



**Managing Mangroves and Capturing Carbon
in Kenyan Communities
2012 FIELD REPORT**

Background Information

Lead PI: Mark Huxham

Report completed by: Mark Huxham

Period Covered by this report: 2011 - 2012

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Dear Volunteers,

I am writing to thank you again for all your efforts and contributions this year in Gazi. The team there all felt we enjoyed a special time together, working on our set tasks but also enjoying each other's perspectives and experiences and sharing cultures.

For me personally, helping with Sarah to run the Capacity Building team back in June was a wonderful opportunity. It was so rewarding to get to know you all and to see the enthusiasm with which you tackled the tasks in the field but also the teaching sessions. I do not think I have ever before been asked to do more teaching on statistics at the end of a three hour session. I sincerely hope that the training and experiences are useful for you in your future careers and that you do not forget what we are doing in Gazi.

I know from speaking to Kairo and Martin that teams 2 and 3 were also excellent - in fact Martin described team 2 as one of the best he had ever led. I know that some of you on that team had been looking forward to joining us for years (and saving up for it too!). I do hope the experience was everything that you had wished for.

We achieved plenty of important scientific objectives this year - planting hundreds of trees, establishing a new experiment on erosion, taking measurements of biomass from older plantations that will inform our carbon credit project are just some of these. But I think we also were particularly good at training and educating - and I do not mean in one direction (staff to volunteers) but collaboratively.

Thank you again for your time, your sacrifices and your enthusiasm and I do hope you stay in touch with us and maybe get the chance to come again.

Best Wishes,

A handwritten signature in black ink, appearing to read "Mark Huxham". Below the signature is a long, horizontal, wavy line that tapers at both ends, serving as a decorative flourish.

Mark Huxham

SECTION ONE: Scientific research achievements

Top highlight from the past season

We are on-course to launch Africa's first community-based mangrove conservation and development project funded by carbon credits. The science has been established, the institutions to share benefits and to monitor progress have been formed; only the formal accreditation process remains.

Reporting against research objectives

Our objectives are:

- 1) To test how the diversity of mangrove species in replanted stands affects a range of ecosystem functions, including primary and secondary productivity.
- 2) To collect data of direct relevance to practical restoration projects (such as the role of intercropping in enhancing productivity, and reducing disease), thus helping to inform future restoration efforts.
- 3) To use controlled experiments to test the effects of replanted mangroves on sediment dynamics (in both low and high energy areas), and to measure how these effects change as the trees mature.
- 4) To explore the potential for mangroves to act as carbon sinks and protect against the effects of sea level rise.
- 5) To develop a large scale demonstration project of sustainable mangrove utilization, and to use this to influence the management of mangrove habitats in Kenya and beyond.

Our progress against these:

1 - 3) Our long running diversity experiment has yielded important data which we have now published - two papers acknowledging Earthwatch came out this year (see Dissemination). However we continue to maintain and to monitor the plots since long term ecological data is rare and very valuable - so we looked at tree survival and growth and at sediment characteristics in our plots again this year, which will help us to understand how these plantations are changing their environment (and being changed by it) over time. In addition we have established a new experiment on the exposed coastal site looking at the effects of mangroves on wave speeds and erosion - this should yield results within one year and is part of the work of a local MSc student (hence will help with local capacity building).

We have made important progress on Objective 4. Our PhD student Joseph Lang'at, who has worked on the effects of mangrove removal on carbon losses for the past four years, graduated this year - a major achievement for him and for the project. His work is being prepared for publication now and will provide important information on the carbon implications of cutting - below is a key figure from that work (Figure 1) showing the difference in CO₂ loss between intact and cut forest areas.

