Project Report

Restoration and Increase of Forest Connectivity in Taita Hills: Survey and suitability assessment of exotic plantations for restoration.

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Executive Summary

This report describes the activities of a project that received support from the Critical Ecosystem Partnership Fund (CEPF) to provide pertinent information and data to another project whose main outcome would be a model on forest connectivity of the Taita hills.

The projects' main goal was to facilitate/coordinate the acquisition and provision of data necessary for the forest connectivity modeling of the Taita hills.

The forest fragments (21) occurring above 1350m asl were assessed for potential to rehabilitation into an indigenous forest which narrowed the list down to 14. Those that had a medium to high potential for rehabilitation underwent GPS mapping, ecological assessment and socio-economic survey. In addition, a single GPS reading of the other forests was taken to show their location and a briefing workshop held in October 2005 for the team that carried out the activities.

A map showing the location of all forest fragments was produced. Most of the forest fragments (14) would require either complete re-planting and removal of exotic trees or some silvicultural practices to encouragement the growth of indigenous trees and enrichment planting with some removal of exotic tree species. The results of the socio-economic survey show that the local people are in support of the conversion of the exotic plantations into indigenous forest cover.

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Background

The Taita Hills (south-east Kenya, 03°20'S, 38°15'E) represent the northernmost extreme of the Eastern Arc Mountains, a chain of mountains that run from south-eastern Kenya to southern Tanzania and boasts an extremely high diversity of flora and fauna, high levels of endemism, and high threat levels. The area is part of a global biodiversity hotspot and is part of the Tanzania-Malawi Mountains Endemic Bird Area. The overriding conservation problem in the Taita hills and other biodiversity hotspots within the Eastern Arc region is loss, fragmentation and degradation of the indigenous forest cover. Indigenous cloud forest in the Taita hills currently covers an area of about 430ha, reflecting 98% forest reduction over the last 200 years, mainly due to clearance for agricultural purposes. Although forest clearance is less widespread at present, past clearance led to increased isolation of the remaining patches, edge effects, soil erosion and negative hydrological effects. Despite the small size of the 12 remaining indigenous forest fragments, they are of global conservation importance, holding numerous rare and endemic plants and animals. Since many of these species persist in small and highly isolated subpopulations, a high proportion is highly threatened and is of immediate conservation concern (demographically and/or genetically).

Introduction

In February 2005, CEPF funded a stakeholders' workshop to discuss the conservation and management of the Taita hills forests. The participants were drawn from community groups from various parts of the Taita hills, NGOs working in the region (both local and international), relevant government departments and institutions conducting research in Taita hills. The workshop's main purpose was to give stakeholders an opportunity to discuss key threats and challenges, as well as identify the best options for restoration and connectivity enhancement among the Taita hills forest fragments. Two key resolutions from the workshop were to: (1) increase indigenous forest area and reduce degradation of remnant indigenous patches (i.e. safeguard biodiversity habitats and population processes); and (ii) increase forested area in the surrounding matrix and convert plantations of exotic trees to indigenous ones (to provide for human needs as well as increase overall connectivity of the landscape).

During the stakeholders' workshop, the conversion of existing exotic forest plantations into indigenous forests was identified as a key target for habitat restoration. In addition to creating stepping-stones to enhance connectivity, it would augment natural habitat area as well as provide a short-term firewood source. A three-stepwise process was decided on to implement the workshop resolutions. These were;

1. Step I: Mapping of the location and boundaries of all forest fragments by a combination of fieldwork and interpretation of high-resolution aerial photographs; scoring of each plantation fragment according to its suitability for habitat restoration, based on biotic and abiotic properties such as existing tree species composition, quality of the indigenous seedbank, age and history of the fragment, slope and altitude; and inquiries into possible legal or socio-economic constraints for conservation actions.
2. Step II: Connectivity analysis and modelling.
3. Step III: Development and implementation of an integrated restoration and connectivity enhancement programme based on the results of steps I and II.

Project Goal
The main goal of this project is to facilitate/coordinate acquisition and provision of data necessary for the forest connectivity modelling of the Taita hills.

Project Objectives
- To locate and map the boundaries of the plantation forest patches using GPS.
- To assess the suitability of the plantation forest patches for restoration.
- To assess or investigate the legal and socio-economic constraints towards restoration.
- To carry out awareness creation during boundary survey among the community members living around the forests.

Expected Results
- The location and boundaries of the plantation forests known and GPS readings taken.
- Ratings of "level of restoration ease" of the plantation forests obtained through a rapid assessment taking into consideration abiotic, biotic and legal/socio-economic aspects.
- Awareness created among the local community living adjacent the forest and local support generated for restoration.

