Kenya's Water Towers Protection and Climate Change Mitigation and Adaptation (WaTER) Programme

1ST INTERIM NARRATIVE REPORT

Component 4: Science to Inform Design of Community-Level Actions and Policy Decisions

Contract number: FED/2015/360-270

Reporting period: 15Th September 2015-14Th September 2016

INTERIM NARRATIVE REPORT
First year of project implementation

Programme title: Kenya's Water Towers Protection and Climate Change Mitigation and Adaptation (WaTER) Programme

Contract period: 2015-2020 (60 Months)

Programme Coordinator: Ministry of Environment and Natural Resources

Implementing agencies: Kenya Forestry Research Institute (KEFRI), Kenya Forest Service (KFS), Kenya Water Towers Agency (KWTA), Kenya Wildlife Service (KWS), and National Climate Change Directorate (NCCD)

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List of acronyms

ATC	Agricultural Training Centre
AWM	Agricultural Water Management
CCD	Climate Change Directorate
CFA	Community Forest Association
EDF	European Development Fund
GIS	Geographical Information System
GPS	Global Positioning System
KEFRI	Kenya Forestry Research Institute
KFS	Kenya Forest Service
KWS	Kenya Wildlife Service
KWTA	Kenya Water Towers Agency
LULC	Land Use Land Cover
LVBERP	Lake Victoria Basin Eco-region Research Programme
MENR	Ministry of Environment and Natural Resources
NPSC	National Programme Steering Committee
NRM	Natural Resource Management
NWFP	Non Wood Forest Products
PIC	Project Implementation Committee
PI	Principal Investigator
PSC	Programme Steering Committee
RPIC	Regional Project Implementation Committee
RS	Remote Sensing
RVERP	Rift Valley Eco-Region Research Programme
SLM	Sustainable Land Management
USGS	U.S. Geographical Survey
WRUA	Water Resource Users Association

1.0 Description

1.1 Name of <u>Coordinator of the grant contract</u>: **Kenya Forestry Research Institute (KEFRI)**

1.2 Name and title of the <u>Contact person</u>: **Ben E. N. Chikamai (PhD), Director**

1.3 Name of <u>Beneficiary(ies) and affiliated entity(ies)</u> in the Action: **Kenya Forestry Research Institute (KEFRI)**

1.4 <u>Title</u> of the Action: **Science to inform design of community-level actions and policy decisions: Evidence-based identification and targeting of interventions and policy decisions**

1.5 <u>Contract number</u>: **FED/2015/360-270**

1.6 <u>Start date</u> and <u>end date</u> of the reporting period: **15ᵗʰ September 2015 – 14ᵗʰ September 2016**

1.7 Target <u>country(ies)</u> or <u>region(s)</u>: **Mt. Elgon and Cherangany Forest ecosystems in Western and North Rift parts of Kenya respectively**

1.8 <u>Final beneficiaries</u> &/or <u>target groups</u>[1] (if different) (including numbers of women and men):

a) **Target group:**

The number of people targeted by the action depends on the site location and covers a large part of Kenya:

- Communities living on the catchments of both Mt. Elgon and Cherangany Hills water towers.
- Some specific activities will focus on women, the youth and people with disabilities in communities in both Mt. Elgon and Cherangany Hills Ecosystem.
- Community Forest Associations (CFAs).
- Water Resource Users Associations (WRUAs).
- Kenya Forest Service (KFS), Kenya Wildlife Service, Water Towers Agency, Climate Change Directorate, Water Resources Management Authority.
- County Governments in the eleven counties of the project area: West Pokot, Elgeyo Marakwet, Uasin Gishu, Kakamega, Vihiga, Nandi, Bungoma, Trans Nzoia, Kisumu, Siaya, Busia.
- Ministry of Environment and Natural Resources (MENR), Ministry of Energy, Ministry of Agriculture, Ministry of Water and Irrigation, Ministry of Tourism and Marketing.

b) **Final beneficiaries:**

- Communities living downstream who benefit from high level water tables of the river systems and   carry out their agricultural and other land based activities.
- Two Water companies (Lake Victoria North and lake Victoria South) downstream that rely on rivers in order to distribute water to urban and peri-urban residents who benefit from the two ecosystems. In addition, reduction in sedimentation and pollution levels of rivers will decrease and   reduce water purification costs.

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[1]   "Target groups" are the groups/entities who will be directly positively affected by the project at the Project Purpose level, and "final beneficiaries" are those who will benefit from the project in the long term at the level of the society or sector at large.

- Universities and othe learning institutions offering their expertise and at the same time benefiting from research results.
- The society in the project targeted areas and beyond since the ecosystems will improve and also contribute to poverty reduction and livelihoods improvement. More so, the policies, protocols and management frame works to be developed based on the research results, and demonstrations done will impact on the society in the counties , the country, the region and the globe at large.

1.9 Country(ies) in which the activities take place (if different from 1.7):

2.0 Assessment of Implementation of Action Activities

2.1 Executive summary of the Action

The project is one of the four components of the larger programme entitled 'Kenya's Water Towers Protection and climate change mitigation and adaptation (WaTER) Programme'. KEFRI implements component four whose overall objective is to contribute to poverty reduction and sustainable livelihoods by applying scientific principles to inform design of community level actions and national policy decisions on rehabilitation and conservation in Cherangany and Mt. Elgon water towers. The aim of the project is to generate and provide scientific data and information for decision making in management of the two ecosystems and similar areas in the country. Due to the crucial role played by the forested landscapes in provision of ecosystem products and services, their degradation is a threat to adjacent communities and beneficiaries further downstream who totally depend on them. In order reverse the current situation by rehabilitating and restoring the two degraded ecosystems, the European Union through its European Development Fund (EDF) funded the initiative (component 4), whose total cost is 5,000,000.00 Euros with the EU contributing 100% of the action. The project implementation period is 60 months (five years); 15th September 2015 to 14th September 2020. The funds release date was 11th November 2015 which did not correspond with the start date of implementation of the action (project). This led to a slight delay in implementation of the project. However, the Beneficiary committed to developing structures at the institution level - both at the headquarters and the two regions, Lake Victoria Basin and Rift Valley eco-regions, to ensure proper management of the action. This ensures that monitoring and evaluation is consistently done at all levels. In addition, decisions are made through a consulatative and participatory processes by all project staff and KEFRI staff working in the project and the institute's core management. Further, during the initial stages of the project, a five-year work plan and budgets for the entire project were developed, including specific regional annual work plans and budgets for activities to be implemented by Cherangany and Mt. Elgon regional offices. To ensure that there was a buy-in from the target groups and stakeholders, an inception workshop and field visits were held on 11th and 12th February 2016 in Kisumu and adjacent areas where KEFRI undertakes research and development activities. Other sensitization activities at both regions were held in May 2016.

During the reporting period (1ˢᵗ year of the action), some of the results described in the logframe have been achieved, others are ongoing while others have been planned to continue during the second year of implementation. The structures developed and the sensitization done at the early stages of the project have laid a a strong foundation for smooth implementation of the action. The status of implementation of specific objectives is elaborated in detail in '**Results and Activities**' section below.

2.2 Results and Activities

Project management

Project management structure: For proper management and operationalization of the project, various meetings were held to discuss project operation modalities and form committees to oversee management and operations in the next 5 years. A Project Steering Committee (PSC), a Project Implementation Committee (PIC) and Regional Project Implementation Committees (RPICs) were put in place with members drawn from KEFRI headquarters and the two regions respectively. The PSC provides policy and strategic guidance, approves project annual work plans, budgets and discusses technical and financial reports. This committee reports directly to the National Steering Committee of the WaTER Program. The PIC discuss and advice on detailed work plans and budgets, reviews progress and discusess technical implementation matters. The RPICs prepare project monthly work plans and budgets, guide and review implementation progress. The PSC meet at least twice in a year, while the PIC meets quarterly basis. The   RPIC meet on monthly basis. The management structure is shown on (Annex 1). Since the implementation started, the three committees have been meering as scheduled and their minutes recorded and used used as references for decisions which are made on a day to day basis to ensure smooth implementation of the project.

Project inception meeting: The meeting was attended by 80 people comprising of KEFRI staff, Project implementing partners, WaTER Towers Programme implementing Institutions, representatives from the 11 target counties and communities. This was a one day meeting held at the Great Lakes Hotel, Kisumu. The aim of the meeting was to share the project objective, specific objectives, activities and partnership modalities with the 11 targeted Counties, partner institutions and communities. Sample degraded forest sites were visited on the second day to show previous successful rehabilitated sites, to learn and appreciate the need to jointly undertake land rehabilitation activities. The inception report is included in this report as annex 2.

Staff placement: During the project reporting period, thirteen project staff were recruited through a rigorous recruitment and placement process. Advertisements were made on the beneficiary's website. Further, a re-advertisement was done on local newspapers for the positions of Project Accountant and Supplies (Supply Chain Management) Officer in order to attract more qualified candidates after having not got suitable candidates during the initial interview process. The following positions have been filled: one Project Officer, two Project Assistants, one Project Accountant, one Supplies Chain Management) Officer, four Project Interns, and

four Project Drivers. An induction was carried out by the Human Resource Management Department of the Institute   from 4th to 10th September 2016 according to the beneficiary's policy.   The following were the objectives of the induction :

- To inform staff about the institution's culture, organisational structure and leadership.
- To enable staff settle in the institution so as to become productive and efficient employees.
- To introduce staff based at the regions to KEFRI headquarters where the project is managed centrally; and to introduce staff based at the headquarters to the two regional centres - Rift Valley Eco-Region Research Programme (RVERP) and Lake Victoria Basin Eco-region Research Programme (LVBERP) - where project activities are implemented for the Cherangany Hills ecosystem and Mt. Elgon ecosystem respectively.
- To ensure project staff familiarize themselves with project activity areas and can relate to the activities being implemented.
- To facilitate interaction of all project staff and KEFRI staff involved in project implementation with an aim of establishing good working relationships.
- To introduce staff to the project activitiy sites and interact with the local communities in the project area

The newly recruited project staff had a two days intensive workshop at the headquarters on 5th and 6th September 2016; a meeting at the Cherangany Hills ecosystem regional office at Londiani on 6th September 2016; a meeting at the Mt. Elgon ecosystem regional office, Maseno on 7th September 2016, and field visits to the project sites in both Mt. Elgon and Cherangany Hills ecosystems. All the objectives of induction were met as earlier planned.

In addition to the above project staff, Ms. Trizah Acheing, a GIS expert was also engaged to provide support to the GIS Team which had a heavy task of preparing maps and images to aid in identifying degaraded areas which were to be rehabilitated. The hiring of Ms. Achieng was necessary given that Mr. Stephen Kiama, the GIS officer was engaged in another project.

The project organised programme pre-launch activities which involved field visits to all the project sites culminating in the launch of the Programme on 23rd of June 2016 at the Hill School in Eldoret (Annex 3).

ER1:1 Land use and cover trend analysis to identify hotspots and drivers conducted

A critical element of the baseline survey relates to understanding the current (or baseline) distribution as well as temporal trends or changes of land cover and land use attributes of the two ecosystems. To implement this activity, a team of experts in Geographical Information Systems (GIS) and Remote Sensing (RS) was formed . The Team members were drawn from KEFRI, the University of Eldoret and Egerton University. The experts employed state of the art techniques including GIS and remote sensing. Remote sensing provided adequate coverage of the target area both spatially and temporally, while Landsat images were the main dataset calibrated using field-based verification data. After initial consultations, a planning workshop was held from 14th

to 17th March 2016 in Nakuru with a goal of developing a robust methodological framework to guide both land cover classification and change analysis (Annex 4).

Sub-activity 1: selection and acquisition of satellite imagery

- For baseline land cover classification, medium resolution of spatial resolution Landsat images for year 2015 were downloaded from the USGS website (http://earthexplorer.usgs.gov/).
- For historical changes, Landsat satellite images downloaded were of years 1985, 1995 and 2000 for Mt. Elgon; and of years 1985, 1995 and 2003 for Cherangany ecosystem.

Sub-activity 2: Digital mapping and geo-referencing for historical land use/land cover using satellite imagery

Based on the methodological framework developed and the images acquired, the experts interpreted the images using unsupervised classification, defined the area of interest and classified the digital images using appropriate algorithms. The following maps were developed (Annex 5):

- Study area map showing County boundaries, rivers, towns and roads.
- Overall catchment map within the project intervention areas.
- Study area maps overlaid with ground truthing points based on Land Use Classes.
- Cherangany Ecosystem showing ground-truth based on Land Use Classes.

Sub-activity 3: Conducting ground truthing using GPS to identify sites for land use/land cover classification

Based on the Protocol for Guiding Ground Truthing Exercise developed in March 2016, the team of experts conducted a ground truthing exercise from 25th May to 8th June 2016 in both ecosystems. The aim of the exercise was to identify sites for land use/land cover classification as well as identify hotspots for land use and land cover interventions. Deliverables of the exercise provided linkages between the spectral data from the satellite images and on the ground reality. The ground truthing exercise yielded a total of 411 ground truth points in both Mt. Elgon and Cherangany forest ecosystems. This was way below the estimated 648 points from the formula. The reasons for this shortfall were that some areas were inaccessible due to terrain and insecurity reasons. This shortfall will be addressed through the use of high resolution images (Annex 5).

From this exercise, the following maps were generated:

- Mt. Elgon Ecosystem showing Ground truth based on Land Use Classes
- Cherangany Ecosystem showing Ground truth based on Land Use Classes
- Degraded areas superimposed on recent LULC- Mount Elgon Ecosystem
- Degraded areas superimposed on recent LULC- Cherangany Ecosystem
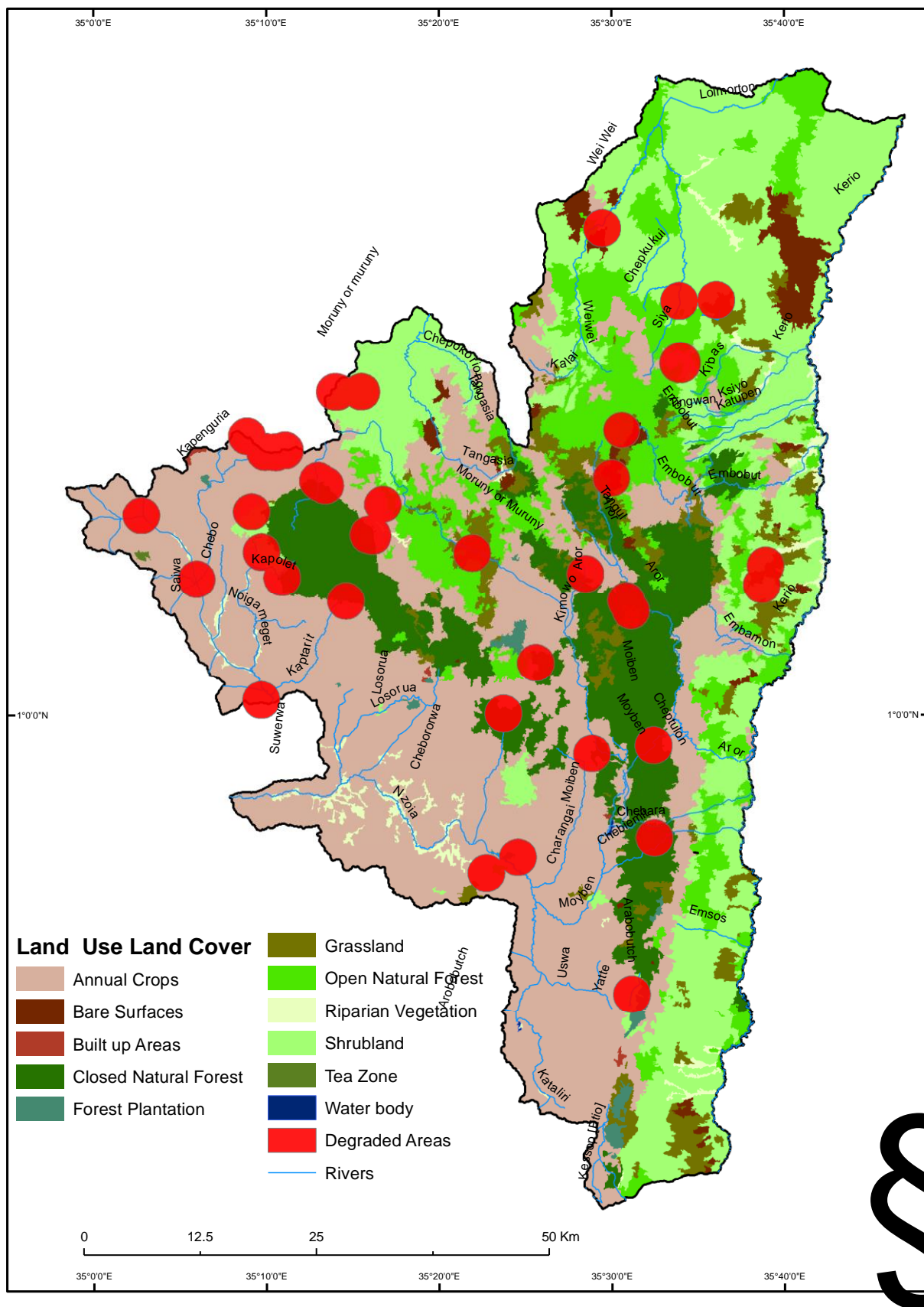
Figure 1: Degraded areas superimposed on recent LULC- Cherangany Hills ecosystem

Figure 2: Degraded areas superimposed on recent LULC-Mt. Elgon Ecosystem

Sub-activity 4: Identify hotspots for land use and land cover (LULC) interventions

As a follow up to the activities implemented after the ground truthing exercise, a workshop was held with an aim of refining 'hotspots'/ degraded areas maps; produce recent land cover/ land use; and historical land cover/ land use maps for Mount Elgon and Cherangany Hills ecosystems (Annex 5). The following maps were developed during the exercise:

- Mt. Elgon Ecosystem Land Use of 1984
- Mt. Elgon Ecosystem Land Use of 1995
- Mt. Elgon Ecosystem Land Use of 2000
- Cherangany Hills Ecosystem Land use of 1984
- Cherangany Hills Ecosystem Land use of 1995
- Cherangany Hills Ecosystem Land use of 2000
- Recent (2015) Land use land cover for Cherangany Hills Water Tower Ecosystem
- Recent (2015) Land use land cover for Mt. Elgon Water Tower Ecosystem

Mt Elgon Hills results: Closed forest was observed to be decreasing over the years (1984-2000) with a steady increase in grasslands and farmlands. Open forest declined in 1995 and appears to have recovered/regenerated slightly in 2000. The class categorized as others (riparian vegetation, bare areas and rock surfaces) appears to be decreasing, probably converted to farmlands and grasslands (Table 1). The decline in closed forest cover concurs with a study conducted by Nield et al., 1999, pinpointing loss in vegetation diversity and density, attributed primarily to a combination of encroachment by local communities and illegal settlements and logging activities. Farmlands and grasslands have replaced forested areas according to the historical trend analysis. Most clearing as a result of subsistence agriculture, logging and infrastructure development.

Cherangany Hills Ecosystem results: Closed forest has steadily decreased in a span of the three trend analysis years (1984, 1995 and 2000) with open forest, farmlands and grasslands on the ascent. Others (riparian vegetation, bare areas and rock surfaces) category also showed decline (Table 2). The decline in closed forest cover is a function of competing land uses and unsustainable extraction of forest products to supplement the resource proximate livelihoods. Encroachment on the forest dates back to colonial times when local people were given permits to graze livestock in forest glades.

Table 1: Land use coverage/changes (Km^2) for Mt. Elgon Ecosystem

Class Type	1984 (Km^2)	1995 (Km^2)	2000 (Km^2)
Closed Forest	469.21	388.06	262.20
Open Forest	121.40	185.63	131.97
Grasslands	536.98	559.13	618.00
Farmland	691.32	727.76	872.13
Water body	0.51	0.31	0.76
Others	318.71	277.84	253.07
Total	**2,138.13**	**2,138.13**	**2,138.13**

Table 2: Land use coverage (Km^2) for Cherangany Ecosystem

Class Type	1984 (Km^2)	1995 (Km^2)	2000 (Km^2)
Closed Forest	949.66	938.80	860.55
Open Forest	1555.57	1424.58	1036.85
Grasslands	822.54	779.33	1162.90
Farmland	623.59	718.27	1214.50
Water body	0.94	1.44	1.21
Others	1042.22	1131.60	918.01
Total	**4994.02**	**4994.02**	**4994.02**

ER1:2 Land tenure profiles and maps developed

Sub-activity 6: Conducting a survey on socio-economic status of ecosystem dependent households in the two ecosystems

A baseline survey on the socio-economic status of households living close to forested areas was carried out from 24th to 11th August 2016. A total of 497 households were interviewed in both ecosystems. In addition, focus group discussions were carried out in selected villages covering the ecosystem. Draft report on the field survey is available at the National Project Office whereas a comprehensive report and a policy brief are in the process of being developed and will be completed in year 2 of project implementation.

Sub-activity 7: Conducting a survey on utilization of public areas; gazetted forests, community lands and other public areas within the two ecosystems

A survey was carried out between 24th July to 11th August 2016 on utilization of public areas in both Mt. Elgon and Cherangany Hills. This was done through focus group discussions at the village level. By understanding how communities benefit from the public areas, it will be possible to reduce tenure insecurity, deforestation and degradation and other demands that put pressure on public areas. The scientists are in the process of developing a report and a policy brief. These will be available during the second year of reporting.

ER 1:3 Status of Biodiversity established

Sub-activity 9: Baseline survey of flora and fauna

A baseline survey was carried in Kapkanyar, Kaisungur, Embobut, Kiptaberr, Kapolet and Lelan forest blocks in Cherangany Hills Forest Ecosystem in August and September 2016. The following key results were achieved:

a) A plant species checklist for Cherangany Forest Ecosystem with 478 plant entries was developed. These included 150 tree species, 91 shrubs, 35 climbers, 5 Fern species, 8 grass species and 189 herbaceous species (Annex 6).

b) Three invasive woody species were recorded in Cherangany Hills water catchments and in the farmlands. These include; *Cestrum auritiacum, Lantana camara, Lantana latifolia* and *Fraxinus pennsylvanica*. A map showing the spatial distribution of invasive woody species was produced and is available at National project office.

c) Six guilds of avifauna were recorded in Cherangany Hills comprising 3 species of raptors, 20 species of frugivores (fruit eaters), 38 species of insectivores, 9 species of granivores, 1 species of omnivores and 7 nectarania species.

d) Eleven families of herpetofauna were recorded within the forest ecosystem. These comprised 6 species of snakes, 3 species of amphibians and 11 species of lizards.

e) Status report on biodiversity is being compiled.

f) Vertebrate and invertebrate animal species database is being developed.

Activities leading to the following results have already been initiated and will be completed in Year 2 of project implementation:

- A list of candidate species for *in-situ* conservation
- Guidelines on management of identified invasive species

Sub-activity 10: Undertake a study on the linkage between biodiversity, livelihoods and indigenous knowledge systems

The study on linkages between biodiversity, livelihoods and indigenous knowledge systems demonstrated a strong relationship between local history, landscape characteristics, ecological features and local livelihoods. The following linkages were identified:

- A majority of local names are derived from names of natural resources. For instance, the name Kapsokwony is derived from the name Sokwondit (*Warbugia ugandensis*) an important medicinal plant used as a cure for common cold, malaria, pneumonia and chest pains.
- Local communities' zone different forest blocks based on ecological functions associated with them.
- Local communities value tree species by their contribution to economic and environmental significance. For instance, Elgon teak (Yemdit) is more valued by the local community because of its quality timber than Podo (*Septeet*), which they consider to have less valuable wood.
- There are cultural taboos surrounding tree species that are highly valued e.g. Kogorwet (*Erythrina abyssinica*), which is used to predict rainfall, in order to protect them from logging.
- A report on the linkages between biodiversity, livelihoods and indigenous knowledge systems in the two forest ecosystem is available at the National Project Office.

ER 3.1 Technologies for rehabilitation of water towers developed and implemented

Sub-activity 36: Identify and prioritize technologies for rehabilitation of hotspots

Hotspots in the following forest blocks were identified as possible sites for demonstrating forest rehabilitation technologies:

- Kaberua, Kaboywo, Saboti and Kimothon forest blocks in Mt Elgon Forest Ecosystem.
- Embobut, Kipkunur, Kapkanyar, Kapolet, Kiptaberr and Lelan forest blocks in Cherangany Forest Ecosystem.
- Techniques demonstrated across the two ecosystems included: Scale up of farm forestry, particularly, woodlots, restoration planting, strip planting and rehabilitation/assisted restoration.

Sub-activity 37: Assess and build capacity of relevant stakeholders on rehabilitation techniques

Capacity needs assessment and stakeholder trainings were carried out for key stakeholders in Mt Elgon and Cherangany forest ecosystems on natural forest rehabilitation techniques.

- Stakeholder meetings were held in Kaberua, Kaboywo, Saboti and Kimothon forest blocks in Mt Elgon to assess stakeholder needs on forest rehabilitation.
- Stakeholder meetings were held in Embobut, Kipkunur, Kapkanyar, Kapolet, Kiptaberr and Lelan forest blocks in Cherangany Forest Ecosystem to assess stakeholder needs on forest rehabilitation.
- A total of 48 key stakeholders from the Kaberua, Cheptais, Kaboywo, Saboti and Kimothon in Mt. Elgon were trained on natural forest rehabilitation techniques at a workshop at Mabanga Agricultural Training Centre in Bungoma.
- Approximately 610 stakeholders were trained on forest rehabilitation techniques in Cherangany Forest Ecosystem through on-site demonstration approaches. Report available at National Project Office.
- Nine institutional stakeholders were engaged in the trainings both as facilitators and participants. These were Kenya Forest Service, Water Resource Management Authority, Water Resource Users Associations, Kerio Valley Development Authority, Nyayo Tea Zone, and Nature Kenya, NGOs, CBOs and county governments of Bungoma, Trans Nzoia, Elgeyo-Marakwet and West Pokot .
- Training report for Mt. Elgon ecosystem (Annex 7).
- Training report for Cherangany hills is being finalised and will be shared during the second year of implementation.

Sub-activity 38: Rehabilitation of forest degradation hotspots with local communities

Demonstration plots showing how to rehabilitate degraded forests were established in selected hotspots in Mt. Elgon and Cherangany forest ecosystems.

- Two demonstration plots of 20 ha and 5 ha were established at Kaberua and Kaboywo, respectively, in Mt Elgon Forest Ecosystem.

- Twelve demonstration plots of 2 ha each were established in Embobut, Kipkunur, Kapkanyar, Kapolet, Kiptaberr and Lelan forest blocks in Cherangany Forest Ecosystem.
- Forest rehabilitation techniques that were demonstrated included: restoration planting, strip planting, liberation thinning and site protection to facilitate natural regeneration.
- Approximately 1.5 ha and 1 ha were planted with bamboo in Cherangany and Mt Elgon, respectively, to demonstrate riparian conservation and protection techniques.
- About 550 community members were engaged in forest rehabilitation in Mt. Elgon Forest Ecosystem.
- Over 400 community members were engaged in forest rehabilitation in Cherangany Forest Ecosystem.
- Reports on establishment of forest rehabilitation demo plots were written and are available in the Project Management office.

Sub-activity 39: Assessing the recovery of rehabilitated hotspots

Baseline assessment was carried out in each of the two forest ecosystems to determine site condition at the onset of forest rehabilitation interventions. The assessment was intended to provide a picture of the site situation before intervention in order to assist in evaluating the impact of forest rehabilitation interventions in the future. It entailed assessment of vegetation and soil properties in both the area intended for rehabilitation and surrounding areas, which were intended to serve as the control (Annex 8).

ER 3.2 On farm tree production intensified and diversified

Sub-activity 42: Demonstrate propagation and management technologies and establish sources of sustainable germplasm

Forestry technologies mainly woodlots, boundary planting and fruit trees intensification were demonstrated on-farm to serve as an alternative source of wood products thereby easing pressure on the forest resource base. In this regard, the following were carried out:

- A survey to identify high priority tree species for intervention on-farm in Siaya, Busia and Bungoma couties in Mt. Elgon Forest Ecosystem; and West Pokot, Elgeyo-Marakwet and Trans Nzoia counties in Cherangany Forest Ecosystem. Some of the tree species identified are; *Eucalyptus grandis, Cupressus lusitanica, Grevillea robusta, Eucalyptus saligna, Pinus patula, Croton macrostachyus, Croton megalocarpus, Syzygium guineense, Prunus africana, Olea africana, Melia azidirach* and *Markhamia lutea*.
- Three high value tree species : *Eucalyptus grandis, Cupressus lusitanica* and *Grevillea robusta* were promoted in West Pokot, Elgeyo-Marakwet and Trans Nzoia counties in Cherangany Forest Ecosystem, Three high value tree species: *E. grandis, C.s lusitanica* and *G. robusta* were promoted in Siaya, Busia and Bungoma counties in Mt. Elgon Forest Ecosystem.

- A survey of community tree nurseries and their capacity building needs was carried out in Siaya, Busia and Bungoma counties in Mt. Elgon Forest Ecosystem, and West Pokot, Elgeyo-Marakwet and Trans Nzoia counties in Cherangany Forest Ecosystem.

- Six community tree nurseries (Tastai, Mt. Elgon Giant Bamboo SHG, Satiate SHG, Sacred SHG, Ojwang Yellow Enterprises, Mt. Elgon Potters Guides,),were supported (with Wheelbarrows, Water tanks, Water pumps, seeds, Potting tubes,water cans, Shovels, Slashers and generator pump) in Siaya, Busia and Bungoma counties in Mt. Elgon Forest Ecosystem as part of capacity for community groups participating the project, while 5 community tree nurseries (Kapsara Farmers Forum, Kokow Porokon Self Help Group, Chemogoi Women Group, Kipsorowo Young Women Nursery Group and Cheptengei Okilgei Women Group) were supported in West Pokot, Elgeyo-Marakwet and Trans Nzoia counties in Cherangany Forest Ecosystem.

- A total of 200 tree nursery operators were trained on tree nursery establishment and management in 6 counties in Mt. Elgon Forest Ecosystem (Bungoma, Kakamega, Vihiga, Kisumu, Siaya and Busia).

- Total of 90 tree nursery operators trained on tree nursery establishment and management in 3 counties; West Pokot, Elgeyo-Marakwet and Trans Nzoia (Annex 9).

- A total of 20 ha were planted on-farm as demo plots for various agro-forestry technologies in Siaya (5 ha), Vihiga (5 ha) and Bungoma (10 ha) counties, Mt. Elgon Ecosystem.

- A total of 24 ha were planted on-farm as demo plots for various agro-forestry technologies in West Pokot (11 ha), Elgeyo-Marakwet (10 ha) and Trans Nzoia (3 ha) counties, Cherangany hills ecosystem.

- A total of 25 ha were planted on-farm as demo plots for various agro-forestry technologies in Siaya (6 ha), Vihiga (7 ha) and Bungoma (12 ha) counties respectively. A total of 52,640 tree seedlings were used in the establishment of the various on farm demo plots in the three counties above.

- A total of 36,000 tree seedlings were planted in the 24 ha to demonstrate various Agroforestry technologies in West Pokot, Elgeyo-Marakwet and Trans Nzoia counties. Trees on woodlot establishmnet were planted at an espacement of 2.5 x 2.5 m while espacement on boundary planting was 4-5 m apart.

Sub-activity 43: Build capacity on market specifications, tree valuation and link them to existing and potential markets.

A survey was conducted in Mt. Elgon and Cherangany forest ecosystems to identify market specifications and tree valuation methods in order to link them to existing and potential markets.

- A total of 60 key informants interviewed during the survey in Busia, Kakamega and Bungoma counties in Mt Elgon Forest Ecosystem.

- A total of 27 timber/charcoal sellers were interviewed in market centres in Uasin Gishu, West Pokot and Trans Nzoia Counties.

- Four main tree products: timber, fencing posts, charcoal and firewood were identified based on local market needs in the two ecosystems.
- Farmers were trained on how to value trees on farm in Busia, Kakamega and Bungoma counties in Mt Elgon Forest Ecosystem.
- Market survey reports produced for the two ecosystems and are available at National Project Office.

