STRATEGIC MANAGEMENT PLAN FOR SUSTAINABLE USE OF THE SACRED KAYA

KAUMA FOREST 2019-2024

NATIONAL MUSEUMS OF KENYA

WHERE HERITAGE LIVES ON

African World Heritage Fund

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ACRONYMS AND ABBREVIATIONS

1. **AWHF**: African World Heritage Fund
2. **NMK**: National Museums of Kenya
3. **CFCU**: Coastal Forest Conservation Unit
4. **MoU**: Memoranda of Understanding
5. **UNESCO**: United Nations Educational, Scientific and Cultural Organization
6. **IUCN**: The International Union for Conservation of Nature
7. **BRAHMS**: Botanical Research and Herbarium Management System
8. **NEMA**: National Environment Management Agency
9. **CBD**: Convention on Biological Diversity
10. **SDG**: Sustainable Development Goals
11. **CITES**: Convention on International Trade in Endangered Species
12. **LAPPSET**: Lamu Port and Lamu-Southern-Sudan-Ethiopia-Transport Corridor

FOREWORD

Kaya Kauma Forest is situated in the North Coast of Kenya within Kilifi County and is part of the Mijikenda Kaya Forests inscribed to the UNESCO World Heritage List in 2008. The Mijikenda Kaya forests consist of 10 separate forest sites spread along the coastal region of Kenya. The forest around the Kayas have been nurtured by the Mijikenda community to protect the sacred groves that are the only remains of the once extensive coastal lowland forests. The Kaya forests for many years have remained protected through long standing local community rich and environmentally friendly traditions, taboos, beliefs and cultures. In the recent times though, decline in community adherence to these taboos, traditions and beliefs has been witnessed threatening the survival of these long standing unique forests. The communities surrounding the forest has led to high demands on forest resources. These demands include; mining, fuel wood, medicinal plants, hunting, water and demand for agricultural land. The Forest Act of 2005 has ushered in a new era in forest management in Kenya, with a dispensation that allows the involvement of forest adjacent communities in their management.

According to the Forest Act 2005, forests should be managed in accordance with a management plan. The current process of developing a management plan for the forest has some key stakeholders that include the National Museums of Kenya (NMK), Coastal Forest Conservation Unit (CFCU), the Kaya elders, the County government of Kilifi and the Kenya Forest Services (KFS). The forest management plan should guide the process of managing the resources of the forest. This is the first management plan for Kaya Kauma forest.

The adoption of this first management plan for Kaya Kauma is hoped to ensure the sustainable management of the Forest while at the same time enriching the livelihood of the forest adjacent communities. I look forward to even more cooperation and growth under the joint management plan with all the key stakeholders. My visualization for NMK is to promote cooperation and collaboration particularly under the devolved County structures to ensure smooth operations in management of both our Natural and cultural heritage. I do hope that the Kaya Kauma strategic management plan will be replicated in other Kaya forests for their sustainable management.

Mzalendo N. Kibunjia, PhD, EBS
Director General, NMK

APPROVAL

This Strategic Management Plan is hereby approved; its implementation will be guided by the Agreement between the NMK, Kilifi County, KFS and the Kaya Kauma Elders. It will be based on the proposed five 5-year work plan and time line. The plan may be amended as need arises through mutual agreement between the parties.

Mzalendo N. Kibunjia, PhD, EBS
Director General, NMK

DEDICATION

This strategic management plan is dedicated to the past and current Kaya Kauma Elders who have over the years overseen the conservation of the Kaya Kauma forest.

ACKNOWLEDGEMENTS

The project leading Implementation team: Dr Joyce Mnyazi Jefwa, Dr Emma N. Mbua, Dr Esther Ndaisi Kioko and Ms Mercy Andeso, would like to thank the Director General, NMK, for the support and approval, and the AWHF for the financial support. Further, we would like to thank our supporting project team: Dr Beryl Akoth, Mr. Morris Mutua, Ms Aziza Zuhura, Mr John Musina, Mr Alex Mwalimu, Ms Josephine Kyaa, Mr Deche Mwamuye, Ms Rehema Hassan, Ms Mercy Korir and Mr Thomas Mwandime for the invaluable time they gave to the biodiversity assessment during this work. The management of the National Museums of Kenya (NMK) and the CFCU in Kilifi are highly acknowledged for all the logistical support provided during the planning and execution of this work. A special gratitude is extended to the Kaya Kauma Elders for cooperation and participation. We extend our gratitude to Kaya Kauma forest adjacent communities for giving us consent and information and access to their farms during the field work. Mr. Anthony Githitho, Mr Lawrence Chiro and Mr A. Matano of the NMK CFCU Kilifi and Kwale offices respectively, are acknowledged for logistics, information and participation during the research work, Mr. Stephen Maikweki is highly acknowledged for his assistance in the final report compilation. Finally, we are grateful to the Chief, Jaribuni Location, for security and information.

EXECUTIVE SUMMARY

This is the first Strategic Management Plan (SMP) for the Kaya forests. This will be implemented over a period of five (5) years, 2019 to 2024. Kaya Kauma is part of a mosaic of sacred forest fragments, along the Kenya coast that mesh into an ecosystem that harbor a rich diversity of flora and fauna. This Kaya serves as a source livelihood for communities living adjacent to it. The goal of this first Strategic Management Plan is to sustainably extract and utilize forest biodiversity products while conserving the cultural and natural heritage. The vision of this first SMP plan is to have Kaya forests conserved and secure, as a World Heritage Site. The goal of the SMP is to enhance and sustain a well conserved Kaya Kauma Forest through stakeholder's participation for provision of a rich biodiversity repository, recreational and ecosystem goods and services for the local and international communities. The SMP is warranted in that it will be the framework for guiding and moderating the participation of the key stakeholders in the conservation of the Kaya Kauma forest. Kaya Kauma forest is faced with numerous conservation challenges including:

i. Cultural erosion of beliefs and perceptions of kaya elders by younger generation
ii. Biodiversity and habitat loss and threats through over- exploitation, deforestation, encroachment
iii. Legislation (policy gap)
iv. Capacity of Human resource –elders and CFCU
v. Cohesiveness between stakeholders
vi. Inadequate capital resources
vii. Infrastructure : Information centre, maintenance of cultural village
viii. Development pressure – authorized and non-authorized sand harvesting and iron and limestone mining.
ix. Absence of legal documents for the Kaya e.g title deed.
x. Inadequate participation of the concerned authorities

Kaya Kauma forest is part of the 10 forests listed as UNESCO World Heritage Site. It is an important scared cultural heritage to the community for prayers and a source of essential natural products. Nationally, the site habours important biodiversity. The strategic management plan will enable the Kaya elders in conjunction with the community explore interventions that are non-destructive to the forest ecosystems. The strategic management plan will devise ways to monitor extraction, recommend sustainable extraction and implement restoration and conservation measures. The strategy will only be achieved if measures are undertaken to understand the types of products and dynamics in product extraction, status of the sources of products and community demands. It is with this understanding that approaches to integrate sustainable extraction of forest products and diversification of use are a prerequisite to alleviate pressure on the kaya forests. The Strategic management plan will be carried out in compliance with the National Museums and Heritage Act, revised edition 2012 (2006) which provides for gazettement of sacred Kaya forests as national monuments. The Act highlights: reservation of forest areas; conservation of flora and fauna;

promotion of research and education; promotion of recreation/tourism; and provision of employment. Kenya National Biodiversity strategy and Action Plan, fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources

JUSTIFICATION

The existing complex nature of the Kaya Kauma forest in terms of its natural resources, the wide range of users and uses, the multiple managers, both government and local (including County government and local communities) and an array of national laws and policies as well as international conventions, protocols and agreements, are all factors that dictate the need for a strategic management planning process for the Mijikenda Kaya Forests.

Kaya Kauma is an important natural forest resource located in Kilifi County. The forest is a major source of timber and non-timber products which support livelihoods of local communities. Increase in population, encroachment for settlement, cultivation and mining activities around the kayas, render the forest resources insufficient and therefore can no longer meet demands of communities. Conservation of the forest is still based on cultural norms imposed by a council of elders. This has culminated to conflict of interest leading to illegal poaching and overharvesting of forest products thus superseding replenishment of the resources. The current approaches of protecting the kayas are inadequate and the existence of the forest and cultural heritage is therefore under threat. There is therefore need to revise the existing approach to conservation of cultural and natural heritage to guarantee sustainability of use and conservation of the resources for all stakeholders. There is currently no strategic management plan guiding extraction, restoration of forest resources and diversification of forest products to alleviate pressure on the limited forest resources. This first strategic management plan outlines the actions to be taken in five years, 2019 – 2024 to enhance the conservation of Kaya Kauma. This new Strategic Management Plan for Kayas will have significant impact on NMK capacities to undertake forest conservation and management by strengthening natural and cultural heritage research to address key biodiversity and cultural issues; to effectively monitor, analyze, report and disseminate cultural and biodiversity information NMK will enhance the capacity and ability of local communities to benefit from nature based enterprises to improve livelihood and conserve the Kayas.

