

**EXTERNAL EVALUATION OF THE
MIOMBO COMMUNITY LAND USE AND
CARBON MANAGEMENT
N'HAMBITA PILOT PROJECT**

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SUMMARY

The project develops forestry and land use practices that promote sustainable rural livelihoods in participation with rural communities in a way that raises living standards and assesses the potential of these activities to generate verifiable carbon emission reductions. The project works with communities and small-scale farmers in the Gorongosa National Park buffer zone, the initial target group will be the N'hambita community and the project extends the activities to other communities in the area. Using a bottom-up approach with much community participation, the project has made considerable and satisfying progress in each of its three main components: the promotion of sustainable land use in N'hambita (forest management, agroforestry and non-timber forest products), research into the regional potential for carbon offsets generated through these activities and capacity building to enable the verification of carbon offsets.

The project design is of high quality and continues to be extremely relevant in connecting in a practical way poverty alleviation with the ever more urgent struggle to stop the life threatening climate change.

The improved land use practices and reforestation programmes are successfully introduced and the direct benefits from the sale of carbon offset compensation as well as the indirect benefits from project activities are tangible. The improvement in the livelihood of the people provides incentives to the communities to actively participate and take up responsibility for their development.

Self esteem, good governance, and responsibility are non quantifiable results that need to be taken into account to properly judge the importance of the project.

The project will have to be scaled up in order to be economically sustainable and the interest from adjacent communities is encouraging in this respect. The income generating activities of the project will also need further development towards financial economic sustainability. The management skills of the active community members need further attention through training in order create more independence from managerial inputs.

Further research has to be done for more exact measurement of carbon offset and also to determine the necessary margin for the Envirotrade and the possible financial compensation to the community.

Complete economic sustainability seems possible, but more research is needed to make the internationally trade of carbon rights reliable and transparent, justifying continued donor support.

INTRODUCTION

In this document, two external evaluators report on the mid-term progress of the N'hambita Pilot Project, as required in a contract between EuropeAid and The University of Edinburgh. This report is based on the mid-term progress report by the co-ordinator of the project, Prof. John Grace, and on a visit by the evaluators to the N'hambita community. During that visit, frank and open discussions took place with representatives of the participants in the project: The Edinburgh Centre for Carbon Management (Dr. Richard Tipper), Envirotrade (Mr Philip Powell), The University of Edinburgh (Prof. John Grace) and the N'hambita community (Community Committee). In addition, two representatives of the European Commission (Mr Eric von Pistohlkors and Mr Noel Cook) took part in the discussions.

The N'hambita community is situated in the buffer zone around the Gorongosa National Park. Here, forest exploitation is unsustainable and there is a lack of technical expertise relating to the use of agro-forestry techniques to improve agricultural production and relating to forestry activities to provide local incomes. Moreover, there is a lack of finances with which to implement tree planting and forestry activities.

The N'hambita Pilot Project is designed to contribute towards a solution to these identified problems. Its main objectives are (1) to develop sustainable land use systems, (2) to produce research outputs relating to carbon sequestration potential and (3) to build capacity to manage carbon assets.

PROJECT EVALUATION

1. Relevance and quality

We consider the project highly relevant and of high quality. Its relevance is evidenced by the following problems that are addressed in this project¹:

Extreme poverty

Low annual cash income, estimated at US \$ 9 per household.

Of all households, only 8,6% has a member with a permanent job.

High incidence of disease (malaria, cholera, diarrhoea and AIDS) and mortality.

Each household owns only 2.3 durable items on average with 16,3% having no durable items at all.

Literacy level is below 10%.

Unsustainable use of resources

The Mashamba slash-and-burn agricultural system is likely to break down under increased population pressure.

High rates of deforestation and forest degradation.

Inadequate forest fire management.

Encroaching unsustainable production of charcoal.

Deficient water management leads to shortage and unclean water.

Lack of 'wise' agricultural practices.

Low productivity, e.g. average maize production is ca. 270 kg/ha.

No mixed cropping systems.

Dependence on a few crops (maize, sorghum).