Sub-activity 44: Promote production and utilization of fruit, fodder and bio-energy trees

A survey was carried out to identify priority fruit, fodder and bio-energy tree species to promote for alternative livelihood sources in Mt Elgon and Cherangany forest ecosystems.

- A list of priority fruit tree species including Avocados (*Persea americana*-28%), Mangoes (*Mangifera indica*-26%), Guavas (*Psidium guajava* – 10%), Paw paw (*Carica papaya* – 9%), Jack fruit (*Artocarpus heterophyllus*-8%), (Oranges (*Citrus aurantium* – 5%), Zambarau (*Syzygium guineese* – 5%) and Bananas (*Musa acuminata* – 4%) was prepared for Busia, Siaya and Bungoma counties in Mt Elgon Forest Ecosystem.
- A total of 10 ha comprising 2,000 grafted mango seedlings were planted by 20 farmers in Samia in Busia County.
- 5 ha of mother stock of fruit trees were planted at ATC in Siaya and Busia.
- Four mother to mother community support groups comprising 124 members in West Pokot were trained and assisted to plant 1,017 mango and pawpaw seedlings.
- Planted 950 avocado tree seedlings with contact farmers within Cherangany Forest Ecosystem.
- Draft report on production and utilization of priority fruit and, fodder trees species prepared.

ER 3.4 Alternative biomass energy sources promoted to reduce forest degradation

Sub-activity 49: Promote use of improved biomass technologies and sustainable charcoal production and utilization technologies

A survey was conducted to determine the number of households using different sources of energy. Some of the energy sources identified in the survey include charcoal, firewood, kerosene and solar ocasionally. Training was carried out targeting key stakeholders on improved charcoal production and utilization technologies. The status of this activity is:

- Training of 78 farmers on installation and use of kuni mbili jikos (10 in Kapolet-Kapsara, 10 in Kapolet Sengwer, 11 in Kapcherop, 11 in Kaisagat, 10 in Lelan, 6 in Kapsait, 10 in Kamasia and 10 in Kapsumai).
- Training of key stakeholders on improved charcoal production and utilization technologies is planned for Year 2 in the same counties. A training report will be prepared after the training session.

ER 3.5 Sustainable utilization of non-wood forest products promoted

Sub-activity 50: Undertake a baseline survey on non-wood forest products (NWFPs)

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The baseline survey was conducted from 15th September to 4th October 2016. The study was carried out by a team of KEFRI Scientists and Project staff in collaboration with local stakeholders. The status for this activity are:

- Primary data has been collected from 636 households (300 in Mt. Elgon and 336 in Cherangany).
- 12 FGDs sessions were conducted.
- 5 Key informants' interviews were conducted.
- Sketch maps showing locations of villages in the selected blocks are available.
- Preliminary findings indicates that the following NWFPS are being utilised from Mt. Elgon and Cherangany Forests:

Honey, Herbs, Indigenous fruits, Indigenous vegetables, Grass (for fodder and thatching), bamboo shoots, Gums and Mushrooms*.*

Sub-activity 51: Document indigenous technical knowledge on production and utilization of NWFPS

During the baseline survey for NWFPs, the scientists carried out household interviews and focus group discussions. Information was gathered on indigenous technical knowledge for production and utilization of NWFPs. A detailed report will be written in the second year after data analysis.

Sub-activity 56: Undertake capacity needs assessment

Assessment capacity for locals to be involved in bamboo work as well as inventory of the existing bamboo resource within the ecosystem was undertaken.

The needs of the following groups/farmers were assessed and analysed:

- Total of 213 respondents were interviewed
- Total of 80% of people interviewed had information on and and used bamboo
- Most prevalent species were *Bambusa vulgaris* and *Bambusa sulri*
- Most community members know that the products are used for fencing and construction, furniture, tooth pick,
- In Cherangany, the predominant bamboo is the indigenous bamboo species, *Yushania abysinica*
- There is need for training on propagation, utilization, marketing and value addition

From the study, it was clear that majority of farmers neighbouring the Cherangany catchment area depended on indigenous bamboo as a resource. However, there was a slow uptake of exotic bamboo species across the counties due to limited planting materials and poor performance in high altitude areas.

ER 4.2 Capacity to implement activities built

Sub-activity 57: Development of bamboo and high value tree resources management guidelines

- Development of Training manual and guideline on propagation and management of bamboo is ongoing.

- As a result of training in bamboo processing and value addition, varying quantities of 21 artisanal products have been made in the bamboo workshop at Londiani. A catalogue of the products is being prepared and will be available in the second year report.

Sub-activity 58: Develop germplasm sources and demonstration plots

Demonstration plots of bamboo were established across the two ecosystems both for income generation, conservation of riparian areas and to act as germplasm sources. The following achievements were made:

- In Mt. Elgon ecosystem, a total of 25 ha of bamboo plantations were established in Butula and Busia Counties of Mt. Elgon Ecosystem. A total of 6000 seedlings of various bamboo varieties were distributed, and 50 farmers were assisted to plant bamboo. In the Cherangany ecosystem, a total 16.2 ha of bamboo plantations were established in all the four counties; West Pokot (2.4 ha), Trans Nzoia (6.8 ha), Elgeyo Marakwet (5.8 ha) and Uasin Gishu (1.2 ha) of the Cherangany ecosystem. A total of 6800 seedlings of three bamboo species (*Dendrocalamus asper*, *Bambusa vulgaris* and *Bambusa striata*) were planted in 14 demonstration plots of various sizes.

Sub-activity 59: Build capacity on sustainable production and harvesting

Capacity on sustainable production and harvesting of bamboo was built in the two ecosystems as follows:

- Forty (40) stakeholders were trained on propagation, management and utilization of bamboo in the Mt Elgon ecosystem. Training reports are available.
- Ten (10) tree nurseries dealing with exotic bamboo and 2 tree nurseries dealing with indigenous bamboo were trained on propagation techniques.
- Eight (8) farmers managing indigenous bamboo on their farms, 6 farmers who had planted exotic bamboos on their farms were trained.
- One key bamboo processer who uses indigenous bamboo to make different bamboo products was trained.
- In Mt. Elgon, three (3) bamboo nurseries were supported-with nursery tools, potting materials, water tanks and water pumps.
- A number of new simple tools and consumables have been purchased for the bamboo workshop at Londiani.

ER 6.1: A communication and knowledge management strategy developed

Communication strategy:

The Terms of Reference have been developed to procure consultancy services for this activity. A communication strategy is to be developed in the second year to ensure that the project objectives and outcomes are efficiently communicated.

Knowledge management: The project's outputs being constantly generated are to be deposited in a central place. A knowledge management system will act as a platform where reports, publications, maps,

2014

documentaries, photographs and data will be accessed. The KEFRI knowledge management and IT experts are developing project's website which will incorporate a database for storing all project outputs. The platform will be complete by the second year and will be maintained throughout the project period.

Monitoring and Evaluation

Various M&E activities and forums were undertaken in the concluded FY as follows:

Development of detailed work plan and implementation teams: KEFRI implements research and development activities through 6 main regions namely; Central Highlands Eco regional Research Programme (CHERP), Rift Valley Eco regional Research Programme (RVERP), Coast Eco regional Research Programme (CERP), Lake Victoria Eco regional Research Programme (LVERP) and Drylands Eco regional Research Programme (DERP). The project is being implemented by Rift Valley and Lake Victoria Eco regional Research Programmes. In the 1st quarter of the program, meetings and workshops were held to develop 5 year work plan and finally a detailed one year work-plans. This included formation of teams drawn from the 2 regions, KEFRI other regions and partner institutions with varying expertise to implement all year 1 activities. A procurement plan with appropriate procedures and specifications was also developed for use to acquire project goods and services. Specifically the project targeted to acquire laboratory equipment, data monitoring and GIS/Remote sensing equipment thus detailed specifications and procurement modalities were developed. Prior to implementation of some activities, reconnaissance meetings were held to plan as well as develop implementation schedules and notes. For ease to capture expenditure and comply with KEFRI accounting operations a meeting was held to develop Project vote heads which will guide accounting and track project expenditures for 5 years.

Formulate Monitoring and Evaluation framework: The project targeted to develop a monitoring and evaluation framework. This will be to expound on the log frame and define the intended actions, timelines and key deliverables. The Terms of reference were developed to enable procure the service and publications made on KEFRI website. The framework will be developed by the 2nd year.

1.1. If relevant, submit a revised logframe, highlighting the changes.

Table 3: Revised logframe

Full Text of Objective / Result	Indicator (IOVI)	Source & means of verification	Assumptions
Overall objective: To contribute to poverty reduction and sustainable livelihoods by applying scientific principles to inform design of community level actions and national policy decisions on rehabilitation and conservation in Cherangany and Mt. Elgon water towers	Extent of contribution of Water Towers intervention in improving wellbeing of populations through a better management and conservation of Cherangany and Elgon Water Towers; ~~i~~Increased tree cover	~~Kenya and MSs~~ Ssocio-economic assessments / reports over socio-economic indicators / data / statistics including MDGs	Political stability and security in all project areas and good political relations Sustained interest of government, donors and investors Required legislation is approved Enhanced production of tree seeds
To apply science based approaches in characterising degradation of Water Towers of Mt. Elgon and Cherangany ecosystems including testing and demonstrating incentive based interventions in order to inform rehabilitation programmes at County and national levels	Ecosystem goods and services are ~~rehabilitated~~ enhanced for improved ~~and conserved and~~ livelihoods ~~are improved~~ in the two Water Towers	Satellite land cover maps – before and after Household survey reports Reports on change in water quality and quantity	
	The capacity of communities and their institutions, public agencies ~~at least 10 County governments~~ to undertake integrated ecosystem management enhanced	Public institution strategies, community action plans~~County strategies, plans~~ and budgets on NRM, SLM, AWM	
	Incentive framework policies for rehabilitation and maintenance of water towers developed	Water and ecosystems related policy documents at County and National level	
ER 1: Current status of the 2 ecosystems in terms of land use, land tenure, biodiversity status, sedimentation levels, hydrological and water characteristics to inform rehabilitation and conservation actions established	1.1 Land use and cover trend analysis to identify hot spots and drivers conducted ~~by Q2 Y1.~~ 1.2 Mapping of Land tenure and consultations with stakeholders conducted ~~by Q3 Y1~~ 1.3 Biodiversity assessment of the two Water Towers conducted and report produced ~~by Q1 Y2~~ 1.4 Assessment of erosion, sedimentation and pollution conducted ~~by PY2~~ 1.5 Hydrological modelling of the 2 Water Towers using SWAT model conducted ~~by Y2~~ 1.6 Water Quality Analyses and monitoring conducted ~~by Y2 and monitoring done between Y2 and Y4~~	Trend maps and report depicting land use changes, hotspots and drivers of change Report and maps on Land tenure Report and maps on the status of biodiversity A report of land use management interventions Functional hydrological model for scenario analysis Baseline water quality report Quarterly water quality monitoring reports	Affordability and availability of satellite imagery data Local communities are willing to share information Favourable weather for conducting hydrology studies Secondary up to date hydrological and water quality data exists and is accessible Field equipment is protected by stakeholders

ER 2: A Payment for Ecosystem services (PES) model for enhanced participation by communities, common interest groups (CIGs), community based organizations (CBOs) in rehabilitation, conservation and for improved livelihoods piloted	2.1 Existing and potential institutional and financial frameworks for implementation of PES reviewed ~~by Q3 Y1~~ 2.2 Business case for PES and other incentive mechanisms developed ~~by Q4 Y2~~ 2.3 Operational PES model piloted ~~by Q1 Y4~~	Report of existing and potential institutional and financial frameworks for implementation of PES Report on Business cases At least 2 Operational PES model piloted in the 2 ecosystems	Financing mechanisms can be established and sustained; Acceptable beneficiary models are established;
ER3 Integration of selected rehabilitation and conservation technologies for improved NRM, SLM and AWM in the 2 water towers demonstrated	3.1 Socio-economic assessment on current drivers of degradation conducted and priority technologies for rehabilitation and conservation identified ~~by Q4 Y1~~ 3.2 Intensified on farm tree production and diversity promoted ~~between Q1 Y2 & Q4 Y4~~ 3.3 Integrated pests and diseases management options are recommended ~~by Q1 Y3~~ and implemented ~~by Q4 Y4~~ 3.4 Alternative biomass energy sources and efficient technologies to reduce forest degradation promoted ~~between Y3&6~~ 3.5 Sustainable utilization of Non Wood forest Products promoted ~~between Y3&4~~ 3.6 Conservation of wetlands and water springs promoted ~~by Y2~~	Socio-economic survey report Report listing priority technologies for water tower rehabilitation sites Tree species inventories report and vegetation maps 4 Technologies demonstrated in the 2 ecosystems ~~10 technology demonstration plots per County~~ Training manuals and guidelines Training and workshop reports Tree valuation reports Register ~~of~~ tree nurseries and tree grower associations Pests inventory records IPM Manual Reports on alternative energy sources and efficient technologies Reports on NWFPs Models on conservation of wetlands and water springs	Technical support from County governments Land availability Security of demonstration sites Willingness of communities and stakeholders to participate
ER4 Enhanced production of bamboo promoted and capacity on value addition built	4.1 Baseline status and capacity needs assessment on bamboo technologies conducted ~~by Q3 Y1~~ 4.2 Training and support provided on bamboo production and management and marketing techniques to at least 1,000 community members in the 2 ecosystems ~~by Q4 Y3~~ 4.3 Training and support on utilization, processing and marketing techniques to 200~~50~~ Artisans provided ~~by Q4 Y4~~ 4.4 At least ~~one~~ 20 ha demonstration plot ~~on~~ of bamboo established ~~per county~~ in each ecosystem ~~by Q4 Y3~~ 4.5 At least one show room established and equipped per ~~County~~ ecosystem ~~by Q4 Y5;~~ 4.7 At least 300 households adopting bamboo technologies ~~by Y5~~	Baseline status and capacity needs assessment report; Training materials; Training reports Demonstration plots Show rooms and equipment Monitoring report	Willingness of the community, artisans and other stakeholders to participate Sufficient Land is available for demonstration plots Artisans willing to operate shows rooms
ER 5 Nature based enterprises developed and promoted	5.1 At least 5 different enterprise categories identified ~~by Q3 Y1~~ 5.2 At least 250 individuals in selected hot spots are trained and supported in	Report on enterprises Training materials; Training reports Business enterprises Monitoring report	Willingness of the community and other stakeholders to participate Markets are functioning well

	setting up nature based enterprises ~~by Q1 Y5~~ 5.3 At least 10 nature based businesses established ~~per County~~at the participating counties ~~by Q4 Y4~~		
ER 6 Communication and knowledge management strategy developed and implemented	6.1 A communication and knowledge management strategy for program visibility action established and launched ~~by Q4 Y1~~ 6.2 Visibility of programme created ~~by Q2 Y1~~ 6.3 Synthesis and sharing of knowledge products generated by the programme ~~by Y5~~	Communication and knowledge management strategy report Website Promotional materials: Brochures, Leaflets etc. Policy and community briefs Radio and TV programmes Synthesis and sharing Reports	Communication infrastructure existing and servicing stakeholders Decision makers support the recommendations from project findings;
ER7 Monitoring and Evaluation	7.1 M&E tools developed ~~by Q1 Y1~~ 7.2 Baselines status of programme outputs and activities established ~~by Q3 Y1~~ 7.3 ~~Programme~~Mid-term and end-term Project ~~E~~evaluations conducted ~~in Y3 and Y5~~ 7.4 Impact assessment studies ~~in Y6~~ 7.5 Annual audits 7.6 M&E forums	Reporting templates Baseline reports Mid-term evaluation report Final/end-evaluation report Impact report Annual audit reports Fore reports	Programme implementation proceeds as planned

Please list all contracts (works, supplies, services) above € 60 000 awarded for the implementation of the action during the reporting period, giving for each contract the amount, the award procedure followed and the name of the contractor.

1) **Supply Contract** for three field operation vehicles (One Prado, 4WD and two Toyota Hillux double cabins) under the EU Financed project – Cost: Euros 183,509.2 (Award procedure: Open tender procedure published on two local newspapers. Contract awarded to Toyota Kenya (**Status: Ongoing**)

2) **Supply Contract** for supply of seedlings (Assorted tree seedlings, high value fruit trees and bamboo seedlings) under EU Financed project – Cost: Euros 78,139.5 (Award procedure: Competitive negotiated procedure where competitive negotiated procedure without publication of a contract notice). (**Status: Ongoing)**

1.2. Please provide an updated action plan [2]

Year 2 Activities Action Plan for Component 4: Science to inform design of community-level actions and policy decisions														
Main Activity	**Sub-Activities**	**Objectively Verifiable Indicators**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**
Specific Objective 1: To undertake a baseline survey on biophysical and socio-economic status of the 2 Ecosystems to inform rehabilitation and conservation actions.														
ER 1:3 Status of Biodiversity established	9. Baseline survey of Species diversity of flora and fauna in the 2 ecosystems. • Map invasive species in forest and on farmlands • Recommend management of identified invasive species • Carry out forest/tree resource inventory • Carry out non-tree species resource inventory • Carry out vertebrate and invertebrate animal inventory • Study impact of invasive species on the biodiversity of the ecosystems • Identify candidate species for in-situ conservation	An inventory report on forest resources Status report on biodiversity Tree and non-tree species database A map and a list of invasive species Vertebrate and invertebrate animal species database A list of candidate species for in-situ conservation Guidelines on management of identified invasive species												

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[2]   This plan will cover the financial period between the interim report and the next report.

	11. Develop Local capacity in Ecosystem (land/forests) health monitoring. • Identify local para taxonomists • Build capacity of para taxonomists to use common indicators for degradation, pest and disease, regeneration and report to a central database	List of prevalent pests and diseases Guidelines on community interventions ecosystem conservation Training reports Workshop reports																		
	12. Select germ plasm and support communities to establish quality nurseries, and agro forestry systems-consider under agroforestry interventions (3.2)	Tree Nursery Germ plasm Training report and guidelines																		
ER 1:4 Erosion, sedimentation and pollution assessed-	16. Sample Soil and water for quality analysis	Soil quality reports Water quality reports for key river systems.																		
ER 1:6 Water Quality Analyzed and monitored **End of water and**	25. Collect, analyze and monitor water quality along rivers and reservoirs.	Water quality reports at key sampling points along rivers and reservoirs.																		
	26. Map water quality and sediment yields	Water and sediments quality maps.																		

soil quality budget	27. Apply agroforestry and soil conservation technologies to reduce point and non-point source pollution-consider combining with rehabilitation interventions	A manual on agroforestry and soil conservation technologies for pollution control Progress Reports and publications																

Objective 2: Payment for Ecosystem services (PES) model for enhanced participation by communities, common interest groups (CIGs), community based organizations (CBOs) in rehabilitation, conservation for improved livelihoods piloted.

ER 2:1 Existing and potential institutional and financial frameworks for implementation of PES reviewed	28. Undertake an institutional analysis of relevant public and private organizations in terms of their statutory responsibilities, roles, and capacity to be involved in a PES and other mechanism	Report of institutional and financial frameworks for PES and other incentive mechanisms List of organizations to be considered for PES participation List of types of ecosystem services available in the 2 ecosystems																
	30. Review of existing policies, institutional arrangements and regulatory frameworks for PES and other incentives	Report on how existing policies and institutional arrangements are likely to affect PES implementation																
	31. Scope for ecosystem services financing opportunities for the 2 ecosystems	Scoping report on PES financing opportunities																

32. Undertake valuation of the 2 ecosystems	Total forest valuations reports for the 2 ecosystems																

Objective 3: Integration of Selected rehabilitation and conservation technologies for improved Natural Resource Management demonstrated and integrated in the 2 water towers developed

ER 3:1 Technologies for rehabilitation of water towers developed and implemented	38. Engage communities in rehabilitation of hot spots	Reports on number of stakeholders and household mobilized for rehabilitation of hotspots Report on the number of hectares of degraded land per year rehabilitated															
	39. Assess the recovery of rehabilitated hotspots	Reports on recovery of the rehabilitated hotspots (vegetation, numbers and species)															
ER 3.3 Integrated Pests and diseases management options integrated and implemented	45. Conduct surveillance and establish action thresholds of tree/forest pests and diseases in the 2 ecosystems	Monitor/surveillance identified pests and disease specimens Field reports Develop intewrvention measures for pests present in the ecosystem Develop intervention measures for parasitic plants both in the natural forests and															

		apples Develop guidelines and manuals to guide interventions.																
	46. Build capacity of farmers/ para taxonomists, KEFRI, KFS, NGOs, CBOS and CFAs, on forestry health. Training at local and a national level workshop.	National Workshop reports Training reports																
	47. Make recommendations on methods for managing /interventions pests and diseases on farms	Manuals used to guide community in managing pests and diseases on farms Strengthen and operationalize KEFRI IPM decision support system																
ER 3.4 Alternative biomass energy sources promoted to reduce forest degradation	49. Promote use of improved biomass technologies and sustainable charcoal production and utilization technologies Work with village polytechnics in development of technologies.	Number of community members in each water tower trained on construction of improved: domestic Earth Kilns, gasifiers, Portable Metal Kilns drum and Casamance Kilns-replace. Report on the number of adopted improved biomass technologies in the 2 ecosystems.																

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Annex VI – KEFRI Interim Narrative Report

ER 3.5 Sustainable utilization of Non Wood forest Products promoted	52. Build capacity of communities on sustainable production, harvesting, utilization and marketing. Consider the *Prunus africana* tea	A report on community capacity building on sustainable production ad utilization of NWFPs.

Market survey reports on NWFPs |
| | 53. Demonstrate and promote new and improved technologies for NWFPS | Reports on number of new and improved technologies demonstrated and promoted. Report on the number of household that adopt the new and improved technologies. |
| **Objective 4: Production, management processing and utilization of bamboo and high value tree resources promoted in the 2 ecosystems** | | |
| **ER 4.2 Capacity to implement activities built** | 57. Development of bamboo and high value tree resources management guidelines | Guidelines/ Booklet for management and commercialization of bamboo

The number of Guidelines, booklets and training manuals produced |
| | 58. Develop germ plasm sources and demonstration plots for high value trees-bemboo and Prunus | A report on number of developed sources of germ plasm

A report on preferred or recommended bamboo species for the 2 ecosystems

Report on the number of demonstration plots |

		established															
	59. Build capacity on sustainable production and harvesting.	Report on the number of capacity building forums															
	60. Train 200 (as per budget) artisans on processing, utilization and marketing of bamboo products in partnership with local institutions. Endeavor to work with village polytechnics and local institutions to ensure retention of the skill.	Training manual 200 artisans trained A list of local institutions involved in bamboo business															
	4.5. Infrastructure development to support demonstrations on bamboo cottage industries																
	61. Establish one show room per county. Consider the budget mentions 3 showrooms	A total of ten show rooms established.															
Objective 5: Nature based enterprises targeting women, youth and people with disabilities promoted and developed																	
ER 5.1 Needs identified	62. Identify and prioritize key nature based enterprises- identify ongoing/existing beekeeping, butterfly, mushroom, medicinal herbs, beekeeping, ornamentals, weaving, beading	A report on priority nature based enterprises in the 2 ecosystems.															

	63. Undertake a capacity needs assessment. Undertake a feasibility/viability study to rank the enterprises for support.	A report on capacity needs identified Ranked matrix on viable enterprises within the region														
	5.4. Village savings and loans associations (VSLA) established-1 per ecosystem	A report on 2 VSLAs that are active														
ER 5.2 Training of communities carried out	64. Introduce and support in setting up of nature based enterprises	A report on number of nature based enterprises set up and supported Existing operational manual on enterprises														
	65. Develop a training programme and carry out trainings	Report on training modules Report on groups trained on nature based enterprises.														
	66. Link communities with existing and potential markets-promotion of markets through having value added products.	Report on number of linkages between communities and potential markets-Listed enterprises and potential customers directory														
ER 5.3 M&E carried out	67. Continuously monitor progress of adoption and implementation	Progress monitoring reports on adoption and implementation of active enterprises														
Objective 6: A communication and knowledge management strategy developed and implemented																

2014

ER 6.1 A communication and knowledge management strategy developed	68. Establish and maintain database, library and website of programme findings and reports	Developed database for online library, and an interactive web portal to host publications in open access platforms e.g. data verse (Harvard University)																
	6.3. A communication strategy implemented and reviewed	Project communication strategy developed																
	6.2. Establish 2 community resource centers	Established 2 resource centers at strategic points within the 2 ecosystems.																
	6.4. Disseminating project outcomes of WaTER program in scientific forums to contribute to scientific knowledge	Reports presented in conferences, workshops, seminars and international forums on WaTER Scientific publications on project activities produced																

3.0 Beneficiaries/affiliated entities and other Cooperation

How do you assess the relationship between the Beneficiaries/affiliated entities of this grant contract (i.e. those having signed the mandate for the Coordinator or the affiliated entity statement)? Please provide specific information for each Beneficiary/affiliated entity.

1.3. How would you assess the relationship between your organisation and State authorities in the Action countries? How has this relationship affected the Action?

The relationship between KEFRI and state authorities is strong both at the national and county levels. This was strengthened when the action was being developed as part of the bigger programme being implemented with MENR, KFS, KWS, KWTA, KCCS, and County governments of the eleven counties where the project is being implemented. Frequent consultations continued since the action started. For instance, joint weekly meetings took place during the pre-launch and launch of the programme planning. Joint field visits took place prior to the launch of the programme where representatives of the state authorities were present. In addition, a joint exhibition was successfully carried out by the representatives of state authorities engaged in the programme and KEFRI. Further, a National Programme Steering Committee (NPSC) was formed and its membership comprises directors of partner institutions. Members of this committee meet biannually to give strategic direction to the programme.

At the regional level, state authorities are always informed and/or engaged in implementation of the action. For instance representatives of government agencies participated in the inception workshop that took place in February 11, 2016. The Project teams from KEFRI also paid courtesy calls to the County Government Offices during reconnaissance visits. During implementation of the action, experts from KFS, universities and county governments are usually called upon to offer their expertise. These engagements have fortified the relationship between KEFRI and state authorities hence paving way for the smooth implementation of the action.

1.4. Where applicable, describe your relationship with any other organisations involved in implementing the Action:
- Associate(s) (if any)
- Contractor(s) (if any)
- Final Beneficiaries and Target groups
- Other third parties involved (including other donors, other government agencies or local government units, NGOs, etc.)

1.5. Where applicable, outline any links and synergies you have developed with other actions.

- Kenya Water Tower Climate Change Resilience (USAID Water Towers Project)
- GOK projects

1.6. If your organisation has received previous EU grants in view of strengthening the same target group, in how far has this Action been able to build upon/complement the previous one(s)? (List all previous relevant EU grants).

4.0 Visibility

How is the visibility of the EU contribution being ensured in the Action?

During the reporting period, KEFRI has focused on the visibility of the project and the European Union in line with the visibility guidelines. The project has implemented dynamic sensitisation programmes with an aim of raising awareness of EU support to target groups and key stakeholders in the project areas. In addition, all materials developed have EU logo on them.

Below is list of completed activities in year 1:

No.	Communication activities	Status
1	Inception workshop: The aim of the workshop was to inform the 11 County Governments, representatives from NGOs, CBOs, private sector and other stakeholders about the project, its objectives and the activities to be undertaken for rehabilitation of degraded water towers and improve the livelihoods of the communities living in the catchments.	Done (11ᵗʰ and 12ᵗʰ February 2016)
2	Sensitisation programme, Cherangany Hills ecosystem (Annex 10)	Done (15ᵗʰ to 21ˢᵗ May 2016)
3	Sensitisation programme, Mt. Elgon ecosystem (Annex 11)	Done (16ᵗʰ to 20ᵗʰ May 2016)
4	Two banners and two backdrops produced and used in events	Done
5	300 polo T-shirts were produced, distributed to target groups and stakeholders during meetings	Done
6	200 Lessos produced and distributed to target groups especially to women	Done
7	Three vehicles and two motorbikes are properly stuck with the EU sticker	Done
8	2000 project brochures developed and distributed in various	Done

	visibility events	
9	1000 file folders with EU logo and the project title printed	Done
10	500 Pamphlets developed titled 'Management of Invasive Woody Species in Water Towers' for distribution during meetings and exhibition events	Done
11	500 Pamphlets titled 'Development of Framework for Payment of Ecosystem Services: Moiben River in Cherangany Watershed'	Done
12	500 Pamphlets titled 'To Graze or not to Graze in Watershed Forests: Reconciling Livestock Grazing and Degradation Impacts'	Done
13	An exhibition was held during the WaTER Programme launch	Done (23ʳᵈ June 2016)
14	Agricultural Society of Kenya (ASK) show where tailor made bamboo products made through the EU finance were displayed. Project banner, brochures and pamphlets were also displayed	Two done, one on 5ᵗʰ -9ᵗʰ July 2016 (Nakuru) and Kisumu between 31ˢᵗ July to 4ᵗʰ Aust 2016
15	Photographs produced through project activities (Annex 12)	Done and are available in the project management office
16	Development of the project website and Knowledge Management platform where all publications and information related to the project will be upload: http://km.kefri.org:8085/do/view/SPG/WaTER/WebHome	At the initial stage but ongoing

The European Commission may wish to publicise the results of Actions. Do you have any objection to this report being published on the EuropeAid website? If so, please state your objections here.

No, we do not have any objection to this report being published on EuropeAid website.

