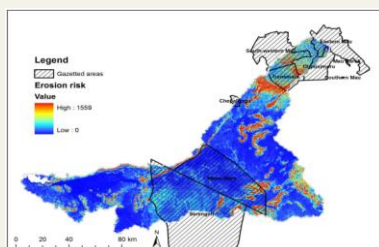
We focused our attention on these “hotspot” farms, instigating measures to help retain soil and water, and thereby reduce rainfall run-off and soil erosion. These measures included:

- contouring steep slopes and planting strips of napier grass to encourage soil retention on slopes;
- digging small trenches on the lower side of grass strips to slow down surface water run-off;
- planting ground cover crops such as sweet potato vines to reduce soil erosion; and
- protecting springs and creating drinking areas for cattle - thereby guarding against bank erosion and faecal contamination.

In addition, we demonstrated and promoted the following practices to reduce stress on water resources and increase farmer resilience to drought:

- protecting riparian land through demarcation and removing “thirsty” trees, namely eucalyptus;
- planting riparian land with native, less “thirsty” vegetation such as bamboo and avocado;
- planting drought-resistant species; and
- diversifying income through promoting horticulture, dairy cattle and fruit trees.

We worked in collaboration with the county agricultural officer who demonstrated and promoted these measures to farmers.



Erosion hotspots in the Mara river basin

Source: WWF Hydrology study to guide development of an Equitable Payment for Watershed Services Scheme in Mara River Basin, Gathenya 2011



The Amala River, a tributary of the Mara, laden with sediment during the rainy season



Wilson Maratim – farmer “We have doubled the production of maize since 2014 and we hope that in 2016 we will harvest more”



Community water quality monitoring © Kate Holt / WWF-UK



A tea factory, one of the potential PES “buyers”

Nurseries have been established to provide a steady supply of appropriate fruit trees. “Bulking sites” have also been established at selected farms, enabling other farmers to access inputs of napier grass and sweet potato vines.

In order to sustain and expand these practices, each village has appointed a local committee to provide farmers with technical support and monitor progress on their farms. However, practices have been spread simply by farmers seeing the benefits and taking the initiative.

Another component of the work has been establishing community monitoring of river water quality. This means farmers can see the results of their efforts, and also enables us to monitor impact and adapt our approach accordingly.

ESTABLISHING PES

We needed a mechanism to scale-up and sustain these efforts in order to ultimately see a tangible improvement in river condition. Some kind of incentive scheme seemed appropriate.

Through the farming practices we advocated, farmers are actually protecting the river’s flow and quality for downstream water users – including private sector users where river degradation poses a risk to their business. It therefore seemed plausible that we could secure their support for farmers to take up and sustain land and water conservation practices.

This led us to pilot a watershed management payment scheme, a form of “payments for ecosystem services” (PES). The idea was that funds from downstream businesses would be used as an incentive for farmers upstream to implement land and water conservation measures. In return, the downstream water users would see reduced sediment quantities in the river, and potentially sustained flows throughout the dry season.

So far, we have engaged the following private sector water users:

- Tea factories: they rely on river water for tea processing and have to spend significant amounts on treating river water before it can be used.
- Tenwick mission hospital: they have a small dam on the Nyangores tributary which generates power for the hospital and also abstracts water for hospital processes. They have to dredge the dam on an annual basis because it fills up so quickly with sediment carried from further upstream. This costs the hospital 14, 000 USD each year.

These private water users act as the “buyers” in the PES scheme: they provide support to the “sellers” (i.e. the farmers



Nancy Rono – farmer. Nancy is a single mother with 3 boys. Her yield of milk has increased from 2 litres to 6 litres over the past year due to the use of napier grass as fodder. She is able to sell this to pay the school fees of her three boys. © Jonathan Caramanus / Green Renaissance / WWF-UK



Chief Katam – farmer. The napier grass is providing readily available fodder for his cows and he has seen milk production from his 2 cows double from 4 litres a day to 8 litres a day. *“The milk that I’m now selling is because of the napier”* he says.

upstream) in order that they continue soil and water conservation practices. Both the hospital and the tea factories have agreed in principle to our proposed scheme, but they are yet to commit any financial resources.

What have we achieved?

We established the work with farmers in June 2014 and by August 2015, 314 farms in the Nyangores tributary had been engaged, covering a cumulative area of 945 acres and protecting 42km of tributary. By August 2016, this had been increased to over 500 farmers, and the WRUA believes this can be scaled up to 2,000 fairly quickly.