We consider the project of high quality because it follows a bottom-up approach with a high level of community participation, includes much capacity building in the community (currently 140 are employed), introduces new technology for agro-forestry, uses adaptive management (i.e. a learning-while-doing approach), pays much attention to diversification of products and activities, introduces a new mechanism for income generation, based on carbon trading and managing, carbon assets, contemplates future up-scaling and has the potential to do so successfully, focuses on income generation but also values less easily quantifiable ecosystem services, is perceived by the community as important and has already improved local livelihood (information Community Committee), is innovative in the way that it aims to harness the opportunities presented by carbon management to provide tangible benefits to rural communities and biodiversity conservation, will encourage co-operation between communities, state authorities and private interests in the region, and provides a system that can be extended to other areas in the region acting as a flywheel to attract further private sector investment into the region.

¹ Most data are based on the MSc thesis of Rohit Jindal, part of this project.

2. Efficiency, effectiveness and sustainability of the separate activities

Activity 1: Forest management

According to the proposal, the forest management component has the following defined objectives:

- The establishment of a community forest association
- Training of community forestry workers
- Forest inventory
- Community forest nursery establishment
- Production of seedlings
- Management planning
- Establishment of Permanent Sample Plots
- Timber extraction
- Replanting and enrichment planting
- Measurements of Permanent Sample Plots

In general, much progress has been made to reach each of these objectives. However, collaboration with local and regional partners was abandoned (ORAM – after finishing the process of securing a land rights title for the community and The International Council for Research in Agroforestry, ICRAF – because their services proved to be extremely expensive). Much of their role has been absorbed by Envirotrade Mozambique Lda. to great satisfaction. The decision by Envirotrade to move its co-ordinating role from Beira to within the N'hambita community has been especially important for the effective development of the project. The value of Mr Antonio Serra and Mr Piet van Zyl can not be overestimated.

To comply with the above objectives, we have identified three main forest management actions: the production of tree seedlings in a community nursery, the extraction of dead timber from the Gorongosa NP buffer zone, and the establishment and monitoring of Permanent Sample Plots.

Seedling production has been very successful. Seedlings looked healthy and included a large variety of species. Over 83,000 seedlings have been planted, presumably to a large extent in Mashambas as part of the new system of agroforestry (see below). We have seen no evidence of replanting or enrichment planting, but according to the local project director over half of the planted trees are for timber. At the same time, there is no urgent need to replant trees in the forest since only dead trunks are removed from the forest. In total 88,506 m³ of dead logs were collected and processed.

As to the Permanent Sample Plots, 15 1.0 ha plots have been established on a long gradient of time since abandonment of the Mashamba. All individual trees in the plot have been identified and measured. Measurements include tree height and trunk diameter at breast height (DBH) to estimate tree growth rates. The sparse and heterogeneous distribution of the trees in the landscape justifies the choice for relatively large (1.0 ha) sample plots. To speed up PSPs inventories and to reduce the variability in the DBH data, we recommend tagging each tree trunk with a label at precisely 1.30 m. In addition, it would be wise to identify at this stage already the relatively rare tree species and the dominant tree species in the plots. For the rare species, additional sampling may be required to reliably estimate the growth rate. For the dominant species it is advisable to include these in the direct determinations of wet biomass, both above-ground and below-ground.

The PSP data are essential to estimate verifiable carbon sequestration in the fallows and to design management plans for sustainable timber extraction. For both aspects, it is vital that the frequency of forest fires is brought down if not brought to a halt (for more on this, see below).

In the long run, responsible fire management may be the biggest challenge this project faces to be successful. At a regional scale, a better understanding of fire-induced and other land-use changes in the area is provided by LANDSAT imagery (the possibility to include aerial photography is being explored). Repeated image analyses, in combination with PSP data, may provide the necessary tools to develop a sustainable land-use plan for the entire Gorongosa NP buffer zone. Until then, it would be prudent to abstain from the harvesting of live forest trees.

Activity 2: Timber utilisation

Thus far, only dead logs are used for timber. These logs are stripped and sawn in a robust saw mill that so far has produced 41,010 planks that are sold to outsiders and to the carpentry shop. Rest-wood is not wasted and used for fuel and/or sold. In total, the saw mill has generated c. € 7,427.00. This activity may well be economically viable, but this needs further investigation. The saw mill employs 5 people. Other costs are the write-off of the machine, spare parts, fuel, and costs related to the collection of the logs in the forests. We agree with the observation by Mr Cook that there is a risk that planks are being sold to the community carpentry shop below market value. In time, dead logs will become scarce in the Gorongosa NP buffer zone and the transition to technically more challenging life timber must be made. To evaluate if the saw mill will be viable as a micro-business, a detailed business plan is needed that includes these aspects. Business registration likely also involves more adverse taxing regime.