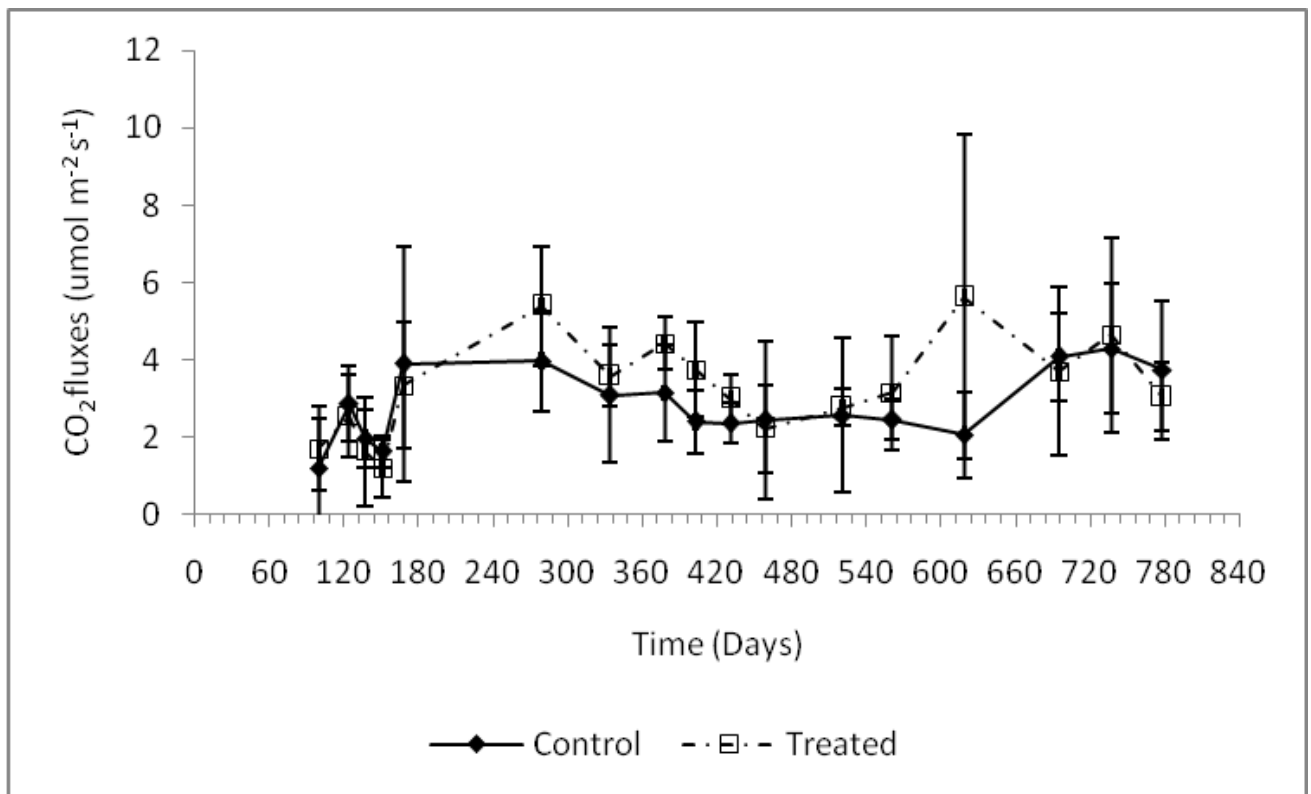


Figure 1: CO₂ flux over time in control and treated forest areas.

Our community based carbon project - Mikoko Pamoja - has made good if sometimes rather slow progress. We are constrained by the politics of working with local and national government to obtain legitimate tenureship for local people over the carbon benefits of their forest- we continue to strive to work around this constraint. We now have a full Project Design Document (attached as Appendix 1) which describes the organisation and running of our project in detail. Figure 2 here gives the local organisational structure whilst Figure 3 shows the proposed disbursement of funds.