ACHIEVEMENTS
1. Reconnaissance visits/awareness creation.

The Taita/Taveta District has 52 areas that are regarded as forests either by the Forest Department and/or the County Council of Taita/Taveta. Out of these, a large number is found within the Taita hills region (about 37). As a preliminary exercise, a desk appraisal was carried out to narrow down the forest patches to only those that meet the basic criteria of altitude (>1350m a.s.l). This resulted in a list of 21 forest patches that was the subject of this reconnaissance survey.

The main objective of the exercise was;
- Examine the forest patches for their potential for restoration to a high indigenous forest.
    - The potential for restoration was determined/assessed by looking at the presence of indigenous vegetation and type, and generally the micro-climatic factors.
- Know the location of the forest patches.
- Have a final list of candidates that will undergo GPS mapping and restoration-suitability rating/ranking (physico-chemical & socio-legal factors).
- Meet the local leaders such as the Chief, assistant Chiefs and village elders and sensitise them on the activity taking place and the importance of forest connectivity to biodiversity conservation.

The following list (Table 1) provides the forests that underwent reconnaissance survey from 22nd August 2005 to 2nd September 2005. The reconnaissance survey was carried out by the Project Coordinator of EAWLS and the Assistant District Forest Officer, with the assistance of the locational extension agen and the respective forest guards.

Table 1. Forest fragments in Taita hills above 1350m asl.

No.	Forest Name	Area (Ha)	Location
1	Kinyesha mvua	49.5	Mghambonyi
2	Choke	73.5	Mbale
3	Irizi	476	Wumingu
4	Mwarunga	?	Saghasa
5	Mwarungu	400	Wumingu
6	Mbili	10.23	Wesu
7	Wesu Rock	50	Wesu
8	Susu	17	Ngerenyi
9	Kilulunyi	0.25	Wusi
10	Weni mwana	5.26	Iyale
11	Ngomenyi	0.2	Ngerenyi
12	Mchungunyi	8	Mgange Dawida
13	Jaycee	10	Mgange Nyika
14	Vuria	115	Mgange Dawida/Mwanda
15	Mwaghanini	14.6	Mwanda
16	Ikuminyi	?	Mwanda
17	Modangache	3.4	Shigharo
18	Goye	14.1	Shigharo
19	Weni Mbogho	2	Shigharo
20	Shomoto	50	Sungululu
21	Boma	?	Wundanyi
22	Mraru	200	Mole – Mwambirwa

The following were the observations (Table 2) made of the forests. On the basis of these observations, the forests' potential was assessed as being high[1], medium[2] or low[3].

Table 2. Summary of observations made of the fragments during reconnaissance survey.

Forest Name	Observations	Potential
Kinyesha-mvua	• Mixed – exotic and indigenous trees. o Exotic species include *Pinus patula, P. radiata, Eucalyptus sp., Acacia mearnsii, Grevillea robusta*. o Indigenous species include *Cussonia spicata, Albizia gummifera, Clausena anisata, Macaranga conglomerata, Maesa lanceolata, Phoenix reclinata.* • Important for water catchment as evidenced by the presence of a stream.	High

[1] High = forest that could easily be converted back to indigenous due to the presence of some indigenous trees, good soils and moisture conditions.
[2] Medium = forest with some forest vegetation of poor quality and that would clearly require a heavy investment to convert to indigenous forest.
[3] Low = fragment that has no forest cover, poor soils (shallow/rocky) and rain-shadowed.