Name of the contact person for the Action:

Ben E. N. Chikamai (PhD). Director, KEFRI

Signature: …………………………………………

Location: **Nairobi, Kenya**

Date report due: **15.11.2016 (Official date, sixty days after the end of the first financial year)**

Date report sent: **15.11.2016**

5.0 FINANCIAL REPORT

ANNEXES

LIST OF ANNEXES

Annex 1: Component 4 Project Implementation Structure

Annex 2: Component 4 Inception Workshop Report

Annex 3: Programme Pre-Launch Mission and Launch

Annex 4: Gis Methodological Framework Workshop

Annex 5: Land Use Land Cover (Lulc) Maps

Annex 6: Floral species checklist for Cherangany Hills forest

Annex 7 : Training of Relevant Stakeholders to Undertake Rehabilitation

Annex 8: Baseline Status of Rehabilitated Sites in Natural Forest

Annex 9: Training of Community Nursery Groups to Produce Quality Germplasm

Annex 10: Reconnaissance Visit to Cherangany Ecosystem

Annex 11: Reconnaissance Visit to Mt. Elgon Ecosystem

Annex 12: Photo Gallery of activities

ANNEX 1: COMPONENT 4 PROJECT IMPLEMENTATION STRUCTURE

Government of Kenya	**European Union**
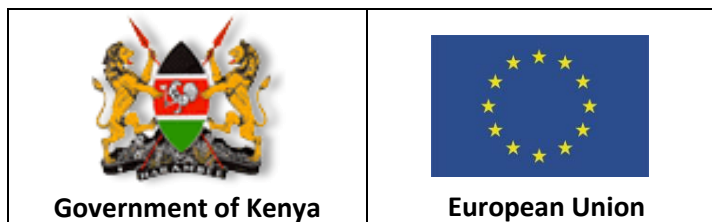
WATER TOWERS PROTECTION AND CLIMATE CHANGE MITIGATION AND ADAPTATION (WATER) PROGRAMME

PROGRAMME IMPLEMENTATION STRUCTURE
COMPONENT 4: SCIENCE TO INFORM COMMUNITY ACTIONS AND POLICY DECISION

```
                    National Program Steering Committee (NPSC)
                                      ↑
                    Project Steering Committee (PSC)
                                      ↑
                    (Component 4) Project Implementation Committee (PIC)
                                      ↑
                    Project Management Office (PMO)
                    ↑                                              ↑
  Regional Project implementation            Regional Project implementation
  Commitee –LVBERP                            Commitee  -RVERP
```
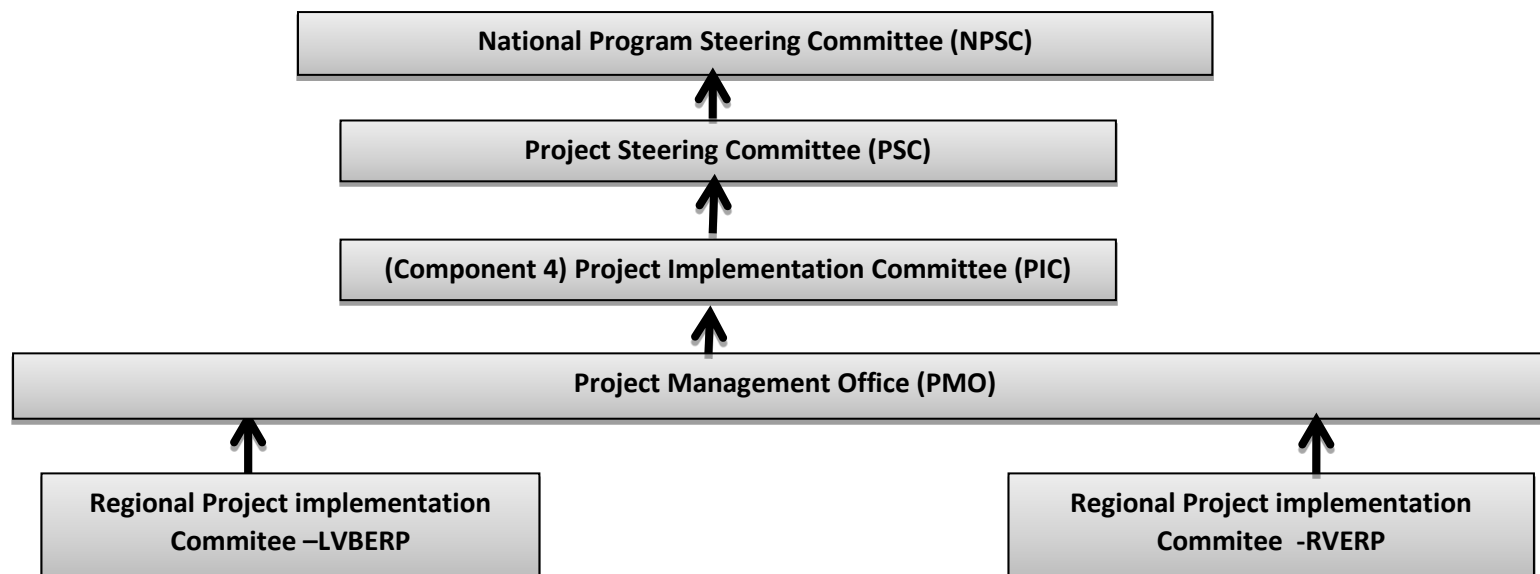
ANNEX 2: COMPONENT 4 INCEPTION WORKSHOP REPORT

KENYA'S WATER TOWER PROTECTION AND CLIMATE CHANGE MITIGATION AND ADAPTATION (WATER) PROGRAMME INCEPTION WORKSHOP REPORT

Venue: Great Lakes Hotel, Kisumu
Activity Dates: Thursday 11th - 12th February 2016

Group photo of the workshop participants

1.0 Background Information

KEFRI held an Inception meeting of the project at the Great Lakes Hotel in Kisumu on 11th February 2016. This was followed by a field visit to forest rehabilitation demonstration plots at Maragoli hills and Kobujoi in South Nandi forest on 12th February 2016. The objective of the inception workshop was to sensitize the stakeholders, participating County Governments and the community representatives on the project. The workshop was officially opened by Hon. Lorna Omuodo, the Chief Secretary from the office of the Governor, Kisumu County

1.1 Workshop Objectives

The KEFRI Principal Investigator (PI) outlined the objectives of the workshop as follows:

- To provide stakeholders and partners the opportunity to interact and acquaint themselves with WaTER Towers Programme and Component 4 project: its purpose, objectives, activities and expected deliverables;

- To review the pertinent issues which affect the protection and sustainable management of the two water towers and natural resources within the programme area and the strategies developed under Component 4 of the Project to address the challenges;
- To share experiences and lessons learnt in rehabilitation of water towers; and,
- To identify more relevant stakeholders to participate in the implementation of the project

The PI thereafter gave a detailed presentation of the programme highlighting the objectives and key roles of the implementing agencies with key emphasis on component 4.

1.2 Project interventions

The planned project activities were highlighted to the participants. They include:

- Mapping the levels of forest degradation and identification of hotspots for rehabilitation
- Demonstration of forest rehabilitation technologies for use as training sites
- Mapping of water flows and monitoring of water quantity and quality over time
- To undertake market surveys for nature based products to inform nature based enterprises
- Piloting nature based enterprises for income generation and employment among the youth, women and people living with disabilities
- Promotion of on-farm tree growing to enhance self-sufficiency and surplus for sale

2.0 Plenary discussions

Following the presentation by the PI, a plenary discussion on conservation and management of water towers and natural resources was held. The following is a summary of conclusion reached during the plenary session:

- There is need to cultivate positive attitude among people to towards environmental conservation actions through awareness creation
- Need to strengthen environmental policies and legislation;
- Gender issues should be well represented in the project through inclusion of women, the youth, disadvantaged groups and people living with disabilities;
- The involvement of communities living adjacent to the forest in income generating activities will minimize their overdependence on natural resources;
- Stakeholder involvement and participatory approach is key in the implementation of the project;
- Create awareness on utilization of invasive species to manage their population and spread

Figure 1: Participants being addressed by the PI during the inception workshop

3.0 Presentations

3.1 Impact of grazing livestock on water towers protection *Cf,* Mau forest

Low or controlled livestock grazing is used as a management tool to reduce fire incidences, reduce weedy plants and enhance plant species diversity. On the other hand, uncontrolled grazing can lead to loss of carbon stocks, reduction of important species, retarded growth of seedlings, and spread of invasive species. Emerging challenges to conservation and management of water towers were highlighted:

- Grazing has become a real threat to the water towers. Initially, cattle were grazed seasonally on glades, but are now permanently grazing in the forest.
- Institutional capacity in terms of physical, human and financial resources is inadequate to support water towers protection activities.
- Increase in disturbance of forests as population move in search of land for new settlements pose a great threat.

The opportunities to address grazing of livestock in natural forests were highlighted as follows:

- Introduction of cut and carry method to minimize entry of livestock into the forests
- Enhance species diversity in the forest through enrichment planting

- Provision of alternative community livelihoods to reduce overdependence of the forest areas.
- Conduct research/ studies to show the carrying capacity of different forests
- Provision of an updated register for grazing to avoid overgrazing of a large number of cattle in a given area
- Analysis of property rights under different land tenure systems, including right of access, use and control
- Review and update grazing orders frequently

3.2 Payment for Ecosystem Services (PES) Mechanisms

Payment for Ecosystem Services (PES) is an innovative tool that provides a voluntary framework to motivate upstream land owners to practice conservation land use. It facilitates engagement of upstream actors with downstream beneficiaries to improve the quantity and quality of ecosystem goods and services. Past studies in Kenya, for instance a study on Moiben River from 2011 to 2013 indicated that PES can be used as a business tool to enhance ecosystem conservation. In the 2012/2013 financial year; Eldoret Water Service Company (ELDOWAS) generated KES 280 million from sale of water. The company pays 1% of its revenue to WARMA to support conservation activities hence recognition of the compensation efforts.

Following the presentation it was pointed out that the water towers project will**;**

- Undertake a socio economic valuation of PES in the project area.
- Develop a model framework to facilitate engagement of the upstream conservation and downstream beneficiaries' actors.
- Creation of awareness on the linkage between the adoption of conservation land use practices and improved flow of water in terms of quantity and quality.
- Develop a potential business case for piloting of PES compensation scheme for enhanced ecosystem conservation and improved flow of ecosystem services.

3.3 Management of invasive woody species

The spread of invasive woody species pose a great challenge exacerbated by the changing climatic conditions. Invasive species can potentially harm biodiversity, the environment, economies and/or human health. Some key impact of invasive species was highlighted as;

- Competition with native species for resources (e.g. light, food, water, space)
- Alteration of ecosystem structure and disruption of ecosystem functions
- Changes to biotic interactions and ecological networks (e.g. pollination, dispersal)

- Disruption of ecosystem services (e.g. flood attenuation)
- Environmental degradation, facilitating further invasions.

Management options of plant invasion was also highlighted;

- Preventing introductions (public education, screening and control of plant materials)
- Eradication, destroying or removing a new invasion (cutting and destroy the invasive plants , herbicides/arboricide, uproot or kill tree stumps)
- Containment, stopping a new invasion from further spreading (reduce human disturbance, promote intact native communities at the edges of disturbance corridors)
- Management of established invasions and restoration of affected ecosystems using manual or mechanical, chemical and biological methods

Figure 2: A participant making contribution during the workshop

4.0 Field Visits

4.1 Visit to Maragoli Hills Rehabilitation site

The degradation of Maragoli hills dates back to 1957 when the County Council of Kakamega introduced plantation forests. In the late 1990s, the plantations matured which led to clear felling of both plantation and natural forests. This led to the exposure of soil to agents of soil erosion which was detrimental due to the sloppy landscapes. Rehabilitation actions by KEFRI started in 2010 through the *Kazi kwa Vijana Initiative*. Through the demonstration of rehabilitation technologies, Kenya Forest service (KFS), Community Forest Association (CFA) and communities living adjacent to the rehabilitated area have adopted and scaled up by planting trees and shrubs on similarly degraded sites.

Lessons Learnt

- There is need to involve communities in project implementation to ensure protection of rehabilitated sites and sustainability
- Identification and selection of the rehabilitation tree species should be done in aprticipatory manner with the local communities
- Monitoring should be conducted regularly at least annually to ascertain recovery of rehabilitated sites

4.2 Visit to South Nandi Forest Rehabilitation site (Kabujoi)

Rehabilitation interventions started in 2009 by Nature Kenya in collaboration with local communities. However, it was not successful due to use of unsuitable restoration tree species. In 2010, KEFRI in collaboration with local communities and KFS established demo plots using a mixture of indigenous tree species at varying espacements. The spacing used was 0.3x 0.3m, 1x1m and 6x6m. Preliminary findings have showed that closely spaced trees established more since closely spaced trees facilitate each other to grow. Additionally, the close spacing encouraged colonization by other trees species hence hasten recovery.

Lessons Learnt

- 0.3x0.3m spacing showed high undergrowth and fast natural regeneration. However, high mortality was experienced due to high competition for sunlight.
- Communities need to be involved in natural resources management activities for long term achievements
- Forests need to be viewed as a resource for everyone hence should be sustainably utilized and managed
- There is need for transfer of technology, skills and knowledge for better forestry management practices.

Figure 3: Participants being taken through the rehabilitation actions at Maragoli hills

Figure 4: Participants being taken through rehabilitation actions at Kubojoi rehabilitation site

Appendix 1: Inception Worksop Program

	Time	Activity	Responsibility
Day 1: 10thFebruary, 2016		Arrival in Kisumu-Early registration in Hotel Venue	Workshop Secretariat
Day 2: 11th January, 2016	08.00-08.30 am	Arrival and late registration in hotel venue	Workshop Secretariat
	09.00-09.15am	-Introduction -Workshop objectives and expectations	Paul Ongugo
	09.15-10.30 am	Official Opening	
		Welcome Remarks by Director KEFRI	Ben Chikamai
		Remarks by European Union	Hjordis Ogendo
		Remarks by Conservation Secretary	Gideon Gathaara
		Official Opening by Governor Kisumu County	His Excellency, Jack Ranguma
		Group Photograph	Workshop Organizers
	10.30-11.00am	**Health break**	**Workshop Organizers**
	11.00 -1.30 am	Presentation on Water Towers Status and future perspectives	Joshua Cheboiwo
	11.30-12.30 pm	Presentation on the WaTER programme and Component 4 Project	Paul Ongugo
	12.30-13.30 pm	Plenary discussion	Bernard Kigomo
	13.30- 4.30 pm	**Lunch break**	**Workshop organizers**
	14.30.15.00pm	Presentation on Grazing and Impact on water towers protection	Jared A. Mullah
	15.30-16.00 pm	Presentation on PES Mechanisms	Joshua Cheboiwo
	16.00-16.30pm	Presentation on threats to sustainable forests: Impact of invasive plant species	Jared A. Mullah
	16.30-17.00 pm	**Health break and end of day 1**	**Workshop organizers**
Day 2: 12th February, 2016:	08.30 am	Depart for Maragoli hills rehabilitation site Sharing Experiences and lessons learnt	Workshop organizers

	09.00-11.30 am	-Arrive at Maragoli rehabilitation site -Overview of the LVBERP -Highlights on forest rehabilitation work with focus on water towers - Upscaling of the technologies by KFS & participation in management of the Water Tower by CFA	Robert Nyambati and John Otuoma
	11.30 am	Depart from Maragoli hills	
	12.00 - 3.00 pm	**Lunch break (Lunch on the way to South Nandi forest)**	**Workshop organizers**
	13.00-2.00 pm	Depart for South Nandi (Kobujoi) forest rehabilitation site	Workshop organizers
	14.00-16.30 pm	Tour South Nandi forest -Arrival at the rehabilitation site -Overview of the RVERP -Highlights on forest rehabilitation work with focus on water towers - Upscaling of the technologies by KFS & participation in management of the Water Tower by CFA	Jared A. Mullah and Edward Mengich
	16.30 pm	**Departure**	**All**

Appendix 2: Inception workshop list of participants

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ANNEX 3: PROGRAMME PRE-LAUNCH MISSION AND LAUNCH

REPORT ON PRE-LAUNCH MISSION TO MT. ELGON AND CHERANGANY HILLS ECOSYSTEMS AND PROGRAMME LAUNCH AT HILL SCHOOL, ELDORET

Pre-Launch Mission activity dates: 21st - 22nd June 2016
Programme Launch activity date: 23rd June 2016

1.0 Background Information

The Programme pre-launch mission and launch were attended by the EU delegation: the EU Ambassador, EU Head of Cooperation and EU Head of Social Affairs and Environment; partners from implementing agencies; collaborators and stakeholders of the Programme. The pre-launch field visits to project intervention sites in Mt. Elgon and Cherangany Hills ecosystems aimed to familiarize with the Programme area and enhance visibility of the Programme within the two ecosystems. During the mission, consultative meetings were held with community members and stakeholders. In the meetings, project was discussed in detail with emphasis on the objectives, its components and role of each of the implementing agencies and participatory implementation of the Programme. The Programme launch was held at Hill School in Eldoret, Uasin Gishu County to officially start the implementation of the Project. The event was officiated by the Cabinet Secretary, Ministry of Environment and Natural Resources Prof. Judi Wakhungu and the Ambassador of the European Union to Kenya H.E. Stefano Dejak.

2.0 Pre-Launch Field Visits

2.1 Visit to Mt. Elgon Ecosystem

2.1.1 Meeting with County Team, Trans Nzoia County

In the meeting, the Programme was discussed in detail with County team led by County Secretary, Hon. Sifuna Wakofula and County Executive Committee (CEC) - Environment and Natural Resources Hon. Maurice Lokwaliwa.

Figure 1: Group photo of the team with County Secretary, Hon. Sifuna Wakofula, Trans Nzoia County after the courtesy call

2.1.2 Meeting with Senior Warden Mt. Elgon National Park

The Team held a brief meeting with the Senior Warden of the Park, Mr. Dickson Ritan. The Senior Warden gave a highlight of the ecosystem which was declared a Biosphere Reserve by UNESCO in 2003, in recognition of its importance as a water tower being the source of Turkwel and Nzoia rivers; and for its diverse natural habitats. Key threats facing the ecosystem according to Mr. Ritan include encroachment exacerbated by high poverty levels; illegal hunting and rampant firewood collection for subsistence and commercial purposes.

The Director KEFRI, Dr. Ben Chikamai, noted that KEFRI shall demonstrate technologies for rehabilitation of degraded areas in natural forests to enhance their resilience to climate change. Mr. David Chege from KFS noted that the service will upscale the activities initiated by KEFRI, and also work in partnership with Counties to address poverty alleviation. Ms. Wanjiku Manyatta from MENR emphasized that the Programme will work towards poverty alleviation, improved livelihoods and environmental conservation within the Ecosystem. Dr. Ogendo noted that multi-stakeholder involvement is critical in the implementation of the Programme especially the involvement of the local communities who are the key resource users.

2.1.3 Visit to Rongai public campsite and Kitum cave

The campsite is on a glade in the park about 3 km from the KWS offices. Mr. Nyongesa the Community Warden noted that the Park was open to the public and tourists are required to pay park and camping fee for those staying overnight. The income generated from the camp was in turn used in conservation activities in the park.

Threafter, the team visited Kitum cave. The cave, which formed as a result of volcanic activity and goes as deep as 160 m inside, is a major touristic site at the Park. It is estimated to have been formed about 15 million years ago with the volcano being dormant. The indigenous Sabaot Community used it in the past as shelter, hideout from raiders as well as cultural and religious site where circumcision and prayers were conducted. The cave is frequented by elephants, medium and small sized mammals to scrape the cave walls for salt especially at night. The site is also a roosting place for cave bats and breeding nests for various bird species.

2.1.4 Climbing of Koitobos peak

This is one of the highest peaks in Mt. Elgon ecosystem which is about 4,222 m a.s.l and 1.1km high. The peak is covered by basalt and tussock grass at the top. The top of the hill provide a vintage point to view

the two water towers, both the catchments and the basins which enhanced the understanding of the Programme area.

2.1.5 Visit to Mt. Elgon Guides and Porters Youth Group tree nursery

The group chair, Mr. Philip Chepso noted that the CBO is involved in production of indigenous seedlings with key focus on those species threatened in the wild for rehabilitation of degraded areas in and around the park. Some of the key tree species raised include: *Syzygium guineense*, *Juneperus procera*, *Olea capensis*, *Olea africana* and *Podocarpus fulcatus* among others. The nursery was well managed with healthy seedlings ready for planting. To enhance visibility of the Programme, the group members were presented with branded *lesos* and polo t-shirts with message on conservation of Cherangany Hills and Mt. Elgon ecosystems.

| Figure 2: Mt. Elgon ecosystem at a glance at Koitobos Peak | Figure 3: Members of Mt. Elgon Guides and Porters Youth Group receive *lesos* and t-shirts |

2.1.6 Meeting with Kimothon CFA and Community members

Dr. Ogendo mentioned that striking a balance between managing natural resources and people is difficult. She was however, confident that by the end of the Programme, there will be an improvement in the ecosystem. The CFA chair, Mr. Fred Lwolei highlighted activities undertaken by the CFA towards conservation of the ecosystem which include rehabilitation of riparian areas and degraded sites within the natural forest mostly using tree species threatened in the wild. They have been able to successfully rehabilitate about 130 acres in the natural forest.

The Assistant Chief Mr. Charles Kiplimo began by noting that impacts of climate change were already being experienced due to degradation of forests. He quoted the constitution of Kenya that advocates for at least 10% tree cover on private land - requiring urgent intervention in order to curb pressure on natural forest as well as contribute in climate change mitigation.

The Lake Victoria Basin Eco-Region Research Programme (LVERRP) Director, Dr. Robert Nyambati gave a highlight of activities prioritized for intervention within the ecosystem:

i. Rehabilitation of hotspots with community members

ii. On-farm tree planting to enhance tree cover

iii. Capacity building on bamboo value chain to create employment for the youth women and people living with disabilities

iv. Capacity building of farmers on grafting especially the fruit trees.

v. Support of community nurseries to raise quality seedlings

The CFA and the local administration were presented with branded *lesos* and polo t- shirts to enhance visibility of the Programme.

2.2 Visit to Cherangany Ecosystem

2.2.1 Courtesy visit on Governor Elgeyo Marakwet County and the press address

The Team paid a courtesy call on the Governor H.E Eng. Alex Tolgos. Representatives from the implementing agencies met briefly with the Governor and other County team members including CEC Water, Environment, Land and Natural Resources Hon. Eng. Simon Kiplagat. The Programme as well as the planned launch in Eldoret was discussed in detail. This was followed by the Governor's public address.

The Governor H.E Eng. Alex Tolgos then addressed the press. He emphasized that communities rely on Cherangany Hills water tower for agriculture and livestock keeping. He however noted that key conservation challenges facing the County were encroachment into the forest exacerbated by population growth and unsustainable land use leading to soil erosion and consequent conflicts among communities due to limited natural resources. He further mentioned that the County prioritizes tree planting to address the challenges noting the Programme will contribute towards enhancing tree cover on-farms and in the natural forest. He also highlighted that the county's forest cover stand at 37.49%, second to Nyeri County which stands at 38%.

Finally, the EU Ambassador informed attendants that the Programme is geared towards improving the ecosystem for sustained provision of services and products in required quantity and quality. This could only be achieved by addressing the drivers of degradation and undertaking rehabilitation and restoration actions which the Programme will support.

Journalists sought clarification on some issues such as: the eviction of squatters from Embobut forest block and plans on restoration of the encroached areas. It was responded that the site initially encroached covering an area of about 1,600 ha would be rehabilitated using indigenous trees and had been earmarked for immediate intervention with support from the project.

Figure 4: Address by EU Ambassador during Elgeyo Marakwet Governor Press briefing in Iten

2.2.2 Consultative meeting at Kamasia Secondary School

The long drive to Kamasia area provided an opportunity for the Team to view the degraded forest landscapes within Elgeyo Marakwet County from a vintage point. The event began with a ceremonial tree planting by the dignitaries to mark the event. The Kaptich location Chief, Mr. Chelimo and School Deputy Principal, Mr. Paul Mutwol gave opening and welcoming remarks.

The Rift Valley Eco-Region Research Programme (RVERRP) Director, Dr. Jared Amwatta, noted that community sensitization had been done in the area through a chief's Baraza. He highlighted the following key activities which had been prioritized for implementation in the area:

      i. Demonstration of rehabilitation technologies of degraded natural forest

      ii. Establishmnet of bamboo demonstration plots to demonstrate their performance in the region and as a future source of germplasm

      iii. Rehabilitation of degraded riparian areas with bamboo

      iv. Diversification of on farm tree species for varied tree products

      v. Energy conservation technologies

The CEC, Hon. Eng. Kiplagat assured the Team of the County Government's support and also urged the community to support the initiatives. The community leaders applauded the Programme and assured of their support led by Mr. Isamile Chemitei of Marakwet Highlands Farmers Association.

The EU Ambassador highlighted the need to protect water towers noting that the effects of degradation on water catchments go beyond loss of forest cover; but also affects other regions such as Lake Turkana. He asked for support from all levels including the national government, county government and more so from the communities.

The Deputy Director Socio Economic Policy and Governance of KEFRI, Dr. Joshua Cheboiwo concluded the meeting by noting that Kamasia shall act as a model and training ground which could only be achieved through community support. He stressed on the need for water conservation and sustainable

land use such as heaping of terraces and avoiding farming along river banks. Finally, to enhance visibility of the Programme, the EU branded *lesos* and t-shirts were given out.

2.2.3 Visit to Chebara Dam

The Moiben WRUA Chairman Mr. Daniel Chemweno noted that overdependence on natural forest especially encroachment of Embobut block had led to sedimentation and siltation of the dam, noting the urgent need to rehabilitate degraded areas in natural forest and riparian strips. The WRUA Secretary Mr. Paul Chelimo noted that the Programme was timely since it would reinforce the efforts of the WRUA in rehabilitation of riparian areas, noting that 5 hectares of land had been set aside by WRUA for riparian rehabilitation which KEFRI had prioritized for planting through the support of the project.

The key intervention activities at the site to be supported by the Project are:

    i.   Rehabilitation of riparian areas using bamboo,
    ii. Intensification of on-farm tree diversification to reduce siltation and sedimentation
    iii. Using the site to pilot a PES model.

Finally, the EU Ambassador applauded the WRUA for their effort to conserve the environment and assured them that the Programme will upscale rehabilitation efforts.

The WRUA members were then presented with branded *lesos* and t-shirts.

3.0 Programme Launch

3.1 Dignitaries

The occasion was graced by the Cabinet Secretary MENR Prof. Judi Wakhungu and the Ambassador to the European Union H.E. Stefano Dejak. The delegates comprised of: the Principal Secretary State Department of Natural Resources Dr. Margaret Mwakima; EU Head of Cooperation Mr. Erik Habers; EU Head of Social Affairs and Environment Dr. Hjordis Ogendo, Elgeyo Marakwet Governor H.E. Eng. Alex Tolgos, Deputy Governor Siaya County Hon. Wilson Onyango, Uasin Gishu County Deputy Commissioner representing the County Commissioner Mr. Christopher Wanjau, CEC Uasin Gishu County Hon Mary Njogu; CEC Elgeyo Marakwet County Hon Eng. Simon Kiplagat, Kenya Water Towers Agency Chair of Board of Management Dr. Isaac Kalua, Director Kenya Water Towers Agency Mr. Francis Nkako, Director KEFRI Dr. Ben Chikamai, Director KFS Mr. Emilio Mugo, KEFRI PI Dr. Paul Ongugo, COs of the 11 Counties implementing the Programme counties among other invited guests.

3.2 Summary of event proceeding

The event began with a ceremonial tree planting led by the chief guest to mark the event. The delegations were then taken through the exhibits by the implementing agencies. Threafter, series of entertainment ranging from songs, poems and recitals, Kalenjin traditional songs and dances with

messages rich on urgent need to conserve and protect forests especially Kenya's water towers. Entertainments were followed by speeches from the dignitaries and the chief guest echoing conservation, protection and sustainable management of natural resources for continued provision of ecosystems goods and services. The event ended with the official launch of the Programme by the Cabinet Secretary, Prof. Judi Wakhungu and His Excellency the Ambassador, Stefano Dejak.

3.3 Programme launch key note speeches

3.3.1 Governor, Elgeyo marakwet County Speech

The County houses 16 gazetted forests which are a source of 16 rivers, 9 among them being permanent. He highlighted the County's' plans on environmental conservation efforts such as: tree planting targeting to plant 1m trees annually and this shall be achieved by supplying seedlings in schools; water conservation through construction of dams for enhanced water supply and; boosting environmental laws such ban on charcoal production until enactment of policy. He noted with emphasis the need to undertake rehabilitation especially in Embobut forest block initially inhabited by squatters.

3.3.2 Implementing Agencies' representatives

Representatives of implementing agencies affirmed their commitment to implementing the Programme. The KFS Director noted that the organization has responsibilities in the Programme and assured all present that they would do all it takes to ensure that the forested areas and surrounding ecosystems are well conserved. The Director KEFRI noted that the organization was already generating information that other implementing agencies will use for decision making and local action. Further, KWS representative assured the guests that the organization is committed to team up with other stakeholders to ensure that water towers are protected. Dr. Kalua, chair of Kenya Water Towers Agency urged the agencies to ensure that communities who are the ultimate beneficiaries benefit from the Programme. Further, he emphasized that implementing agencies must ensure that there are synergies among the four components. Finally, the Environment Secretary, Dr. Alice Kaudia noted that the Ministry will ensure all targets of the Programme are met for its overall success.

3.3.3 Principal Secretary, State Department of Natural Resources

The Principal Secretary, Dr. Mwakima noted that Kenya is endowed with various ecosystems which host diverse species of flora and fauna - and hence great biodiversity. She further said that the Ministry has gazetted eighteen water towers in a bid to conserve and protect them; whereas there are other thirty small water towers scattered all over the country. Multi-sectoral and multi-stakeholder involvement in management of natural resources is critical.

3.3.4 EU Ambassador

The Programme will contribute towards achievement of sustainable development crucial for growth and climate change resilient global economy. He emphasized that the EU is in support of Programmes on environmental protection with key focus on sustainability. Through the partnership with the Kenyan Government, it is anticipated that environment will be improved for present and future generations and improved livelihoods through sustainable land use systems and income generation through alternative livelihood activities. Conserving water towers would in turn lead to achievement of SDGs and climate change adaptation.

3.3.5 Cabinet Secretary, Ministry of Environment and Natural Resources

Climate change alone is estimated to cost Kenya's economy about USD 500 million annually, equivalent to 2% of GDP hindering the country's economic growth. The Ministry plans to rehabilitate 5.2 million hectares of degraded forests based on global agreement on climate change mitigation noting that mapping of the rehabilitation hotspots has been done, which the Programme will support towards achieving. She also said the Ministry has enacted several legislations and policies to address climate change such as the National Climate Change Response Strategy, 2010, National Climate Change Action Plan, 2012 and Climate Change Act, 2016. The forest cover currently stands at about 7.2% and the Ministry is committed to the achievement of 10% forest cover which the Programme will support towards its attainment. On behalf of the Government of Kenya, Prof. Wakhungu appreciated the EU for supporting the initiative and affirmed the cordial relationship among the states.

At exactly 12.10 pm, she declared the Programme officially launched.

Figure 6: Official unveiling of the Programme

Appendix 1: Pre – Launch Mission Program

Date &time	Location and purpose	Notes	Responsible
DAY 1: Monday 20 June 2016 (Overnight stay at Hotel, Kitale)			
8:00 am – 3:00 **3pm -5pm**	Travel from Nairobi to Kitale Team meeting in Kitale	VI Agro-forestry Hall next to Kitale museum.	
DAY 2: Tuesday 21 June, 2016 (Overnight stay at Eldoret Club)			
8.00-8.30	Courtesy call on Governor, HE Patrick Simiyu, Trans-Nzoia County,	Discuss WaTER programme and schedule programme launch on 23 June, 2016	KEFRI, KFS, KWTA, KWS Technical Team
08.30-12.30	Visit Mt. Elgon National Park (Camp site, Kitum Cave and Koitobot)	Meet KWS KFS Officials point out general project area in the Elgon forest ecosystem	KWS, KFS and KEFRI Team
1:00 pm – 2:00 pm: Lunch break (Packed lunch from Hotel)			
14:00 – 16:00	Visit KEFRI site (Kimothon) and Mt Elgon (time permitting)	Kimothon CFA members	KEFRI Team (Robert Nyambati)
16:00	Depart for Eldoret		Technical Team
Day 3: Wednesday 22 June, 2016 (Over Night at Eldoret Club)			
7:30 **8:30 am – 9:30 am**	Departure to ITEN Courtesy call on the Governor, HE Eng. Alex Tolgos, Elgeyo Marakwet County (ITEN)	Discuss WaTER programme and the Programme launch scheduled for 23rd. June, 2016	All team KEFRI, KFS, KWTA, Technical Team
09:30 am – 12:00	Visit to Kamasia	• To assess the Integration of communities and collaborators in programme implementation • Areas targeted for rehabilitation and tree planting with farmers/Meet members of a CFA including special interest groups	KEFRI, KFS, KWTA, Technical Team
12:00 pm -12:30 pm: Lunch break (Packed lunch from Hotel)			
12:30 – 16:00 **16:00**	Visit to Chebara Dam Travel to Eldoret.	• Targeted for riparian rehabilitation • Areas targeted for rehabilitation and tree planting with farmers • Meeting with Water Resource Users Associations	KEFRI, KFS, KWTA, Technical Team
Day 4: Thursday 23 June 2016 Launch at Hill School grounds, Eldoret			

Appendix 2: Pre-launch list of participants

Sn/No	Name	Organization/ Institution	Phone No.	Email Address
1	Kipkorir Chumo	Council of Governors	722628403	*kipkorirchumo@yahoo.com*
2	Charles C	EMC	720831082	*charlesckelisosuta@yahoo.com*
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4	Erik Habers	EU	705831988	
5	Hjordis Ogendo	EU	726632502	*hjordis.ogendo@eeas.europa.eu*
6	Brenda kiprono	KBC TV	728819337	*sephobrenda@yahoo.com*
7	Lugusa Andrew	KBC TV	722409437	*andrewmayodi@gmail.com*
8	Rachunyo Duncan	KBC/Radio Talk	720920527	*Rachuonyo.duncan@gmail.com*
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12	Betty Prissy Njoki	KEFRI HQ	723670453	*bettyprissy@yahoo.com*
13	Jackson Mulatya	KEFRI HQ	721385835	*jmulatya@kefri.org*
14	Paul Ongugo	KEFRI HQ	722820660	*paulongugo@yahoo.com*
15	Joshua Cheboiwo	KEFRI HQ	722464469	*jkchemangare@yahoo.com*
16	Bernard N. Kigomo	KEFRI HQ	722791656	*bkigomo@kefri.org*
17	Purity Karuga	KEFRI HQ	713837377	*puritykaruga@yahoo.co.uk*
18	Paul Tuwei	KEFRI HQ	722740830	*ptuwei@yahoo.com*
19	Ben Chikamai	KEFRI HQ		
20	Samson Mugire	KEFRI Karura	720905003	
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23	Kisiwa Abdalla	KEFRI Londiani		
24	Robert Nyambati	KEFRI Maseno	722273595	*nyambatir@yahoo.com*
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30	N. Mwatika	KFS- EC Trans Nzoia		
31	G. Nderitu	KFS –HOC North Rift		
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46	Shose Oyalo	Winnie Gor Consultancy	722683982	
47	Winnie Gor	Winnie Gor Consultancy	726811010	*wgor@winniegor.com*

ANNEX 4: GIS METHODOLOGICAL FRAMEWORK WORKSHOP

REPORT ON GEOGRAPHIC INFORMATION SYSTEM AND REMOTE SENSING (GIS/RS) METHODOLOGICAL FRAMEWORK WORKSHOP

Venue: Nakuru

Activity dates: 14th - 17th March 2016

1.0 Introduction

Forest resources are threatened by diverse land uses and climate change (Russel, 2012). Africa's forests faced the greatest pressure in early 1980s, 1990s and 2000 with severe loss in 1980s, and 1990s (FAO, 2010). Mount Elgon and Cherangany Hills forest ecosystems represent key water towers threatened with changing land uses. This activity aimed to undertake desktop review on land use and land cover scenarios in the two ecosystems, compare different methods used to map land use and land cover change, identify gaps in methodological frameworks and to develop appropriate assessment technique and sequence to be utilized to generate historical and current land use maps for the two ecosytems.