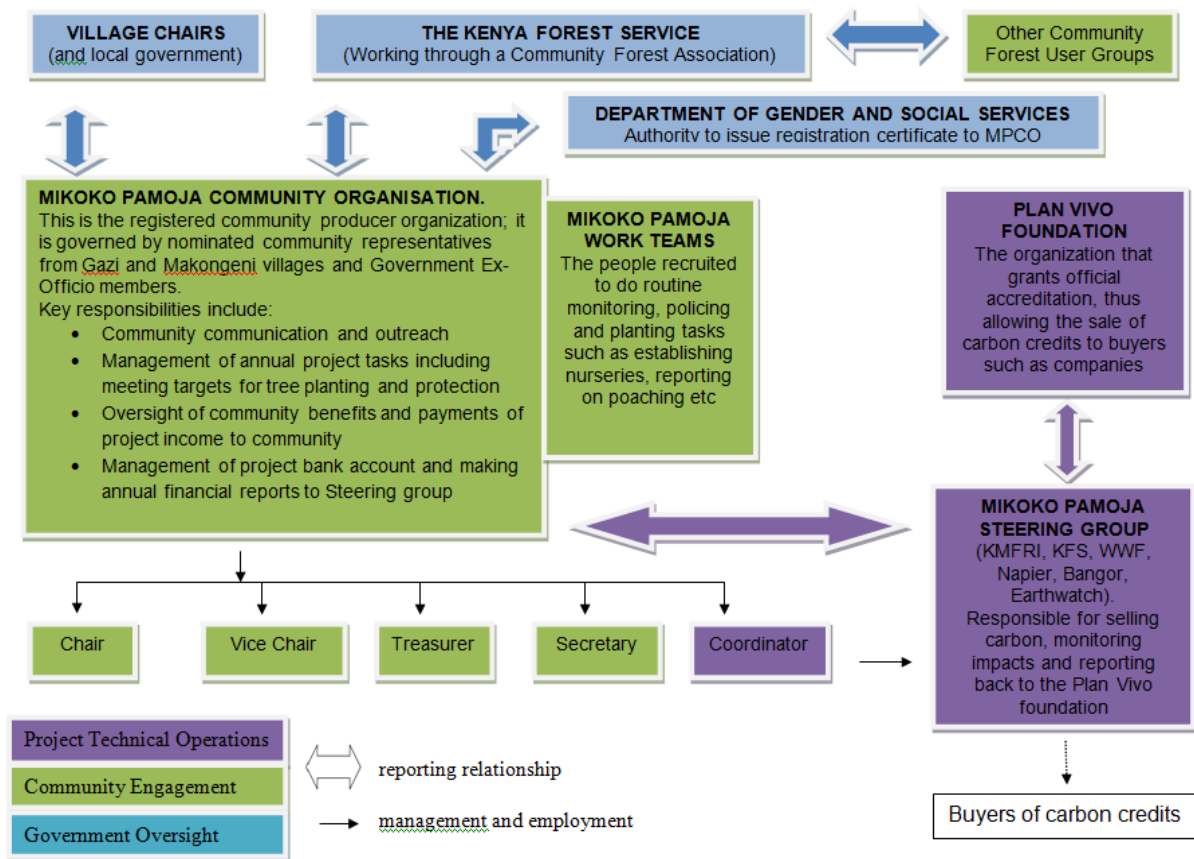


Figure 2: Mikoko Pamoja organisational structure and governance

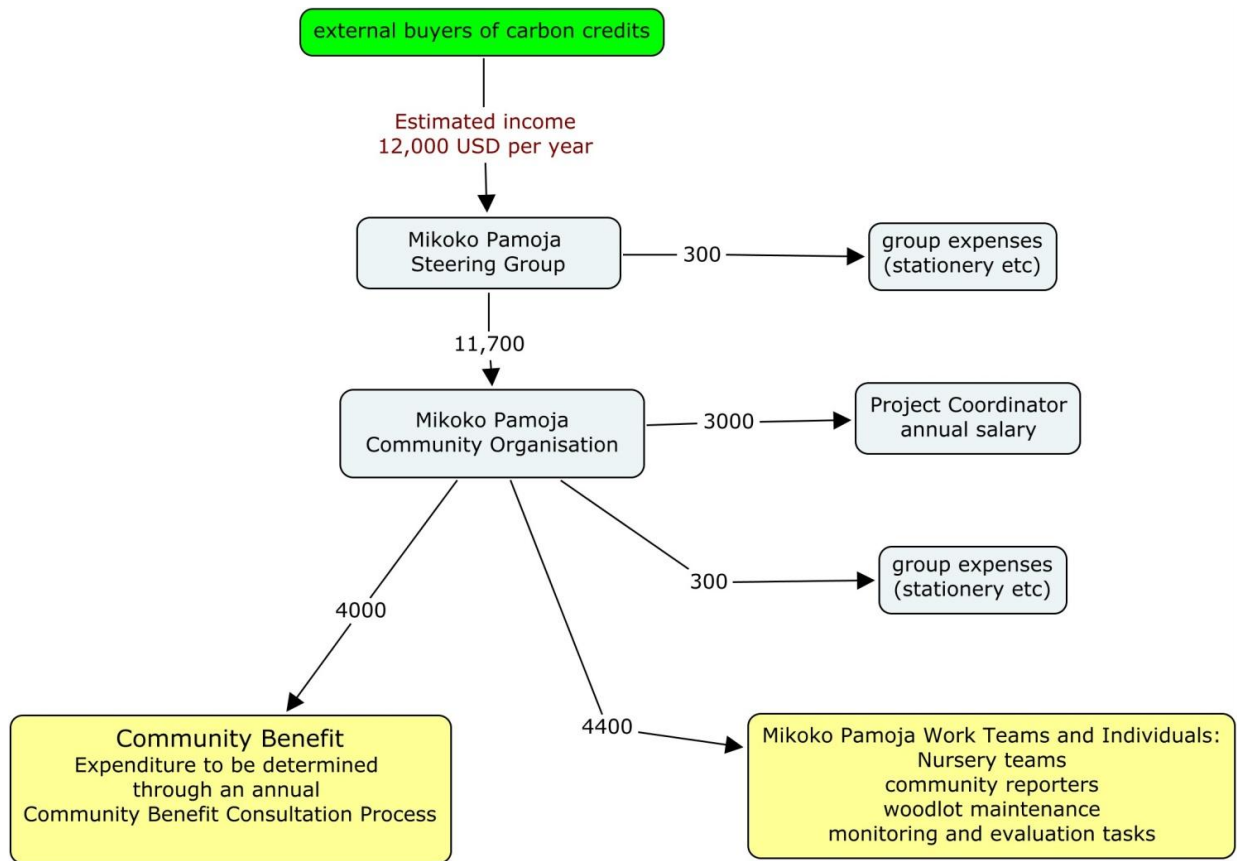


Figure 3: Mikoko Pamoja disbursement of funds

SECTION TWO: Impacts

Partnerships

Kenya Marine and Fisheries Research Institute - KMFRI is our key partner organisation in Kenya involved in everything that we do.

Kenya Forest Service - KFS are key new partners responsible for helping us achieve legal conservation status for our forest.

WWF - they are new partners on the steering committee of the East African Forum for Payments for Ecosystem Services, a forum we established and manage

Contributions to conventions, agendas, policies, management plans

- **International**

Our work is being used in the UNEP 'Blue Carbon' group in considering international best practice in measuring and monitoring marine organic carbon sinks. Our PI Dr James Kairo is a member of this group

- **National or regional**

Our data was specifically requested this year by the Kenyan Ministry of Forestry and Wildlife to help inform the National REDD+ plan

- **Local**

Our Mikoko Pamoja project is establishing a Community Forest Association to allow local people legal tenureship over the carbon benefits of their forest.

Developing Environmental Leaders

We ran a John Ellerman funded team this year which involved ten emerging scientists from Africa, Saudi Arabia and Sri Lanka in an intensive ten day training course. Our Kenyan PhD student Dr Joseph Lang'at successfully defended his thesis this year.

Actions or activities that enhance natural and/or social capital

We aim to plant 4000 trees per year

Conservation of Habitats