	• Fire damage (frequent).	
Choke	• Partly covered by shrubby vegetation (*Dodonea augustifolia*). • Exotic trees growing (stunted) – *Pinus sp., Eucalptus sp.* • Shallow soils. • The forest area is in a rain-shadowed position.	Low
Irizi	• Has an indigenous portion – *Cussonia spicata, Podocarpus latifolius, Syzygium guineense, Milletia oblata*. • Other portion is covered mainly by exotic species – *Cupressus lusitanica, Pinus sp., Acacia mearnsii, Eucalyptus sp.*, stunted in some areas.	Medium
Mwarunga	• Tree species include *Caltris sp., Pinus sp.* • Very thin soils. • Rain-shadowed.	Low
Mwarungu	• A large portion covered by a bare rock. • Vegetation include *Phoenix reclinata, Acacia mearnsii, Eucalyptus sp.*	Medium to low
Mbili	• Indigenous vegetation – *Phoenix reclinata, Prunus africana,Albizia gummifera, Cussonia spicata, Nuxia sp., Milletia oblata, Macaranga conglomerata.* • Exotic vegetation – *Cupressus lusitanica, Grevillea robusta, Eucalyptus sp., Acacia mearnsii.*	High
Wesu Rock	• Some areas with very shallow soils. • Exotic vegetation – *Acacia mearnsii, Eucalyptus sp., Cupressus lusitanica, Grevillea robusta.* • Indigenous vegetation – *Prunus africana, Milletia oblata, Cussonia spicata, Albizia gummifera, Phoenix reclinata.*	High
Susu	• Has quite a large portion covered by exotic tree species, especially the higher part – *Acacia mearnsii, Eucalyptus sp., Cupressus lusitanica.* • There are portions of indigenous –*Cyathea sp., Phoenix reclinata, Tabernaemontana stapfiana, Ficus sp., Albizia gummifera, Cussonia spicata, Macaranga conglomerata, Prunus africana.* • Forms an important water catchment area.	High
Kilulunyi	• A communal plot. • No forest vegetation except for a few planted seedlings. • Construction of some buildings taking place. • Small area.	Low
Weni mwana	• Water catchment area. • Quite some indigenous forest cover – *Prunus africana, Cinnamomum camphora, Phoenix reclinata, Milletia oblata, Ficus sp., Cussonia spicata.*	High

	• Exotic tree cover – *Cupressus lusitanica, Eucalyptus sp., Acacia mearnsii.* • A good portion of the forest is bare rock.	
Ngomenyi	• Very tiny area. • Some indigenous forest vegetation – *Phoenix reclinata, Ficus sp., Albizia gummifera, Milletia oblata.* • Exotic vegetation – *Acacia mearnsii, Grevillea robusta.*	High
Mchungunyi	• The place is generally dry. • Mainly covered by exotic trees – *Pinus sp., Eucalyptus sp.*	Low
Jaycee	• A large portion covered by exotic trees – *Cupressus lusitanica, Grevillea robusta, Acacia mearnsii, Eucalyptus sp.* • Some indigenous trees – *Prunus africana, Cussonia spicata, Ficus sp., Newtonia buchananii.*	High
Vuria	• Highest point in Taita hills. • An important water catchment forest. • Natural vegetation cover a small portion of the forest – *Cyathea sp., Lobellia gibberoa, Psychotria sp., Podocarpus latifolius, Prunus africana, Tabernaemontana* and many others. • Exotic vegetation cover the larger portion of the forest – *Acacia mearnsii, Eucalyptus sp., Cupressus lusitanica*.	High
Mwaghanini	• Rain-shadowed by Vuria hill. • No forest vegetation except for planted exotic trees doing poorly – *pinus sp., Caltris sp., Acacia mearnsii, Cupressus lusitanica.*	Low
Ikuminyi	• Rain-shadowed by Vuria hill. • Has little vegetative cover mainly dominated by *Euphorbia sp., Commiphora sp., Acacia sp.*	Low
Modangache	• A small patch – probably preserved due to its traditional use (shrine). • The patch seems to be an important place for birds, one Taita White-eye was sighted. • Indigenous trees – *Cussonia spicata, Albizia gummifera, Phoenix reclinata, Ficus sp., Macaranga conglomerata, Nuxia sp., Tabernaemontana stapfiana, Milletia oblata* and others. • Exotic trees – *Maesopsis eminii, Grevillea robusta, Eucalyptus sp.*	High
Goye	• Rock outcrop. • Few shrubs surrounding the rock outcrop.	Low
Weni-mbogho	• A small indigenous forest patch. • Apparently an important water catchment area. • Trees include – *Phoenix reclinata, Prunus africana,*	High

	Albizia gummifera, Cussonia spicata, Tabernaemontana stapfiana,	
Shomoto	• Indigenous vegetation cover a small portion of the forest – *Phoenix reclinata* and a few others. • Recent planting of indigenous trees observed, mainly *Prunus africana*. • Exotic trees	High
Boma	• A small forest. • Dominated by exotic trees – *Maesopsis eminii, Eucalyptus sp., Cupressus lusitanica* and tea bushes in the undergrowth. • A few indigenous trees – *Macaranga conglomerata, Syzygium guineense.*	High
Mraru	• A forest next to Mbololo forest. • Upper portions support an indigenous vegetation with a few exotics such as grevillea. • Lower portion has a shrubby vegetation (Dodonea) and exotic trees such eucalypts.	Medium

All the forest fragments whose potential for conversion to indigenous forest cover was medium to high were selected to undergo further assessment and GPS boundary mapping. The foragments are; Kinyesha-mvua, Irizi, Mbilli, Susu, Weni-mwana, Jaycee, Vuria, Modangache, Weni-Mbogho, Shomoto, Mraru and Boma.