1. Background information

1.1 Introduction

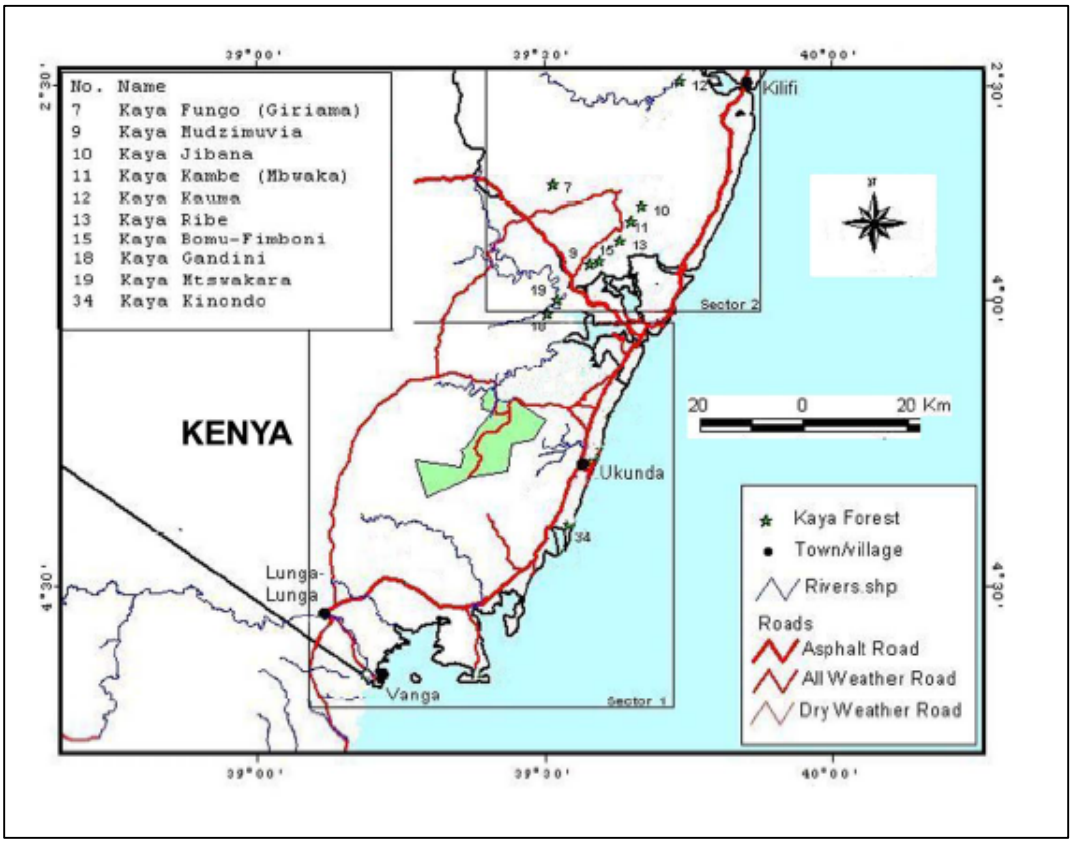
The Coastal forests, important centers of endemism for a variety of globally threatened fauna and flora. The forests supports supportive, regulatory, cultural, recreational, services. The forests are highly fragmented and mainly threatened by increased human population and activities; poverty, unregulated use, insufficient local and national institutional capacities, policy gaps and weaknesses and lack of alternative means of livelihood among others (Reference). The National Museums of Kenya (NMK) was subsequently included in the MoU under an addendum that recognized its role in cataloguing, researching and conserving forest biodiversity. NMK has also been responsible for the surveying and gazetting of sacred coastal forests as national monuments, through the Coastal Forest Conservation Unit (CFCU).

National monuments are managed by the National Museums of Kenya not principally for their Biodiversity but for their historical importance. Sacred forests are managed by the local elders which if promoted and supported can be very strong. There are almost 50 Kaya forest patches scattered throughout the ecosystem, most of which are now protected under the Antiquities and Monuments Act.

Erosion of cultural values and economic development has caused the greatest impact on the environment and culture. The destruction of natural and cultural heritage for short term gain and without proper management and restoration strategy has devastating consequences that are irreversible. The Kaya resources are irreplaceable and valuable elements of the national and global heritage. The high population growth rate has created demand for food and acute clearing of once vast forest for agriculture and settlement along the coastal strip. Kwale, Kilifi and Mombasa Counties still have many small patches of remnants of indigenous forest whose sacred status has been preserved by the local Mijikenda people. The sacred Kaya value as repositories of plant and animal species and cultural heritage are under major threats.

The coastal sacred kaya forests are cultural and natural heritage rich in biodiversity some of which is rare and endemic. Kayas epitomize the history and culture of the Mijikenda and are now listed as the World's Heritage Site by the UNESCO. There are some kayas gazetted as world heritage sites such as Kaya Fungo, Kauma, Kambe, Ribe, Bomu Fimboni, Mdzimuvya, and Mtswakara, while other are not e.g. Kinondo and Muhaka. They have been declared as a National Monument by the National Museums of Kenya under the National Museums and Heritage Act, 2006, revised in 2012.

Kaya Kauma is located in Jaribuni location in Kilifi County at latitude 3°37.821S and longitude 39°44.189E, with an altitude of 120 m above the sea level, and occupies an area of 100 Ha. This forest slopes down in the north to "Ndzovuni" river and was once a water catchment area supplying Kilifi town. The forest is under the management of a Council of Kaya elders and the National Museums of Kenya.



Map 1 Sacred Mijikenda Kaya forests, map sourced from NMK Dossier to UNESCO

The status of the biodiversity community, the products extracted, magnitude of extraction and the potential capacity of products to support communities living adjacent to the forests is not yet documented. In order for the community to optimally harness the value of biodiversity and cultural heritage, there is need to generate knowledge, interventions, innovations for sustainable utilization of the forest ecosystem. Strategic management plan that will monitor extraction, replenishment, and incorporates alternative interventions such as: recreation, cultural artifacts, on-farm integration, kitchen gardens, bee keeping, butterfly farming, ecotourism, tree nurseries, restoration exercise to replenish resources to alleviate pressure on the forest biodiversity resources, is key to the conservation of the Kaya natural and cultural heritage.

The major outcomes of the project are: (1) Improved management of biodiversity (2) Changed attitude among elders, women and youth on the best way to sustain use and conservation of biodiversity products (3) Product line groups sustainably accessing useful biodiversity resources (4) Counties stakeholders using project outputs in decision making.

1.2 Biophysical and Forest description

Kaya Kauma forest primarily belongs to the Kauma community. It is located on the low hills of Jaribuni area in Kilifi County. The geographical position of this forest is 3°37.821S and 39°44.189E, altitude of 120m above the sea level and the size is 100 ha in area, exhibiting a dry deciduous woodland vegetation type. The forest slopes down the north to "Ndzovuni" river which flows into the Kilifi creek at "Mtsanganyiko". The area has a clay and shale geological formation with deep iron-rich soil and rich in iron-ore deposit. Kaya Kauma is surrounded by scattered villages and farmlands with few coconut palms.

Kaya Kauma has one entry and an exit entry path (Fig. 2). The main entrance is on the Southern border near a water tank that once supplied water to Kilifi town. The entrance at one end in an old road with deep gulley erosion leading to the dilapidated water pump descending down towards Ndzovuni River. Along the old road and slightly into the Kaya are deep iron ore pits. On the west of Kaya Kauma is a secondary Kaya of the Starehe Kambe (Separate) descending towards the highly degraded area onto the water pump compound with broken houses of the once water pump station. Thereafter at the valley bottom is the Ndzovuni River spring. On the western side bordering the river basin is a moist part of the forest characterized by a riparian vegetation of ferns and moist conditions and a wetland. On the Northwest is an encroached area with farmlands, homesteads and the pathway into the Kaya. The Northern boundary is characterized by cleared farms and bushes. The Northern boundary is largely characterized by *Cynometra* thickets and climbers among them the Vanilla orchid. On this side are steep slopes with loose soils and mudslides. This leads to dry bushes and a gentle slope on the Northern part. Opening up to light bushes on the North Eastern Side of the Kaya. On the eastern border, there is a fenced plot and water pipe line and iron ore mining area. The cultural village is at the Centre of the forest fortified by the natural forest. The village and all vegetation is still intact. Within the village a shrine for offering prayers which is accessed by a high level council of elders, the area where different clans used to inhabit allocated based on clans and a place of 'Vigango" symbolizing ancestors.

Along the southern entrance there is an area known as "Kadzumba ka Mulungu" (The house of God) for divining, mainly done by women through dance, who foresee calamities and any events that are unfavorable to the community. The site has a small house made from *Grewia Plagiophyla,* a motor and *Osimum gratissimum*. This is communicated to the elders who offer sacrifice to evade the calamities. There are three gates leading to the cultural villages marked by the species *Bombax rhodognophalon*. At the first entrance, shoes and huts are removed and only wrappers are allowed into the Kayas.

Picture 1 Kaya Kauma physical features

a) River Ndzovuni

b) iron ore mining pit

c) gully erosion

d) Farm land

e) Water tank

f) abandoned water pump

1.3 Importance of Kaya Kauma

a) Important to Kauma community for historical, cultural and natural resources
b) Important for Ecosystem services – water catchment, source of forest products (wood and non-wood products), Regulatory (pollination, soil erosion, nutrient cycling), cultural (spiritual and burial)
c) Biodiversity repository – Habitat for fauna and flora among which are vulnerable and critically endangered species.
d) Ecotourism and recreation
e) Education
f) Research
g) Mitigate climate change and carbon sequestration
h) Job creation
i) Provide seeds and seedlings

1.3.1 Fauna of Kaya Kauma

The biodiversity studies undertaken during the baseline survey done to guide the forest management plan process has shown that Kaya Kauma is home to a great faunal diversity (picture 2 & 3). A total of seventy-four (74) bird species from thirty-six (36) families were recorded indicating that Kaya Kauma forest is an important habitat for birds. There were twenty-seven (27) forest dependent species, two (2) of which were true forest bird species that exclusively live and breed in the forest. The Kaya is home to two (2) species classified by the IUCN as Near Threatened. These two were; Southern Banded Snake Eagle (*Circaetus fasciolatus*) and Fischer's Turaco (*Tauraco fischeri*). The kaya forest and its surroundings are habitat for long and short-distance migratory bird species. Long distance migrants that migrate between Europe and Asia were; Eurasian Bee-eater (*Merops apiaster*), Eurasian Golden Oriole (*Oriolus oriolus*) while those that migrate within Africa were; White-throated Bee-eater (*Merops albicollis*) and Northern Carmine Bee-eater (*Merops nubicus*).