1.1 Mount Elgon ecosystem land use change

Mt. Elgon forest ecosystem has experienced loss in terms of vegetation diversity and density attributed primarily to a combination of encroachment by local communities and large illegally allocated logging concessions (Nield et al, 1999). The recent year's pattern of climate variability and increased frequency and severity of extreme events, such as landslides and flooding are creating additional pressures on local communities, thus increasing their reliance on forests as part of their climate coping strategies. As result, encroachment into the forest has been increasing with conversion of forest into farming and establishment of settlements.

1.2 Cherangany Hills land use change

Cherangany Hills is threatened with anthropogenic disturbances of land use pressure, demographic characteristics and even climate change leading to forest loss (Cherangani Hills Forest Ecosystem Strategic Management plan, 2015). With population on the ascent, forest encroachment for establishment of farmlands, settlements and grazing has become rampant to sustain their livelihoods. Encroachment on the forest dates back to colonial times when local people were given permits to graze livestock in forest glades. Since then, people have been encroaching onto the forest from the glades (Lambretchs et al., 2002).

2.0 Methodology

2.1 Land use land cover change detection techniques

The two main categories of change detection methods woud be applied in this study: pre-classification and post-classification change detection techniques (Lu et al., 2004).

The pre-classification techniques, include various techniques that directly use the multiple dates of satellite imagery to generate ''change'' vs. ''no change'' maps (Al-doski et al., 2013). Pre-classification techniques are most accurate, straight forward and effective for identifying and locating change and are easy to implement (Sunar, 1998).

Post-classification techniques is based on rectification of more than one classified image; where it involves the classification of each of the images independently, then the thematic maps are generated, followed by a comparison of the corresponding labels or themes to identify areas where change has occurred. The technique minimizes sensor, atmospheric, and environmental differences because data from two dates are separately classified (Lu et al., 2004).

2.2 Land use land cover classification

A map was developed using 90m Digital Elevation Model (DEM) data, and shape files of county boundaries, major rivers, major towns and major roads laid (Figure 1).A land use and land cover classification system which can effectively employ orbital and high-altitude remote sensor data was adopted that met the following criteria (Anderson, 1971):

- The minimum level of interpretation accuracy in the identification of land use and land cover categories from remote sensor data should be at least 85 percent.
- The accuracy of interpretation for the several categories should be about equal.
- Repeatable or repetitive results should be obtainable from one interpreter to another and from one time of sensing to another.
- The classification system should be applicable over extensive areas.
- The categorization should permit vegetation and other types of land cover to be used as surrogates for activity.
- The classification system should be suitable for use with remote sensor data obtained at different times of the year.
- Effective use of subcategories that can be obtained from ground surveys or from the use of larger scale or enhanced remote sensor data should be possible.
- Aggregation of categories must be possible.
- Comparison with future land use data should be possible.
- Multiple uses of land should be recognized when possible.

2.3 Preparation of the preliminary baseline maps

The land use land cover types used for a preliminary production of maps was suggested to include: forest, hotspots/degraded areas, riparian vegetation, farmlands, build up areas, water bodies and

grasslands. Use of remotely sensed Landsat images will be the main input data, besides some other ancillary data. For that reason, two key considerations were important.

- The application of various techniques and procedures, and
- The consideration for critical seasons/periods when remotely sensing images can potentially be interpreted conveniently.

Climate data would be used to optimally assign the various images to their specific season mainly depending on the amount of precipitation (Table 1).

Table 1: Critical seasons for remote sensing data

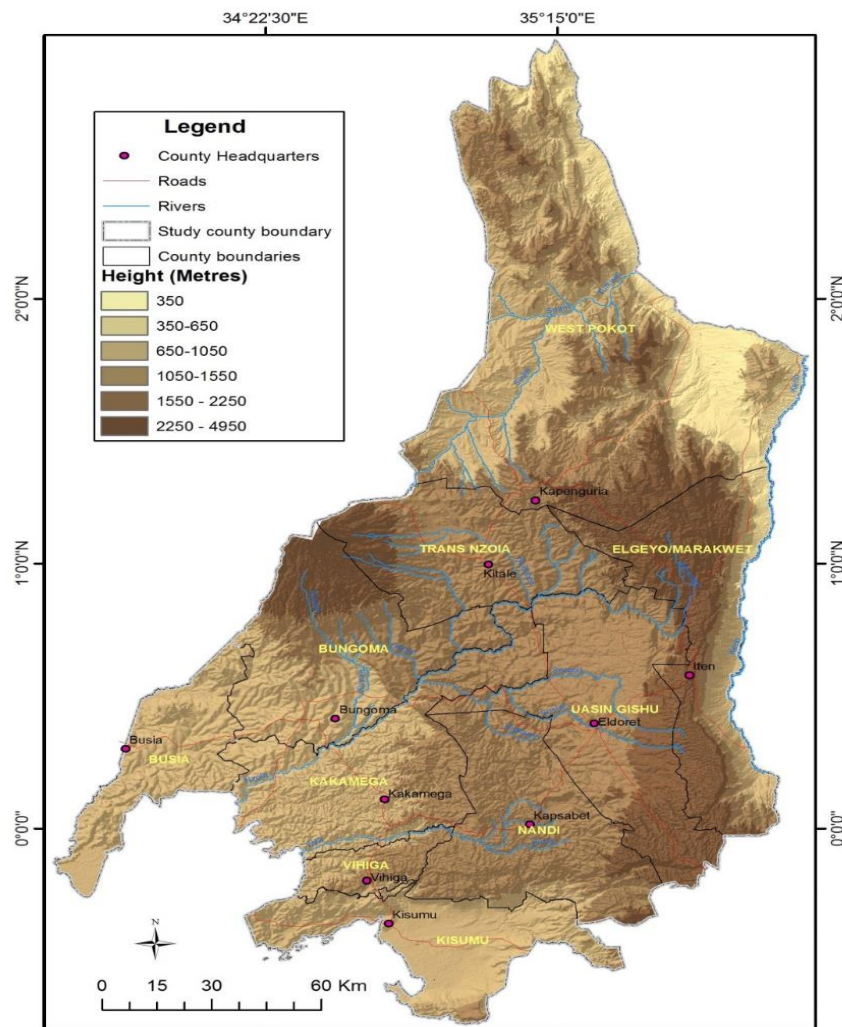|							
Tail-end of dry season	Onset of wet season	Middle of wet season	Tail-end of wet season	Onset of dry season	Middle of dry season	Tail-end of dry season	Onset of wet season

Figure1: Project Intervention area with respect to county boundaries, major rivers, major towns and major

Multi-spatial landsat 8 images for recent years (2015/2016) for dry season, that is, December and January Images orthorectified to WGS84 UTM referencing System would be used. The images will be sourced from EarthExplorer website (www.earthexplorer.usgs.gov). Table 2 presents the details of 5

scenes that would be used to develop the preliminary maps.

Table 2: Landsat Images to be used for preliminary development of land cover maps

Year	Path/Raw/Scene	Date	Forest/Site
2016	170/58	6th January	Mount Elgon
	170/59	6th January	Mount Elgon
	170/60	6th January	Mount Elgon
	169/59	15th January	Cherangani
2015	169/60	30th December	Cherangani

2.4 Classification Procedure

A decision tree classification protocol will be used to classify and generate different classes of land use land cover in the two ecosystems. Two seasons, wet and dry scenes could be used given different bands to run specific analyses to provide map inputs in the tree. The order of analyses will be neural based on what can be distinguished within a queried class/band. The steps are summarized in figure 2.

2.5 Land use land cover detection 1975-2016

The methodology for land use land cover change detection will involve 5 main phases: image acquisition, image pre-processing, image classification, post-classification and accuracy assessment (Figure 4).

Image acquisition : To assess how the land use land cover has changed over the past 40 years, multi-spatio-temporal Landsat images years from 1975 to 2016 will be sourced from EarthExplorer website (www.earthexplorer.usgs.gov) at intervals of about 5 years.

Image Pre-processing: The following procedure will be undertaken as pre-processing steps for the acquired multi-temporal images (Figure 3).

- Identification of image shifts, given Y and X to generate RMS error.
- Georectification of the master image (for every scene) using digital top sheet (pre-processing)-co-registration.
- Masking/sub setting the scenes.
- Identify clouds and shadows band by band, mask them off and correct (Correct DN values by filling in the missing gaps).
- Change the DN to their real reflectance values (radiometric corrections).
- Atmospheric correction to the master image and thermal band.

- Horizontal and vertical normalization scene by scene for all the bands and later merge the products.
- Layer stacking.

Pre-classification techniques: The following 7 pre-classification techniques will be used and compared to select the one with highest accuracy: Image Differencing (ID), Improved change vector analysis, Band Image Differencing, RGB-NDVI Change Detection Method, Spectral Change Vector Analysis (CVA), Principal Component Differencing (PCD) and Change Vector Analysis (CVA).

Post-classification techniques: The following three post-classification techniques will be used and compared to select the one with the highest accuracy and minimum uncertainty: the decision tree protocol, supervised classification using Maximum Likelihood Classifier and Object-based classification.

The Field work included

- Perform unsupervised classification and generate as many classes as possible repeatedly until no further changes can be noticed.
- The classes generated above will require a preliminary knowledge to verify their respective representations.
- Having actual knowledge of the classes will allow collapsing/merging of sub-classes from the unsupervised classification to generate the key land categories.

Mt.ELGON AND CHERANGANI CATCHMENT ARES

Using VI for Wet Season, Has the class been clasified as green?

NO | YES

NON VEGETATION
water bodies
-rocks
-sand
-green houses
-built up areas
-degraded land
clouds

ALL VEGETATION

Using VI for Dry Season, has the class been clasified to have continued greenness?

NO | YES

Using NIR and MIR (bands 4&5) Did the land cover types go beyond the defined threshold

YES | NO

-CROP AREAS ESP ANNUALS
-DEGRADED BARE LANDS
-OPEN GRASSLAND

-EVERGREEN FORESTS
-RIPERIAN VEGETATION
-IRRIGATED LANDS
-PERENNIAL CROPS
-AGROFORESTRY AREAS

-green houses
-clouds

-water bodies
-rocky outcrops
-non white sands
-built up areas
-shadowS
-Etreamly degraded areas

using land surface temperature derived from B6 and Tasseled cap transformatin, does th progile show low yellowness and high greeneess over dry season?

based on LST, does land cover show low LST profile over dry season?

Using a DEM did the land cover types go beyond a certain threshold

NO | YES

Green houses

-CLOUDS

using clear dry season images, did the land cover types go below defined reflectance threshold?

NO | YES

Grass Land

-CROP AREAS ESP ANNUALS
-DEGRADED BARE LANDS

YES

-evergreen forests/woodlands
-wetland/riparian vegetation/irrigated agriculture
-Some cropped areas (especially perennials e.g. tea, banana plantations, orchards, coffee)
-Some agro-forestry systems (where trees are a bit dense per unit area)

-WATER BODIES
-SHADOWS

-rocky outcrops
-non white sands
-built up areas
-Etreamly degraded areas

Supervised classification based on Maimum Likelihood Classifier (MLC)

time series images ranging from wet-dry season, was there variation?

NO | YES

Crop Areas (Annuals)

Degraded Bare Lands

NO

Supervised classification based on Maimum Likelihood Classifier (MLC) based on wetness surfaces over dry season

Water Bodies

Shadows

Supervised classification based on Maimum Likelihood Classsifier(MLC)

-Some cropped areas (especially majority of annuals including cereals, vegetables)
-Some agro-forestry systems (especially with few trees per unit area)

Evergreen forest

Rocky Outcrops

Buid up areas

Non-Whitish Sand

Exteamly degraded areas

Supervised classification based on Maimum Likelihood Classifier (MLC)

-wetland/riparian vegetation/irrigated agriculture

Some agro-forestry systems (where trees are a bit dense per unit area

Some cropped areas (especially majority of annuals including) cereals, vegetables

Some agro-forestry systems (especially with few trees per unit area)

Some cropped areas (especially perennials e.g. tea, banana plantations, orchards, coffee)
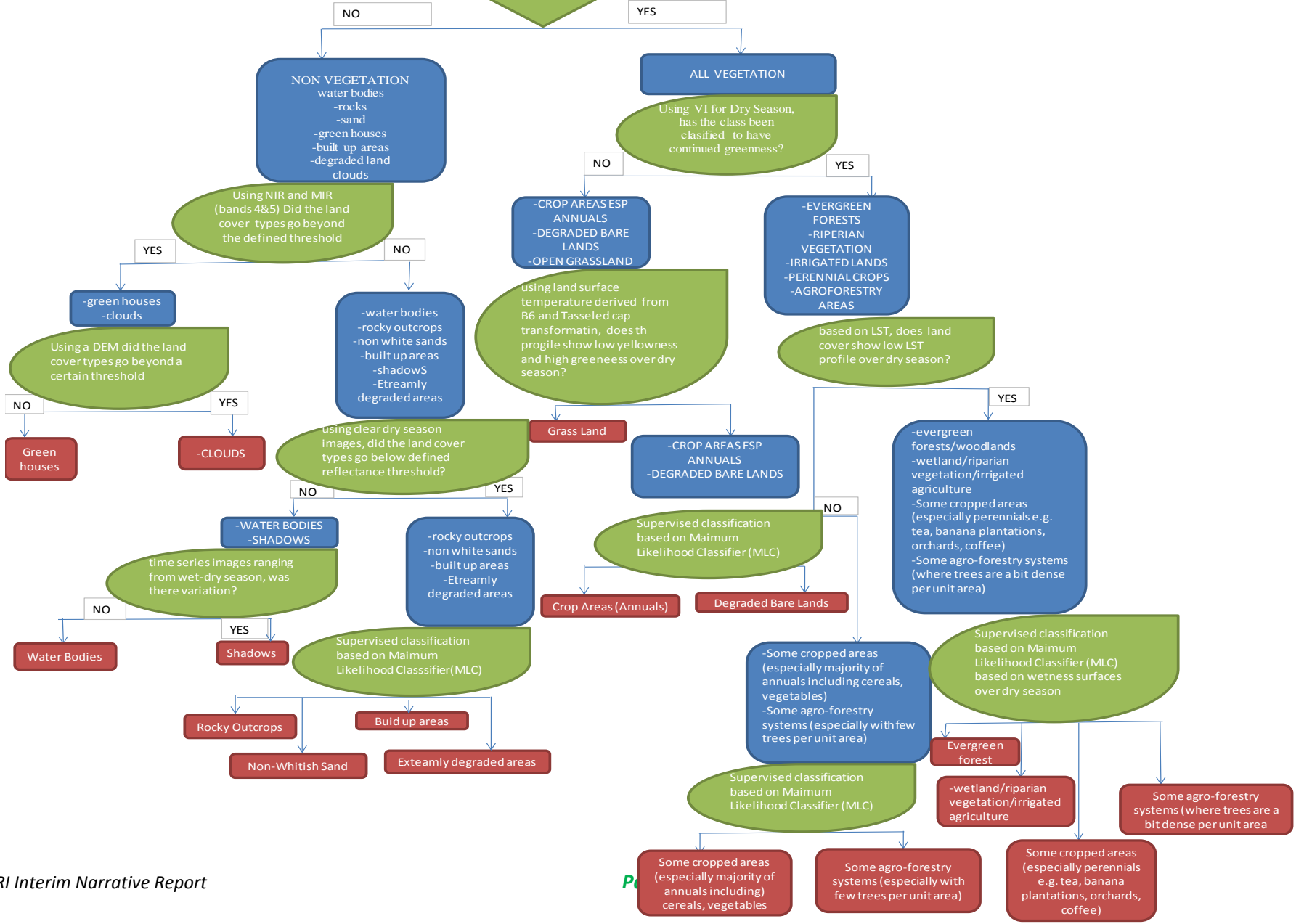
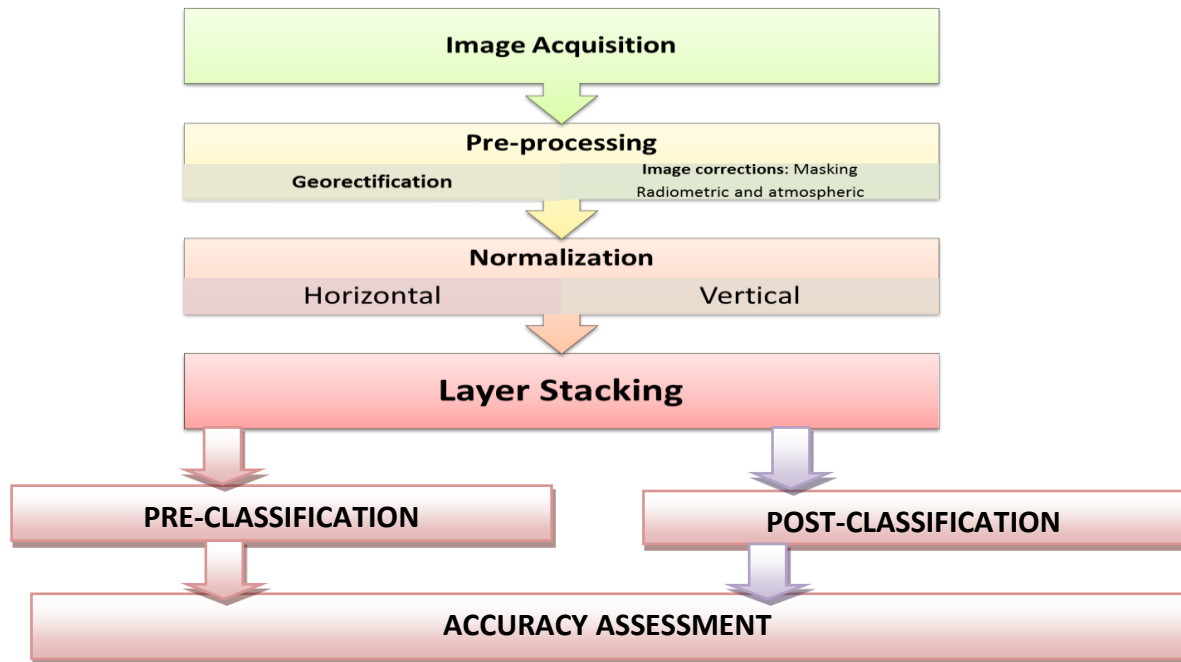Figure 2: Summarized steps for decision tree classification

Figure 3: Outline of the methodology encompassing satellite data processing for production of maps.

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ANNEX 5: LAND USE LAND COVER (LULC) MAPS

REPORT ON HISTORICAL AND RECENT LAND USE LAND COVER (LULC) FOR CHERANGANY HILLS AND MOUNT ELGON ECOSYSTEMS

1.0 Background Information

This activity aimed at determining both historical and contemporary land use and land cover dynamics using social and physical techniques. To achieve this, mapping activity using Geographic Information System (GIS) and Remote Sensing (RS) tools to generate historical and recent land use land cover maps was conducted. The imagery analysis aimed to deliver two key outputs; recent land cover land use and historical land cover land use for Mount Elgon and Cherangany ecosystems.

2.0 Methodology

Different techniques were used for historical and recent analyses. Recent land cover land use inputs included scenes p170 r59 2016, p169 r59 2015 and p169 r60 2015, all acquired in dry seasons ranging from late December to early January in the respective years. In the historical context, a range of 10-15 years' scenes were acquired from 1984, 1995, 2002 and 2016/2015, all during the dry months in these ecosystems (http://earthexplorer.usgs.gov). For the generation of tentative recent Land Use Land Cover Map, segmentation approach was applied using Mapping Device for Change Analysis Tool (MAD-CAT)- Global Land Cover Network (GLCN 2009). The result was then exported to QGis for assignment of land use classes. This was followed by supervised classification validated using online Google link to check accuracy. Land Cover Classification System (LCCS) was used to generate legend for land cover classes.

Historical LULC assessment employed unsupervised classification to generate as many classes as possible, developed training areas from the unclassified classes to perform supervised classification of confined classes in the respective years as shown in figures 3, 4, 5, 6, 7, 8, 10,11, 12, 13,14 and 15. Trend change tables (tables 1 and 2) and graphs (figures 9 and 16) were generated as shown in the results section. Degraded areas in Mt. Elgon and Cherangany Ecosystems identified during ground-truthing activity were superimposed on recent classes as shown in figures 18 and 20 respectively. The methodology is as summarized in figures 1 and 2.

2.1 Analysis anomalies

Limitation of availability of wet season data was encountered. Mount Elgon and Cherangany are high altitude zones, hence difficult to acquire noise free images for wet season for objective analysis, hence modification of the proposed decision making tree protocol to the used suitable methodologies (figures 1 and 2). With the input data being medium resolution platform, delineating certain land cover land uses proved challenging thus patched cover ws merged to the dominating land use, except in cases where a cluster displayed a distinguishable pixel unit size. To ensure classification accuracy, the

dimensions of raster segments generated has to be small to relatively medium to avoid generalization as much as possible. Since accuracy was key, the segments were manually assigned representing classes validated on Google link, a procedure which proved tedious and time consuming but with higher accuracy.
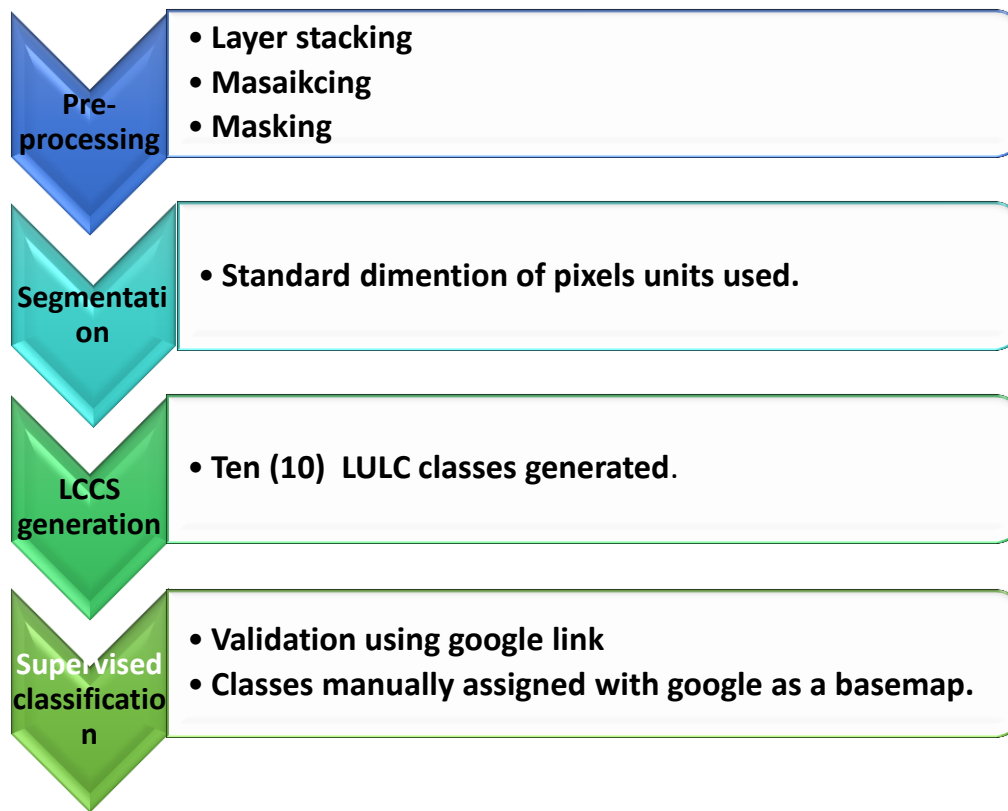
Pre-processing
- Layer stacking
- Masaikcing
- Masking

Segmentation
- Standard dimention of pixels units used.

LCCS generation
- Ten (10) LULC classes generated.

Supervised classification
- Validation using google link
- Classes manually assigned with google as a basemap.

Figure 1: Recent Land Use Land Cover classification technique

Image pre-processing

Unsupervised classification
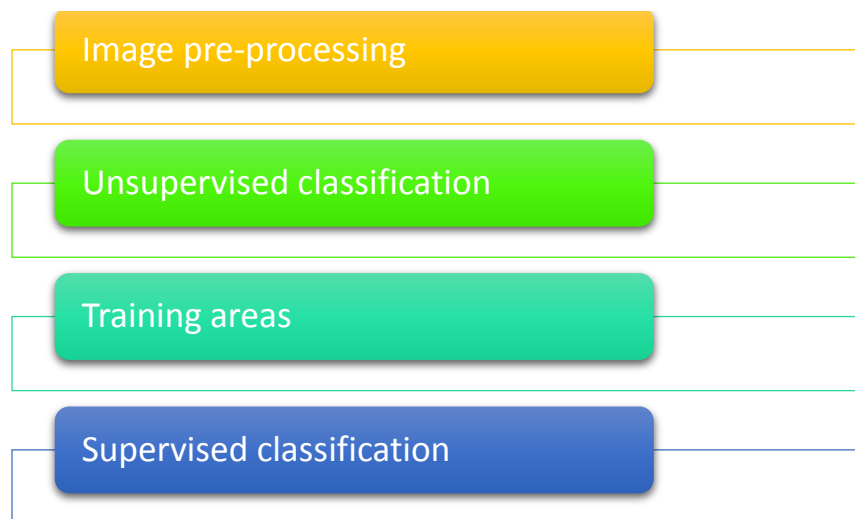
Training areas

Supervised classification

Figure 2: Historical Land Use Land Cover classification technique

4.0 Results

4.1 Historical Land Use Land Cover Maps

4.1.1 Historical Land Use Land Cover maps for Mt. Elgon ecosystem

Closed forest was observed to be decreasing over the years having lost to steady increase in grasslands and farmlands. Open forest declined in 1995 and recovered/regenerated slightly in 2000 (table 1 and figure 9). The class categorized as others (riparian vegetation, bare areas and rock surfaces) appeared to be decreasing and being covered by farmlands and grasslands. The decline in closed forest cover concur with Nield *et al.* (1999), pinpointing loss in vegetation diversity and density, attributed primarily to a combination of encroachment by local communities and large illegally allocated logging concessions.