2. Convening the Team and its Training

A team was convened that would carry out the GPS mapping of the boundaries, the suitability assessment and the socio-economic survey of the community living around the forest fragments that had been shortlisted. The proposed team members were; a surveyor from the survey section of FD (Forest Department), a forest ecologist from KEFRI (Kenya Forestry Research Institute), the District Forest Officer, the Project Coordinator - EAWLS, the Project Assistant – EAWLS, and the Clerk of the County Council of Taita/Taveta. This team was to be assisted by a forest guard, the respective Chiefs, assistant Chiefs and village elders, and forest guards especially in identifying the forest boundaries.

A two-day workshop was organised in Wundanyi (6 and 7th October 2005). The participants were drawn from; the Universities of Ghent and University of Antwerp - Belgium, the Forest Department, the County Council of Taita/Taveta and The East African Wild Life Society. The following persons (Fig. 1) participated in the briefing workshop moderated and facilitated by Dr. Frank Adriaensen (Universities of Ghent and Antwerp) and James Mwang'ombe (EAWLS);

- Dr. Mwangi Githiru (University of Ghent)
- Mr. Patrick Maingi (Asst. DFO - Forest Department)
- Mr. David Mwasaru (FG/Forest Extension Officer - Forest Department)
- Mrs. Julither Mwaviswa (Administartive Officer - County Council of Taita/Taveta)
- Ms. Elizabeth S. Jilani (Environment Student - ICIPE/Egerton University)
- Ms. Ethel Mngola (Community/Social student - Mombasa Polytechnic/NEMA)
- Dawson Mwanyumba (Project Assistant - EAWLS)

Fig. 1. October '05 workshop participants.

Other participants that had been invited from the Forest Department-Survey section and the Kenya Forestry Research Institute sent their apologies for their unavailability during the period. In order to cover gaps created by them, Ms. Elizabeth Jilani, and Ms. Ethel Mngola were invited to take their places and enrich the team. Dr. Mwangi was particularly useful in explaining issues to do with the endangered birds and the benefits that may be obtained from forest connectivity in terms of their conservation.

The objectives of the workshop were;

- To specify data type, level of accuracy and analysis.
- To develop a schedule of work.
- To familiarise the modelling expert and the team members on the location and kind of terrain and in the process work out how best to collect the data.
- To get to have an idea how the data collected in the field and from the aerial/satellite images will be used to develop the least-cost model.

Three main activities on the ground are expected to be done and these are;-

- GPS readings of the selected forest patches
- Socio-economic survey of the people, their attitudes and willingness to participate in the conservation efforts
- Vegetation survey, soil status and forest nature.

A schedule of fieldwork was developed as presented in table 3 below.

Table 3. Fieldwork schedule.

Forest	**Size (Ha)**	**Days for work**	**Date scheduled**
Kinyeshamvua	49.7	2 days	23rd – 24 October
Irizi	476.0	3 days	14th – 16th November
Mbilli	10.2	1 day	3rd November
Wesu	50	2 days	11th-16th November
Susu	1.7	1 day	17th November
Weni-mwana	5.2	1 day	28th November
Jaycee	10	1 day	29th November
Vuria	115	4 days	9th – 12th November

Modangache	3.4	1 day	18th October
Weni-Mbogho	2.0	1 day	18th November
Shomoto	50	2 days	30th November
Mraru	200	4 days	23rd – 27th October
Boma	?	1 day	2nd December
Mwachora (Chome)	?	1 day	31st October

Tasks for the GPS reading, socio-economic and vegetation survey were allocated as follows:-

1. GPS reading - Forest Department surveyor and David Mwasaru Forest Guard.
2. Socio-economic survey - Mrs. Julither Mwaviswa, Ms. Ethel Mngola and Dawson Mwanyumba
3. Ecological survey for suitability - KEFRI Scientist, Elizabeth Sidi and Mr. Maingi, forest department.
4. General duties and logistics - Mr. Mwang'ombe

The first collection of data is to be sent to Frank at the University of Ghent between the 19th or 20th of October 2005. Letters to the chiefs and their assistants and the village elders requesting for their assistance, cooperation and participation were sent soon after detailing the dates of visits to their respective forests.

The modelling expert together with the team made visits (familiarisation tour) of the forest patches that had earlier been identified to have a potential for rehabilitation. The itinerary is presented in table 4.

Table 4. Familiarisation tour itinerary.