Picture 2 Eastern Bearded Scrub Robin** **Cercotrichas quadrivirgata

Picture 3 Dark-backed Weaver** **Ploceus bicolor

A considerable high number of mammals was recorded in Kaya Kauma consisting of 42 mammal species. These species include olive baboons (*Papio anubis)*, colobus monkeys (*Colobus guereza*), green vervet monkeys (*Chlorocebus pygerythrus*), shrews (*Crocidura* species) dik-dik (*Madoqua* sp.). The survey recorded 23 species of amphibians and reptiles (herpetofauna) in Kaya Kauma comprising of 5 amphibians and 18 reptile species occurring in the forest and its surroundings. Recorded were also 251 species of invertebrate representing 18 Orders in Kaya Kauma forest, forest edge and surrounding farmlands. The forest recorded 162 species, the forest edge 93 species, and 115 species in the farmlands. The order Lepidoptera had the highest number of species (86), followed by Coleoptera (46), Hymenoptera (45), Diptera (16), Orthoptera (17), Hemiptera (12), Mantodea (7), Odonata (5), Blattodea (4), Neuroptera (2), Spirostreptida (2), Stylommatophora (2), Aranaea (1), Geophilomorpha (1), Isopoda (1), Phasmatodea (1), Polydesmida (1), Solifugae (1), Diplopoda (Pachylobidae) (1). Among the insects recorded, a number of coastal endemic species were included, pointing to the great value of this Kaya in the conservation of coastal endemic species. Four coastal endemic butterfly species, *Acraea rabbaiae* (Clear wing Acraea), *Acraea satis* (Coast Acraea), *Graphium kirbyi* (Kirby's swallowtail) and

Baliochila minima, (Minimal buff) were recorded along the forest transect. *Neptidopsis fulgurata* (Malagasy sailer), a coastal endemic species was recorded in the forest edge along Ndzovuni River. *Graphium philonoe* (White-dappled swallowtail), mainly a butterfly of the coastal forests, was recorded in all three habitats; forest, forest edge and the farmland.

Key Informants Information on animals

A transect walk with the community members and the questionnaire results, recorded that a number of the animals in Kaya Kauma are well known to the community and some are utilized for food. The animals mentioned include; Insects: Nyuchi (bees), Maungu (moth caterpillars), Parare (grasshopper) and Mbazi (grasshoppers). All these contribute to the food security as they are utilized for food. Birds: Nzuzi, Puji, Kanga, Mverezi, Gia, Kerengeze, Hondolomwe, Kololo chimburu, matali, kanga, vitswetswe and mwewe- gongonyika . Some of these like the kanga are used for food and it was indicated that wooden boxes for carrying tomato are used for trapping them in the wild. Mammals: Ngulue (wildpig), tumbili (primate), chima (primate), pala (mammal), Kavii (dikdik), nungu (hedgehog), kuhe (rodent), fungo (rodent), Isanje (rodent), ndezi (rodent) sungura (rabbit) and pala (mammal). Among these animals, the local community had some ideas on the potential for domestication and efforts have been done towards the domestication of Kanga (Guinea fowls), sungura (rabbits) and vitswetswe (small bird) for consumption.

The communities indicated that most of these animals are mostly found in the main forest and farmlands. The community indicated that large mammals were previously present but they are no more due to overhunting and degradation of the forest. The harvesting of some of these animals is seasonal. For example, maungu (moth caterpillars) are found on specific trees such as mango trees in the farmlands and mulishangwe in the main forest and are collected during rainy season; Kanga(guinea fowls) are found at the time of planting maize (short or long rains) and found in the main forest ; Makumba (fish) are collected by children from river Ndzovuni. Ngulue (Wild pigs) are found in the main forest and hardly come out when the forests are green. Too, hunting is no longer practiced but trapping is still going on to some extend in the forest and farmland.

The community mentioned some products from animals such as drums and whiskers, and also recorded that some snakes are found in the Kaya such as python. The community recorded that the animal population has decreased in the last 5 years as the forest has faced degradation and it cannot sustain large animals.

1.3.2 Flora of Kaya Kauma

Three transects, forest and forest edge and farmland were surveyed for plant species at Kaya Kauma. Plant assemblage in Kaya Kauma showed the farmland forms a separate cluster from those of forest and forest edge with the latter two sharing some similarity as per the close clustering displayed. However, there is still some dissimilarity between the forest and forest edge (Fig. 1)

Figure 1 Plant assemblages in Kaya Kauma forest, forest edge and the farmlands

A total of 93 species were documented from Kaya Kauma forest out of which 42 different plant species were recorded on the farmland. All the 42 species are useful plants (Appendix 1). The conservation status of the species recorded on the farmland, comprised of two near threatened (*Lannea schweinfurthii* and *Pupalia lappacea)* and four species of least concern (*Uvaria acuminata, Tamarindus indica, Commelina benghalensis* and *Capsicum frutescens)*. At the forest edge, 59 plant species were recorded out of which three were near threatened (*Lannea schweinfurthii, Brachylaena huillensis* and *Sterculia Africana),* five *(*5) of least concern (*Cussonia zimmermanii, Uvaria acuminata, Euphorbia tirucalii, Acacia nilotica* and *Adenium obesum)* and four vulnerable (*Cynometra suaheliensis, C. webberi, Gyrocarpus americanus* and *Euphorbia nyikae*). A *total of* 49 species were recorded in the forest out of which two (2) were near threatened (*Lannea schweinfurthii* and *Sterculia africana),* 8 species were of least concern (*Cussonia zimmermanii, Uvaria acuminata, Bombax rhodognaphalon, Adenium obesum, Euphorbia tirucalii, Brachylaena huillensis, Commelina benghalensis and Indigofera trita*), and four (4) are vulnerable (*Cynometra suaheliensis, C. webberi, Gyrocarpus americanus* and *Euphorbia nyikae).*

It was noted that some of the listed species under the IUCN red list category are useful to the local people. They include *Bombax rhodognaphalon*, *Euphorbia nyikae*, *Brachylaena huillensis, Adenium obesum, Tamarindus indica, Cussonia zimmermanii, Capsicum frutescens, Commelina benghalensis Indigofera trita, Pupalia lappacea, Euphorbia tirucalii* and *Acacia nilotica. Aloe kilifienisis,* a critically endangered endemic species, was recorded only once (one plant cluster).

Kaya Kauma habours economically important plants for food (Fruits, vegetables), food additives, medicinal, constructional, ornamental, gums and resins, weaving, firewood, charcoal, dyes, fibre, essential oils, plants for oral hygiene wood curving and ecologically important plants as insect repellant, agroforestry, intercrop, soil fertility. The important plants have been left on farmlands indicating the importance of these species to the community. These plants have been documented as useful elsewhere (Appendix 1 and 2).

The high number of economically important predominantly indigenous plant species (Appendix 2) on the farmland, is a clear indication of the value of these plants to the community and the potential to scale them up on the farmed landscape so as to alleviate pressure on the forest.

A total of 62 different herbarium voucher specimens were collected from Kaya Kauma. During the exercise, notes for the same were captured including descriptions of vegetation type, associated plant species, habit, coordinates and uses. The specimens were sorted and identified at the East African Herbarium. This first collection will be put in BRAHMS database at the CFCU in Kilifi.

Key Informant Survey on Plants

Key informants were identified during a focus group discussion and household interviews. The key informants were Kaya elders, Kaya Kauma conservation group and herbalists. The interviews were conducted along four (4) transect walks of 100m long and useful plants and harvested trees identified and documented (Appendix 3). Medicinal, food, scared plants, constructional plants, charcoal, firewood were identified by the Key informants along the transect walk. There is still evidence of useful plants existing in the forest and also knowledge amongst the older people.

Seed Systems of Kaya Kauma

Seeds are an important component to sustainability of the forest. The ability to germinate is important for continuous recruitment of the population. Plant populations for seed production is low and regeneration is also low in the forest. Species like *Aloe kilifiensis*, *Afzelia quanzensis* and *Brachyleana huilensis* are threatened with disappearance (Appendix 1)

About fifty percent (50 %) of the plants had mature fruits (Fig.3) at the same time, other plant species were in flower. *Aloe kilifiensis* which is a rare endemic, medicinal and an ornamental plant had both mature and immature fruits with only one cluster recorded. *Afzelia quanzensis* a timber and ornamental species was in fruit with only one individual recorded. Mature fruits of two food plants including *Adansonia digitata* and *Haplocoelum inoploeum* were also collected. Only four individual of *Adansonia digitata* were recorded. Only one individual for both species were found to be mature and fruiting. Two medicinal plant species including *Ricinus communis* and *Senna occidentalis* had mature fruits.

Seed were processed for *Adansonia digitata*, *Aloe kilifiensis, Afzelia quanzensis, Ricinus communis, Senna occidentalis* and *Haplocoelum inoploeum.* They all attained 100% germination germinating at 5^{th} – 14^{th} day after sowing. However, *Aloe kilifiensis* and *Haplocoelum inoploeum* were not adapting to conventional nursery medium on transplanting at the NMK, Nairobi. Other species such as the *Premna chrysoclada, Hoslundia opposita, Vernonia homilantha* and *Abutilon mauritianum* were noted to be having low germination percentage. It is therefore important that further research be conducted on their germination for adoption by local people of Kaya Kauma.

Picture 4 Selected images of plant and seed systems (a-e)

a) *Aloe kilifiensis*

b) *Afzelia quanzensis*

c) Adenium obesum

d) Adansonia digitata seedlings

e) *Vanilla roscheri*

1.4 Socio-Economic and Cultural Status and Assessment of the Forest Community

1.4.1 Kaya Kauma Zonation and Cultural rituals village

Kaya Kauma ritual and historical village areas are located adjacent to the main foot trail that runs in a north-south direction. The trails leading to the Kaya village is cleared twice a year by men, women and youth.

Immediately after the entrance to Kaya is a ritual area, "Kadzumba ka Mlungu'', a place where women perform divination dances known as "Ngoma za Mbingu Kutambira". The components of the Kadzumba ka Mlungu are a mortar (Kinu) made of *Afzelia quanzenisis* (Mwamba) tree, a small thatched hut (Kadzumba) made from *Gerwia* sticks (Kidzija) roofed by use of Mkone, and grass. The ropes for construction are derived from the same *Grewia* species. The Kauma regard *Grewia* as a holy plant ("mti wa baridi- Mtakatifu") and is traditionally used during burial. During divination dance the women foretell various issues regarding the community such as weather, rain, disease peace and others aspects of their lives.

Preceding Kadzumba ka Mlungu area, the trail leads to a burial site marked by sticks from *Grewia* and stones. Nearby there is a place for waiting (Cheroni) where bodies rest before burial and simultaneously enquire the cause of death which finally determines the burial location. Only elders who die in the Kaya are buried inside and those who die outside are buried at the designated burial sites depending on the cause of death. Thereafter, a commemoration ceremony (Msiba) is held. The next ritual zone is a place where everyone is required to remove shoes before entering the sacred village.