Biophysical analysis of forest condition in Mount Elgon by ADapTEA project found that between the periods 1985, 1995 and 2008, significant areas in Mount Elgon forest ecosystem transitioned from high canopy cover to low/no canopy cover which concurred with findings of this study. This transition was further corroborated by IFRI plot-level forest vegetation sampling data from both Chorlim and Kimothon IFRI sites in Mount Elgon, showing trending decline in tree cover since 1997-2013. According to IFRI, forest vegetation cover declined by approximately 20.4% (IFRI, 2001). Aerial photography and Land cover mapping of Mt. Elgon in 1999 and 1960s further showed depreciation by a marked decline in the area covering the indigenous forest. Forest cover declined from 49% to 35% while the shamba systems rose from non-existence to 9%(IFRI, 2001). Linked to this analysis, farmlands have remained on the ascent indicating the forest ecosystem is being encroached for agricultural production.
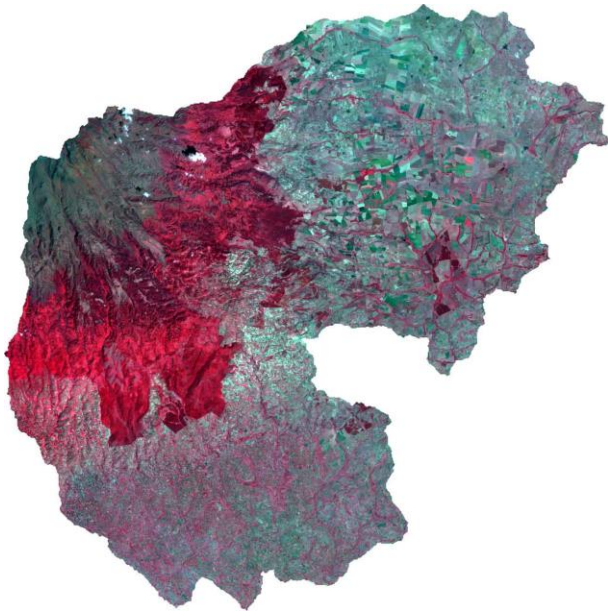
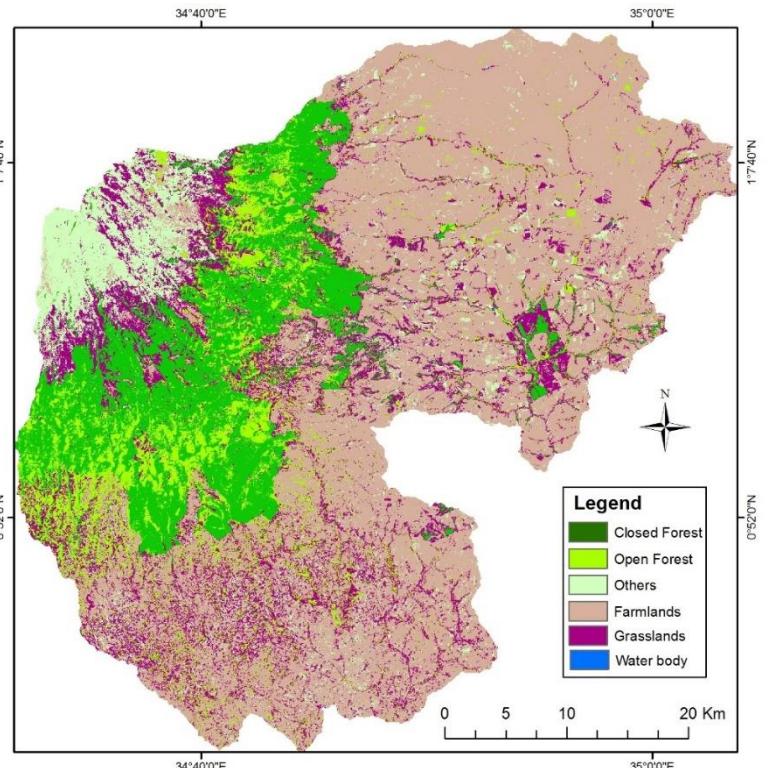Figure 1: Landsat imagery of Mt. Elgon in 1984

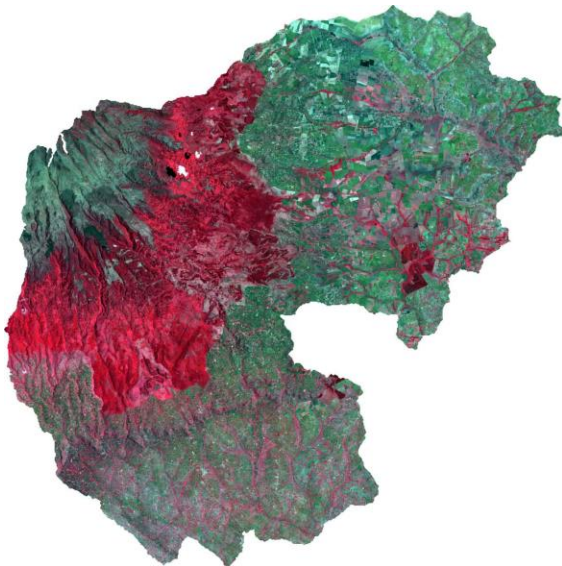Figure 4: Land Use map of Mt. Elgon in 1984

Figure 5: Landsat imagery of Mt. Elgon in 1995
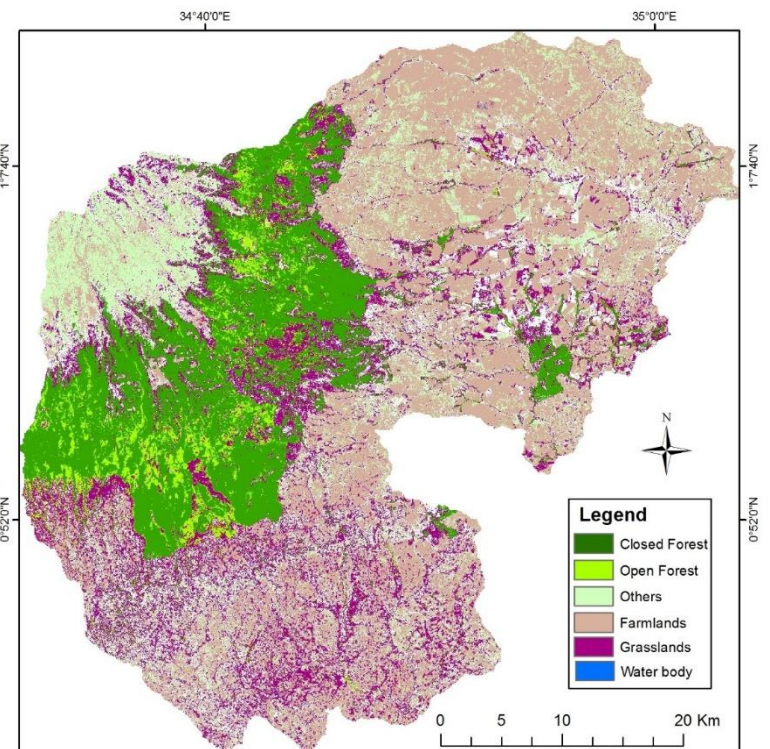
Figure 6: Land use map of Mt. Elgon in 1995
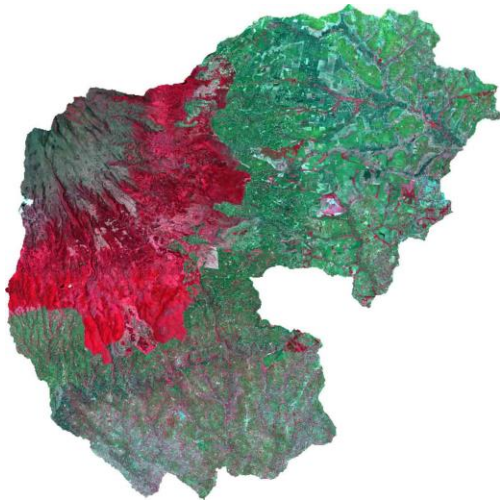
Figure 7: Landsat imagery of Mt. Elgon in 2000
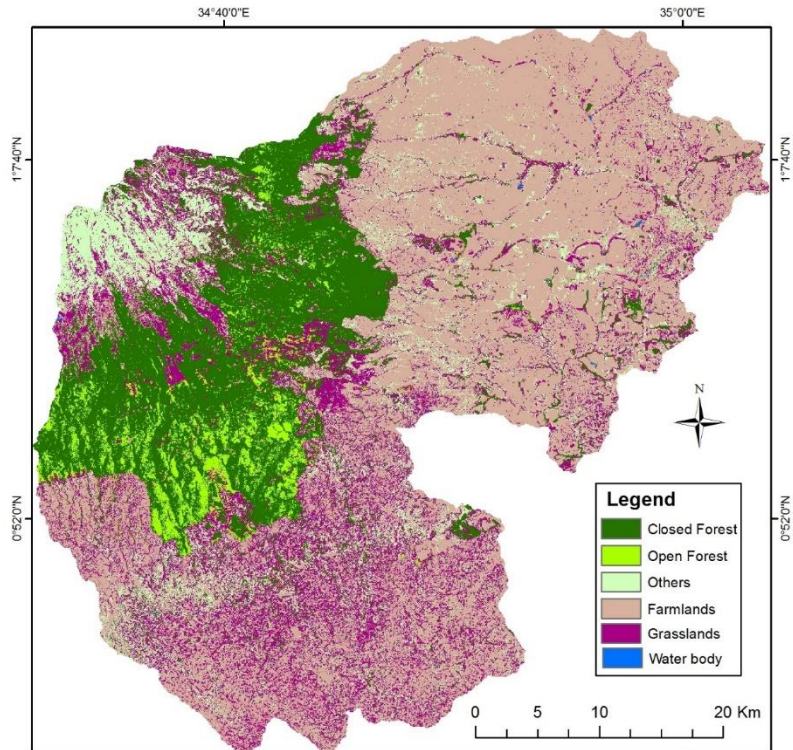
Figure 8: Land use map of Mt. Elgon in 2000

Table 1: Land use coverage (Km^2) for Mt. Elgon Ecosystem

Class Type	1984 (Km^2)	1995 (Km^2)	2000 (Km^2)
Closed Forest	469.21	388.06	262.20
Open Forest	121.40	185.63	131.97
Grasslands	536.98	559.13	618.00
Farmland	691.32	727.76	872.13
Water body	0.51	0.31	0.76
Others	318.71	277.84	253.07
Total	2,138.13	2,138.13	2,138.13

Figure 9: Summarized historical trend for Mt. Elgon forest ecosystem

4.1.2 Historical Land Use Land Cover Maps for Cherangany Hills ecosystem

Closed forest showed steady decline over the years with open forest, farmlands and grasslands on the ascent. Others (riparian vegetation, bare areas and rock surfaces) equally showed decline (table 2 and figure 16). The decline in closed forest cover could be attributed to competing land uses and unsustainable extraction of forest products to supplement the resource proximate livelihoods exacerbated by land uses such as settlements, farming and grazing (KFWG and DRSRS, 2000-2003). With population on the ascent, forest encroachment is pinned to streaming needs of communities to establish settlements and practice farming to sustain their livelihoods and still secure grazing areas for livestock and or use the forest itself as grazing areas. Encroachment on the forest dates back to colonial times when local people were given permits to graze livestock in forest glades. Since then, people have been encroaching into the forest from the glades (Lambretchs et al., 2002).

High rise in grasslands and farmlands as found in the analysis output indicates a higher contribution of anthropogenic drivers towards degradation. Although natural regeneration was observed to occur in few spots, recruitment was impeded by degradation drivers especially grazing. In addition, forest fires experienced in the forest suppressed and destroyed forest growth and regeneration. The analysis results of land uses in 1984, 1995 and 2002 are as presented in figures 10, 11 and 12 with result summary in table 2 and figure 16.
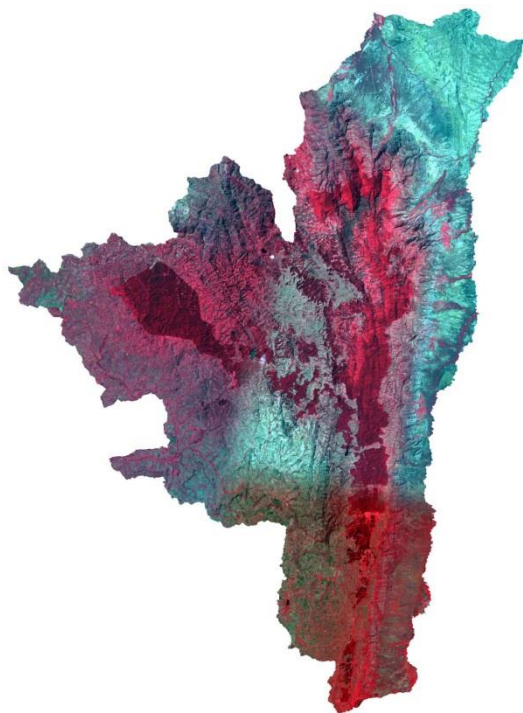
Figure 10: Landsat imagery of Cherangany Hills in 1984

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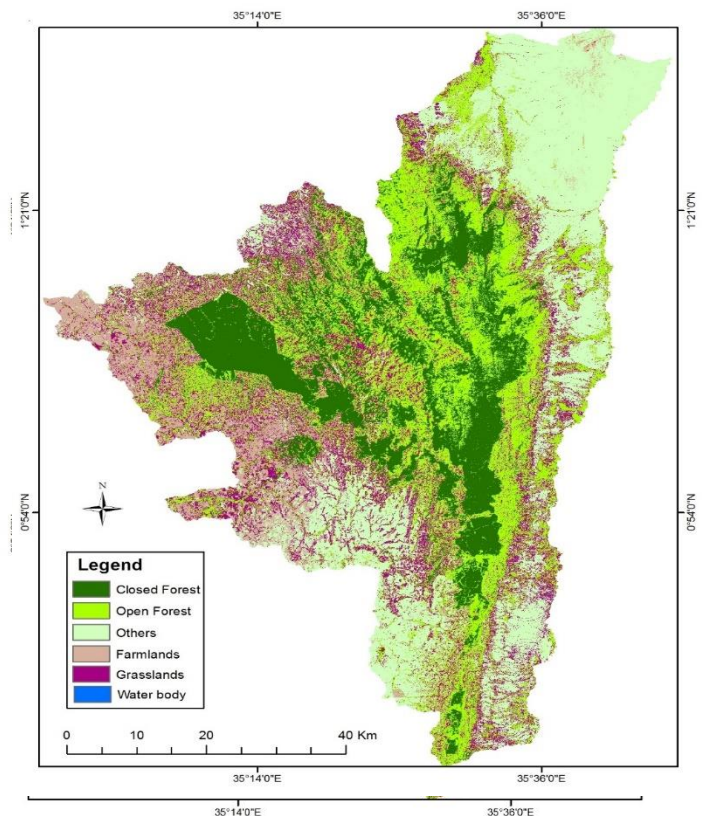
Figure 11: Land use map of Cherangany Hills in 1984
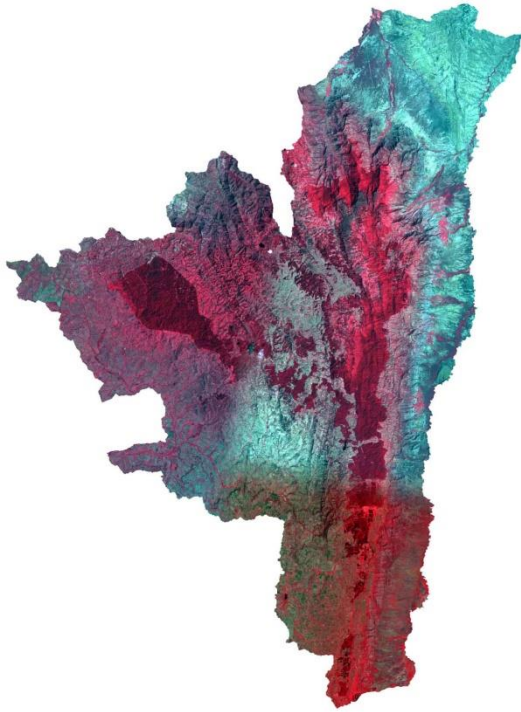
Figure 12: Landsat Imagery of Cherangany Hills in 1995
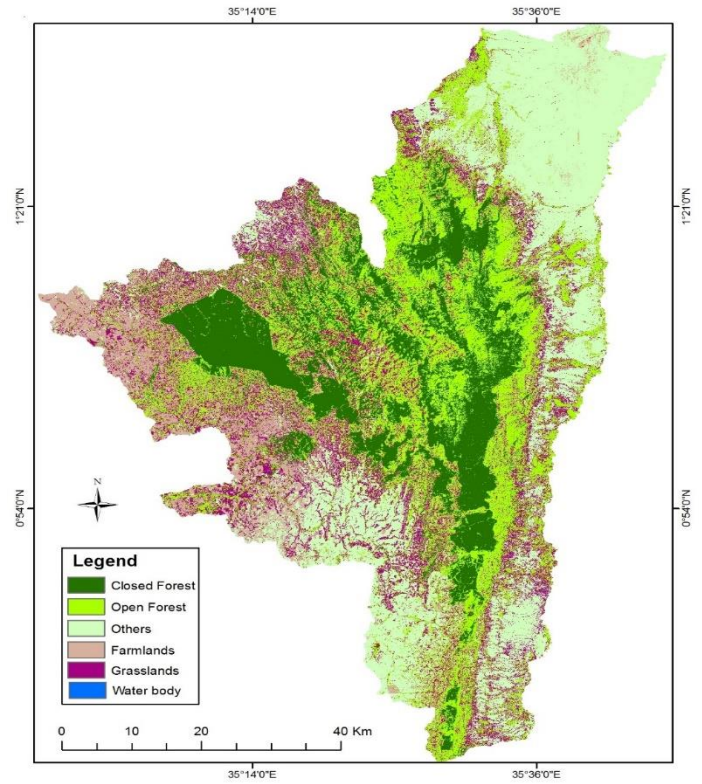
Figure 13: Land Use map of Cherangany Hills in 1995

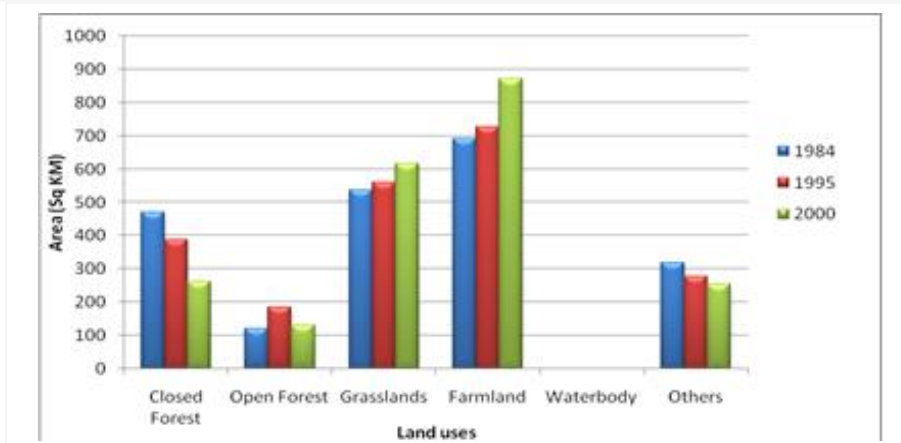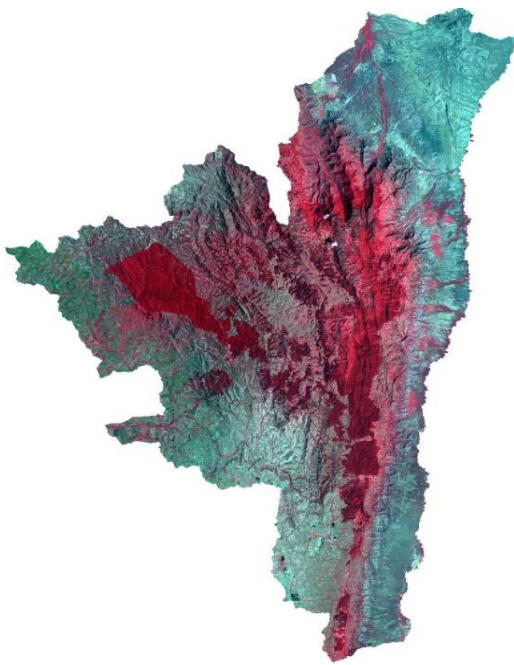Figure 14: Landsat Imagery of Cherangany Hills in 2000
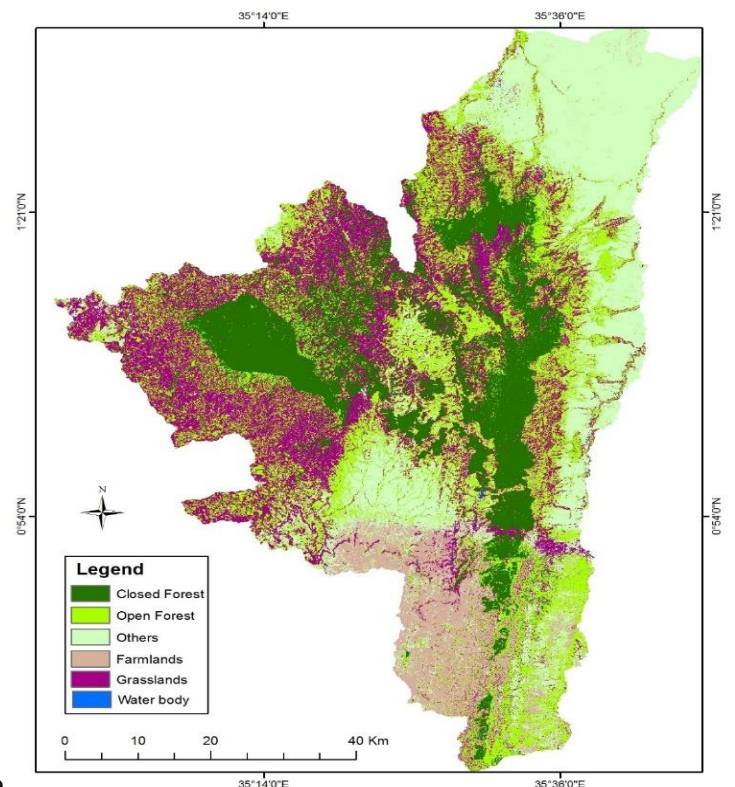
ure Figure 2: Land use map of Cherangany Hills in 2000

Table 2: Land use coverage (Km2) for Cherangany Ecosystem

Class Type	1984 (Km^2)	1995 (Km^2)	2000 (Km^2)
Closed Forest	949.66	938.80	860.55
Open Forest	1555.57	1424.58	1036.85
Grasslands	822.54	779.33	1162.90
Farmland	623.59	718.27	1214.50
Water body	0.94	1.44	1.21
Others	1042.22	1131.60	918.01
Total	**4994.02**	**4994.02**	**4994.02**

Figure 16: Summarized historical trend for Cherangany forest ecosystem

4.2 Recent Land Use Maps

The section shows the maps of recent land use as analyzed using 2015/2016 imageries for Mt. Elgon and Cherangany Hills ecosystem.
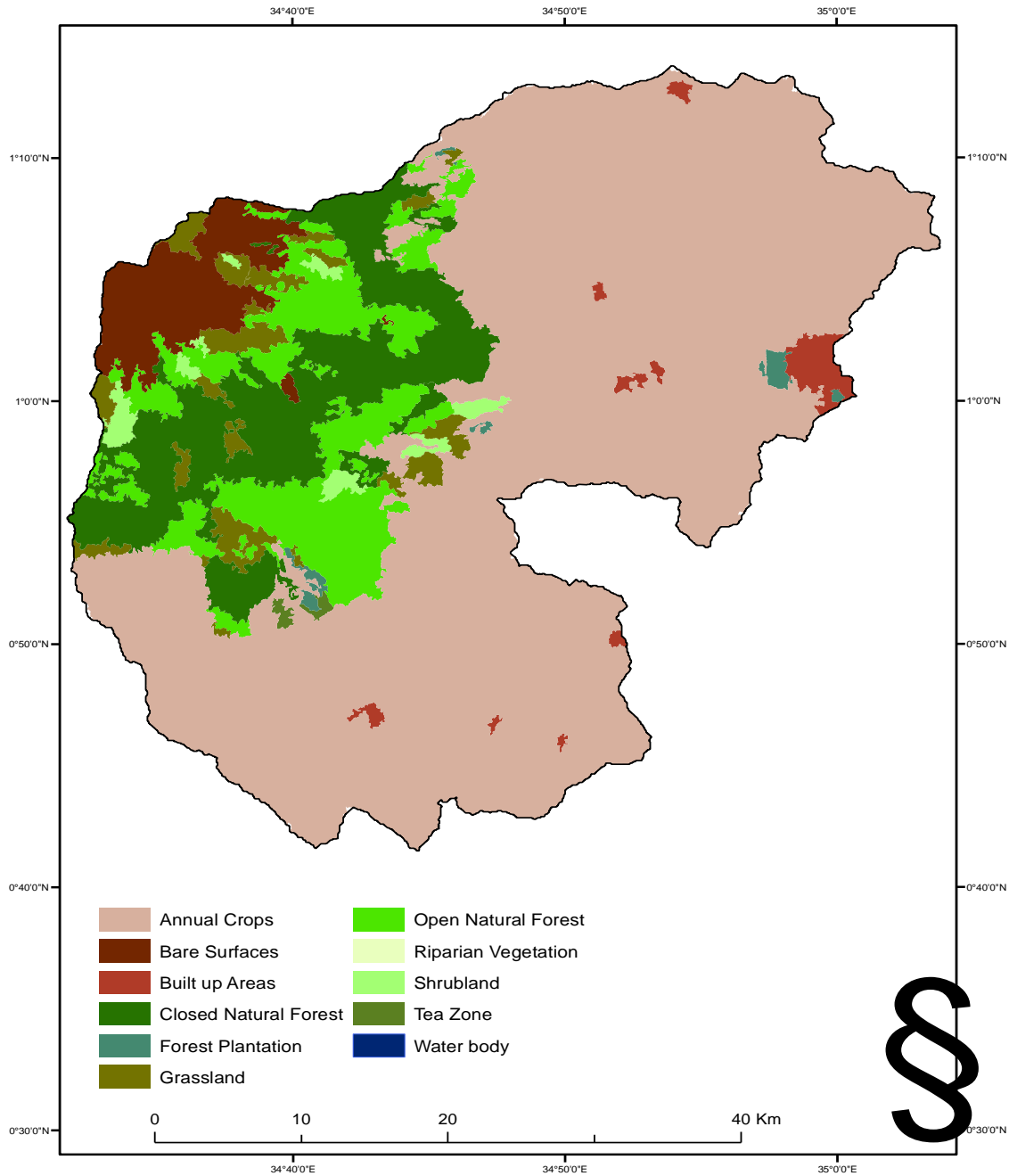
Figure 17: Recent Land use land cover for Mount Elgon Ecosystem
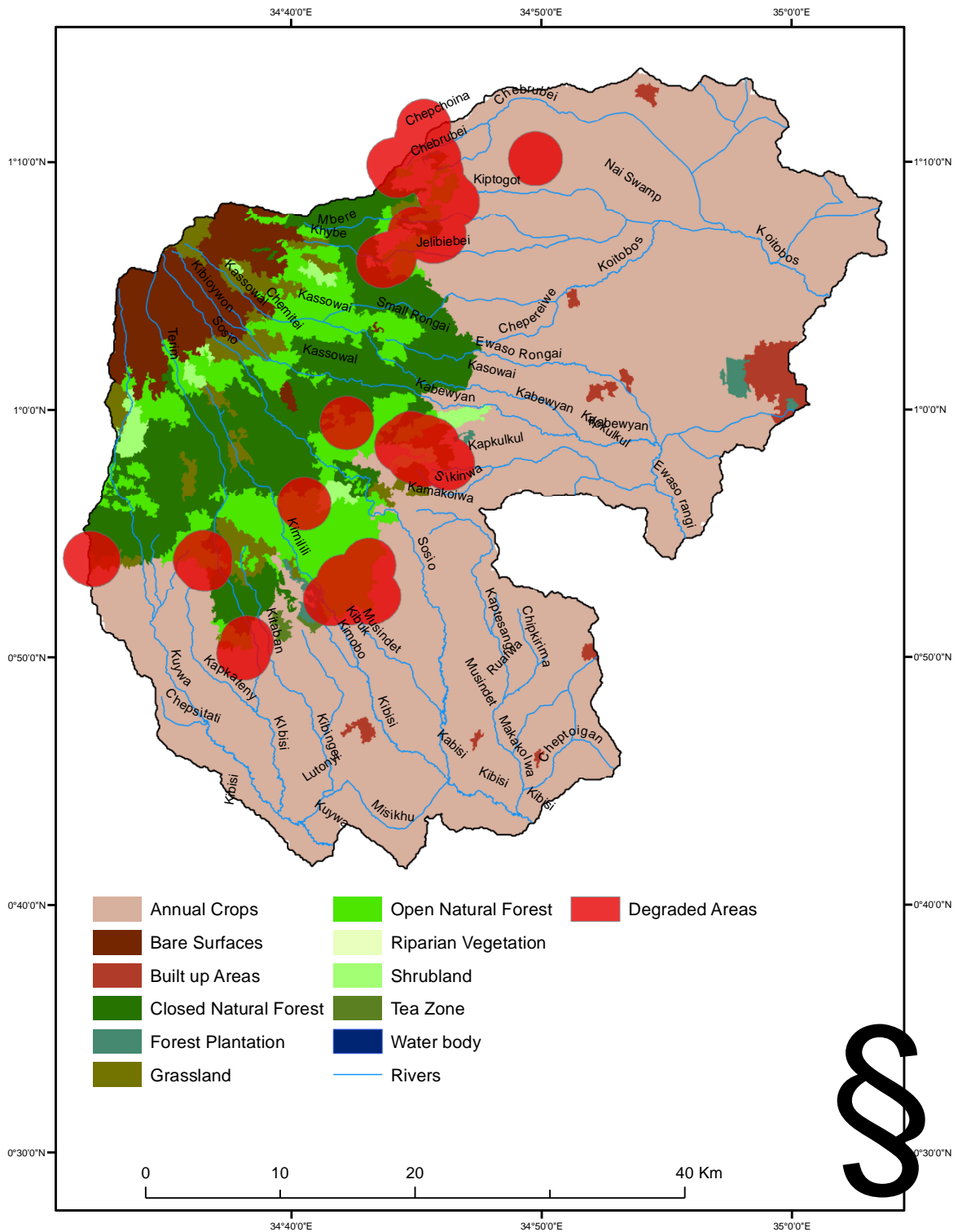
Figure 18: Degraded areas superimposed on recent LULC- Mount Elgon Ecosystem
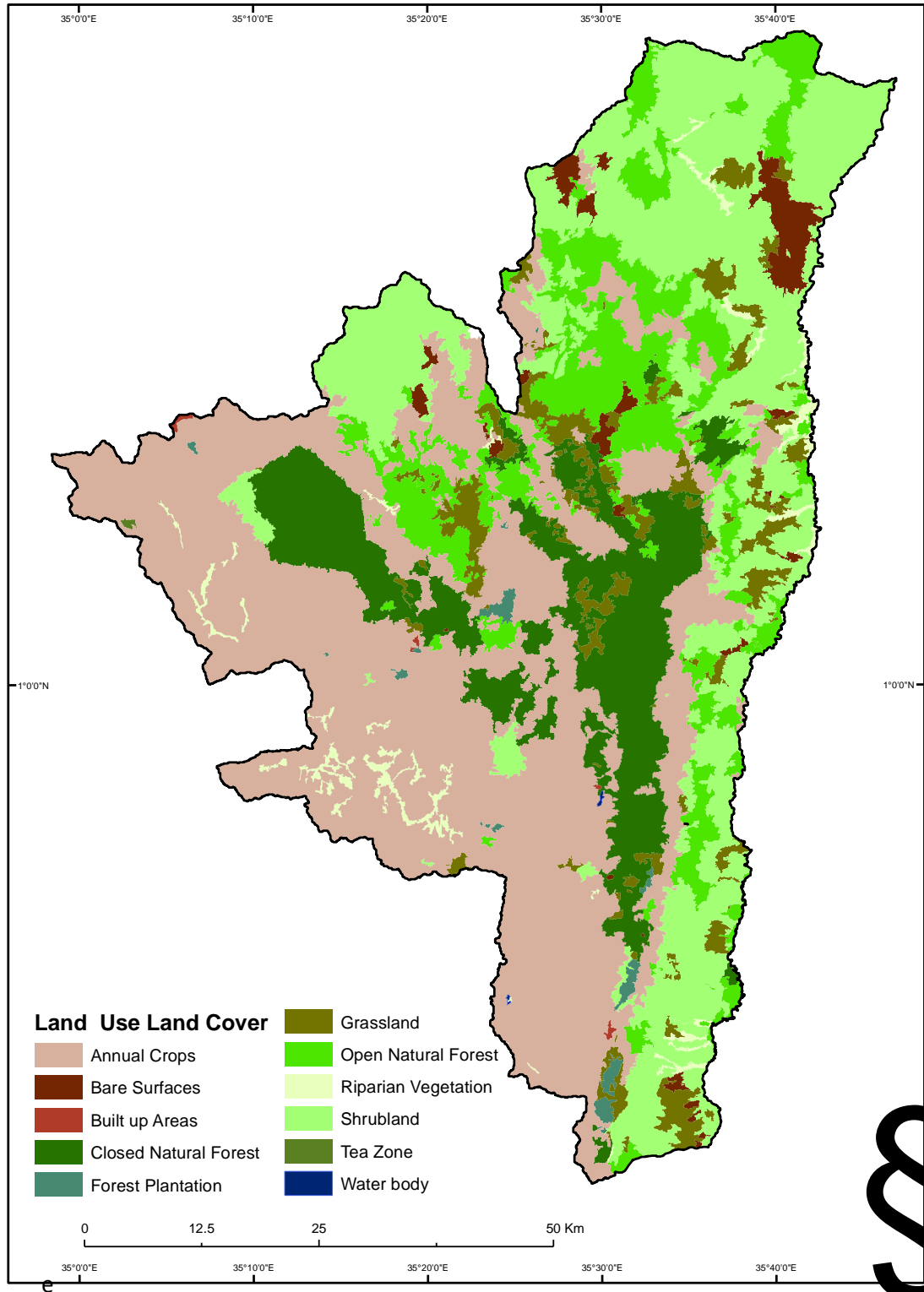
Figure 19: Recent Land use land cover for Cherangany Hills Ecosystem
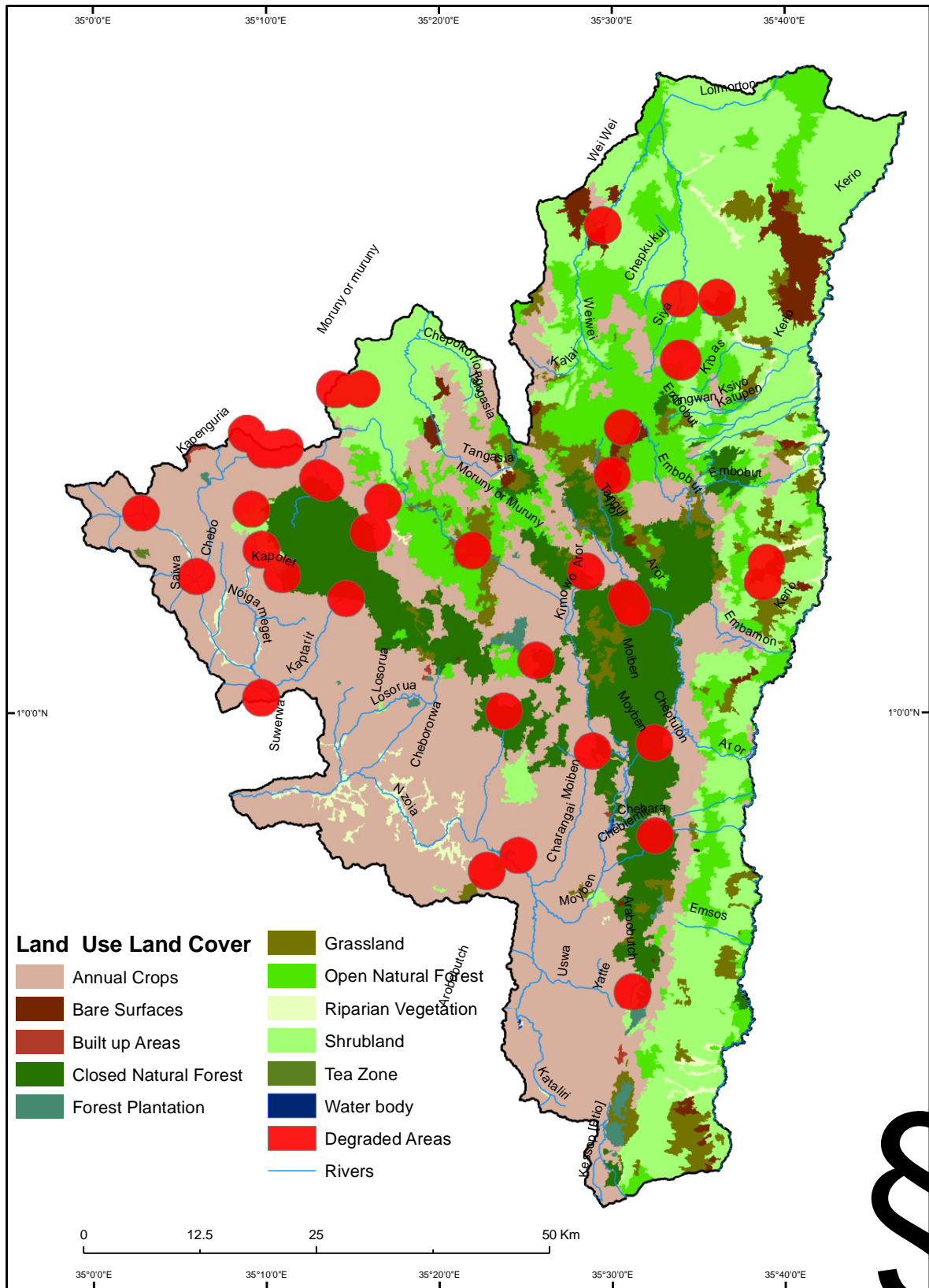
Figure 20: Degraded areas superimposed on recent LULC- Cherangany Hills Ecosystem

References

1. Nield, R., Mugo, E., Mwathe, K. (1999). Review of the management of the forest resources of Mt. Elgon Ecosystems, Kenya. Prepared for: The National Project Steering Committee of Mt. Elgon Integrated Conservation and Development Project (MEICDP). Nairobi, Kenya.
2. Kenya Forest Working Group & Department of Remote Sensing and Resource Survey (KFWG &DRSRS) Report 2004: Change in forest cover in Kenya's Five Water Towers 2000-2003. 8.
3. Lambrechts et al, (2002): "Aerial survey of the destruction of the Aberdare Range forests". UNEP, KWS, Rhino Ark, KFWG.