Yes - enhancement, restoration and replanting of mangroves is a core project activity

Ecosystem Services

Our main focus has been on carbon because of the potential market - the attached Project PDD document details the calculations behind the expected carbon benefit and puts this in financial terms

Impacting Local Livelihoods

We continue to employ a team of 7 (although not all full time) and train dozens of school students and three or four masters students every year. Mikoko Pamoja will bring ~\$12,000 US gross to the community every year.

Local community activities

The Earthwatch -Gazi Community Committee continues to operate as a medium for communication between the local villagers and our teams. WE have established new community organisations under Mikoko Pamoja

Dissemination of research results

Scientific peer-reviewed publications

Sigi Lang'at, Joseph, K., Kirui, Bernard, K. Y., Skov, Martin, W., Kairo, James, G., Mencuccini, Maurizio & Huxham, Mark. (2012) Species mixing boosts root yield in mangrove trees. *Oecologia*, DOI 10.1007/s00442-012-2490-x

Joseph, K., Kirui, Bernard, K. Y., Kairo, James, G., Skov, Martin, W., Mencuccini, Maurizio & Huxham, Mark (2012) Effects of species richness, identity and environmental variables on growth in planted mangroves in Kenya. *Marine Ecology Progress Series*, **465**: 1-10

Kirui, K. B., Kairo, J. G., Bosire, J., Viergever, K. M., Rudra, S., Huxham, M. & Briers, R. A. (2012) Mapping of mangrove forest land cover change along the Kenya coastline using Landsat imagery. *Ocean and Coastal Management*, doi:10.1016/j.ocecoaman.2011.12.004

SECTION THREE: Anything else

Thanks again for all your support this year - great working with you.