There are three gates leading to the sacred village: the first gate (Gate 1) is known as Mviryani. At this place the first time visitors are asked to cut a fresh twig from any tree and drop it at this entrance symbolizing peace, and one is required to walk on a straight line avoiding tripping. All the three Gates are marked with *Bombax* (Mware) trees. Once inside the cultural homestead, several traditional grass thatched huts are evident.

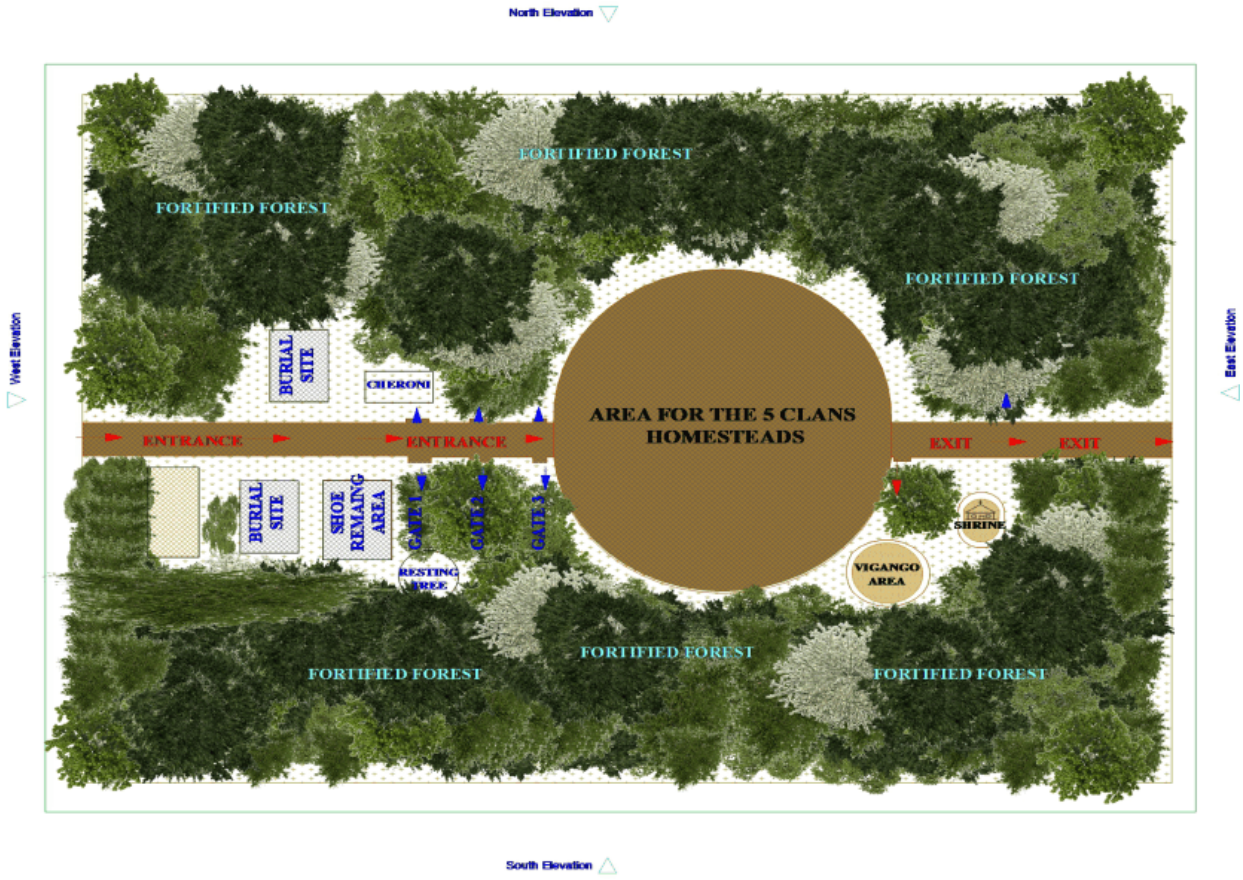


Figure 2 General layout of Kaya Kauma

Generally, the huts are constructed using specific species of grass. Inside the huts are a variety of traditional items including horns made from Buffaloes (Nyati) which are blown to announce meetings (Mbiyu). Interestingly, there is a presence of a heavy metallic object shaped like a short-put and used for games called 'Gole' . The Mijikenda are associated with smelting iron (Vyanda) to make metals (chuma). Other items found inside the huts include ropes (Kata) made from sisal strings (*Premna chrysoclada*), a bow and arrow (Uta-Mvumo) used for naming children. Bow (Uta) and arrow (Mshlale) are presented to a boy child whereas the ropes (Kata) and firewood (Kuni) are presented to a baby girl. The presentations are made at the community oath ceremonies. Calabashes (Mboko) made from a Calabash plant (Murenje) are present within the hut (Picture 5)

Picture 5 Cultural objects within the huts

a) pottery

b) bow & arrow,

c) Gole for games

The traditional huts are built of grass (Nyasi), and wooden poles (Kitonza). The roofing poles (Mwamba) are from a tree known as Mtesedzi and Mfunda (*Manilkara*) which host edible catapillars (Maungu). Cooking spoons (Upawa) are made out of coconut shells. A serving and cooking spoon (Kata) are made out of coconut shells and used for scooping water. The whipping stick (Ufidzo) is made from "Mfidzo", "Mumwemwe"and "Muchomechome" plants. Animal traps (Mihoto) are made out of *Grewia sp*. (Mkone) and Baobab (Mabuyu) while Mortar (Kinu) is curved out of *Afzelia quanzensis* and pestle (Mchi) from Mfunda plant (refer to Appendix 1 & 2 for scientific names)

Other designated places within the cultural homesteads were the "Kigojo", an area for resting and eating. In addition, a designated area known as "Koma", has curved traditional wooden statues known as "Vigango" representing the different clans of Kaya Kauma, with male statue symbolizing the clan.

The Kauma community comprises of five clans, which perform similar traditional roles for identity (Table 1)

Table 1 Clans, sub-clans and founders of Kauma

Clan	Sub-clans	Founders
Mvitsa	Mwachirer, Mwachipa, Mwadzala, Mwangala, Mwakubo	Gohu Muhavi Nzamba
Mdzundza	Mwachizango, Mwaragi Mkoka Mwarajimkoka, Bwede, Mwakere	Mkurumbo mikirimbo – Kurumbo
Amombwe	M'mwamaya, Mwagua, Mwakoba, Mwatsola	Mwamaya Nyoka
Mdarari	Mwajefa Tune, Aderi, Mwakiringi	Ndaa Tune Ndaa
Mdzakaa	Mwamura, M'Makongo, Muyuni, Miriri, Mwambura*	Musuko Shoka Masusko

Historically, the Mijikenda Taita, Pokomo and Wagunya (Bajuni) are said to have originated from a place known as Sungwaya (River Juba). The Pokomo are said to have come from a woman who had a full term pregnancy referred to as "Mimba Komu" (Mbokomo). The Taita and Mijikenda parted ways at Mwangea while the Mgunya (Bajuni) and Mijikenda remained close.

1.4.2 Demographic status of the community adjacent to Kaya Kauma forest

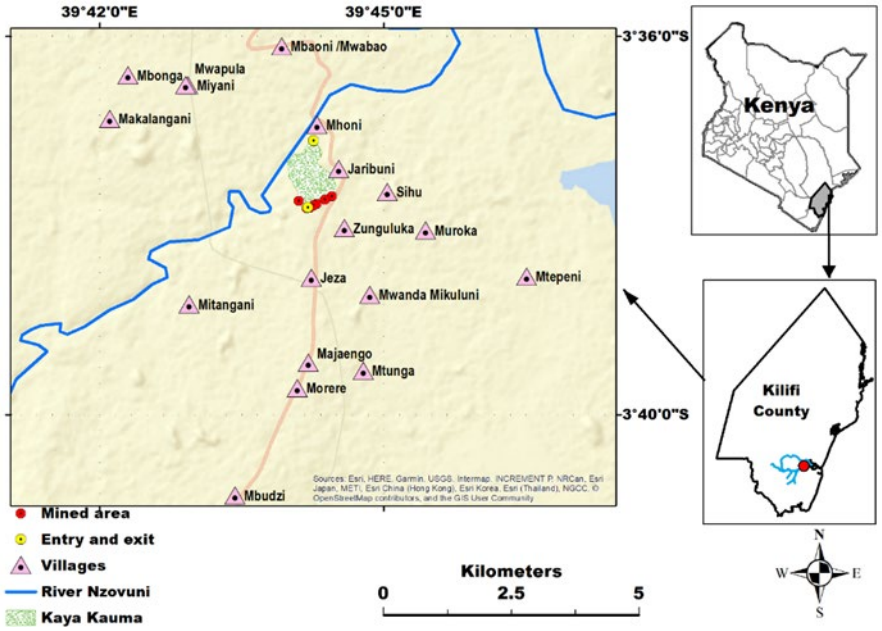
Information derived from the Chiefs office, Mr. Albert Muzungu, indicated Kaya Kauma is surrounded by five villages with a total population of 2384 distributed in 166 homes composed of 777 households (Table:2 & 3, Fig.). The Kauma people belong to the Mijikenda group along the coastal strip in Kenya. They are mostly small scale subsistence farmers who exploit the forest for part of their livelihood requirements. The community practices farming and grow maize, cassava, beans and cowpeas, coconut, and some a variety of fruits.

Table 2 Kaya Kauma villages and households

Name of Village	No. of Homes	No. of Households	Total
Muhoni	20	66	238
Marere	51	86	365
Mitangani	25	97	460
Wamboi	27	125	454
Jeza	43	43	403

Table 3 Villages adjacent to Kaya Kauma forest

Villages	Sub-locations	Locations
Jaribuni	Vinagoni	Jaribuni
Jeza (17)	Marere	Jaribuni
Marere (1)	Marere	Jaribuni
Muhoni	Marere	Jaribuni
Miyani (11)	Mwapula	Jaribuni
Mwabau (2)	Mwapula	Jaribuni
Sosoni (1)	Magogoni majolani	Kauma
Vinagoni	Vinagoni	Kauma
Zunguluka	Vinagoni	Kauma



Map 2 Villages adjacent to Kaya Kauma forest

1.4.2 Community knowledge on biodiversity

a) Habitat from where plants were collected

Most of the plant products were collected from farm, main forest and forest edges as shown in the table below (Table 4). The highest knowledge on habitats of collected plants was on medicinal, food, weaving and to some extent construction, basketry and furniture. The habitats mentioned most for collection were main forest, forest edge and river bed.