ANNEXE 6: FLORAL SPECIES CHECKLIST FOR CHERANGANY HILLS FOREST

A check list of plant species for Cherangany Hills Forest

No.	Family	Species	Author	Life form
1	Acanthaceae	*Hypoestes aristata*	(Vahl) Roem & Schulf	H
2	Acanthaceae	*Hypoestes forskahli*	(Vahl) R. Br	H
3	Acanthaceae	*Justicia flava*	Vahl	H
4	Acanthaceae	*Justicia striata*	(Kiotz.Sch) Bullock	H
5	Adiantaceae	*Adiantum poireti*	Wikstr	H
6	Adiantaceae	*Cheilanthes bergiana*	Schltdl ex Kunze	H
7	Adiantaceae	*Cheilanthes inaequatis*	(Konze) melt	H
8	Adiantaceae	*Doryopteris concolor*	(Langsd & Fisch) Kuhn	H
9	Adiantaceae	*Pellaea calomelanos*	(Sw) Link	H
10	Adiantaceae	*Pellaea viridis*	(Forssk) Prantl	H
11	Amaranthaceae	*Achyranthes aspera*	L.	H
12	Amaranthaceae	*Scadoxus multiftorus*	(Martyn) Rai	H
13	Amaranthaceae	*Chloropylum zavatanii*	(Cufod) Nordal	H
14	Araceae	*Culcasia falcifolia*	Engl.	H
15	Asclepiadaceae	*Gomphocarpus stenophyllus*	Oliv	H
16	Asparagaceae	*Asparagus racemosus*	Willd	H
17	Aspleniaceae	*Asplenium aethiopicum*	(Burm .f.) Bech	H
18	Aspleniaceae	*Asplenium boltonii*	Hook	H
19	Aspleniaceae	*Aspleniun bugoiense*	Hieron	H
20	Aspleniaceae	*Asplenium ceii*	Pic Serm	H
21	Aspleniaceae	*Asplenium dregeanum*	Kunze	H
22	Aspleniaceae	*Asplenium elliottii*	C.H. Wright	H
23	Aspleniaceae	*Asplenium erectum*	willd	H
24	Aspleniaceae	*Asplenium friesiorum*	C. Chr	H
25	Aspleniaceae	*Asplenium inaequilaterale*	willd	H
26	Aspleniaceae	*Asplenium manii*	Hook	H
27	Aspleniaceae	*Asplenium monanthes*	L.	H
28	Aspleniaceae	*Asplenium protensum*	Schrad	H
29	Aspleniaceae	*Asplenium sandersoni*	Hook	H
30	Aspleniaceae	*Asplenium stuhlmannii*	Hieron	H
31	Aspleniaceae	*Asplenium theciferum*	(Kunth) Mett.	H
32	Balsaminaceae	*Impatiens hochstetteri*	Warb	H
33	Balsaminaceae	*Impatiens pseudoviola*	Gilg	H
34	Balsaminaceae	*Impatiens sodenii*	Engl.	H
35	Boraginaceae	*Cynoglossum amplifolium*	A. DC.	H

36	Boraginaceae	*Cynoglossum coeruleum*	A. DC.	H
37	Compositae	*Ageratum conyzoides*	L	H
38	Compositae	*Artemisia afra*	Willd	H
39	Compositae	*Bidens pilosa*	L	H
40	Compositae	*Carduus nyassanus*	(S.Moore) R.E.F.r	H
41	Compositae	*Conyza bonariensis*	(L) Cronquist	H
42	Compositae	*Crassocephalum montuosum*	(S. Moore) Miine-Redh	H
43	Compositae	*Dichrocephala chrysanthemifolia*	(Blume) D.C	H
44	Compositae	*Dichrocephala integrifolia*	(L.f) Kuntze	H
45	Compositae	*Galinsonga parviflora*	Cav	H
46	Compositae	*Gutenbergia cordiflora*	Benth. Ex Oliv	H
47	Compositae	*Haplocarpha rueppellii*	(Sch Bip) Beauverd	H
48	Compositae	*Helichrysum formossissimum*	(Sch. Bip.) A Rich	H
49	Compositae	*Helichrysum forskahlii.*	(J.F. Gmel) Hilliard & Burtt	H
50	Compositae	*Helichrysum globosum*	(SCh Bip) A Rich	H
51	Compositae	*Helichrysum schimperri*	(A. Rich) Moeser	H
52	Compositae	*Laggera brevipes*	Oliv & Hiern	H
53	Compositae	*Laggera elatior*	R.E.Fr	H
54	Compositae	*Senecio schwainfurthii*	O. Hoffm	H
55	Compositae	*Sonchus schwainfurthii*	Oliv & Hiern	H
56	Compositae	*Spilanthes mauritania*		H
57	Compositae	*Tegates minuta*	L.	H
58	Compositae	*Vernonia galamensis*	(Cass) Less	H
59	Compositae	*Vernonia syringifolia*	O. Hoffm	H
60	Convolvulaceae	*Cuscuta kilimanjari*	Oliv	H
61	Convolvulaceae	*Ipomoea wightii*	(Wall) Choisy	H
62	Crassulaceae	*Crassula alsinoides*	(Hook. F) Engl	H
63	Crassulaceae	*Kalanchoe densiflora*	Rolfe	H
64	Cruciferae	*Cardamine africana*	L	H
65	Dryopteridaceae	*Dryopteris pentheri*	(Krasser) C. Chr	H
66	Dryopteridaceae	*Polystichum volkensii*	(Hieron) .C.hr.	H
67	Dryopteridaceae	*Tectaria gemmifera*	(Fee) Alston	H
68	Euphobiaceae	*Euphorbia depauperata*	A. Rich	H
69	Euphobiaceae	*Euphorbia engleri*	Pax	H
70	Euphobiaceae	*Phyllanthus fischeri*	Pax	H
71	Euphobiaceae	*Tragia brevipes*	Pax	H
72	Geraniaceae	*Geranium arabicum*	Forssk	H

73	Gramineae	*Oplismenus hirtellus*	(L.) P. Beauv	H
74	Gramineae	*Setaria plicatilis*	(Hochst) Engl.	H
75	Guttiferae	*Hypericum revolutum*	Vahl	H
76	Iridaceae	*Dierama cupuliflorum*	Klatt	H
77	Labiatae	*Leucas argentea*	Gurke	H
78	Labiatae	*Leukas deflexa*	Hook. F.	H
79	Labiatae	*Leukas grandis*	Vatke	H
80	Labiatae	*Stachys aculeolata*	Hook. F.	H
81	Leguminosae	*Chamaecrista usambarensis*	(Taubert) Standley	H
82	Leguminosae	*Desmodium adscendens*	(Sw.) Dc	H
83	Leguminosae	*Desmodium repandum*	(Vahl) Dc	H
84	Malvaceae	*Pavonia urens*	Cav	H
85	Malvaceae	*Sida rhombofolia*	L.	H
86	Malvaceae	*Urena lobata*	L.	H
87	Moraceae	*Dorstenia brownii*	Rendle	H
88	Myrsinaceae	*Rapanea melanophloeos*	(L.) Mez	H
89	Orchidaceae	*Disperis dicerochila*	Summerh	H
90	Oxalidaceae	*Oxalis comiculata*	L.	H
91	Piperraceae	*Peperomia abyssinica*	Miq	H
92	Piperraceae	*Peperomia tetraphylla*	(G.Forst) Hook. & Arn	H
93	Plantaginaceae	*Plantago palmata*	Hook.f	H
94	Polypodiaceae	*Drynaria volkensii*	Hieron	H
95	Polypodiaceae	*Lepisorus excavatus*	(Bory ex Willd) Kaulf	H
96	Polypodiaceae	*Loxogramme abyssinica*	(Baker) M.G. Price	H
97	Polypodiaceae	*Pleopeltis macarocarpa*	(Bory ex Willd) Kaulf.	H
98	Pteridaceae	*Pteris catoptera*	Kunze	H
99	Pteridaceae	*Pteris cretica*	L.	H
100	Pteridaceae	*Pteris dentata*	Forssk	H
101	Pteridaceae	*Pteris preussi*	Hieron	H
102	Ranunculaceae	*Thalictrum rhynchocarpum*	Dillon & A. Rich	H
103	Rhizophoraceae	*Alchemilla cryptantha*	A.Rich	H
104	Rosaceae	*Alchemilla rothii*	Oliv	H
105	Rubiaceae	*Galium apanoides*	Forssk	H
106	Rubiaceae	*Galium spurium*	L.	H
107	Schrophulariaceae	*Hebenstrelia amgolensis*	Rolfe	H
108	Schrophulariaceae	*Veronica abyssinica*	Fresen	H
109	Solanaceae	*Physalis peruviana*	L.	H

110	Thelypteridaceae	*Amauripeita bergiana*	(Schitdl.) Holttum	H
111	Tiliaceae	*Triumfetta rhomboidea*	Jacq	H
112	Umbelliferae	*Centella asiatica*	(L.) Urb	H
113	Umbelliferae	*Sanicula elata*	D. Don	H
114	Urticaceae	*Droguetia debilis*	Rendle	H
115	Urticaceae	*Droguetia iners*	(Forssk.) Schweinf	H
116	Urticaceae	*Elatostema monticolum*	Hook	H
117	Urticaceae	*Girardinia diversifolia*	(Link) Friis	H
118	Urticaceae	*Laportea alatipes*	Hook. F.	H
119	Urticaceae	*Pilea johnstonii*	Oliv	H
120	Urticaceae	*Pilea rivularis*	Wedd	H
121	Urticaceae	*Urtica massaica*	Mildbr	H
122	Violaceae	*Viola eminii*	(Engl.) R. E. Fr.	H
123	Zingiberaceae	*Aframomum zambesiacum*	(Baker) K. Schum	H
124	Amaranthaceae	*Amaranthus hybridus*		H
125	Malvaceae	*Agrocalyx incoginata*		H
126	Compositae	*Launea conuta*	C.Jeffrey	H
127	Basellaceae	*Basella alba*		H
128	Acanthaceae	*Hypoestes aristata*	(Vahl) Roem & Schulf	H
129	Acanthaceae	*Hypoestes forskahli*	(Vahl) R. Br	H
130	Acanthaceae	*Justicia flava*	Vahl	H
131	Acanthaceae	*Justicia striata*	(Kiotz.Sch) Bullock	H
132	Adiantaceae	*Adiantum poireti*	Wikstr	H
133	Adiantaceae	*Cheilanthes bergiana*	Schltdl ex Kunze	H
134	Adiantaceae	*Cheilanthes inaequatis*	(Konze) melt	H
135	Adiantaceae	*Doryopteris concolor*	(Langsd & Fisch) Kuhn	H
136	Adiantaceae	*Pellaea calomelanos*	(Sw) Link	H
137	Adiantaceae	*Pellaea viridis*	(Forssk) Prantl	H
138	Amaranthaceae	*Achyranthes aspera*	L.	H
139	Amaranthaceae	*Scadoxus multiftorus*	(Martyn) Rai	H
140	Amaranthaceae	*Chloropylum zavatanii*	(Cufod) Nordal	H
141	Araceae	*Culcasia falcifolia*	Engl.	H
142	Asclepiadaceae	*Gomphocarpus stenophyllus*	Oliv	H
143	Asparagaceae	*Asparagus racemosus*	Willd	H
144	Aspleniaceae	*Asplenium aethiopicum*	(Burm .f.) Bech	H
145	Aspleniaceae	*Asplenium boltonii*	Hook	H
146	Aspleniaceae	*Aspleniun bugoiense*	Hieron	H

147	Aspleniaceae	*Asplenium ceii*	Pic Serm	H
148	Aspleniaceae	*Asplenium dregeanum*	Kunze	H
149	Aspleniaceae	*Asplenium elliottii*	C.H. Wright	H
150	Aspleniaceae	*Asplenium erectum*	willd	H
151	Aspleniaceae	*Asplenium friesiorum*	C. Chr	H
152	Aspleniaceae	*Asplenium inaequilaterale*	willd	H
153	Aspleniaceae	*Asplenium manii*	Hook	H
154	Aspleniaceae	*Asplenium monanthes*	L.	H
155	Aspleniaceae	*Asplenium protensum*	Schrad	H
156	Aspleniaceae	*Asplenium sandersoni*	Hook	H
157	Aspleniaceae	*Asplenium stuhlmannii*	Hieron	H
158	Aspleniaceae	*Asplenium theciferum*	(Kunth) Mett.	H
159	Balsaminaceae	*Impatiens hochstetter*	Warb	H
160	Balsaminaceae	*Impatiens pseudoviola*	Gilg	H
161	Balsaminaceae	*Impatiens sodenii*	Engl.	H
162	Boraginaceae	*Cynoglossum amplifolium*	A. DC.	H
163	Boraginaceae	*Cynoglossum coeruleum*	A. DC.	H
164	Compositae	*Ageratum conyzoides*	L	H
165	Compositae	*Artemisia afra*	Willd	H
166	Compositae	*Bidens pilosa*	L	H
167	Compositae	*Carduus nyassanus*	(S.Moore) R.E.F.r	H
168	Compositae	*Conyza bonariensis*	(L) Cronquist	H
169	Compositae	*Crassocephalum montuosum*	(S. Moore) Miine-Redh	H
170	Compositae	*Dichrocephala chrysanthemifolia*	(Blume) D.C	H
171	Compositae	*Dichrocephala integrifolia*	(L.f) Kuntze	H
172	Compositae	*Galinsonga parviflora*	Cav	H
173	Compositae	*Gutenbergia cordiflora*	Benth. Ex Oliv	H
174	Compositae	*Haplocarpha rueppellii*	(Sch Bip) Beauverd	H
175	Compositae	*Helichrysum formossissimum*	(Sch. Bip.) A Rich	H
176	Compositae	*Helichrysum forskahlii.*	(J.F. Gmel) Hilliard & Burtt	H
177	Compositae	*Helichrysum globosum*	(SCh Bip) A Rich	H
178	Compositae	*Helichrysum schimperri*	(A. Rich) Moeser	H
179	Compositae	*Laggera elatior*	R.E.Fr	H
180	Cruciferae	*Cardamine africana*	L	H
181	Euphobiaceae	*Euphorbia depauperata*	A. Rich	H
182	Euphobiaceae	*Tragia brevipes*	Pax	H
183	Euphobiaceae	*Phyllanthus fischeri*	Pax	H
184	Schrophulariaceae	*Hebenstrelia amgolensis*	Rolfe	H

185	Umbelliferae	*Sanicula elata*	D. Don	H
186	Urticaceae	*Droguetia iners*	(Forssk.) Schweinf	H
187	Urticaceae	*Pilea johnstonii*	Oliv	H
188	Leguminosae	*Crotalaria axillaris*	Aiton	H
189	Leguminosae	*Crotalaria lachnocarpoides*	Engl.	H
190	Poaceae	*Pennisetum clandestinum*		G
191	Cyperaceae	*Kyllinga bulbosa*	P. Beauv.	G
192	Poaceae	*Oplismenus burmanii*	P. Beauv.	G
193	Poaceae	*Cynadon dactylon*		G
194	Cyperaceae	*Cyperus difformis*	L.	G
195		*Perogonia senegalensis*		G
196	Poaceae	*Yushania alpina*	K.Schum	G
197	Poaceae	*Digitaria horizontalis*	Henrard	G
198	Cyatheaceae	*Cyathea manniana*	Hook	F
199	Polypodiaceae	*Drynaria volkensii*	Hieron	F
200	Plantaginaceae	*Plantago palmata*	Hook.f	F
201	Pteridaceae	*Pteris cretica*	L.	F
202	Pteridaceae	*Pteris dentata*	Forssk	F
203	Acanthaceae	*Thurnbergia alata*	Bojer ex Sims	C
204	Acanthaceae	*Thurnbergia usambarica*	Lindau	C
205		*Anabotrys likinensis*	De wild	C
206	Asclepediaceae	*Periploca linearifolia*	Quart-Dill & A. Rich	C
207	Celastraceae	*Salacia cerasifera*	Oliv	C
208	Asteraceae	*Gloriosa minor*	Rendle	C
209	Colchicaceae	*Gloriosa superba*	L	C
210	Combretaceae	*Combretum paniculatum*	Vent	C
211	Asteraceae	*Mikania chenopodiifolia*	willd	C
212	Asteraceae	*Senecio badlensis*	Forssk	C
213	Asteraceae	*Senecio saringifolius*	O.Hoffm	C
214	Cucurbitaceae	*Momordica friesiurum*	(Harms) C. Jeffrey	C
215	Cucurbitaceae	*Oreosyce africana*	Hook. F.	C
216	Cucurbitaceae	*Zehneria scabra*	(L.F.) Sond	C
217	Menispermaceae	*Cissampelos pareira*	L.	C
218		*Stephania abyssinica*	(Quart-Dill & A. Rich) Walp	C
219	Menispermaceae	*Tiliacora funifera*	(Miers) Oliv	C
220	Olacaceae	*Jasminum abyssinicum*	Hochst ex DC	C
221	Olacaceae	*Jasminum fluminense*	Vell	C

222	Passifloraceae	*Adenia gumifera*	(Harv.) Harms	C
223	Ranunculaceae	*Clematis brachiata*	Fresen	C
224	Rhamnaceae	*Gouania longispicata*	Engl.	C
225		*Galium ruwenzoriense*	(Cortesi) Chiov	C
226	Rutaceae	*Toddalia asiatica*	(L.) Lam	C
227	Smilcaceae	*Smilax krausiana*	Meissenen	C
228	Solanaceae	*Solanum terminale*	Forssk	C
229	Urticaceae	*Urera hypselodendron*	(A. Rich.) Wedd	C
230	Verbenaceae	*Clerodendrum buchholzii*	Henriq	C
231	Vitaceae	*Cissus humbertii*	Robyns & Lawalree	C
232	Vitaceae	*Cymphostemma kilimandscharicum*	(Glig). Wild & R. B. Drumm	C
233	Vitaceae	*Cyphostema orondo*	(Gil &M. Brandt.)Desc.	C
234	Cyatheaceae	*Cythea maniana*	Hook	C
235	Hydrangeaceae	*Ladophia buchanani*	(Hall.f.)Stapf	C
236		*Seneria scabra*		C
237	Papilionaceae	*Glycine whitii*	(Taub)Verde	C
238	Acanthaceae	*Acanthopale pubescens*	O.B. Clarke	S
239	Acanthaceae	*Acanthus eminens*	O.B. Clarke	S
240	Acanthaceae	*Acanthus pubescens*	(Oliv) Engl	S
241	Acanthaceae	*Erythrina madagascariensis*	T. Anderson ex Lindau	S
242	Acanthaceae	*Macrorungia pubinervia*	(T. Anderson) C.B Clarke	S
243	Acanthaceae	*Mimulopsis alpina*	Chlov	S
244	Amaranthaceae	*Cyathula cylindrica*	Moq	S
245	Annonaceae	*Monathefaxis schweinfurthii*	(Engl & Diels) Verda	S
246	Capparaceae	*Ritchiea albersii*	Gilg	S
247	Celastraceae	*Maytenus heterophylla*	(Eckl. & Zeyh) N. Robson	S
248	Celastraceae	*Maytenus senegalensis*	(Lam.) Excell	S
249	Celastraceae	*Maytenus undata*	(Thunb.) Blakelock	S
250	Compositae	*Bothriocline fusca*	(S.Moore) M.G. Gilbert	S
251	Compositae	*Helichrysum argyranthum*	O. Hoffm	S
252	Compositae	*Mikaniopsis bambusell*	(R.E.Fr.) C.Jeffrey	S
253	Compositae	*Mikaniopsis usambarensis*	(Muschl) Milne-Redh	S
254	Compositae	*Senecio mannii*	(HOOK.F.) C Jeffrey	S
255	Compositae	*Stoebe kilimandsclerica*	O. Hoffm	S
256	Compositae	*Vernonia lasiopus*	O. Hoffm	S
257	Dioscoreaceae	*Dioscorea quartiniana*	A. Rich	S
258	Dioscoreaceae	*Dioscorea schimperana*	Kunth	S

259	Dracaenaceae	*Dracaena fragrans*	(L.f) Sond	S
260	Dracaenaceae	*Dracaena laxissima*	Engl.	S
261	Euphobiaceae	*Acalypha fruticosa*	Forssk	S
262	Euphobiaceae	*Acalypha volkensii*	Pax	S
263	Euphobiaceae	*Alchornea hirtella*	Benth	S
264	Euphobiaceae	*Drypetes gerrardii*	Hutch	S
265	Euphobiaceae	*Erythrococca bongensis*	Pax	S
266	Euphobiaceae	*Erythrococca trichogyne*	(Mull Arg) Prain	S
267	Euphobiaceae	*Euphorbia brevicornu*	Pax	S
268	Euphobiaceae	*Sapium ellipticum*	(Krauss) Pax	S
269	Flacourtiaceae	*Dovyalis abbyssinica*	(A. Rich) Warb	S
270	Flacourtiaceae	*Oncoba spinosa*	Forssk	S
271	Hamamelidaceae	*Trichocladus ellipticus*	Eckl & Zeyh	S
272	Labiatae	*Achyrospermum schimperi*	(Briq.) Perkins	S
273	Labiatae	*Plectranthus luteus*	Gurke	S
274	Labiatae	*Pycnostachys meyeri*	Gurke	S
275	Labiatae	*Satureja abbyssinica*	(Benth) Briq	S
276	Labiatae	*Satureja biflora*	(D. Don) Benth	S
277	Leguminosae	*Crotalaria axillaris*	Aiton	S
278	Leguminosae	*Crotalaria lachnocarpoides*	Engl.	S
279	Leguminosae	*Dalbergia lactea*	Vatke	S
280	Leguminosae	*Psoralea foliosa*	Oliv.	S
281	Leguminosae	*Pterolobium stellatum*	(Forssk) Brenan	S
282	Leguminosae	*Senna-septemtrionalis*	(Vivian). Irwin & Barnerby	S
283	Lobeliaceae	*Lobelia giberroa*	Hemsl	S
284	Malvaceae	*Hibiscus calyphyllus*	Cav	S
285	Meliaceae	*Turraea abyssinica*	A. Rich	S
286	Monimiaceae	*Xymalos monospora*	(Harv.) Warb	S
287	Myrsinaceae	*Myrsine africna*	L.	S
288	Piperraceae	*Piper capense*	L.f	S
289	Rhamnaceae	*Scutia myrtina*	(Burm. F.) Kurz	S
290	Rosaceae	*Rubus apetalus*	Poir	S
291	Rosaceae	*Rubus niveus*	Thunb	S
292	Rosaceae	*Rubus pinnatus*	Willd	S
293	Rosaceae	*Rubus scheffleri*	Engl.	S
294	Rosaceae	*Rubus steudneri*	Schweinf	S
295	Rubiaceae	*Galiniera saxifraga*	(Hochst) Bridson	S

296	Rubiaceae	*Heinsenia diervilleoides*	K. Schum	S
297	Rubiaceae	*Keetia gueinzii*	(Sond). Bridson	S
298	Rubiaceae	*Oxyanthus speciosus*	D.C	S
299	Rubiaceae	*Rothmannia urcelliformis*	(Hiern) Robyns	S
300	Rubiaceae	*Rutidea orientalis*	Bridson	S
301	Rubiaceae	*Rytigynia acuminatissima*	(K. Schum.) Robyns	S
302	Rutaceae	*Clausena anisata*	(Wild.) Benth	S
303	Rutaceae	*Vepris nobilis*	(Delile) W. Mziray	S
304	Rutaceae	*Vepris simplicifolia*	(Delile) W. Mziray	S
305	Solanaceae	*Cestrum aurantiacum*	Lindl.	S
306	Solanaceae	*Nicotiana tabacum*	L.	S
307	Solanaceae	*Solanum aculealissimum*	Jacq	S
308	Solanaceae	*Solanum mauense*	Bitter	S
309	Solanaceae	*Solanum mauritianum*	Scop	S
310	Solanaceae	*Solanum renschii*	Vatke	S
311	Thymelaeaceae	*Strithiola thomsonii*	oliv	S
312	Tiliaceae	*Triumfetta brachyceras*	K. Schum	S
313	Ulmaceae	*Trema orientalis*	(L.) Blume	S
314	Verbenaceae	*Clerodendrum johnstonii*	Oliv	S
315	Verbenaceae	*Clerodendrum tricholobum*	Gurke	S
316	Verbenaceae	*Lantana trifolia*	L	S
317	Solanaceae	*Solanum indicum*	L	S
318	Caesalpinaceae	*Caesalpinatus dicapitata*		S
319	Macroglossinae	*Macroglosa phylypholia*		S
320	Solanaceae	*Solanum incanum*	L	S
321	Verbenaceae	*Lipia javanica*	(Burm.f.)Spreng	S
322	Labiatae	*Leonatis malisina*	Gurke.	S
323	Myrsinaceae	*Myrsine africna*	L.	S
324	Malvaceae	*Hibiscus calyphyllus*	Cav	S
325	Leguminosae	*Psoralea foliosa*	Oliv.	S
326	Leguminosae	*Pterolobium stellatum*	(Forssk) Brenan	S
327	Leguminosae	*Dalbergia lactea*	Vatke	S
328	Anacardiaceae	*Rhus nataleinsis*	Krauss	S
329	Alangiaceae	*Alangium chinese*	(Lour) Harms	T
330	Apocynaceae	*Tabernaemontana stapfiana*	Britten	T
331	Araliaceae	*Cussonia noistii*	Engl.	T
332	Araliaceae	*Polyscias fulva*	(Hiern) Harms	T
333	Araliaceae	*Schefflera abyssinica*	(A. Rich) Harms	T

334	Boraginaceae	*Ehretia cymosa*	Thonn	T
335	Compositae	*Vernonia aunculifera*	Hiern	T
336	Cornaceae	*Afrocrania volkensii*	(Harms) Hutch	T
337	Cupressaceae	*Juniperus procera*	Endl	T
338	Dracaenaceae	*Dracaena afromontana*	Mildbr	T
339	Dracaenaceae	*Dracaena steudneri*	Engl.	T
340	Ebenaceae	*Diospyros abbyssinica*	(Hiern) F. White	T
341	Ericaceae	*Erica arborea*	L.	T
342	Euphobiaceae	*Croton megalocarpus*	Hutch	T
343	Euphobiaceae	*Croton sylvaticus*	Krauss	T
344	Euphobiaceae	*Euphorbia obovalifolia*	A. Rich	T
345	Euphobiaceae	*Macaranga capensis*	(Baill) Sim	T
346	Euphobiaceae	*Macaranga kilimandscharica*	Pax	T
347	Euphobiaceae	*Neoboutonia macrocalyx*	Pax	T
348	Flacourtiaceae	*casaeria battiscombei*	R.E.Fr	T
349	Flacourtiaceae	*Dovyalis macrocalyx*	(Oliv) Warb	T
350	Icacinaceae	*Apodytes dimidiata*	Arn	T
351	Leguminosae	*Albizia gummifera*	(J.F. Gmel) C.A. Sm	T
352	Leguminosae	*Calpurnea aurea*	(Aiton) Benth	T
353	Leguminosae	*Craibia brownii*	Dunn	T
354	Loganiaceae	*Nuxia congesta*	Fresen	T
355	Meliaceae	*Ekebergia capensis*	Sparrm	T
356	Meliaceae	*Lepidoptrichilia volkensii*	(Gurke) J-F. Leroy	T
357	Meliaceae	*Turraea holstii*	Gurke	T
358	Melianthaceae	*Bersama abyssinica*	Fresen	T
359	Moraceae	*Trilepisium madagascariensis*	DC	T
360	Myrtaceae	*Syzygium guineense*	(Wild.) DC	T
361	Ochnaceae	*Ochna holstii*	Engl.	T
362	Olacaceae	*Strombosia scheffleri*	Engl.	T
363	Olacaceae	*Olea capensis*	Baker	T
364	Olacaceae	*Olea europea*	L.	T
365	Olacaceae	*Olea welwitschii*	(Knobl.) Gilg & Schellenb	T
366	Oliniaceae	*Olinia rochetiana*	A. Juss	T
367	Pittosporaceae	*Pittosporum manii*	Hook. F	T
368	Podocarpaceae	*Podocarpus falcutus*	Mirb	T
369	Podocarpaceae	*Podocarpus latifolius*	(Thunb) Mirb	T
370	Proteaceae	*Protea gaguedi*	J.F. Gmel	T
371	Rhamnaceae	*Rhamnus prinoides*	L.Her	T