Date & Time	**Place**
Saturday 8th (0900 – 1600 hrs)	Ngangao forest
Sunday 9th (0900 – 1600 hrs)	Ngangao forest
Monday 10th (0900 – 1600 hrs)	Kinyeshamvua, Irizi, Wesu and Mbilli forests
Tuesday 11th (0900 – 1600 hrs)	Chawia, Susu, Jaycee, Vuria and Iyale
Wednesday 12th (0900 – 1700 hrs)	Mwambirwa, Mbololo and Mraru
Thursday 13th (0900 – 1200 hrs)	Weni-Mbogho, Mwachora and Chome

A discussion was held between Dr. Frank, Dr. Mwangi and the Project Coordinator on the possibility of holding a dissemination workshop in Wundanyi in September 2006. The University of Ghent would prefer that the EAWLS through the Project Coordinator carry's out the organization of the workshop. It was generally agreed that, the Project Coordinator should work out a budget for the workshop including expenses related to its organization and send it by end of February 2006.

Other outputs of the workshop was the development of a simple form (Appendix 1) to be used in ecological assessment, and the socio-economic survey questionnaire (Appendix 2).

3. Forest boundary Mapping, ecological assessment and socio-economic survey.

GPS readings for the 14 fragments and the rehabilitation area in Mwambirwa forest was carried out. Also taken were single GPS readings for the fragments not found suitable for restoration. As much as possible the team endeavoured to locate the beacons of the forest and take the readings. Assistance to do this was provided by the forest guards, the Chief and assistant chiefs, the village elders and the owners of farms sharing boundaries with the forests. Figure 2 below shows the location of the forest fragments mapped.

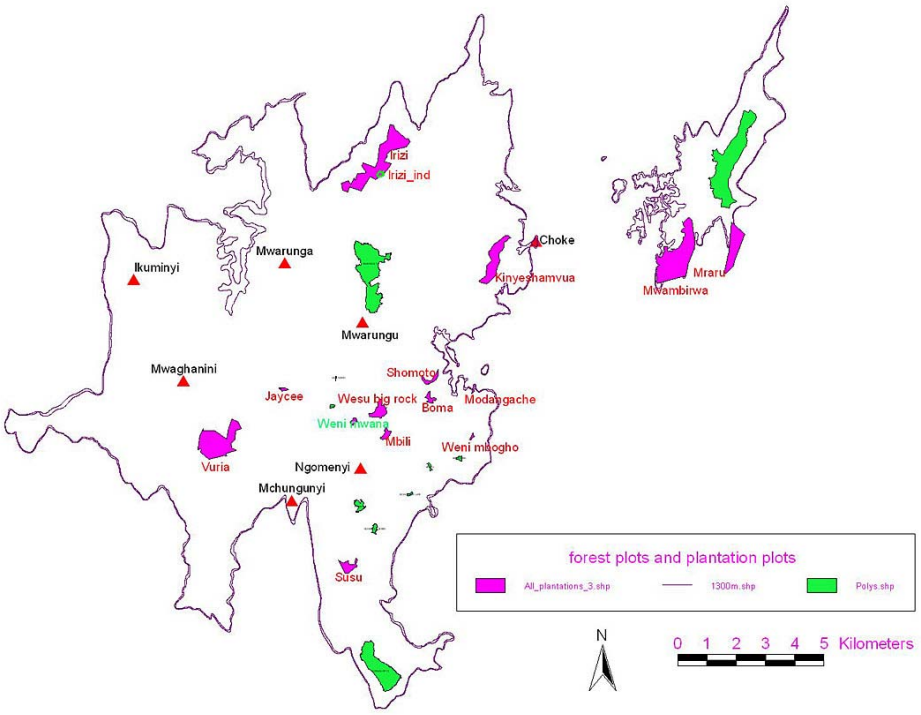

Figure 2. Location of forest fragments in Taita hills (NB. ***For Mwambirwa forest, only the rehabilitation area was mapped***).

The ecological assessment was carried out concurrently with the GPS mapping. The team looked at the types of tree species currently growing in the area, regeneration, soil depth, animal species and other factors that may be of interest or prominent. Table 4 presents a summary of the observations. It is important to note that, the list of tree species identified is not exhaustive. The team restricted itself to the species they could positively identify.