Table 4 Habitats where plants are collected (% population with knowledge on habitats where plants are collected)

Item	Farms	Main forest	Forest edge	River bed	Shrub land	Grassland	Woodland
Mushroom	2	6	0	0	0	3	2
Medicine	27	38	5	2	2	0	0
Furniture	6	11	2	2	0	0	0
Construction	5	17	5	2	0	0	0
Food	21	25	11	2	0	0	0
Musical instruments	2	5	2	0	0	0	0
Basketry	6	11	3	8	0	0	0
Weaving	13	17	6	0	3	0	0
Curving	2	5	2	0	0	0	0

b) Sub division of labour in animals' and plant collection

For animal collection, the majority of the work was done by male members of the family although women and children played a much lesser role. In the plant collection the subdivision of labour on plant's products varied with the majority of the products being collected by male respondents. Even so, the responsible parties of collecting some of the plant products were not identified. Medicinal plants formed the bulk of what was collected followed by furniture, construction material and food.(Table. 5). Seventeen plants were identified as domesticated within the study area.

Table 5 Plant collection (% population with knowledge on how products are collected)

How collected	Construction materials		Medicinal		Curving		Mushroom		Utensils		Toys	
	Male	**Female**	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Part	16	38	19	38	1	1	0	2	1	1	1	5
Whole plant	3	16		3		1	3	3	3	3	5	6
Digging	6	5	14	40	11	13	0	0	2	0	2	0
Mwangani	0	0	0	0	0	0	0	0	0	0	0	0
Mbambakofi	0	0	0	0	0	0	0	0	0	0	0	0
Mhuhu	0	0	0	0	0	0	0	0	0	0	0	0
Pruning	0	0	0	0	0	0	0	0	0	0	0	0
	Adornments and Decoration		Cultural and rituals		Musical instruments		Food		Ornamental		Furniture	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	**Male**	**Female**
Part	11	5	6	6	6	13	24	43	6	11	19	25
Whole plant	3	2	0	2	5	6	5	0	3	7	5	25
Digging	0	0	6	2	0	0	0	0	0	0	3	0
Mwangani	0	0	0	0	0	0	0	0	0	0	0	2
Mbambakofi	0	0	0	0	0	0	0	0	0	0	0	2
Mhuhu	0	0	0	0	0	0	0	0	0	0	0	2
Pruning	1	0	0	0	0	0	0	0	0	0	0	0

Highest percentage of the population indicated that plant products were collected throughout the year. This was expressed most by the female population.

Table 6 Seasons when plant products are collected (% population with knowledge on when products are collected)

	Female			Male		
Plant products	**Rainy Season**	**Dry season**	**All season**	**Rainy Season**	**Dry season**	**All season**
General	0	0	21	0	0	16
Adornments and Decorations	0	0	5	0	0	7
Furniture	5	0	41	0	2	13
Basketry	0	0	21	0	0	11
Curvings	0	0	10	0	0	5
Constructional	3	0	41	3	0	13
Mushrooms	6	0	6	2	0	0
Medicinal	2	0	44	2	0	16
Food	3	0	22	1	0	7
Musical instrumentals	0	0	10	0	0	3
Cultural and rituals	0	0	7	0	0	0

c) Methods of plant collection

Most methods mentioned were for collecting construction materials, medicinal plants, food products and furniture (Table 7). Medicinal were the most collected by digging. Occasionally whole plants were collected with the highest population mentioning methods of construction materials and medicinal plants.

Table 7 How plants are collected (% population with knowledge on parts of products are extracted)

Method of collection	Construction materials	Medicinal	Curving	Mushroom	Utensils	Toys
Part	54	57	11	3	13	14
Whole plant	17	3	5	3	9	11
Digging	11	54	24	0	2	2
Pruning	0	0	0	0	0	0
	Adornments and Decoration	Cultural and rituals	Musical instruments	Food	Ornamental	Furniture
Part	16	13	19	67	17	44
Whole plant	5	2	11	5	11	29
Digging	0	7	0	0	0	3
Pruning	2	0	0	0	0	0

d) Plant domestication

Seventeen plants species were identified as domesticated in the study area. (Refer to appendix 1&2 for scientific names).The knowledge on the domesticated plants was over 50% except for "Mkuha" and "Mkone".

Table 8 Percentage (%) population with knowledge on domesticated plants

	Domestication	
Plant	No	Yes
Mkulu	66.7	33.3
Mkunazi	52.6	47.4
Mngambo	75.0	25.0
Mkuha	42.9	57.1
Mrihi	91.7	8.3
Mfumba	91.7	8.3
Mpambachiko	91.7	8.3
Tamarnd	91.7	8.3
Mtola	100	0
Mwangani	76.9	23.1
Mkwaju	69.2	30.8
Mkone	41.2	58.8
Mumbu	78.6	21.4
M'boho	76.9	23.1
M'dzaladoe	83.3	16.7
Mzenekta	52.6	47.4
Chizumilo	71.4	28.6
Mporojo	91.7	8.3

e) Perceived change in the past five years

Majority of the respondents perceived that the different plants yields or status have decreased while some perceive that it has increased. The total population that perceived a decrease was 63%

Table 9 Percentage (%) population that perceived change in the past 5 years

Reason for decrease	Frequency	Reason for increase	Frequency
Deforestation	23	Adequate rain	5
Population growth	10	Deforestation	5
Drought	38	overharvesting of products	3
Burning Charcoal	13	Regeneration	23
Famine	3	Degeneration of forest	3
Firewood collection	6	Afforestation	5
Farming increase	3	reduction of drought	3

f) Subdivision of labour in animals' collection

For animal collection, the majority of the work was done by male members of the family (Table 10). The subdivision of labour of the plant's products collected varied with the majority of the products being collected by male respondents. Knowledge on collection was highest in some of the animals.

Table 10 Percentage(%) population with knowledge on animals

Animal	Male	Children	Female
Nzuzi (bird)	2	3	0
Nyuchi (bees)	3	0	0
Puji (bird)	3	3	0
Kavii (dikdik)	6	3	3
Chima (primate)	13	0	0
Makumba (fish)	14	16	14
Nyani (primate)	24	0	0
Maungu(moth-caterpillar)	30	35	24
Ngulue (mammal)	43	2	0
Matali (rodent)	43	30	16

Kuhe (rodent)	46	35	13
Pala (mammal)	48	8	3
Vivii (dikdik)	49	3	3
Parare (grasshopper)	60	71	56
Kanga (bird)	76	60	6
Mverezi (bird)	77	59	8
Gia (bird)	77	63	8
Kerengeze (bird)	79	60	8
Hondolomwe(bird)	79	60	8
Kololo(bird)	81	60	6
Fish	86	75	81

The knowledge on plant products was recorded for male, female and children (Table 11). Male had the highest knowledge on collection of plant products. All including children had same knowledge on collection of food products. Male had the highest knowledge on basketry while both male and female had the highest knowledge on collection of medicinal plants.

Table 111 Percentage (%) population with knowledge on plant products

Plant Products	**Responsible person**		
	Male	**Female**	**Children**
Medicinal	61	50	6
Furniture	45	11	8
Construction Materials	39	11	2
Food	35	34	32
Basketery	35	16	0
Mvure(wooden bowl)	19	6	0
Music Instruments	16	1	0
Chinu(mortar)	15	0	0
Mutsi(pestle)	13	3	0
Adornments and Decoration	13	9	2
Mwiko(cooking stick)	12	1	0
Curving	9	0	0
Matunda(fruit)	8	8	9
Mushroom	7	7	4
Lufijo (whisk)	6	1	0

1.5 Household Forest Products of Kauma Community

Results of a recent social-economic survey indicate most of the respondents were married women of Christian faith. The mean age of the respondents was about 55 years old with the oldest being 88 and youngest 20 years. The percentage of household with employed children was 41.3% while the quality of housing was diverse with the majority of the respondents having mud and thatched type of house. About 71.4% of the people sourced water from piped water with majority walking about 10-minute to the source of clean water. Most of the land in the surveyed area was communal land (85%) while the rest was family owned. Majority of the respondents owned between 1-2 acres of land. Regarding the perception of the Kaya most of the respondents saw the forest as place of burial while a smaller number believed the Kaya was ancestral home of the Mijikenda. The respondents had different perception on the importance of the Kaya with most of the respondents stating the Kaya brought rain and fresh air. About 41.3% of the respondents were in a social group while the rest were not. The majority of the families used cultural products from Kaya forest resources. For animal product collection, the majority of the work was done by male members of the family although women and children played a much lesser role. In the plant product collection, the subdivision of labour on varied with the majority of the products being collected by male respondents.

Table 122 Household forest products and degree of use

	Product		**When used**
1	Mortar & pestle	Kinu & mchi	Daily
2	Wooden Chair with back support	Chihi	Daily
3	Wooden cooking sticks (stirring & whipping)	Mwika & Mfidzo,	Daily
4	Informal sitting benches	Magogo	Daily
5	Wooden Fishing traps		Occasional
6	Wooden building poles	Fiho	Occasional
7	Hives for honey	Mzinga	Occasional
8	Firewood	Kuni	Daily
9	Sleeping mats	Mkeka	Daily
10	Baskets	Chikahana	Daily
11	Charcoal	Makala	Daily
12	Musical instruments (Kayamba, drums)	Kayamba,& ngoma	Occasional
13	Wooden traps for small mammals	Sanduku	Daily

Although it was evident 80% of household products presumably derive from the forest, this information was not conveyed to us directly due to fear of arrest by government forest agency. It is most likely that the building posts were obtained from the forest and either sold to the villagers by illegal harvesters.