372	Rhizophoraceae	*Cassipourea malosana*	(Baker) Alston	T
373	Rosaceae	*Hagenia abyssinica*	(Bruce) J.F Gmel	T
374	Rosaceae	*Prunus africana*	(Hook.F.) Kalkman	T
375	Rubiaceae	*Coffea eugenioides*	S. Moore	T
376	Rubiaceae	*Hymenodictyon floribundum*	(Hochst &Steud.) B.L Rob	T
377	Rubiaceae	*Pavetta abyssinica*	Fresen	T
378	Rubiaceae	*Psychotria fractinervata*	Petit	T
379	Rubiaceae	*Psychotria orophila*	Petit	T
380	Rubiaceae	*Rytigynia bugoyensis*	(K. Krause) Verdc	T
381	Rubiaceae	*Vangueria volkensii*	K. Schum	T
382	Rutaceae	*Vepris simplicifolia*	(Verdoon) W. Mziray	T
383	Rutaceae	*Zanthoxylum gilletii*	(De Wild.) P. G. Waterman	T
384	Sapindaceae	*Allophylus abyssinicus*	(Hochst.) Radlk.	T
385	Sapindaceae	*allophylus rubifolius*	(Hochst.) Engl.	T
386	Sapindaceae	*Deinbollia kilimandscharica*	Taub.	T
387	Sapotaceae	*Manilkara discolor*	(Sond.) J. H. Hemsl	T
388	Sapotaceae	*Pouteria adolfi-friedericii*	(Engl.) Meeuse & Gilbert	T
389	Sterculiaceae	*Dombeya torrida*	K. Schum	T
390	Ulmaceae	*Celtis africana*	Burm. F.	T
391	Ulmaceae	*Celtis durandii*	Engl.	T
392	Verbenaceae	*Vitex fischeri*	Gurke	T
393	Phyllanthaceae	*Briddelia micrantha*	(Hochst.)Baill	T
394	Apocynaceae	*Rauvolfia spp*	Stapf	T
395	Papilionoideae	*Erythrina abyssinica*	DC.	T
396	Ulmaceae	*Celtis gomphophylla*	Baker	T
397	Melaceae	*Fracotia indica*		T
398	Moraceae	*Ficus sycamore*	L	T
399	Meliaceae	*Trichilia emetica*	Vahl	T
400	Alaraceae	*Polyscias kikuyuensis*	(Hiern) Harms.	T
401	Mimosoideae	*Acacia tortilis*	(Forssk.) Hayne	T
402	Myrsinaceae	*Rapanea melanophloeos*	(L.) Mez	T
403	Monimiaceae	*Xymalos monospora*	(Harv.) Warb	T
404	Flacourtiaceae	*Trimeria grandifolia*	(Burkill) Sleumer	T
405	Hamamelidaceae	*Trichocladus ellipticus*	Eckl & Zeyh	T
406	Flacourtiaceae	*Dovyalis abbyssinica*	(A. Rich) Warb	T
407	Dracaenaceae	*Dracaena fragrans*	(L.f) Sond	T
408	Dracaenaceae	*Dracaena laxissima*	Engl.	T

409	Araliaceae	*Schefflera volkensii*	(Engl.) Harms	T
410	Euphobiaceae	*Croton macrostachyus*	Deliele	T
411	Celastraceae	*Maytenus undata*	(Thunb.) Blakelock	T
412	Rubiaceae	*Keetia gueinzii*	(Sond). Bridson	T
413	Rutaceae	*Vepris nobilis*	(Delile) W. Mziray	T
414	Rubiaceae	*Vangueria apiculata*	K. Schum	T
415	Rubiaceae	*Psydrax parviflora*	(Afzel) Bridson	T
416	Rubiaceae	*Psydrax schimperiana*	(A. Rich) Bridson	T
417	Cupressaceae	*Juniperus procera*	Endl	T
418	Dracaenaceae	*Dracaena afromontana*	Mildbr	T
419	Dracaenaceae	*Dracaena steudneri*	Engl.	T
420	Ebenaceae	*Diospyros abbyssinica*	(Hiern) F. White	T
421	Euphobiaceae	*Croton megalocarpus*	Hutch	T
422	Euphobiaceae	*Croton sylvaticus*	Krauss	T
423	Euphobiaceae	*Euphorbia obovalifolia*	A. Rich	T
424	Euphobiaceae	*Macaranga capensis*	(Baill) Sim	T
425	Euphobiaceae	*Macaranga kilimandscharica*	Pax	T
426	Euphobiaceae	*Neoboutonia macrocalyx*	Pax	T
427	Flacourtiaceae	*Casaeria battiscombei*	R.E.Fr	T
428	Flacourtiaceae	*Dovyalis macrocalyx*	(Oliv) Warb	T
429	Icacinaceae	*Apodytes dimidiata*	Arn	T
430	Fabaceae	*Albizia gummifera*	(J.F. Gmel) C.A. Sm	T
431	Leguminosae	*Calpurnea aurea*	(Aiton) Benth	T
432	Leguminosae	*Craibia brownii*	Dunn	T
433	Loganiaceae	*Nuxia congesta*	Fresen	T
434	Meliaceae	*Ekebergia capensis*	Sparrm	T
435	Meliaceae	*Lepidoptrichilia volkensii*	(Gurke) J-F. Leroy	T
436	Meliaceae	*Turraea holstii*	Gurke	T
437	Melianthaceae	*Bersama abyssinica*	Fresen	T
438	Moraceae	*Trilepisium madagascariensis*	DC	T
439	Myrtaceae	*Syzygium guineense*	(Wild.) DC	T
440	Ochnaceae	*Ochna holstii*	Engl.	T
441	Olacaceae	*Strombosia scheffleri*	Engl.	T
442	Olacaceae	*Olea capensis*	Baker	T
443	Olacaceae	*Olea europea*	L.	T
444	Olacaceae	*Olea welwitschii*	(Knobl.) Gilg & Schellenb	T
445	Oliniaceae	*Olinia rochetiana*	A. Juss	T
446	Pittosporaceae	*Pittosporum manii*	Hook. F	T

447	Podocarpaceae	*Podocarpus falcutus*	Mirb	T
448	Podocarpaceae	*Podocarpus latifolius*	(Thunb) Mirb	T
449	Proteaceae	*Protea gaguedi*	J.F. Gmel	T
450	Rhamnaceae	*Rhamnus prinoides*	L.Her	T
451	Rhizophoraceae	*Cassipourea malosana*	(Baker) Alston	T
452	Rosaceae	*Hagenia abyssinica*	(Bruce) J.F Gmel	T
453	Rosaceae	*Prunus africana*	(Hook.F.) Kalkman	T
454	Rubiaceae	*Coffea eugenioides*	S. Moore	T
455	Rubiaceae	*Hymenodictyon floribundum*	(Hochst &Steud.) B.L Rob	T
456	Rubiaceae	*Pavetta abyssinica*	Fresen	T
457	Rubiaceae	*Psychotria fractinervata*	Petit	T
458	Rubiaceae	*Psychotria orophila*	Petit	T
459	Rubiaceae	*Rytigynia bugoyensis*	(K. Krause) Verdc	T
460	Rubiaceae	*Vangueria volkensii*	K. Schum	T
461	Rutaceae	*Vepris simplicifolia*		T
462	Rutaceae	*Vepris simplicifolia*	(Verdoon) W. Mziray	T
463	Rutaceae	*Zanthoxylum gilletii*	(De Wild.) P. G. Waterman	T
464	Sapindaceae	*Allophylus abyssinicus*	(Hochst.) Radlk.	T
465	Sapindaceae	*allophylus rubifolius*	(Hochst.) Engl.	T
466	Sapindaceae	*Deinbollia kilimandscharica*	Taub.	T
467	Sapotaceae	*Manilkara discolor*	(Sond.) J. H. Hemsl	T
468	Sapotaceae	*Pouteria adolfi-friedericii*	(Engl.) Meeuse & Gilbert	T
469	Sterculiaceae	*Dombeya torrida*	K. Schum	T
470	Ulmaceae	*Celtis africana*	Burm. F.	T
471	Ulmaceae	*Celtis durandii*	Engl.	T
472	Verbenaceae	*Vitex fischeri*	Gurke	T
473	Alangiaceae	*Alangium chinese*	(Lour) Harms	T
474	Boraginaceae	*Ehretia cymosa*	Thonn	T
475	Apocynaceae	*Tabernaemontana stapfiana*	Britten	T
476	Araliaceae	*Cussonia noistii*	Engl.	T
477	Araliaceae	*Polyscias fulva*	(Hiern) Harms	T
478	Araliaceae	*Schefflera abyssinica*	(A. Rich) Harms	T

ANNEX 7 : TRAINING OF RELEVANT STAKEHOLDERS TO UNDERTAKE REHABILITATION

REPORT ON CAPACITY NEEDS ASSESSMENT AND TRAINING ON FOREST REHABILITATION TECHNIQUES IN MT ELGON ECOSYSTEM

1.0 Introduction

Inadequate capacity to restore degraded forest sites is one of the challenges facing sustainable forest management in Kenya. Over the years, time and resources have been expended in tree planting efforts to restore degraded forests, but the outcome has been relatively poor. The situation is attributable to inadequate capacity to design, execute and maintain forest restoration projects. This activity aimed at undertaking rehabilitation need assessment and capacity of stakeholders to undertake rehabilitation.

1.1 Scope of the capacity needs assessment

The scope of this assessment was to:

a) Identify forest degradation hotspots,

b) Determine causes of forest degradation,

c) Assess the impact on past and / or on-going forest rehabilitation efforts,

d) Identify any gaps in existing forest restoration initiatives,

e) Explore suitable forest rehabilitation technologies to address the gaps,

f) Carry out training on the identified forest rehabilitation needs

1.2 Objectives of the assessment

The objectives of the assessment were:

1. Determine capacity building needs of forest adjoining communities in Mt. Elgon on natural forest rehabilitation

2. Develop training manuals to address the capacity building needs

3. Carry out training on identified forest rehabilitation needs

2. Materials and methods

2.1 Study sites

The assessment was carried out in four forest blocks of Mt. Elgon Forest Ecosystem, namely: Kaberua and Kaboywo in Bungoma County, and Saboti and Kimothon in Trans Nzoia County. The four were selected because they are located in low lying areas that border community farmlands and therefore, the most degraded.

2.2 Study design and tools used

The assessment began with scoping meetings in July 2016. The meetings assumed a focus group technique targeting different gender categories and were conducted using a checklist that was guided by the scope of the needs assessment. Thereafter, a questionnaire survey was conducted among key informants to assist in obtaining in-depth information on specific trainings of different stakeholder groups.

2.3 Stakeholders training on forest rehabilitation

Based on the needs that identified from the training needs assessment, a workshop was held to train key stakeholders from various common interest groups on some of the following topics:

a) Natural forest rehabilitation techniques

b) Management of water catchments and riparian zones

c) Group dynamics and leadership with community groups

d) Legal and policy framework on forest management

e) Challenges and opportunities in participatory forest management

3. Key results

The following key results were achieved from this sub-activity:

- Over 400 people (from local government, national government, religious leaders, men, women and youth) were involved in focus groups discussions on capacity needs assessment on forest rehabilitation

- About 60 people were interviewed as key informants on natural forest rehabilitation needs

- A total of 48 key stakeholders from the Kaberua, Cheptais, Kaboywo, Saboti and Kimothon forest blocks in Mt. Elgon Forest Ecosystem were trained on natural forest rehabilitation techniques at a workshop at Mabanga Agricultural Training Centre in Bungoma.

- Six institutional stakeholders were engaged in the training both as facilitators and participants. These were Kenya Forest Service (KFS), Water Resource Management Authority (WRMA), Water Resource Users Associations (WRUAs), NGOs, CBOs and county governments of Bungoma and Trans Nzoia.

Figure 1: A group photo of participants at a workshop on forest rehabilitation techniques at Mabanga Agricultural Training Centre in Bungoma

Appendix I – Checklist for focus group discussions
Key stakeholders targeted:
   a) Kenya Forest Service (KFS) staff – resource managers
   b) Members of community forest associations (CFAs) – local communities
   c) Forest resource users associations / WRUA - local communities
   d) Organized women groups – where applicable
   e) Organized youth groups – where applicable
   f) The Provincial Administration (National Government) – office of area Chief
   g) County Government - Ward Administrator
   h) Private Sector – relevant CBOs and NGOs
   i) Religious leaders

Objectives of capacity needs assessment
   1. Assess stakeholder understanding of environmental and economic significance of Mt Elgon Forest Ecosystem
   2. Determine possible linkages between resource utilization and forest degradation
   3. Assess the outcome of past forest rehabilitation efforts, and constraints and challenges encountered
   4. Determine the capacity to develop alternative sources of forest products on-farm

Assess stakeholder understanding of environmental and economic significance of Mt Elgon Forest Ecosystem

1) Do you think Mt Elgon Forest Ecosystem has any environmental / ecological and economic significance to the local community and the international community?
2) Please list the environmental / ecological importance of Mt Elgon Forest Ecosystem
3) List also economic benefits of the forest ecosystem

Determine possible linkages between resource utilization and forest degradation

1) What products do you obtain from Mt Elgon Forest Ecosystem?
2) What quantities do you obtain per household per day?
-e.g., head loads of firewood; number of livestock that graze in the forest; or logs of wood per household per day, etc
3) Do you follow a prescribed / approved plan in resource utilization e.g., a management plan, or is it just done anyhow?
4) What impact has resource utilization had on the condition of the forest over time?
5) If it has led to forest degradation, what measures have been put in place to address such degradation?
6) Are these measures working? – (working excellently, somewhat working, not working, not sure)

Assess the outcome of past forest rehabilitation efforts and constraints and challenges encountered

1) What are the main causes of forest degradation in Mt Elgon Forest?
2) Have you made any attempts to rehabilitate degraded forest sites in past?
3) List some of the degraded sites where rehabilitation efforts have been made
4) Identify some of the rehabilitation techniques applied in these degraded site
5) Describe the level of success of these forest rehabilitation efforts (very successful, moderately successfully, unsuccessful)
6) List some key constraints and challenges facing these rehabilitation efforts
7) List any efforts that have been made to address these constraints and challenges?

Determine the capacity to develop alternative sources of forest products on-farm

1) Describe the present land use on most farmlands in areas bordering the forest
2) Estimate the average land holding / size per household
3) Estimate the average tree (%) under each land holding
4) What are the key tree species that are currently planted on most farms?
5) What purpose are the trees expected to serve?
6) Identify agroforestry technologies that are presently common in the area
7) On average, how many households are presently able to meet their forest product needs from trees planted on their farms?
8) Are there other forest products that you desire to, but cannot obtain from your farms presently?
9) Do you think more investment in farm forestry may ease pressure on Mt Elgon Forest Ecosystem for forest products?

Stakeholder feedback

Are there issues that we have not captured in this discussion but you feel are relevant and important for this discussion? If yes, please mention them

Appendix II – Questionnaire for key informant interviews

   General Information

Date…………………Name of the Respondents/household head………………………………

County…………………………………Sub county…………………………………………………

Ward…………………………………Location……………………………………………

Sub-location……………………………Village………………………………………………..

Sex of respondent………………………Age ……………………………………………

A.   Significance of Forest Resources

1.   Do you think Mt Elgon Forest Ecosystem has any environmental/ ecological and economic significance to the local and the international community? [ ] No   [ ] Yes.

     If yes, what are the environmental / ecological importances of Mt Elgon Forest Ecosystem? *Tick as appropriate. (Multiple choices may apply)*

          [ ] Source/ conservation of water [ ] Air purification [ ] Eco-tourism

          [ ] Medicinal value [ ] Carbon credit [ ] Source of food (fruits and honey)

          [ ] Fertile soils for crop production [ ] Source of fuel wood [ ] Fodder

          [ ] Others-Specify…………………………………………………………..

2.   What are the economic benefits of the forest ecosystem? *Tick as appropriate. (Multiple choices may apply)*

          [ ] Farming of maize, potatoes and vegetables [ ] Grazing sites

          [ ] Source of herbal medicine [   ] Tourist attraction

          [ ] Source of tree products (timber, poles, firewood, charcoal) [ ] Source thatching grass [ ] Source of honey and fruits

          [ ] Others-Specify…………………………………………………………..

B.   Resource Utilization

3.   Which of these forest products and benefits do you obtain from Mt Elgon Forest Ecosystem?

          [ ] Firewood [ ] Timber [ ] Honey [ ] Charcoal [ ] Fodder [ ] Fencing posts

          [ ] Bamboo shoots [ ] Wild fruits [ ] Medicinal herbs [ ] Murram and stones

          [ ] Forest soil for nurseries [ ] Crop production [ ] Water [ ] Power transmission poles

          [ ] Others-Specify…………………………………………………………..

4.   What quantities do you obtain per household per day / month?

Product	Unit	Quantity
Firewood	Head loads	
Livestock grazing (pasture)	Heads of cattle	

Logs of wood	Pieces	
Medicinal herbs	Kg	
Timber	Pieces / tones	
Honey	Litres	
Charcoal	Bags	
Others-Specify………………….		

5. Does Mt Elgon Forest Ecosystem have a forest management plan? [   ] Yes [ ] No, if yes do you/community follow the forest management plan in resource utilization? [   ] Yes [ ] No.

6. What impact has resource utilization had on the condition of the forest over time? *Tick as appropriate. (Multiple choices may apply)*
    [ ] Forest degradation [ ] Climate change [ ] Reduced water levels in the rivers/streams
    [ ] Extinction of some tree species [ ] Soil erosion
    [ ] Increase of landslides within the forest [ ] Migration of wild animals
    [ ] Biodiversity loss [ ] Overgrazing
    [ ] Others-Specify…………………………………………………………..

7. What measures have been put in place currently to address the impact of resource utilization? *Tick as appropriate. (Multiple choices may apply)*
    [ ] Community sensitization [ ] Protection of water catchment areas
    [ ] Soil erosion control [ ] Controlled grazing [ ] Exchange Programme
    [ ] Planting of exotic trees [ ] Introduction of PELIS Program
    [ ] Partnerships with NGOs or KFS in conservation
    [ ] Others-Specify…………………………………………………………..

8. How can you rate the success of the conservation measures/activities in question 7 above?
    [ ] Excellent [ ] Good [ ] Somewhat working [ ] Not working [ ] Not sure

C. Rehabilitation Constraints and Challenges
9. What are the main causes of forest degradation in Mt Elgon Forest? *Tick as appropriate. (Multiple choices may apply)*
    [ ] Saw milling/ lumbering [ ] Charcoal burning [ ] Overgrazing
    [ ] Clearing land for cultivation [ ] Human settlement [ ] Forest fires
    [ ] Community clashes [ ] Theft of trees [ ] Lack of environmental education
    [ ] Others-Specify…………………………………………………………..

10. Have you made any attempts to rehabilitate degraded forest sites in Mt Elgon Forest Ecosystem in the past? [ ] Yes [ ] No.

If yes, which are the degraded sites and the techniques you have used for rehabilitation?

No	Name of the degraded site	Rehabilitation techniques used 1. *Restoration planting* 2. *Natural regeneration* 3. *Aided regeneration* 4. *Other (specify)*	Rate success of rehabilitation efforts 1. Very successful 2. Moderately successful 3. Unsuccessful
1.			
2.			

11. What are the major constraints and challenges facing these rehabilitation efforts? *Tick as appropriate. (Multiple choices may apply)*

[ ] Climate change [ ] Labour constraints [ ] Inadequate resources for tree planting

[ ] Uncontrolled grazing [ ] Lack of certified tree seeds [ ] Lack of seedlings

[ ] Poor forestry extension services [ ] Fire outbreaks

[ ] Others-Specify…………………………………………………………..

12. List the efforts that have been made to address these constraints and challenges by the community and key stakeholders e.g. KFS. *Tick as appropriate. (Multiple choices may apply)*

[ ] Designing of firebreaks (buffer zones) [ ] Climate change sensitization

[ ] Extension services/ technical advises   [ ] Establishing community / group nurseries

[ ] Appointing community scouts to assist with forest guarding

[ ] Formation of groups to fight forest fires

[ ] Exchange programmes

[ ] Others-Specify…………………………………………………………..

D. Capacity to Establish Forest Products On-Farm

13. What is the size of your farm……………….. acres

14. What is the present land use on most farmlands in areas bordering the forest? *Tick as appropriate. (Multiple choices may apply)*

[ ] Tea production [ ] Grazing field [ ] Woodlots [ ] Mixed farming

[ ] Bee keeping [ ] Agro-forestry [ ] Crop production

[ ] Others-Specify…………………………………………………….

15. List key tree species and the average number that you have planted on your farms ?

No	Tree species	Local name	No. planted
1.			
2.			

16. What is the purposes of these trees species on your farm?

No	Tree species	Purpose

17. Which are the agro-forestry technologies that are presently common in the community?
    [ ] Hedge grow [ ] Woodlots [ ] Boundary planting [ ] Terrace planting
    [ ] Others-Specify……………………………………………………….

18. Are you able to fully meet your forest product needs from the trees planted on your farms? [ ]
    Yes [ ] No. If No, which products are insufficient?
    i.   ……………………………………………………………………………
    ii.   …………………………………………………………………………….
    iii.   …………………………………………………………………………….

19. Do you think more investment in on-farm forestry may ease pressure on Mt Elgon Forest
    Ecosystem for forest products? [ ] Yes [ ] No. If yes, which agroforestry technologies would be
    more effective?
    i.   ……………………………………………………………………
    ii.

ANNEX 8: STATUS OF REHABILITATED REPORTS

REPORT ON BASELINE STATUS OF REHABILITATED SITES IN NATURAL FOREST

1.0 Background information

Following establishment of demonstration plots, vegetation assessment on the rehabilitated areas was done to ascertain current vegetation status as a benchmark for subsequent assessment to determine forest recovery rate. The heights and diameter at ground level of planted seedlings were measured in all the sites already planted. Information on the herbal, grass and shrubs diversity colonizing the degraded rehabilitated sites were collected to form the baseline information.

Figure 1: Baseline vegetation data collection

2.0 Preliminary findings

2.1 Quality of seedlings used in the rehabilitation demonstration plots

Rehabilitation requires seedlings of good quality in terms of height and health. The optimal seedlings height should be 50 cm tall. In Lomuge site in West Pokot, only seedlings of *Croton megalorcapus* and *Prunus africana* had mean height above 40 cm with none of the planted seedlings having a height of more than 50 cm. Figure 2 shows that most species used in the restoration were of poor quality which called for immediate weeding to reduce competition from aggressive annual grasses and herbs.
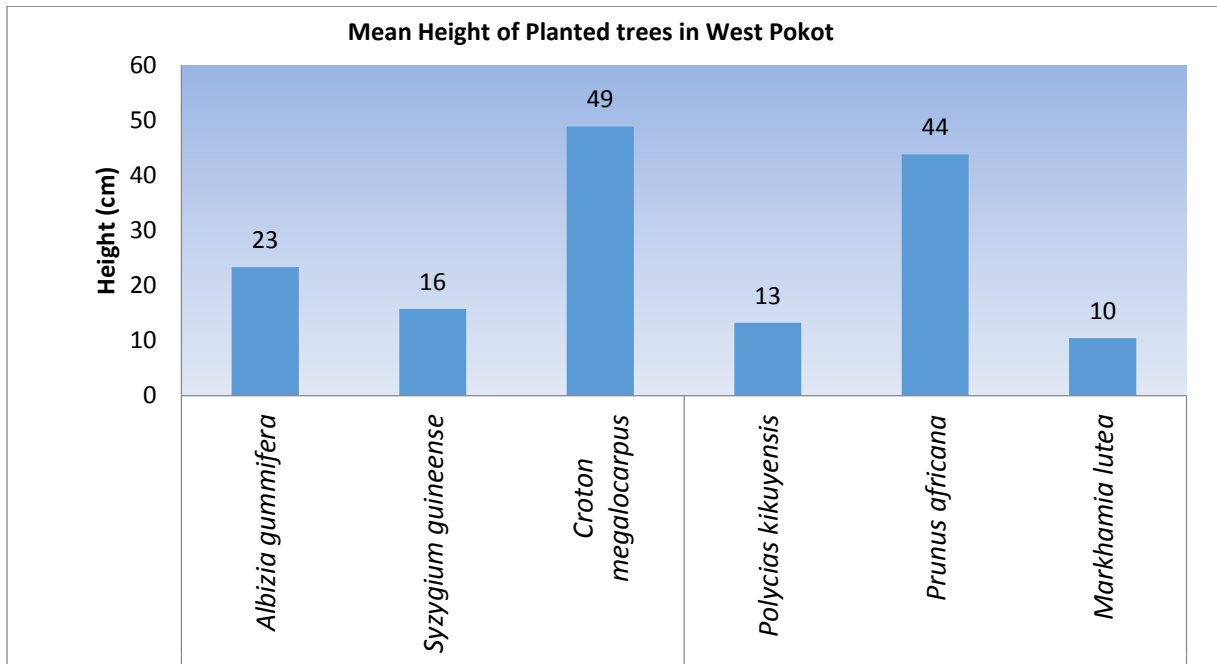
Mean Height of Planted trees in West Pokot

Figure 2: Mean height of species in West Pokot

2.2 Diameter at ground level (DGL)

The DGL of the planted seedlings was measured and the results were computed on the mean DGL per species planted. A mean of 0.6 cm for *Albizia gummifera* was the largest while *Syzygium guineense* was the lowest with a mean DGL of 0.1 cm in all the two sites in West Pokot as outlined below.
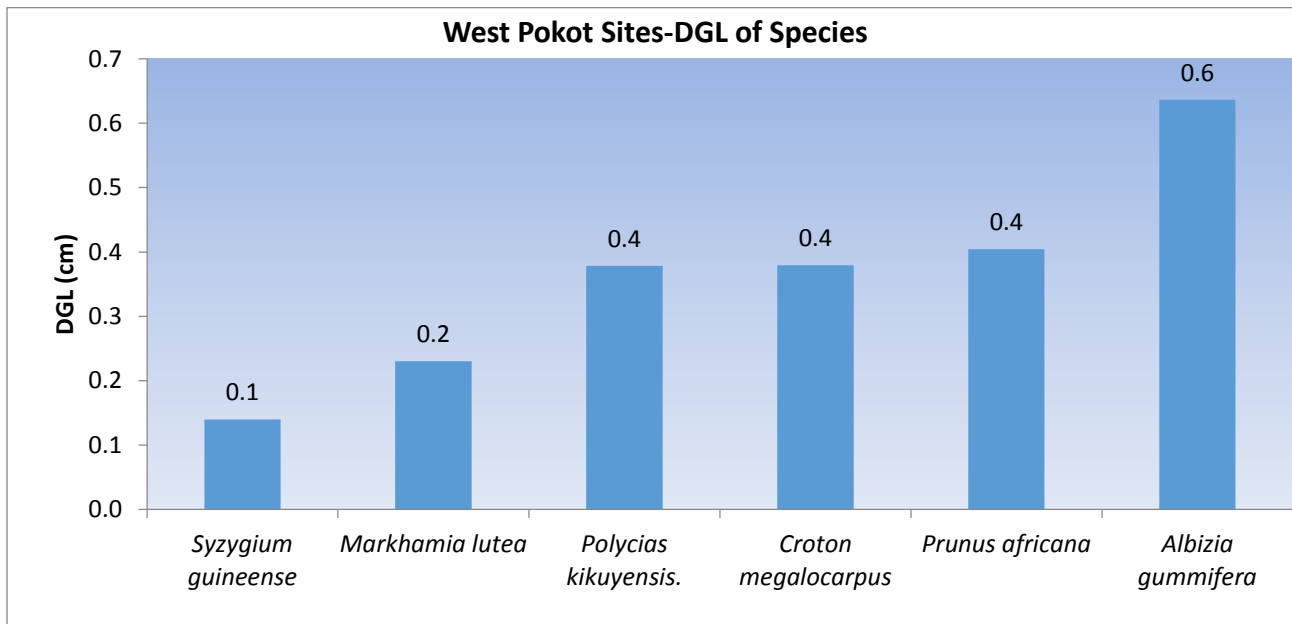

Figure 3: Mean DGL of planted restoration species in Lomuge

2016

2.3 Grass diversity

The preliminary results indicate that *Pennisetum clandestinum* and *Oplismenus burmannii* recorded a higher percentage presence of 34% while the *Pennisetum polystachion* and *Kyllinga bulbosa* had the lowest (5%) percentage presence in Lomuge site 1 in West Pokot as indicated in the figure 4 below.
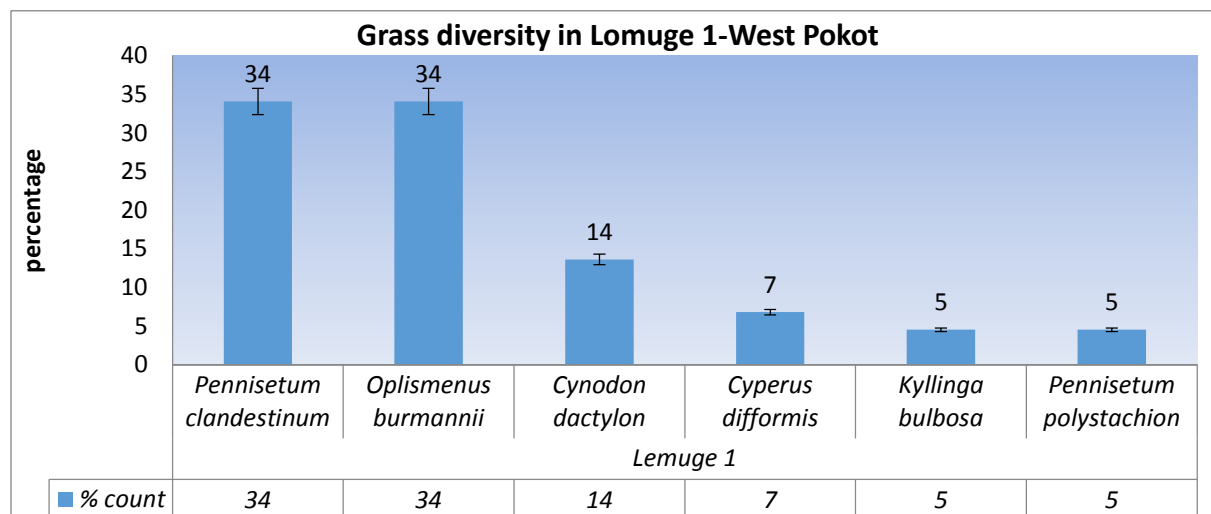

Figure 4: Grass diversity in Lomuge site 1-West Pokot

Lomuge site 2 in west pokot, *Pennisetum clandestinum* recorded a higher percentage presence of 35% while the *oplismenus burmanii* (Pokot) had the lowest (15%) percentage presence as below.
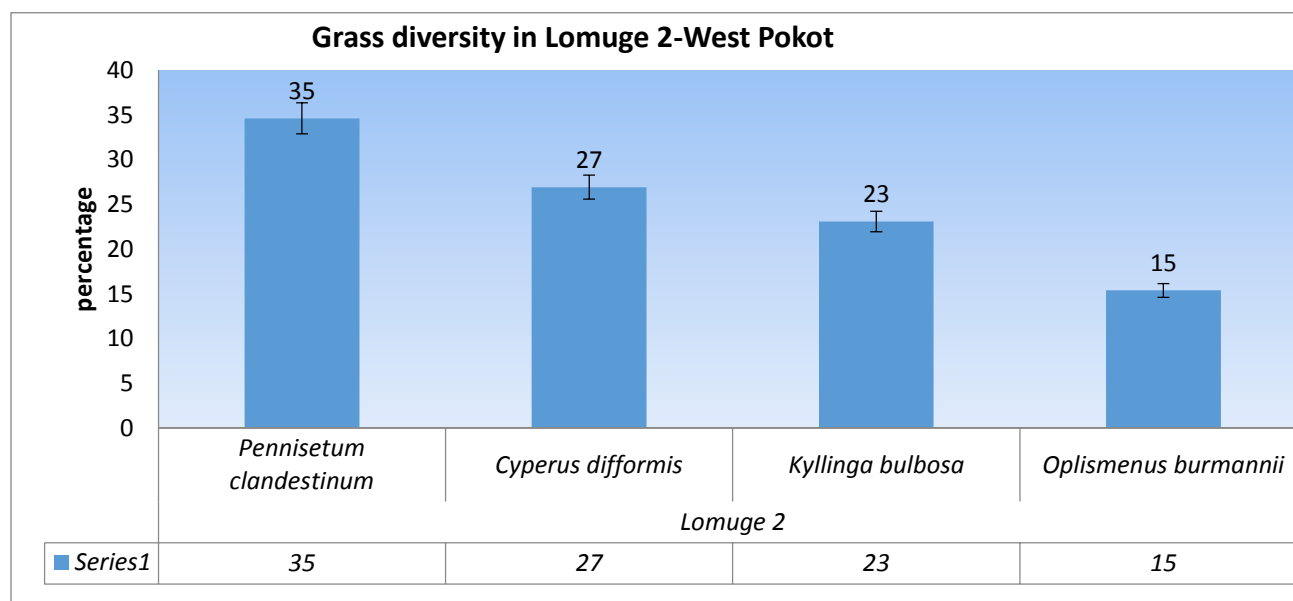

Figure 5: Grass diversity in Lomuge site 1 in West Pokot

2.4 Shrubs diversity

Vernornia auricufela had the highest count with a percent of 34% followed by *Maytenus leterophyla* with 17% while *Hibiscus ludwigii* had the lowest count recording only 3% of the total counts of the shrubs recorded from the planted sites in both West Pokot and Elgeyo Marakwet. The figure below outline the results.
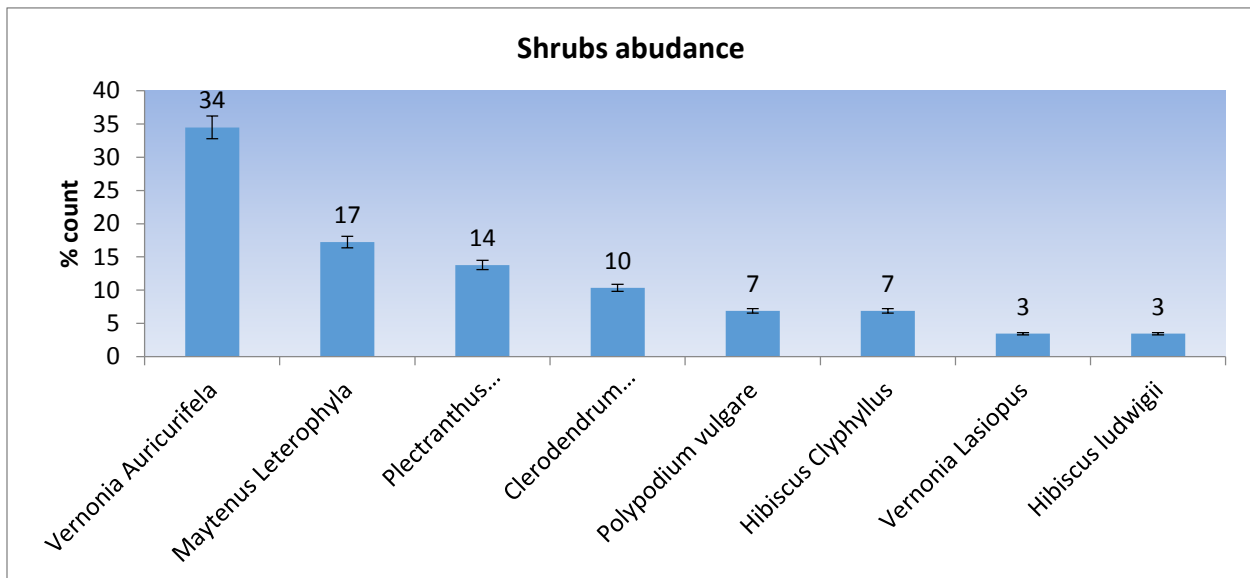

Figure 6: Shrubs abundance in rehabilitated sites in Cherangany Hills

ANNEX 9: CAPACITY BUILDING OF COMMUNITY NURSERIES TO PRODUCE QUALITY GERMPLASM

REPORT ON TRAINING OF COMMUNITY TREE NURSERIES GROUPS IN WEST POKOT TRANS-NZOIA AND ELGEYO MARAKWET COUNTIES

1.0 Background Information

Needs assesment survey was carried out on community tree nursery groups in Cherangany Hills (Elgeyo Marakwet, West Pokot and Trans-nzoia counties). Lack of technical knowhow in tree nursery establishment and management was identified as one of the key challenges facing most groups. On this regard, capacity building of community nurseries was undertaken to equip nursery operators with skills on proper nursery management for enhnaced production of quality seedlings.