The resulting accumulation of soil on farms has been measured using calibrated boards that are placed on the grass strips. This is soil that otherwise would have been washed down to the river. Meanwhile, farmers and WRUA members report an improvement in the turbidity and dry season flow of the small streams which drain the farms where we have worked. WRUA members are collecting samples and measuring turbidity on a frequent basis. However, it is still early days and we are yet to see a measurable improvement in the water quality of the Nyangores tributary.

The biggest immediate success is that farmers have seen, in just one year, dramatic improvements in the fertility of their farms, which has led to an increase in yield and incomes. For example one farmer, Mr Maritim, was on the verge of giving up farming because soil erosion was causing loss of nutrients from his land: his maize and beans were always wilting and he could never harvest more than 2 bags of beans and 5 bags of maize. Since the introduction of soil and water conservation measures in 2014 Mr Maritim has been able to harvest 5 bags of beans and 12 bags of maize, and he has seen his income more than double. His household income has also increased from the sale of napier grass as fodder. He has used the extra income to buy another cow and pay for school fees.

Such positive impacts have been seen by many farmers; indeed monitoring in August 2016 indicated that 80% of farms engaged by the programme are reporting an increase in farm yield.

Because the farmers can see tangible benefits for their families from these efforts, they are now more committed to soil and water conservation. Moreover, 40 farmers who had initially opted not to join the programme have taken the initiative and adopted the measures - simply because they can see the benefits that their neighbours are accruing.

Where will we go from here?

Build the business case: we need to continue to advocate the benefits to downstream businesses of being part of the scheme. It seems that appealing to their reputational risk might be the easiest way to secure their commitment in the short term. Reputation, for example, appears important to the tea factories, who want to be seen to be making positive contributions to protecting the environment, particularly if they want their processed tea to retain accreditations such as Rainforest Alliance. Meanwhile, the hospital is motivated by the food security benefits of the scheme as this aligns well with their disease prevention work with farming communities. However, to gain sustained commitment we will also need to demonstrate that the scheme is having a tangible impact on the river. One idea is therefore to focus our efforts on one small sub-tributary where it's possible to transition all farms to soil/water conservation measures within a year or two and monitor the resulting change in the sediment load of the river.

Expansion: an important next step is to conduct a rainfall-runoff analysis to calculate the farming area we need to reach before we're likely to see a discernible change in the sediment load of the Nyangores tributary. It will also be useful to calculate the percentage of the erosion "hotspot" areas that we have covered. These analyses will enable us to ascertain the scale of scheme required to bring about tangible improvements for downstream users, and thus the level of time and resources required to reach our goal. The Nyangores WRUA estimates that we will need to reach five times as many WRUAs in order to achieve such impact. The WWF team working in Lake Naivasha, also in Kenya, have done a similar analysis, so we must learn from what they have done.

Expansion will occur through participating farmers inculcating the culture of conservation farming in fellow farmers in the upper catchment, encouraging them to adopt the practices we have promoted and diversify their income streams. Certain farms are earmarked for the provision of seedlings and cultures to other farmers. The WRUA believes this farmer-to-farmer support will help catalyse the scheme, allowing uptake to happen more quickly than when we were initiating the first group of farmers. Further significant expansion of the scheme is likely if incentives can be secured from downstream businesses, for example in the form of vouchers for specific materials and other inputs.

Although incentives help, farmers also need continual encouragement to sustain the new measures, as well as support in solving specific problems that arise. Thus extra support for

Project checklist for watershed

Payments for Ecosystem Services

- Are upstream farmers/land-users likely to be motivated to change their farming practices if they receive some benefit?
- Are downstream private sector enterprises at risk because of declining freshwater ecosystem services? Are they motivated to change the situation?
- Ensure there is demonstrable evidence that a change in farming practice delivers improved freshwater ecosystem services.
- Calculate the area over which farming practices would have to change in order to achieve tangible improvement in freshwater ecosystem services – to check the goal is achievable!
- Monitor, monitor, monitor – to ensure improvements to ecosystem services can be demonstrated.
- Focus farming practice changes in a small tributary initially, to demonstrate proof of concept.

the WRUA to facilitate the scheme would also help enormously. WRUAs are voluntary organisations and receive no funding, and therefore have scant resources even for moving about the catchment and visiting farms. We're advocating for WRUAs to collect water user fees (rather than the government's Water Resources Management Authority) and retain a small percentage to help fund their activities. However, this arrangement has proved challenging to establish, as described in the [Mara WRUA case study](#). An alternative would be for downstream businesses to contribute a small amount to the WRUA, on the basis that they are protecting water resources for their benefit.