Picture 6 Kauma Community cultural products (a-d)

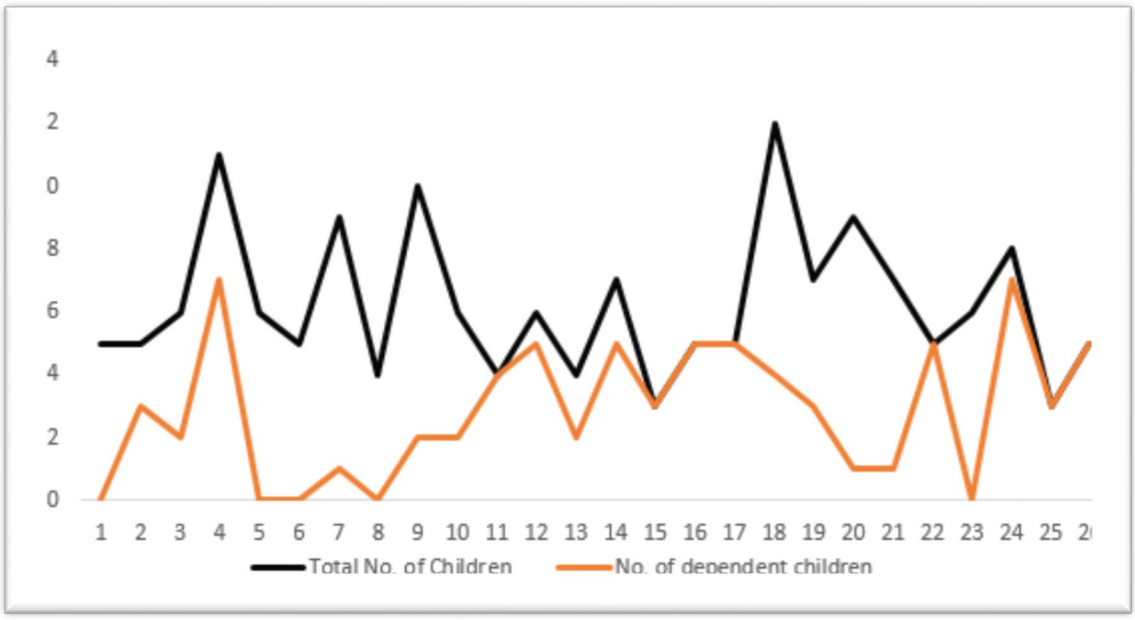
a) Traditional fishing basket trap,

b) Wooden trap for small mammals

c) Wooden cooking stick, whipping stick and wooden bowl

d) Mortar and pestle,

Kaya Kauma is surrounded by communities of almost the same socio-economic status sparsely distributed households. Sociologically, a household is defined as a composition of one or more people who occupy a housing unit and are related by birth, marriage or adoption. A family constitutes of individuals who are related whereas a household are individuals who may be unrelated but still living together. Families in Kauma are generally large with many children who highly depend on the parents (Graph 1).



Graph 1 Number of children dependent on parents.

The population around Kaya Kauma is generally poor based on types of houses which mainly are made of mud and thatch. The population depends on forests resources for their daily sustenance. These include food, herbal medicines, and general livelihoods, which may impact the forest negatively. The following section thus highlights major socio-economic issues facing the community living adjacent to the Kaya Kauma.

a) Health

There was a health facility near in Jaribuni location and at the time it was undertaking leprosy testing.

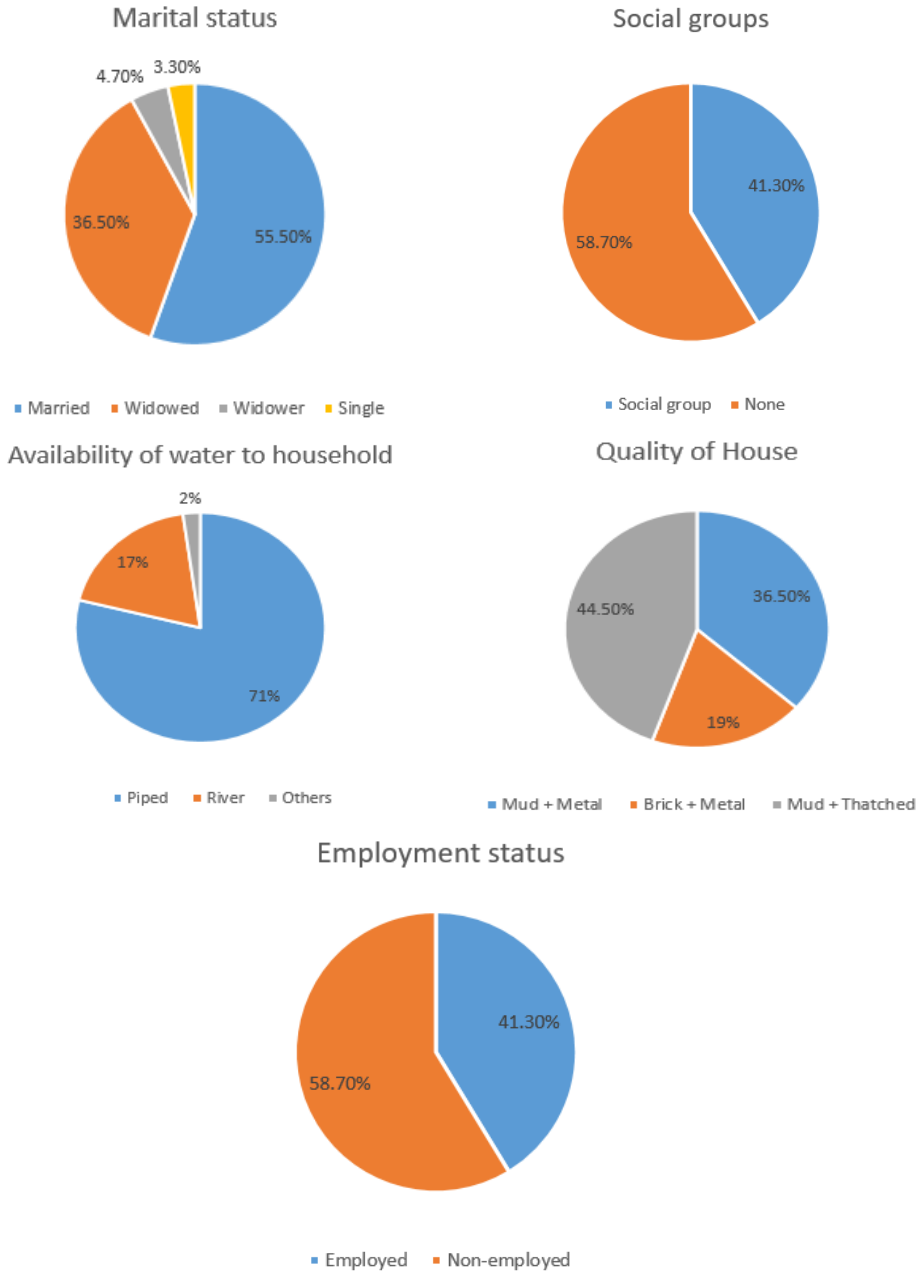
b) Food Security.

This can be termed as the ability of every household to either have the means to produce or buy its own food. Adequacy of food implies that it must satisfy the dietary needs of every person considering age, living conditions, health, occupation, sex, culture and religion. We observed that the state of food security in this region relies heavily on indigenous biodiversity resources e.g wild vegetable and fruits, tubers, wild mushrooms, edible insects, edible mammals, reptiles, fish and crustaceans from river Ndzovuni and edible birds.

c) Safe Water

The majority of Kauma community had access to clean piped water located approximately 10 minutes away from the homesteads.

Graph 2 Social economic status of Kauma community



1.6 Stakeholders in the management of Kaya Kauma

Kaya Kauma is under the management of the National Museums of Kenya and a Council of Kauma Elders who enforce traditional guidelines for protection of the forest. Other stakeholders include the Kenya Forest Services, the Kilifi County and the people of Kilifi in general (Table 13).

Table 13 Stakeholders roles and responsibilities

Stakeholders	Roles of responsibilities	Level of influence
National Museums of Kenya	Fundraising; Research in natural and cultural heritage conservation; Research on restoration of the Kaya, Education programmes and presentations through videos, documentaries; Produce reference materials on forest Kaya Kauma ecosystem; Contact research on use of cultural site; Identification of flora and fauna services; Enforcement of policy and regulation,	High
Council of Elders	Enforcement of traditional laws and beliefs regarding the forest	High
Kenya Forest Services	Forest administration: Licensing and regulation of exploitation of forest products ; Collaboration with stake holders on ecosystem management; Forest fires prevention and Suppression	High
Kenya Water Towers Agency	Implementation of Water Act, Protect water catchment area, Monitor water quality and quantity	High
World Wildlife Fund (WWF)	Development partners	Moderate

County government of Kilifi	Land boundaries, title deeds, security, law and order	High
Kauma Community	Conservation	High
National Land Commission	Issuance of title deeds; Revocation of title deeds	High
Ministry of environment and Forestry	Policy formulation and enforcement	High
Kenya Tourism Board (KTB)	Marketing	High
Nature Kenya	Advocacy, awareness creation	High

2. Planning Considerations

Relevant Kaya Forests Policy Guidelines and Framework

2.1.1 Introduction

Forest resources in Kenya are valued natural endowment that must be sustainably managed for present and future generations. Forest resources offer a range of benefits and opportunities for local and national economic development, improved livelihoods and provision of environmental goods and services such as watershed protection, provisional services, pollination services, nutrient cycling services, spiritual and carbon removal. The Kaya forests forms an integral part of this endowment and are governed by various laws under the Ministry of Environment and Forestry, and some are listed as protected areas under the UNESCO.

2.1.2 National Museums and Heritage Act, 2006.

This is an Act of Parliament which consolidates the laws relating to national museums and heritage. It provides for the establishment, control, management and development of national museums and the identification, protection, conservation and transmission of the cultural and natural heritage of Kenya. The Act repealed the Antiquities and Monuments Act (Cap. 215) and the National Museums Act.

2.1.3. Culture and National Heritage Policy, 2009

The Kenyan Culture and National Heritage Policy is aimed at creating the benchmark necessary for mainstreaming culture and heritage and setting standards as well as raising awareness and the capacity building necessary for infusing culture and heritage as integral parts of public policy and development plans. In addition, this policy seeks to define the major components of Kenyan culture as well as national heritage and further identifies and outlines major cultural institutions. The policy statement map out operational strategies and identifies the resources, approaches and administrative practices necessary for cultural renaissance and sustainable preservation of national heritage.