Many of the planks from the saw mill are processed in the carpentry shop that employs an additional 16 people from the community and in the hope to create additional value. The shop has produced over 600 lovely pieces of which about a third are sold to date, generating € 6,418.00. Tables are at c. € 100.00 a piece the most valuable. Much of the furniture has been sold to the Gorongosa NP headquarters. This activity looks promising and there may well be a market beyond the Sofala Province, possibly even for export. Again, a business plan (break-even analysis) has to be produced to see if this activity is indeed economically viable.

Activity 3: Agroforestry

The goal of this activity is to entice the farmers to abandon the traditional slash-and-burn agricultural system by maintaining soil fertility within agricultural lands. Traditional farmers may be expected to be wary, but have nevertheless enthusiastically embraced the new agroforestry methods. Intercropping of nitrogen fixing trees and reforestation with fruit trees was first implemented by a few selected farmers and subsequently copied by others. As a testimony of its success, in the neighbouring community of Boa Maria farmers have now also adopted the new farming methods.

The farmers have obtained tree seedlings from the community nursery and over 12,000 N-fixing trees and 23,000 fruit trees have now been planted in 371 0.1 ha agricultural fields (Mashambas). In addition, 8.2 ha of *Jatropha* (*Jatropha curcas* L.) plantations have been established. This was not envisaged in the original proposal, but we appreciate such adaptive management in the project. The products of *Jatropha* are oil and press-cake. The oil (from seeds) can be used for lighting, for

cooking, as fuel in plant-oil engines, as a lubricant, and for soap making. The press-cake is a good organic fertilizer.

Whilst the acceptance in the community of agroforestry is good and growing, its sustainability is threatened by surface fires in neighbouring fields. The risk of burning has been recognised in the project and Mashambas are now surrounded by 4-5 m wide fire-breaks. However, this has not always deterred fires, resulting in the loss of trees and despite the efforts of 12 trained and equipped community fire fighter groups. One solution may be to plant a living fence of *Jatropha* trees around the fields to block fires. Since *Jatropha* trees are not suitable for timber, in other parts of the world *Jatropha* is often planted in a hedge that serves to keep animals out and to prevent soil- and wind erosion. It seems worth investigating if a *Jatropha* hedge blocks fires also, since *Jatropha* stems contain much water.

Activity 4: Non timber forest products

The goal of NTFPs is to increase local income, diversify production systems and to reduce pressure on the forest.

Beekeeping was already practiced in the community, but the project has provided superior protective clothing and equipment. As a result, bee keeping activities have increased dramatically. Currently there are 30 bee keepers that operate 295 hives (another 150 hives are being built). These hives are built according to a tested design in the carpentry shop. In turn, the bee keepers provide wax to the carpenters. Smokers are produced in a community metal shop.

The reproduction of cane rats proved problematical and this activity was terminated. Alternatively, several farmers are successfully reproducing Guinea fowls from eggs, in incubators.

Another not contemplated activity in the initial proposal is the establishment of vegetable gardens that now permanently employ 10 people. As an example, the sale of vegetables such as tomatoes, cabbage, beans and unions generated € 385.00 between January 1 and October 1, 2006.

Finally, 25 people have taken up the production of crafts such as weavings, wood carvings and pottery. In particular, the weavings have generated additional income (€ 875.00).

We appreciate the inclusion and look-out for such new activities. Not all will be economically viable, but strong diversification reduces overall risk. We have seen little evidence of marketing of the NTFPs. The general outlook for many NTFPs will likely improve with the development of the Gorongosa National Park that hopes to attract tens of thousands of tourists annually. However, several years will pass before taking effect. In the meantime, an effort should be made to try to market the NTFPs in the region and bigger cities.

Activity 5: Regional carbon management research system

The goal is to quantify the carbon benefits that can be generated in the various land-use activities. On a local scale, such data are needed to establish Plan Vivo farming contracts with individual farmers that will be compensated for the sequestration of carbon. Regionally, such data are needed to establish how much carbon is annually sequestered in the 30.000 ha 'regulado' under particular management.

This research is well under way. Initial allometric equations to estimate tree biomass that were derived from the literature are gradually being replaced with 'real' equations from trees in the Gorongosa NP area. Using a modelling approach (CO3FIX and SPA) it will be possible to estimate carbon sequestration in each of the land-use units in the landscape. Next, LANDSAT imagery may be used to estimate carbon sequestration in the whole 'regulado'.