1.1 Training objectives

The training aimed to provide tree nursery operators with knowledge on;

  i.   Identification of seed sources, seed collection and seeds storage
  ii.   Preparation and management of germination beds, and routine nursery operations; watering, weeding, root pruning, soil collection, potting, pricking out and hardening off
  iii. Pests and diseases management
  iv.   Nursery record keeping

1.2 Training approach

The training encompassed on-site theory and practicals. Participants were asked to outline their expectations at the onset of the training. The sessions were very interactive whereby participants were asked questions and they too allowed to ask questions and share out how they have been undertaking their activities in relation to the training topics. During practical sessions, all members participated in performing various practical activities.

1.3 Training topics

  1.   Seed sourcing
  2.   Purpose of nursery establishment
  3.   Nursery siting
  4.   Nursery tools
  5.   Nursery structures
  6.   Seedbed construction
  7.   Sowing and care of seedlings in the seedbed
  8.   Nursery soil
  9.   Potting
  10. Seedling beds
  11. Pricking-out

12. Nursery tending operations

13. Pest and diseases management

14. Nursery records

The table below provide a summary of tree nurseries trained

Place	Community nurseries trained
Kaptek- Elgeyo Marakwet County	i. Cheptangot ii. Kahawa iii. Matira group rehabilitation site iv. Chemogoi v. Irasmoi vi. Reformed youth group
Kapcherop- Elgeyo Marakwet County	i. Kipsorwa Women group ii. Taonet group iii. Tenden Youth group iv. Surtek self help group
Kapolet (Kapsara)- Trans-nzoia County	i. Green belt junior club ii. Mogotu iii. Habari njema women group iv. Jumuika v. Kapsara bonde vi. Green rescue vii. Hewa safi viii. Makutano joy bringers youth group ix. St Joseph makutano youth polytechnic x. Marithiano tree nursery xi. Chinese tree nursery xii. Kapsara friends
Kapchila- West Pokot County	i. Kokwo porokon self help group ii. Lomuge self help group
Chebara- Elgeyo Marakwet County	i. Cheptinges okilgei ii. Baiga

Figure 1: Participants undertaking potting during a practical session

Figure 2:Trainess undertaking weeding of seedlings beds during parctical session

Figure 3: Group photo of Kapsara nursery group trainees

ANNEX 10: RECONNAISSANCE VISIT TO CHERANGANY ECOSYSTEM

REPORT ON RECONNAISSANCE VISIT TO SENSITIZE WATER TOWERS PROJECT PARTNERS IN UASIN GISHU, ELGEYO MARAKWET, WEST POKOT AND TRANS-NZOIA COUNTIES IN CHERANGANY ECOSYSTEM

Activity Dates: 15th-21st May 2016

Meeting with Sengwer community leaders and KFS officials
at Kapolet Forest Station, Trans Nzoia County

1.0 Overview

The Rift Valley Eco-Region Research Programme spearheads the implementation of WaTER Tower project activities in Cherangany ecosystem. The region prioritized activities for immediate implementation which include;

i.   Demonstration of rehabilitation technologies of degraded natural forest in partnership with local communities;

ii. Planting of bamboo species to demonstrate their performance in the region;

iii. Rehabilitation of degraded riparian areas with bamboo;

iv. Diversification of on farm tree species for varied tree products; and

v.   Energy conservation technologies through the use of improved jikos and solar lamps as well as promotion of fast growing trees for reduced pressure on natural forest.

Before actual implementation of project activities, the region undertook a reconnaissance visit to the four participating counties with the following objectives;

i.   To meet the key project partners and sensitize them on prioritized project activities for implementation in year 1 and discuss implementation approaches;

ii. To undertake participatory identification of the potential intervention sites together with stakeholders and the entry points for the activities;

iii. Select sites for immediate intervention together with the stakeholders

iv. Identify land for establishment of bamboo demonstration plots

2016

v.   To identify the existing tree nurseries within the programme area and to determine their management status and sustainability as well as tree species stocking;

vi.   To identify suitable tree species for planting and source for planting materials

In each of the four counties visited, meetings were held with Kenya Forest Service (KFS) officers (Head of Conservancy, Ecosystem Conservators, Zonal Managers, Foresters and Rangers), County Government officials (CECs, COs and Directors from the environment sector), community members (CFAs leaders and members, individual farmers) local administration and other stakeholders. Joint visits to potential intervention sites were made and all the approaches discussed in the necessary detail. At each meeting held, the team introduced the project in detail, underlining the major objectives and the various project components.

1.2 Team Members

The team consisted of:

-   Dr. Jarred Amwatta   PI-Rehabilitation of natural forest
-   Dr. Edward Mengich   PI- On- farm tree promotion
-   Mr. Joram Mbinga   PI-Bamboo propagation, management and processing
-   Mr. Simon Choge   PI- Energy conservation
-   Mr. Thomas Wambua   Regional Procurement Officer
-   Ms. Leley Nereoh   Project Assistant
-   Mr. Joel Imbuye   Driver
-   Mr. John Biomdo   Driver

Figure 1: Meeting with CEC Uasin Gishu County

Figure 2: Selected site for rehabilitation at Kapkanyar forest block, West Pokot County

2.0 Outcomes

The following is a summary of meetings held, sites visited and key deliberations reached.

Visit	Deliberations
1.0 Meeting with Ecosystem Conservator Uasin Gishu County	Uasin Gishu County does not form part of the catchment area thus intervention in the County shall focus on rehabilitation activities along Chebara and Moiben rivers. The team was linked to foresters in charge of Soy (Eldoret West) and Moiben (Eldoret East) forest stations for identification of intervention hotspots.
2.0 Meeting with CEC-Environment Uasin Gishu County	The CEC endorsed the project and assured of county's support in implementation of project activities as they were in line with County's initiatives towards environmental conservation. It was suggested that the project could work closely with the county staff who hold permanent positions (e.g the Directors) to ensure sustainability of the projects when Government changes hands.
3.0 Meeting with Head of Conservancy (HOC) North Rift	The HOC gave a go ahead to undertake the interventions which were geared towards conservation of the water towers as highlighted in MTP 11 of vision 2030. He noted that the efforts would contribute to achievement of management options outlined in Cherangany Hills strategic ecosystem management plan (2015-2040).
4.0 Meeting with CO-Environment Elgeyo Marakwet County and the Ecosystem Conservator	The main environmental conservations drawbacks were pointed out as: inadequate technical knowhow on establishment and management of tree nurseries, lack of market for seedlings, rampant tree cutting on farm without replacement and overgrazing in natural forests. It was noted that sufficient sensitization through frequent consultative meetings especially on grazing, sustainable land-use were crucial before embarking on rehabilitation and fencing of rehabilitated sites. The CO said it was important to ensure balance in implementation of project activities between the two sub counties to abate local conflicts.
5.0 Meeting at Marakwet Zonal Forest Manager office in Kapsowar	Meeting was held with the Marakwet Zonal Forest Manager, Assistant Zonal Manager, Kapyego forest station manager and Marakwet Community Development Trust chair. Embobut forest was highlighted to be the most degraded forest block in the sub-county with about 16,000 ha out of 22,000 ha initially inhabited by squatters. About 11,000 ha was repossessed in 2013 and required urgent intervention. It was noted that the Moiben Water Resource Users Association (WRUA) has set aside 5 acres of land for planting of bamboo which the project would support. The following sites were proposed for intervention; Kaptoror (heavy soil erosion, source of water for many community members, close to a degraded forest, active CBOs); Kapyego (source of many rivers, community have adopted tree planting, adjacent to Embobut forest block, community have large land sizes); Kipchumwo (initially bamboo zone which has been harvested unsustainably); Kapchelaga/Kamasia (easily accessible, adjacent to Embobut forest, community well sensitized and responsive).
6.0 Visit to Kapchelaga/Kamasia proposed sites	The Kapchelaga area had been initially encroached by squatters who were evicted 5 years ago. The site was accessible and heavily degraded, and was selected for immediate intervention. The team held a meeting at Kamasia secondary school with the school Principal, Assistant Chief and chairman of Marakwet Highlands Farmers Association to discuss plan of action for Kamasai area. The challenge in the area was inadequate tree nurseries in the area and it was suggested that a nursery could be

	established in the school as a source of planting materials. The team threafter visited Cherangany Nature Based CBO involved in seedling production, bee keeping and tree planting.
7.0 Meeting at Kapenguria West Pokot County	It was noted that rampant landslides were being experienced due to deforestation and canal irrigation, thus soil conservation measures such as planting of bamboo is critical. The challenges to conservation of county managed forests were identified as: overgrazing, encroachment, inadequate personnel to manage the forests and heavy charcoal production especially around Kacheliba area. It was suggested that sustainable charcoal production technologies could be prioritized where the practice was rampant.
9.0 Visit to Action against Hunger Programme	The team paid a courtesy visit to Action against Hunger office, an EU funded project on nutrition. KEFRI shall collaborate with the project on environmental conservation and nutrition. The Project Officer promised to provide a list of groups they are working with for consideration in our activities.
9.0 Visit to Kaisagat and Kapkanyar forest block	Kaisagat area was heavily degraded area and adjacent to Kapkanyar forest block and a main source of River Nzoia was threatened with siltation and sedimentation due to surface runoff was thus selected for immediate intervention. The team also interacted with a model farmer at the site, Samwel Kariwo who is involved in rehabilitation of degraded riparian areas using bamboo as well as involved in agro-forestry. The farm had fruit trees which could be upscaled in the neighbouring landscapes. The team visited a degraded area in Kapkanyar forest block. KFS had initiated rehabilitation at the area with tree species of *Markhamia lutea*, *Croton megalocarpus*, *Croton macrostaychus* and *Prunus africana*. A site adjacent to the rehabilitated area was selected for rehabilitation as well as for demonstration of rehabilitation of riparian area using bamboo. The team later visited the Kapenguria GK Prison Department to assess the suitability of the land proposed by the prisons for establishment of bamboo. An area initially rehabilitated with *Croton megalorcapus* and under a maize plantation was found suitable because it was accessible and was adjacent to the river thus suitable to demonstrate rehabilitation of riparian ecosystem using bamboo.
10.0 Meeting at Cherangany forest station Elgeyo Marakwet County	A meeting was held with the Assistant Forester, Cherangany forest station in presence of CFA and community members. Kerrer forest block was identified as the most degraded and required urgent intervention. However, the site was inaccessible. Following deliberations it was agreed that Kaptebungon area which is adjacent to Kapteberr forest block be prioritized for intervention.
11. Visit to Kaptebungon area	Heavy soil erosion was occurring in the area due to intensive upslope farming. Most of the farms had been leased thus famers maximize land use by farming to the river banks and clearing of trees on-farm. The site was accessible and adjacent to Kipteberr forest which is degraded. The community members were receptive and assured full support.
12.0 Visit to Kipsorwo Young Women tree nursery	The nursery was well maintained and had seedlings of *Dombeya torrida*, *Prunus africana*, *Syzygium guinnensee*, Eucalyptus spp, *Cupressus lusitanica*, *Podocarpus latifolius* and indigenous bamboo spp (*Yushania alpina*) among others. The challenge

	was inadequate water due to lack of water storage facility, inadequate potting tubes, market for seedlings, seeds especially *Grevillea robusta* and lack of technical knowhow on nursery establishment and management. The group was prioritized for support.
13.0 Meeting with Ecosystem Conservator, Trans Nzoia County	The meeting was held at EC office in Kitale. It was noted that Kapolet forest which is the only forest block in Trans Nzoia County within Cherangany ecosystem was heavily degraded. It was noted that adequate sensitization of the community especially the indigenous community was necessary before intervention. Degraded areas along River Nzoia were also suggested for intervention.
14.0 Meeting with County Director of environment Trans Nzoia County	A meeting was held in presence of the EC Trans Nzoia County. A 2 ha land at Bidii wetland area owned by the county and was easily accessible and strategic for learning was issued for establishment of bamboo demo plot as source of germplasm.
15.0 Meeting at Kapolet forest station	A meeting was held with community members from Sengwer community in presence of EC, Forester Kapolet forest station and area Assistant Chief. It was noted that the forest under trust land had been heavily encroached and intervention in such areas would require sufficient community involvement through consultation and sensitization. On gazetted forest areas, Kiambu beat and Talau area were heavily degraded and required urgent intervention. The community members endorsed the project as it would contribute to conservation of the water catchment. However, they required more time to consult other community members and agree on sites to be prioritized for action and ensure there was equity in project beneficiary across the villages. The issue of livelihoods improvement was raised by the community members. It was responded that the community members shall be trained on nursery establishment and management; planting and utilization of bamboo where through sale of seedling and bamboo products would generate income. Furthermore, the project will promote nature based enterprises in the next financial year which is geared towards livelihood improvement.
16.0 Visit to Tiriki Tropical Gardens and Farm in Shamakhokho Kakamega County	The farmer is a large scale producer of various species of bamboo seedlings and also involved in value addition.. The farmer raises several species of bamboo using seeds imported from China. Some of the species include: *Dendrocalamus asper*, *Bambusa bamboos*, *Dendrocalamus strictus*, *Phylostacius edulis (Moso)*, *Dendrocalamus membranasis cv grandis*, *Bambusa tulda*, *Bambusa vulgaris* and *Dendrocalamus giganteus*.

Appendix 1: List of participants/contact persons

SN. No	Name	Institution/Organization	Designation	County	Contacts
1	Paul Karanja	KFS	Ecosystem Conservator	Uasin Gishu	0722 265 029
2	Achim Walingo	KFS	Forester, Soy	Uasin Gishu	0725 080 197
3	Laban Gitimba	KFS	Forester, Moiben	Uasin Gishu	0720 355 552
4	Cheruiyot	Jabali farm, Ainabkoi	Bamboo farmer	Uasin Gishu	0722680 443
5	Mary Njogu	Couty Government	CEC- Environment	Uasin Gishu	
6	Boaz Changach	Couty Government	CO- Environment	ElgeyoMarakwet	
7	Kibiwott Kurgat	KFS	Zonal Forest Manager, Iten	Elgeyo Marakwet	
8	Alfred Nyaswabu	KFS	Zonal Forest manager, Marakwet	Elgeyo Marakwet	721558963
9	Herman Waliaula	KFS	Assistant Zonal Forest Manager, Marakwet	Marakwet Forest	
10	Fredrick Oyor	KFS	Forester Kapyego/Chesoi forest station	Marakwet Forest	722877875
11	Joseph Kosgey	Marakwet Community Development Trust (MCDT)	Chair	Elgeyo Marakwet	0723 224 774
12	Ishmael Chemitei	Marakwet highlands farmers association	Chair	Elgeyo Marakwet	729337156
13	Juma Mwaro	Kamasia secondary school	Principal	Elgeyo Marakwet	708224422
14	Alfred Tulei	County government	CEO Environment	West pokot	
15	David Kenduiywa	KFS	Forester, Kapenguria station	West pokot	0722 228 252
16	Samwel Kariwo	Kaisakat	Model farmer	West pokot	0722 852 854
17	Joel Songol	KFS	Extension officer, Kapenguria	West pokot	0722 930 753
19	Cherongos	Community leader	Overall indigenous leader	Cheragany hills	

20	John	Community leader	Chair for indigenous people	Cheragany hills	
21	Reuben Tekeroi	Community leader	Vice Chair for indigenous people	Elgeyo Marakwet	
22	Kipseru	GoK	Area chief, Kiptaberr	Elgeyo Marakwet	
23	Thomas Kirop	GoK	Area chief, Kiptarbugon	Elgeyo Marakwet	0726 788 856
24	Musa Kanda	Marakwet Highlands Farmers Association	VI agroforestry	Elgeyo Marakwet	0721 953 212
25	Kibet Carrington	Cherangany CFA	Chair	Elgeyo Marakwet	0726 669 745
26	Ezekiel Sakwa	Cherangany CFA	Member	Elgeyo Marakwet	0725 293 150
27	Barnabas Kibet	Cherangany CFA	Member	Elgeyo Marakwet	
28	Paul Kirwa	Cherangany CFA	Member	Elgeyo Marakwet	
29	Elizabeth Kiptoo	Kipsorwo Tree nursery	Chairlady	Elgeyo Marakwet	
30	Njoroge Waithinji	Kapsara micro-catchment farmers forum	Chair	Trans nzoia	0710 522 795
31	Julius Sabatia	Gok	Assistant Chief Kapolet	Trans nzoia	0724 615 752
32	Yator Kiptum	Community leader	Sengwer chair	Trans nzoia	0726 806 100
33	Charles Kiberen	Sengwer	Community Member	Trans nzoia	0721 977 818
34	Stephen Kipsoi	Sengwer	Community Member	Trans nzoia	0725 728 391
35	David Omotto	KFS	Forester in charge Kapolet	Trans nzoia	700498478
36	Vincent Kitiyo	Sengwer	Community Member	Trans nzoia	0715 344 094
37	Stehen Kiplimo	Sengwer	Community Member	Trans nzoia	0724 761 450
38	Mkung Daniel	KFS	Extension officer, Kapolet	Trans nzoia	
39	Nicodemus Mwatika	KFS	Ecosystem Conservator	Trans nzoia	

ANNEX 11: RECONNAISSANCE VISIT TO MT. ELGON ECOSYSTEM

REPORT ON RECONNAISANCE AND SENSITIZATION ACTIVITIES IN MT. ELGON ECOSYSTEM

Activity dates: 16th - 20th May 2016

Photos: Top - Undisturbed Natural forest in Mt. Elgon ecosystem;

Bottom - Degraded section of Mt. Elgon Ecosystem due to anthropogenic activities

1.0 Introduction

Component 4 of the Water Tower Project on science to inform local actions and national policies requires collaboration with stakeholders as a requisite to achievement of the expected results. It is was therefore imperative that before the planned activities are carried out in the action areas, various stakeholders and partners such as government authorities, lead agencies and the local communities are   sensitized on the project and key activities to be implemented. It was on this regard that the Regional Director, the Regional Project Leader and the Project Assistant undertook a reconnaissance visit to meet various stakeholders within the project area which shall inform the planning and implementation actions of the project.

1.1 Team members

1. Dr. Robert Nyambati- Regional Director
2. Dr. John Otuoma- Regional Project Leader
3. Mr. Bophines Sewe- Project Assistant
4. Mr. Nicholas Odhiambo- Driver

1.2 Process

In all the meetings convened, the project was discussed in detail. The objectives, the implementing agencies, objectives and the participating counties were highlighted. Additionally, the activities prioritized for implementation were also discussed with the stakeholders.

2.0 Meetings and site visits

2.1 Meeting with Ecosystem Conservator, Bungoma County

The team met with KFS Ecosystem Conservator, Bungoma County, Mr. Dennis Serengo in presence of his Assistant and discussed planned rehabilitation and restoration actions in the Mt. Elgon ecosystem. Other activities that were discussed in detail were:

- Capacity building and support of community nursery groups to produce quality planting materials
- Sourcing of site in the county land for establishment of bamboo demonstration plot and seed stands
- Promotion of energy conservation methods through the use of energy conservation jikos and other technologies
- Rehabilitation of the degraded sites within the ecosystem (hot spots)
- Establishment of 5 green houses within the project area for the propagation of bamboo
- Creating linkages between forest resources and livelihoods

Chepkitale Nature Reserve which covered about 17,200 ha in the early 1970s was mentioned to be heavily degraded due to invasion by the squatters at Chebyuk site and required urgent intervention.

Some of the conservation and management challenges facing the ecosystem mentioned were; overgrazing in the forest by the Ogieks and the Dorobos, encroachment especially at the Chebyuk settlement scheme, poor roads and infrastructure, inadequate personnel, boundary dispute between the government and the community, selective logging and charcoal burning. The key actions to address the challenges were highlighted as: delineating forest boundary, erection of an electric fence around the forest, rehabilitation actions especially in Cheptais and Kaberua forests which are threatened with degradation as a result of rampant forest fires and encroachment.

2.2 Meeting with Western Kenya Community Driven Development and Flood Mitigation Programme

A meeting was held with the Coordinator of Western Kenya Community Driven Development and Flood Mitigation Programme. This is a government of Kenya community driven initiative formerly under the Ministry of Special Programmes and currently a directorate under the Ministry of Devolution. The programme is implemented in collaboration with Ministry of Agriculture with an aim on community development and natural resource management. The key activities they carry out are; soil and water conservation, river bank protection, spring protection and raising tree seedlings (in nurseries) of both indigenous and exotic tree species. The challenges they encounter in the implementation of the project were highlighted as: low survival rate of seedlings due to poor management, inappropriate planting time and poor road network.

2.3 Meeting with Chief Officer Department of Water, Environment and Natural Resources

Meeting was convened with Chief Officer, Bungoma County in The Department of Water, Environment and Natural Resources, Eng. John Situma Mukhwana. Following discussions, it was suggested that protection of water banks should be prioritized to curb rampant flooding in the County which could only be addressed fully by rehabilitating the degraded catchment areas. Value addition of bamboo was also recommended to be upscaled in the region with support from the project.

Figure 1: Meeting with Chief Officer Water, Environment and Natural Resources Bungoma County

Figure 2: Heavily degraded River Chuywa in Bungoma with observably brown water flowing as a result of siltation

2.4 Meeting with zonal manager and field visit to Mt. Elgon

A meeting was held at zonal managers' office and later field visit was made to Mt. Elgon forest reserve. During the field visit, it was observed that Cheptais forest block had been heavily degraded due encroachment and required urgent rehabilitation actions.

2.5 Meeting with Cheptais community Forest Associations

The CFA is actively involved raising of tree seedlings, rehabilitataion of degraded areas in the forest and protection of the forest.

The key conservation challenges mentioned by the CFA members were:

1. Cultural norms: Most people still believed that forest should be used for cultivation and thus large areas in the forest are being cleared for farming. It was suggested that sensitization and awareness creation was crucial.

2. Insecurity: Some areas in the forest are conflict zones and therefore insecure for conservation, restoration and rehabilitation activities before consensus is reached.

3. Encroachment: The upper side of the mountain has been invaded by squatters who migrated from moorland due to population pressure.

4. Degazettement: Forest land has been used to resettle squatters, for instance Chebyuk settlement scheme.

5. High population growth rate in the area

6. Overstocking and overgrazing.

Figure 3: Meeting with Mt. Elgon Zonal Forest Officer in his office at Kapsokwony town

2.7 Meeting at VI Agroforestry

VI agroforestry is an NGO implementing Mt. Elgon Livelihood project in Trans-Nzoia and Bungoma Counties. The NGO carry out the following activities; integration of conservation in the dairy value chain, linking communities to carbon credit markets, extension services and market access for farmers, conservation of water resources, sustainable agriculture and establishment of Water Resources Users Association in collaboration with Water Resources Management Authority (WARMA). They achieve this by organizing farmers into groups and supporting them to carry out various activities.The NGO also enhance on-farm diversification by promoting establishment of fruits trees and horticulture as well as promotion of alternative energy technologies using the energy conserving jikos and capacity building of community groups to make the jikos. Some of the challenges the NGO experience in implementing the project include: low adoption of soil and water conservation measures, overgrazing in gazetted forests and poor terrain.

| Figure 4: Meeting with the Manager, VI Agroforestry, at his office in Kitale | Figure 5: An energy saving jiko at VI Agroforestry display room in Kitale |

The meeting was held at KFS offices in Kitale. The station manager, Mr. Anthony Tabut, noted that there were 7 Forest stations in the region as follows: Suam (2,392 ha), Kitale (401 ha), Kapolet (1,551.6 ha), Kimothom (10,243.6 ha), Saboti (10,800 ha), Sosion (10,000 ha) and Kiptogot (10,243 ha). Challenges to conservation efforts were highlighted as: poor road network with some areas completely inaccessible during the rainy season, insecurity by Sabaot Land Defence Force (SLDF), erratic weather and climatic condition leading to poor survival rate of planted trees, inadequate staffing and wildlife damage on trees especially the elephants. The potential opportunities within the ecosystem are; ecotourism (caves and beautiful sceneries) and rehabilitation of the cleared areas.

2.9 Meeting at Kenya Wildlife Service

Meeting was held at KWS offices in Kitale. It was pointed out that unsustainable hunting and firewood collection were the key threats to the ecosystem which could be addressed through poverty alleviation. This could be achieved through provision of alternative livelihood sources to reduce dependence on natural forest.

3.0 Conclusion

The sensitization and reconnaissance visit was a success. The team met with key stakeholders and partners within ecosystem. Necessary information was gathered to inform planning and implementation of the project in the area. The challenges encountered were bad and impassable roads which made accessing some site impossible.

Appendix 1: List of participants

No	Name	Organization	Designation	Contact
1	Eng. John situma	Bungoma County	Chief officer,Water environment and natural Reasources	722316115
2	Mr. Nashon wawire	Western Kenya flood mitigation program	Bungoma county co-ordinator	733546306
3	Mr.Rob	NEMA kenya	NEMA officer	723896479
4	Mr. Kiptoo	KWS	Warden	722680991
5	Mr.Kahindi Francis	KFS-Kapsokwony	Zonal forest officer	727855685
6	Mr.Anthony Tabut	KFS-Kitale	Forest Officer	722114473
7	Mr. Marani Fred	VI Agroforestry	County director	733837154

ANNEX 12: PHOTO GALLERY OF ACTIVITIES

Biodiversity Status

The Pokot chameleon, *Trioceros nyirit* sampled in Cherangany ecosystem. This is recently described Cherangany endemic

Jameson's mamba, *Dendroaspis jamesoni* from Lelan, Cherangany ecosystem. This record was a range extension for the species

Grey-headed Negrofinch *Nigrita canicapillus,* a forest specialist found in Lelan forest block, Cherangany ecosystem

Assessing *Cestrum auritiacum* invaded areas in Cherangany Forest block during mapping of invasive wood species

Linkage between biodiversity, livelihood and indigenous knowledge systems

Focus group discussion in progress at Cheptongei, Cherangany ecosystem	Participants rating landscape types using Pebble Distribution Method, Mt. Elgon ecosystem

Alternative biomass energy sources promoted to reduce forest degradation

Trainer enlightening the community members on the benefits of biomass technologies in Kaisagat village, West Pokot County	Demonstration on the construction of the *Kuni Mbili Jiko* in Kapsait, Elgeyo Marakwet County

Women trained on construction of *Kuni Mbili Jiko* issued with Jiko liners for enhanced adoption	A complete *Kuni mbili jiko* constructed at Kaptek, Elgeyo Marakwet County

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Annex VI – KEFRI Interim Narrative Report

Technologies for rehabilitation of water towers developed and implemented

Community members mobilized to undertake rehabilitation at Kaberua Forest Block, Mt. Elgon Forest Ecosystem	Community members undertaking rehabilitation of degraded areas in Lomuge, Cherangany ecosystem

Well fenced rehabilitated site at Sinen, Elgeyo Marakwet County to preclude grazing, a key hindrance to successful regeneration	Well fenced site in Lomuge West Pokot County to demonstrate rehabilitation of riparian areas using bamboo

Mr. Isaac Sabulei, forester for Kaboywo, taking participants through challenges associated with forest rehabilitation interventions in Mt. Elgon	Workshop participants at Maragoli hills rehabilitation demo plot during an exposure field trip to learn on forest rehabilitation efforts

2016

On farm tree production intensified and diversified

A community tree nursery supported by the project at Kongit near Kapsokwony in Bungoma County	A group photo of tree nursery management trainees in Kisumu intervention site

KEFRI staff demonstrating how to plant an avocado (*Persea americana*) seedling in Kamasia, Elgeyo Marakwet County	KEFRI team together with Kapkarawai Mother- to- Mother Support group planting *Grevillea robusta* in the group land, West Pokot County

Production, management, processing and utilization of bamboo

Capacity building of Chogoo Women Group in Elgeyo Marakwet County on propagation of bamboo	A bamboo nursery supported by the project at Kongit in Bungoma County

Capacity building of Marakwet Highlands CBO members on propagation of indigenous Bamboo, Elgeyo Marakwet County	A farmer receive nuirsery materials for bamboo production in Busia County

Establishment of bamboo demoplot at a site prepared by complete cultivation in Uasin Gishu County	Bamboo artifacts made at Londiani regional workshop

2016

Enhancing visibility of the project

| Exhibition during VI agroforestry open learning event in Kitale | Participant fascinated by bamboo products during exhibition at VI agroforestry in Kitale |

| The Project Assistant enlighten school going children on importance of conserving water towers during Nakuru ASK show | The Project Assistant taking through the CS Ministry of agriculture, livestock and fisheries Hon. Wily Bett on value addition of bamboo during ASK show in Nakuru |

| Exhibition of bamboo products during Kisumu ASK show | Community meeting at Kamasia Secondary School, Elgeyo Marakwet County during pre-launch mission |