2.1.4. Kenya Forest Policy (2014)

The Kenya Forest Policy provides a framework for improved forest governance that include strengthening forest capacity to meet the local needs for wood and other forest products; meeting the demands for industrial wood products; protecting biodiversity, promoting eco-tourism and conserving the forest; ensuring that sustainable benefits from the forest which support agriculture and mitigation of global warming. The document established a good foundation for future forestry sector planning.

2.1.5. The Forest Conservation and Management Act, 2016

This is an Act of the Parliament which gave effect to Article 69 of the Constitution with regard to forest resources; to provide for the development and sustainable management, including conservation and rational utilization of all forest resources for the socioeconomic development of the country and for connected purposes.

2.1.6. Environmental Management and Coordination Act, 1999

Parliament passed the Environmental Management and Coordination Bill, 1999, which came to force on in 2000 and revised in 2015. This legislation establishes the national environmental principles, provides guidance and gives coherence to good environmental management. It also deals with cross-sectional issues such as overall environmental policy formulation, environmental planning, protection and conservation of the environment, environmental impact assessment, environmental audit and monitoring, environmental quality standards, environmental protection orders, institution coordination and conflict resolutions. The Act guides other legislations dealing with the environment such as: land tenure and land use legislation, forestry legislation, wildlife legislation, water laws, and agriculture legislation. The Act provides a good avenue for environmental protection and the establishment of an operation framework under the National Environment Management Agency (NEMA) mandate.

2.1.7. The National Policy on Traditional Knowledge, Genetic resources and Traditional Cultural expressions, 2009.

The policy aims to:

a) Provide a legal and institutional framework to support the integration of various aspects of traditional knowledge, genetic resources and traditional cultural expressions in national development planning and decision making processes.

b) Promote the preservation, protection and development of traditional knowledge, genetic resources and traditional cultural expressions for multiple applications and use.

c) Promote and foster the documentation, use and dissemination of traditional knowledge, genetic resources and traditional cultural expressions with mechanisms to acknowledge, protect and benefit the sources and/or custodians.

d) Promote the protection of traditional knowledge associated with conservation and sustainable use of biological diversity and equitable sharing of accrued benefits.

e) Enhance collaboration and partnership in the generation, access to and utilization of traditional knowledge, genetic resources and traditional cultural expressions.

2.1.8 Vision 2030 Policy

A national long-term development blueprint to create a globally competitive and prosperous nation with a high quality of life by 2030, which aims to transform Kenya into a newly industrializing, middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment. The Vision is a product of a highly participatory, consultative and inclusive stakeholders' (international and local experts, ordinary Kenyans and stakeholders from all parts of the country) process carried out between October 2006 and May 2007.

2.1.9. Convention on Biological Diversity (CBD) 1992

The objectives for Convention on Biodiversity Diversity establishes several scenarios which include conservation of biological diversity, sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and technologies, and by appropriate funding.

2.1.10. Sustainable Development Goals (SDGs)

SDGs build on the successes of the Millennium Development Goals, while incorporating new areas such as climate change, economic inequality, innovation, sustainable consumption, peace and justice, among other priorities. The goals are interconnected – often the key to success on one will involve tackling issues more commonly associated with another.

The SDGs work in the spirit of partnership and pragmatism to make the right choices now to improve life, in a sustainable way, for future generations. They provide clear guidelines and targets for all countries to adopt in accordance with their own priorities and the environmental challenges of the world at large. The SDGs are an inclusive agenda. They tackle the root causes of poverty and unite us together to make a positive change for both people and planet.

2.1.11. The Convention on International Trade in Endangered Species (CITES)

This is an international agreement between governments to protect plants and animals. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

2.1.12. Nagoya Protocol

The Nagoya Protocol is a 2010 supplementary agreement to the 1992 Convention on Biological Diversity on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity.

2.1.13. River Authorities Act (Cap. 443)

This Act empowers all existing river authorities to, inter alia, construct any works necessary for the protection and utilization of water and soils on areas along river- banks. Fallow land acts as a reservoir of terrestrial carbon, while trees and vegetation growing along riverbanks sequester

carbon dioxide. Efforts will be made to protect the riparian belt by planting of appropriate species like bamboo.

2.1.14. Land Registration Act, 2012 (Cap. 300)

This is an Act of parliament that revises, consolidates, and rationalizes the registration of titles to land, gives effect to the principles and objects of devolved government in land registration, and for connected purposes.

2.1.15. Science, Technology and Innovation Act 2012

This Act facilitates the promotion, coordination and regulation of the progress of science, technology and innovation in the country. It aims to assign priority to the development of science and technology and entrench technology and innovation into the national production system.

2.1.16. The Energy Act 2006

The Act mandates the Government to promote the development and use of renewable energy Including biodiesel, bioethanol, biomass, solar, wind, hydro-power, biogas, charcoal, fuel wood, Tidal, wave, municipal waste among others. It established the Energy Regulatory Commission to be in charge of the production, distribution, supply and use of renewable energy.

2.1.17. The Energy Bill 2015

This Bill will replace the Energy Act 2006 when signed into law. It aims to consolidate the laws relating to energy, to provide for National and County Government functions in relation to energy, to provide for the establishment, powers and functions of the energy sector entities. It aims at the promotion of renewable energy, exploration, recovery and commercial utilization of coal and geothermal energy and the production, supply and use of all energy forms.

2.1.18. Mining Act 2016.

The mineral Act 2016 Part vii-Mineral Agreements. This applies to the illegal iron ore mining and the intensive extraction of limestone in Jaribuni Location.

3. Zonation of Kaya Kauma forest

a) Natural forest
b) Cultural Village area
c) Vigango area
d) Shrine area
e) Prediction area – Rain, calamities
f) Burial site
g) Forest edge
h) Ndzovuni River
i) Water tank infrastructure area at the edge
j) Iron ore Mines

4. Conservation Challenges

a) Cultural erosion of beliefs:
b) Perceptions of kaya elders by younger generation
c) Biodiversity loss and threats through over- exploitation, deforestation, encroachment
d) Legislation (policy gap):
e) Capacity of Human resource –elders and CFCU
f) Cohesiveness between stakeholder
g) Inadequate capital resources
h) Infrastructure: Information Centre, maintenance of cultural village
i) Mines: Sand, Iron and Limestone (conflicts with conservation of the Kaya), Unauthorized mining (illegal mining; Authorization of Unsustainable practices)
j) Legal documents for the Kaya (title deed)

5. Management of Kaya forest ecosystem and Action

a) Monitoring framework for the Kaya biodiversity: The forest is a source of wood and non-wood products. The high biodiversity and products documented in the forest will be mapped for ease of monitoring the production capacity. Manuals on sustainable methods of extraction and guides on monitoring of biodiversity will be developed. The National Museums of Kenya together with the elders, youth and KFS will develop a sustainable extraction plan.
b) Awareness creation on the value of cultural and natural heritage of the Kaya: Although the Kaya exists for the community, there is little value attached to it by the general public and the youth. This was evident from the responses made on the uses of the Kaya. The Kaya forest meant different things to different people. Approaches to harmonize the value to the general public who are also custodians and reach a consensus will be include Kaya biodiversity products database, social media platforms, chiefs barazas, county cultural festivals, local media stations, introduction of school culture and biodiversity clubs. This will be undertaken by the National Museums of Kenya, Kaya elders, County Government, schools and the media.
c) Introduce alternative livelihoods – Based on the rich culture and biodiversity of Kaya Kauma, the following activities will be undertaken: ecotourism and recreation, butterfly farming, herbal gardens, tree nursery, agroforestry, bird watching, fish farming, crafts and basketery and pollination and botanic garden in schools. Kaya Kauma is regularly visited by researchers, naturalists and schools. There is still no system of documenting the users of Kaya and their interest. Kilifi town which has touristic attractions and investors in Villas and the newly settled Vipingo ridge who are still not aware of the attractions of Kaya Kauma. There are variety of nature and cultural based attractions in the Kaya such as the sacred use, historical homesteads, vast

knowledge on plants, birds and butterflies. Other attractions are a wild experience by creating a camp site and an arena for cultural festivals and games. The first step will be to empower the elders on record keeping on visitors. This will form the basis of the marketing towards ecotourism and recreation. To promote ecotourism and recreation, an information Centre similar to Kaya Kinondo and a Hall are important for successful implementation.

d) Capacity building of the elders and community: Training specific target groups, kaya council of elders, students, field extension workers on sustainable use and access of products. The Kaya governance is threatened by extinction. The elders are under threat and the forest as well. There is need to build capacity of the elders on governance issues, succession plan in the advent of modernity, extend the knowledge to schools and tertiary institutions, extension workers in other sectors such as agriculture and forestry to understand the operations and also target youth on social media platforms.

e) Research and Education: The forest offers a lot of opportunities for research to NMK, local and International researchers, interns, volunteers, case studies, nature based organizations and education tours. A strong research and education Centre should be facilitated at the NMK CFCU office. The loss of biodiversity, habitat and cultural integrity of Kaya Kauma is evident. Specific researchable issues include cultural and biodiversity loss, restoration of natural and cultural heritage, developing new tools to sustain heritage, address the dynamics of pollinators and seed production systems for posterity and sustainable alternative livelihoods. This calls for working with diverse stakeholders in the energy sector to combat firewood collection and charcoal burning, construction sector to alleviate harvesting of poles from the forest, Agricultural and livestock sector to harness local biodiversity for domestication and diversification for food and nutritional security, and research to address aspects of modernity and cultural heritage to combat erosion and loss of cultural knowledge. Research on impact of mining on river Ndzovuni water quality and quantity, and aquatic and riparian biodiversity also needs to be addressed by NMK and stakeholders. Multidisciplinary and multi-sectoral research approaches should be encouraged.