To attain more reliable estimates it pays to address the following points:

First, little information is still available on the growth rate of planted trees in the agroforestry system.

Second, little information on below-ground biomass is still available.

Third, it would be desirable to get at least a rough idea how the frequent fires affect tree growth and tree survivorship.

Activity 6: Carbon verification capacity building

A number of farmers have incorporated the planting of trees in their Mashamba to sequester carbon (i.e. Plan Vivo management). A community trust fund has been established. With the direct and close involvement of Envirotrade Mozambique Lda., there is sufficient capacity in the community to teach the farmers how to monitor the carbon uptake in their fields.

3. Impact of the project as a whole

Impact on target groups:

The project has contributed to sustainable resource use and also to additional income for the community as well as for the individual members participating in the project. Talking to the members of the community committee reveals an amazing awareness about the complexity of the aims of the project. The difference shows a dramatic change in the attitude of the community committee members regarding the problems they are facing in their daily lives and in carrying forward the project. Initially, 2 to 3 years ago after the community had secured the exclusive right to live on the land and use it, the community was in doubt as to what to do with the land other than what they had always done traditionally. They showed a strong dependency of whatever they could receive from outside and what others would tell them to do. The problems are now discussed in terms of what they are going to do about it now, in the near future and later on. This reflects a much clearer sense of the need to plan and a longer term vision on their own potential for improvement of their situation.

The uncontrolled fires, caused by hunters and charcoal producers and by traditional farming, continue to pose a serious threat to the successful realization of project objectives as well as to the aspirations of individual farmers. The community shows to be very conscious of this threat and assumes responsibility for the common fight against the fire. Charcoal burning is still legal to some extent. The authorities issue the licenses to individuals. The community has recently managed to convince the local authorities to involve the committee in the decision about issuing licenses on the community land. The active attitude to fight the present production methods (charcoal, hunt and agriculture) reflects a growing awareness of the advantages of sustainable land use systems.

The income generated for the community fund from carbon as well as from project activities (particularly timber extraction and utilization) has led to investment in the school, the construction and improvement of wells and the presently ongoing

construction of health facilities. An important aspect of the self generated development is that these facilities, once created, are adopted into the government scheme of responsibility for the sectors health and education.

The additional individual incomes earned by community members from different sources (carbon and other project activities) have a considerable direct effect on the lives of people. School fees can be paid, bicycles are bought and maintained, radios are entering in the houses and corrugated iron roof sheets put on top of houses.

Regarding the food situation a major improvement is the possibility to bridge the period of food shortages between the new harvest and the running out of stocks. Members in the community are now in a position to buy some extra food in the market to supplement their diet.

Some individuals went as far as hiring labor to be able to extend the cultivated area, which is often limited by the availability of hands to work on it.

The direct advantages of agro forestry are only slowly beginning to be felt. Once Mashambas have been developed according to the new approach less labor is required for clearing and preparing the land. The fruit trees have not started to yield fruits and also the firewood is not yet available from new systems of plantation.

Community members have been and continue to be provided with training for all activities. These plans will be used by the trust fund to assess land use activities. Community members are trained in the production of simple management plans in the form of annotated maps. These plans serve to help community members plan their time and monitor their own results as well as facilitate carbon verification. Certain key community technicians were given further training in monitoring methods for carbon verification in conjunction with the trust fund technical team.

The project includes monitoring systems as an intrinsic part of its design. Monitoring is carried out by community technicians with support from the trust fund technical team. Carbon verification requires an assessment of tree growth, soil fertility and deforestation. The research component generated simple-to-measure indicators of these attributes recorded by community technicians and project trust fund technical staff.

Monitoring indicators have been developed to assess the social impacts of project activities in the community.(see MSc thesis of Rohit Jindal) This will cover:

- Experiences with land use activities
- Skills and experiences
- Income generation
- Organisation and communication

Key indicators of project impact will be based around:

- The number of community members involved in the project
- The area of various land use activities implemented
- The income generated by various activities
- Activities funded by project income
- GHG emissions avoided
- Carbon asset value realised

The Forest and Wildlife Department receives training and support in order to assess land use activities for carbon offset potential. This will include the management of the trust fund and the use of Plan Vivo administrative systems.