The socio-economic survey of the community living around the forest plantations in Taita hills was carried out using a questionnaire geared to obtain pertinent information varying from demographic data to views towards biodiversity conservation and willingness to participate in habitat restoration activities. A total of 189 persons (59% women) were interviewed for 14 forest patches where GPS readings were taken. In general, the survey confirmed the point of view that Taita people are very positive towards indigenous forest, conversion of plantations into indigenous forests and trees on private land. Below is a summary of the results;

- The average family size is 6.2 persons.
- 61% of the respondents thought the forests were a threatened natural resource while 33% thought they were not threatened.
- 25% perceived the threats to their forests as being firewood collection, while 10% thought it to be grazing, 6% collection of timber, 2% corruption, 11% poor law enforcement, 12% inadequate stakeholder involvement in management of the forest, and 1% poor management. Other threats mentioned include alienation (0.6%), building pole cutting (0.6%), fodder (1%), cultural erosion (1%), encroachment (3%), invasive species such as eucalyptus (0.6%), and forest fires (30%).
- 35% of the respondents reported to have received some education/awareness on importance of environmental conservation.
- The following institutions were mentioned as having contributed towards awareness creation; Provincial Administration (PA), The East African Wild Life Society (EAWLS), Taita/Taveta Agricultural Programme (TTAP), Kenya Forestry Research Institute (KEFRI), Ministry of Agriculture (MoA), Greenbelt Movement (GbM),

Peace Corp volunteer (a USAID programme), Community Based Organisations, LUMO[4], School, Adult education class, and traditional knowledge.

- The perception towards forest management was very good with 25% saying the forests should be completely protected, 21% access to the forest should be controlled, 47% the forest should be managed jointly by the government and the community, while only 0.6% said people should have free access to it and 32% it should be left to the local community to manage.
- Asked what they liked about living near the forest, the respondents said; it provided resources (such as timber, fodder, medicine, water) (28%), it brought rain (87%), and it gave clean fresh air (85%). Other likes mentioned include the scenery (aesthetic value), erosion control, pollution control, honey, shade and water catchment function.
- Asked what they disliked about living near the forest, the respondents said; it harboured destructive animals (70%), has dangerous animals (2%).
- The most common products obtained from the forests were water (100%), firewood (18%) and fodder (7%). Others include timber, medicine, honey, fruits and shrine.
- None of the respondents could give the quantities of the products they obtained from their forests because they only do so occasionally.
- 75% claimed to have participated in some forest conservation activities in the past.
- The forest conservation activities participated in include agro-forestry/farm forestry, tree planting, retention of indigenous trees on the farm, fruit tree planting, forest protection, soil conservation and having a tree nursery.
- Majority of the respondents (89%) said they had never heard of the term biodiversity.
- The respondents who had heard of the term biodiversity, 77% claimed to be aware of Taita hills as being an important area for biodiversity.
- All the respondents said they were willing to participate/support activities geared towards biodiversity conservation.
- 97% said that they would be happy if the neighbouring forest was converted to indigenous.
- Asked which institution or institutional arrangement they would prefer to carry out the conversion work, 80% preferred a collaboration of the Forest Department and Non-Governmental Organisation (NGO) and a CBO, 10% a CBO and 7% a collaboration of an NGO and a CBO.
- Asked on whether they would be willing to plant a few indigenous trees on their farms, 97% responded positively.

[4] Lualenyi-Mramba-Oza – a community owned wildlife sanctuary.

Table 5: Results of ecological assessments of the forest fragments.

Forest Name	Indigenous trees sps	Exotic tree sps	Regeneration	Soils	Remarks/Comments
Boma	*Macaranga conglomerata*	*Maesopsis eminii*	*C. camphora*	deep well drained	Forest area dominated by exotic, however
	Maesa lanceolata	*Cinnamomum camphora*	*M. conglomerata*		the forest can be converted to indigenous
	Milletia oblata	*Eucalyptus saligna*	*S. guineense*		by silvicultural practices that would encourage
	Prunus africana	*Pinus patula*	*M. oblata*		the growth of indigenous tree seedlings.
	Tabernaemontana stapfiana				However, enrichment panting will be necessary.
	Phoenix reclinata				Removal of exotic trees will be necessary.
	Syzygium guineense				
	Cussonia spicata				
Irizi	*P. africana*	*Caltris robusta*	*E. Maculata*	Soils quite varied	Forest is dominated by exotic species mainly
	M. oblata	*Acacia mollissima*	*P. africana*	In some places deep	cypress, pines, eucalypts, grevillea.
	C. spicata	*P. radiata*		well drained in other	Only a portion of the forest can be converted to
	Albizia gummifera	*E. maculata*		areas rocky and shallow	indigenous vegetation. However, this will involve
	S. guineense	*Cupressus sp.*			removal of exotic species and re-planting with
		Casuarina sp.			indigenous seedlings. There is a small indigenous
		Grevillea robusta			patch.
Jaycee	*Ficus sycomorus*	*G. robusta*	*A. gummifera*	Soils in some places	Forest area can easily be converted to
	A. gummifera	*A. mollissima*	*F. sycomorus*	deep well drained	indigenous forest through silvicultural practices
	M. lanceolata	*Cupressus lusitanica*	*M. oblata*	very steep in some places	that would encourage the natural regeneration to
	F. thoningii	*Eucalyptus sp.*	*M. lanceolata*	large area taken up by a rock	grow.
	M. oblata				
	C. spicata				
	P. africana				
Kinyeshamvua	*A. gummifera*	*P. patula*	*M. lanceolata*	deep well drained	Section of forest dominated by exotic trees, however,
	P. reclinata	*G. robusta*	*T. orientalis*		there are portions of indigenous trees. Rehabilitation of
	Trema orientalis	*C. lusitanica*	*A. mollissima*		forest into indigenous can easily be done by combining
	M. lanceolata	*A. mollissima*	*P. recinata*		silvicultural practices that would encourage the growth
	F. sycomorus	*E. saligna*	*F. sycomorus*		of regeneration into large trees and enrichment planting.
			A. gummifera		Clearing of exotic trees would be necessary.