Engaging other private water users and expanding to other catchments: there are other private water users we could engage in this initiative. For example, large irrigated commercial farms further downstream, and the parastatal Bomet water supply company who are spending significant sums of water to clean the water that they abstract from the Nyangores tributary.

We also want to expand this initiative to other sub-catchments in the Mara basin. The basin is geographically diverse and other tributaries face quite different issues and have different private sector water users. For example, in the Talek and Sand River tributaries which run through the Maasai Mara Game reserve and surrounding rangelands, the main issues are over-grazing by cattle and waste water from tourist hotels and lodges. Tourism accounts for 10% of Kenya's GDPⁱ, and a significant portion of tourism is based on wildlife in the Maasai Mara region which depends on the Mara river ecosystem for its survival. There are clear benefits for the tourist industry if the hotels can clean up their act and support measures that work to protect the river ecosystem.

Build our capacity on erosion from footpaths and tracks: significant soil erosion appears to be occurring from roads and footpaths, particularly the steep paths used to take cattle down to the rivers. There is a significant opportunity for farmers to help improve this kind of erosion, but it requires us to better understand possible measures and what might be most appropriate in the context.

ⁱ GOK 2013, The State of Kenya's Private Sector



Edna Maina – farmer. Edna is a single mother with 5 children. “WWF has rescued me”, she says. Before Edna started conservation measures with WWF, soil and water ran over the land without any interruption. The top soil was bare and even rocky in places. Essentially the farm was barren and nothing could be grown. The new measures she has instigated have slowed the speed of run-off and allowed fertility to come back.

What helped to ensure our success?

The following approaches helped ensure we achieved positive change within farming communities quickly:

- Analysing the sub-catchment and identifying erosion hotspots where we should focus.
- Advocating soil and water conservation measures that were tried and tested in similar contexts.
- Focusing on achieving positive change quickly, to generate enthusiasm and uptake amongst farmers.
- Working through the catchment WRUA, thereby ensuring the scheme had legitimacy with the communities and paving the way for its sustainability once we step back.
- Working with the agriculture officer from the County Government who has many years of experience with the farmers and understanding what motivates them.
- Exchange visits to Naivasha where the PES program is functional, thereby encouraging farmer to farmer learning.

The hard lessons

Difficulty in engaging the private sector. Securing the support of businesses is difficult. Until we can demonstrate real improvements in river condition, it seems difficult to ask them to support and ultimately pay for farmers to change their practices upstream. However, as discussed above, demonstrating tangible improvements requires significant expansion of the scheme over a large area, and this in turn requires funds. Many businesses like the concept, but they don’t want to be the first to sign up and commit their resources; they’d like another organisation to be the guinea pig and see whether it really works.

In reality, it’s going to be difficult to link improved river condition with specific actions further upstream. Perhaps then, our approach should be to highlight in broader terms the risks businesses face with respect to the river, and the necessity of engaging with other river users to tackle these.

In addition, we need to appeal to alternative motivations for supporting this work: for example, improving yields and therefore food security is aligned with Tenwick hospital’s

disease prevention agenda; meanwhile practices which prevent the loss of soil and its fertility are beneficial for the tea factory because they ensure a consistent supply of tea from the small holders that supply them.

But do we actually need them? Another interesting consideration is whether we actually need the downstream businesses for this scheme to work. The benefits that the scheme brings to farmers in terms of increased yields have been accrued over a short period of time and are clearly visible to other farmers. Indeed, there has been significant uptake of the practices in surrounding farms. There is therefore an argument that our focus should be on securing sustainable funds for the WRUA to maintain momentum and facilitate farmer-to-farmer learning, rather than on engaging private businesses.

Resources

Other case studies from the HSBC Water Programme

¹ Hydrology study to guide development of an Equitable Payment for Watershed Services Scheme in Mara River Basin. Dr. Mwangi Gathenya, March 2011. WWF-ESARPO.

FOR MORE INFORMATION

Contact the WWF-Kenya team



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To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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