CEF will work closely with the University of Edinburgh. Personnel of CEF will receive training from project staff in the production of technical specifications of land use systems for carbon verification purposes. Two students have been provided with the opportunity to carry out MSc research in the project.

A fully documented assessment of the impact on the community quantifying the achievements of the different indicators will have to be part of the end of project evaluation. The Rohit Jindal thesis offers important base line data for such an exercise to be potentially very informative.

The overall impact:

The present mission had the opportunity to travel around in the different parts of the Regulado (the total area in which four communities located at different places form a comprehensive unit under the rule of the traditional leader called Regulo). Some parts show a desolate image of burned fields where both legal and illegal charcoal production takes place. The N'hambita community project participants (one of the four communities of the regulado with the same name, where the camp of the project management is located) is aware of the advantages of the newly developed land use systems. They serve as examples for other communities at larger distance from where the project has started its core activities. Also the participating community and the community committee are actively involved of spreading the message. Improved transport(bicycles) and means of communication (radio) are considered potential instruments that enhance the attempt to fight fire and involve more people in the sustainable land use patterns.

The perspective of controlled and sustainable charcoal production would offer a badly needed alternative for the presently devastating uncontrolled activity in that area. The short term felt needs have to be balanced by long term interests. The project has contributed to an awakening consciousness in this regard.

The interest of the population for the advantages of the project has attracted people from the communities that were originally planned to serve as control groups (Boa Maria and Munhanganha) as compared to N'hambita forming the target group.

4. Potential sustainability of the project as a whole (economically, ecologically, and socially)

The project aims to attain financial sustainability through the production of timber and other forest products in the community and through the sale of carbon offsets generated by these activities.(see activities under 2) The international market for carbon offsets is developing and much will depend on international level negotiations about which there is uncertainty.

The sustainability of the project needs to be looked at in the perspective of future expansion. The project particularly pretends to draw from the experimental phase the knowledge and know how and experience to make it serve as a model for extensive replication.

At first sight the assessment after two years of implementation shows very encouraging results against the three original principal objectives.

Develop sustainable land use practices, in participation with the N'hambita community, which have the potential to provide socio-economic benefits and protect and restore forest resources.

Produce research outputs into the potential of sustainable land use in the Miombo ecosystem to sequester and conserve carbon in order to produce regionally applicable models that may be used to quantify carbon benefits in the pilot project area and in other future projects in the region.

Build capacity in provincial organisations, including the Forest and Wildlife Department, so that they can use the results of the research to advise on land use activities and assess potential carbon benefits from projects in the province.

The sustainability of the achievements will depend on a number of variables that would still need further analysis.

To capitalize on the future sales of carbon right now the market value of carbon rights is one and the interest rate is two. If the interest rate would be taken as neutral (no change) than the present value depends completely on the development of the value of carbon sales. Given the demand that Envirotrade now meets and cannot be satisfied, certain optimism would seem to be justified. Growing international concern over climate change and its consequences will increase pressure on the community of states to tighten the policy principles of Kyoto ,which presumably will lead to a rise in the price of carbon rights.

Against that background the sustainability will have to be judged of the different parts of the project.

The carbon sales. The sustainability will require the carbon sales to be sufficient to bear all costs directly related to production, research and measurement. As at this moment it seems that more analysis needs to be done about the exact quantities that can be produced per land-use system and in the Regulado as a whole. In this analysis potential sources of leakage, for example through the conversion of old fallows into Mashambas, must also be included. Once carbon sequestration is quantified, a break-even analysis should be performed to determine the required scale of the future operation that will support the costs and will leave a sufficient margin for the communities (and individuals) to continue to serve as an incentive for participation.

The different income generating activities introduced by the project are still supported by the project but will eventually have to be individually self supporting in the economic sense.

The management capacities must be developed to the extent that sustainable operation of the enterprises is a perspective in a near future without major supervision from the part of the project management. This will be a slow process, likely extending the time frame of the EC grant. Therefore, we believe that a continued presence of Envirotrade Mozambique Lda. in the N'hambita community is vital.

With respect to project management also, it is imperative that Envirotrade Mozambique Lda. continues to intermediate in the sale and administration of carbon offsets. The project management structure as presented to us by Dr. Tipper (ECCC), building on experiences obtained in Mexico, makes much sense. We encourage that the project keeps contacts with scientific experts, e.g. at the University of Edinburgh.