Mbili	*P. reclinata* *A. mollissima* *G. robusta*	*E. saligna*	*Polyscias kikuyuensis* *A. mollissima* *E. saligna*	deep well drained	The forest is dominated by exotic trees and conversion to indigenous will require clearing the exotic trees and replanting with indigenous tree seedlings.
Modangache	*A. gummifera* *Ficus sp.* *P. africana* *N. congesta* *Acacia brevispica*	*Eucalyptus sp.* *C. lusitanica* *M. eminii* *Markhamia lutea*		deep well drained but in some areas shallow and rocky.	Can be easily rehabilitated by silvicultural practices that will encourage regeneration of indigenous tree seedlings and in enrichment planting.
Mraru	*P. africana*	*C. robusta* *Eucalyptus sp.*		some places deep well drained others shallow and rocky	Only the upper portion of the forest is suitable for rehabilitation into indigenous. The lower portion cannot support a proper high forest vegetation. Has shallow rocky soil and is below the 1300m a.s.l threshold.
Shomoto	*Nuxia congesta* *Cussonia spicata* *Phoenix reclinata*	*P. patula* *E. saligna* *A. mollissima* *Casuarina equisetifolia* *C. camphora* *Delonix regia*	*E. saligna* *N. congesta* *C. equisetifolia* *D. regia* *A. mollissima* *C. spicata* *P. reclinata*	deep well drained in some places and in others shallow and rocky.	Forest area is dominated by exotic trees. Conversion will require clearing of the trees and replanting with indigenous tree seedlings.
Susu	*P. reclinata* *A. gummifera* *M. lanceolata*	*E. saligna* *A. mollissima*	*E. saligna* *A. gummifera* *A. mollissima* *M. lanceolata*	deep well drained in some places and in others shallow and rocky.	Dominated by exotic trees especially cypress and eucalyptus. Conversion into indigenous forest will require clearing and replanting with indigenous tree seedlings.
Vuria	*Ficus sp.* *M. lanceolata* *S. guineense* *Draceana sp.* *C. spicata* *M. oblata*	*E. saligna* *A. mollissima* *C. lusitanica*	*A. mollissima* *C. lusitanica* *M. lanceolata*	some places deep well drained and others rocky	Portion of the forest under indigenous vegetation and may not need any intervention. A large portion is under exotic trees but rehabilitation will require clearing and replanting with indigenous tree seedlings because very few indigenous tree seedlings were found.

	Agauria salicifolia				
Weni mbogho	*P. africana*	*Maesopsis eminii*	*P. africana*	deep well drained	Forest dominated by indigenous trees. However, removal
	M. conglomerata	*G. robusta*	*M. eminii*		of exotic tree species may be necessary and to encourage
	P. reclinata	*C. lusitanica*	*M. oblata*		the growth indigenous seedlings.
	C. spicata		*M. platycalyx*		
	Markhamia platycalyx		*M. conglomerata*		
	M. oblata				
Weni mwana	*C. spicata*	*C. camphora*	*A. mollissima*		Forest dominated by exotic species, however, it can be
	M. lanceolata	*A. mollissima*	*P. reclinata*		converted easily through enrichment planting.
	P. reclinata				
	P. africana				
	M. oblata				
	S. guineense				
Wesu Big Rock	*C. spicata*	*A. mollissima*	*E. saligna*	some places deep well drained	Upper portion dominated by exotic vegetation mainly
	P. reclinata	*E. saligna*	*A. mollissima*	and in others shallow and	black wattle and the lower portion is dominated by
	M. oblata		*P. reclinata*	rocky	eucalypts and phoenix.
	P. africana				

NB: The species identified are not exhaustive. These are only the most common species found. There are a few that the team could not identify. However, the team believes that the information contained would be adequate for the preliminary work.

APPENDIX 1

REHABILTATION POTENTIAL ASSESSMENT

1. Forest name: _____
2. Date: _____
3. Assessor: _____
4. Vegetation
   i) Indigenous tree species: _____
   _____
   _____
   _____
   ii) Exotic tree species: _____
   _____
   _____
   _____
   iii) Shrubs and other plant species: _____
   _____
   _____
   _____

5. Soils (Please tick as appropriate).
   i) Depth _____ deep _____ shallow _____bare rock
   ii) Type _____ clayey _____ loamy _____ sandy ____ gravelly

6. Animals (Please tick as appropriate, where possible identify the species).
   i) Birds _____ ii) Butterflies _____ iii) Mammals _____
   iv) Others (specify) _____

7. Forest structure (please tick as appropriate).
   i) _____ Upperstorey ii) _____ Understorey iii) _____ Undergrowth

8. Regeneration of indigenous tree species (please tick as appropriate).
   i) _____ seedlings ii) _____ saplings

9. Springs from the forest. (Tick as appropriate).
   i) _____ Present ii) _____ Absent

10. Comments (Please add any important observations not captured above).
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____

APPENDIX 2

SOCIO-ECONOMIC ASSESSMENT OF FOREST PLANTATIONS IN TAITA HILLS FOR RESTORATION POTENTIAL

Name of Respondent:_____ Division:_____
Date:_____Location:_____
Sub-Location:_____Village:_____

1. Demographic Profile.

Name of Member	Age	Sex	Level of Education	Relationship to Household Head	Main Occupation	Years on the farm

2. Is the forest a threatened natural resource according to you? ____Yes _____No

3. What do you perceive as the threats to the forest today?

_____Firewood collection
_____Harvesting of medicinal plants
_____Grazing
_____Collection of timber
_____Corruption
_____Poor law enforcement
_____Inadequate stakeholder involvement in management of the forest
_____Poor management
_____Destructive cultural practices
Other (specify)_____

4. Have you received any education/awareness on importance of environmental conservation?
_____Yes _____No

5. If yes in 4, which organization(s),

1. _____
2. _____
3. _____

6. What is your perception towards the forest management today?

_____It should be completely protected
_____People should have free access to it
_____Access to the forest should be controlled
_____The forest should be cleared partly for agriculture/settlement
_____The forest should be cleared completely for agriculture/settlement
_____It should be left to the local community to manage
____The forest should be managed jointly by the government and community
Others (Specify)_____

7. What do you like about living near the forest?

____It provides resources (like timber, fodder, firewood, medicine, water, etc)
____It brings rain
____It promotes eco-tourism
____It gives us clean fresh air
Others (Specify)_____

8. What do you dislike about living near the forest?

_____It has dangerous animals
_____It has destructive animals
_____It causes conflict with government officials
_____It has no benefits to the people
Others (Specify)_____

9. What products do you get from the forest?

_____Timber
_____Firewood
_____Birds (edible)
_____Insects (edible)
_____Game meat
_____Grass thatch
_____Fodder
_____Medicine
_____Honey
Others (specify)_____

10. Approximately what quantities of the above products do you collect during each visit and how do you use them?

Product	Quantity	Use	Time used/week (Rainy season)	Time used/week (Dry season)

11. Do you participate in any forest conservation activities? _____Yes _____No
12. If yes in 11, which ones?

1. _____
2. _____
3. _____

13. Have you ever heard of the term "Biodiversity"? _____Yes _____No

14. If yes in 13, are you aware that Taita hills is an important area in terms of Biodiversity? _____Yes _____No

15[5]. Would you be willing to support/participate in Biodiversity conservation activities? _____Yes _____No

16. Would you be happy if this forest is converted to indigenous? _____Yes ____No

17. If yes in 16, whom (which institution) would prefer to carry out this work?

_____Forest Department (FD)
_____Non-Governmental Organisation (NGO)
_____Community-Based Organisation (CBO)
_____FD + NGO
_____FD + CBO
_____FD + NGO + CBO
_____NGO + CBO

18. Would you be willing to plant a few indigenous trees on your farms?

_____Yes _____No

[5] If the respondent answered "No" in No. 14, then explain the meaning of biodiversity and how important how the Taita hills is to biodiversity.