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f) Rehabilitate degraded mined sites and landscape: Kaya Kauma is heavily affected by mining of iron ore around and within the Kaya and also nearby intensive limestone mining for the construction of the LAPPSET project. The forest area and its environs is surrounded by deep pits and the old road that was frequented by large Lorries has developed deep gullies. The pits and gullies are a major threat to human and livestock, and the erosion is degrading the land and depositing soils into the river. The Limestone mine has major impact on the river and its biodiversity. The mining has polluted the river and the water is no longer fit for consumption and has affected fish and crustacean production as was explained by the community.

g) Restoration of biodiversity – Although biodiversity is high, the frequency of encountering some species was very low. This is a threat to the sustainability of the different species with inbreeding of the small population a threat to the gene pool and subsequent survival of the species. For example there was only one cluster of the coastal endemic plant *Aloe kilifiensis*. The actual abundance of especially the vulnerable and endemic species must be undertaken and immediate restoration plan undertaken by the National Museums of Kenya. The restoration exercise should extend to the entire landscape to allow animal biodiversity to increase. The community largely assigned the role of the Kaya to ecosystem services such as rain, water, coolness, combating soil erosion and although not directly mentioned, the use of wood and non-wood products was evident. Continuous extraction and over-exploitation of some species is a major threat. A programme to combat biodiversity loss is mandatory and inevitable.

h) Managed farming of edible animals: The local community still depends on wild harvest of mammals, Insects, birds, fish and crustacean for their dietary needs. These are getting fewer and their habitats largely threatened. There is limited efforts to domesticate as was observed on the Guinea fowl. The potential of domestication of wild animals is known as it has been observed for other animals. The National Museums in collaboration with Livestock sector will work on the domestication of the edible animals. The National Museums will work with stakeholders towards a plan to increase the ex-situ population of the edible animals.

i) Outreach through education: Biodiversity products thematic platforms for knowledge sharing, social media platforms, pamphlets, factsheets and brochures. Training of tour guides and hoteliers on cultural and nature based tourism.

j) Nature based enterprise for craft: Bead work, weaving, basketry, reproductions (casting of the Vigango for souvenir), and pottery. The availability of diversity of natural resources provides an opportunity to develop nature based crafts as a source of livelihood. One of the Kaya elder is actively involved in basketry for income generation. This will be expanded to include mats and involve the community groups around the Kaya. The art of pottery is dying off and this can be revived to also support livelihoods and also to conserve the tradition. Other art based crafts includes beading from seeds and sticks. A youth group from Mida, in Watamu are selling beads made from seeds. Seeds that are common can be targeted for the activity with the permission of the elders.

6. Rehabilitation and management programme

To start the process of rehabilitation

a) Continue to generate and build the knowledge base on cultural and natural aspects, knowledge/skills associated with useful products of the kayas and enrich the biodiversity database.

b) To start to determine the distribution, quantity and replenishment ability of useful floral and faunal biodiversity resources.

c) Implement interventions to sustainably harness useful resources *in-situ* and *ex-situ*: (i). extraction of honey, edible insects and mammals, materials for artifacts e.g. necklaces, musical instruments, recreational activities such as ecotourism (2) the second category will include products that can be produced on-farm or homesteads kitchen gardens and nurseries, butterfly farming (*ex-situ*).

d) Start to build capacity of groups to sustainably use, conserve, manage and monitor useful biodiversity resources of the Kayas. This will address some of the needs and constraints by (i) creating awareness among the various groups (farmers, women, youth, elders) (ii) developing training, information and education material, (iii) targeting groups based on product line on how to extract and/or establish source of product outside the forest.

e) Start to create awareness on cultural, environmental, economic value (significance) of natural heritage. Through stakeholder workshops, brochures, exhibitions, posters, conferences, seminars, media and presentations at county meetings.

7. **Timeline**

The time line of the implementation plan is represented by action plan, means of verification, the time of implementation and the key organizations as shown on Table 14.

Table 14 Time Line of Implementation of Strategic Management Plan for Kaya Kauma

Strategic Objective	**Activities**	**Means of Verification**	**Implementation time (years)**					
			1	**2**	**3**	**4**	**5**	**Organizations**
Monitoring framework for the Kaya biodiversity:	6. Maps for monitoring Kaya biodiversity products/resource, 7. Production of manuals on extraction, 8. Guides on monitoring sustainable use of biodiversity	Resource maps, Manuals Guides						NMK, Kaya elders
Awareness creation on the value of cultural and natural heritage of the Kaya:	Kaya biodiversity products database	Data base, Workshops, Seminars, Publications, Conferences . Media						NMK, Media houses, NGO's, Development partners
Introduce alternative livelihoods –	Introduce: • ecotourism, • butterfly farming, • herbal gardens. • tree nursery, • agroforestry, • pollination and	Ecotourism, Butterfly farm. Herbal gardens, tree nursery, Pollination and botanic gardens in schools						NMK and Development partners

	botanic garden in schools							
Capacity building:	Training of specific target groups: • Kaya council of elders on governance, • Students importance of cultural and natural values of the Kayas, • Conservation groups on sustainable use and access of products. • Training on Eco- business enterprises	Training manuals, Certificates,						NMK, Kaya elders, Community, development partners
Research:	• Restoration of habitat biodiversity, cultural heritage • Understand the dynamics of pollinators and seed production for posterity, • Harnessing biodiversity for to improve livelihood	Publications, Factsheets, guides						NMK, Universities, Development partners
Rehabilitate degraded mined sites	• Plant trees • Fill the pits • Construct gabions • Sensitization on policy on	Trees planted and mining pits and erosion gullies covered						NMK, Community and Development partners

	rehabilitation of mine sites							
Restoration of biodiversity on landscape/watershed level	• Introduce trees on landscape: • tree nurseries, • trees in farms, trees in schools • vegetable gardens • kitchen gardens • indigenous fruit orchards • *Exsitu* support (releasing butterflies, and seed germination)	Community tree planting on farm and other landscapes, schools and local groups adopting tree planting and increase in other biodiversity on landscape (animals)						NMK, Community, Developing partners
Managed farming of edible animals	Domestication of mini livestock e.g. bees, butterflies, birds, guinea fowls, small mammals, edible insects (caterpillars and grasshoppers, crickets, beetles)	Domesticated edible animals						NMK, community, County, Developing partners
Outreach through Education:	Create thematic platforms for knowledge sharing targeting schools, clubs, youth groups, women groups	School clubs, Youth involvement, women participation, County departments, tertiary Institutions						Schools, Community, NMK, Kilifi County
Creation of information/Visitor Centre	Establishment of biodiversity and cultural park for recreation, mini market outlets for indigenous	Structure in place						NMK and County and developing partners

	items and products, initiate cultural festivals and games							
Nature based entrepreneurship for craft	Creation of indigenous products e.g. bead work, Weaving, basketry, musical instruments, indigenous dolls, reproductions/casting of the Vigango and pottery	Products from enterprises available at Information centers and other tourist locations						Enterprises and business community, Community, County

8 Resource and infrastructure Plan

a) Additional staff at NMK to support Kaya operations and facilitation of a vehicle and motor cycle.
b) Employment of youth to run some of the enterprises (youth), undertake Education programmes and also support business operations.
c) Support Kaya elders and facilitate elders council in the Governance and operations of the Kaya.
d) Engage youths with knowledge on tourism and markets to manage the information/visitors center.
e) Provide Internet facility for use by the community and a hall for training and seminars.

9. Plan Implementation

This Strategic Management Plan will be implemented through institutional arrangements involving development partners and key stakeholder institutions.

10. Financial Management

The model of Kaya Kinondo on financial management on ecotourism and other activities is recommended. Revenue collected will be taken back to the community to finance communal activities. Management will be through a committee as per the community own choice. The sale of products will adapt the Kipepeo model at Gede, where coordination will be conducted from the CFCU office Kilifi.

Appendix 1 Plant species recorded in Kaya Kauma forest edge, main forest and farmland.

No.	Plant name	Family	Vernacular	Life form	IUCN	Indigenous/ Exotic
1	*Asystasia gangetica* T.Anderson	Acanthaceae	Tsalakushe	Herb	0	Indigenous
2	*Anacardium occidentale* L.	Anacardiaceae	Mkorosho	Tree	0	Naturalized
3	*Lannea schweinfurthii* (Engl.) Engl.	Anacardiaceae	Mumbu	Tree	Near threatened	Indigenous
4	*Ozoroa obovata* R.	Anacardiaceae	Mkayukayu	Tree	0	Indigenous
5	*Ozoroa insignis* baker	Anacardiaceae		Tree	0	Indigenous
6	*Mangifera indica* L.	Anacardiaceae		Tree	data deficient	Naturalized
7	*Achyranthes aspera* Baker	Amaranthaceae		Herb	0	Indigenous
8	*Amaranthus dubius* Mart.	Amaranthaceae		Herb	0	Uncertain
9	*Pupalia lappacea* Juss.	Amaranthaceae		Herb	Near threatened	Indigenous
10	*Annona senegalensis* Pers.	Annonaceae		Tree	0	Indigenous
11	*Uvaria acuminata* Oliv.	Annonaceae	Mufumba/Mrori	Climber	Least Concern	Indigenous
12	*Adenium obesum* Roem. & Schult.	Apocynaceae		Shrub	Least Concern	Indigenous

13	*Carissa spinarum* L.	Apocynaceae	Mtandamboo	Shrub	0	Indigenous
14	*Thevetia peruviana* Merr.	Apocynaceae	Mkode	Tree	0	Exotic
15	*Landolphia kirkii* Dyer	Apocynaceae	Mtongaza	Climbing shrub	0	Indigenous
16	*Cussonia zimmermannii* Harms	Araliaceae	Munyala	Tree	Least Concern	Indigenous
17	*Markhamia zanzibarica* (Bojer ex DC.) K.Schum.	Bignoniaceae	Mlaga kuku / Mutawanda	Tree	0	Indigenous
18	*Adansonia digitata* (L.) Kuntze	Bombacaceae	Muyu/Mbuyu	Tree	0	Indigenous
19	*Bombax rhodognaphalon* L	Bombacaceae	Mware	Tree	Least Concern	Indigenous
20	*Bourreria nemoralis* (Gürke) Thulin	Boraginaceae	Mbunduki	Tree	0	Indigenous
21	*Cordia sinensis* Lam.	Boraginaceae		Tree	0	Indigenous
22	*Commiphora edulis* Engl.	Burseraceae	Mugongolo	Tree	0	Indigenous
23	*Capparis cartilaginea* Decaisne	Capparaceae	Mgwada paka	Tree	0	Indigenous
24	*Carica papaya* L.	Caricaceae	Papayu	Tree	data deficient	Exotic

25	*Combretum illairii* Engl.	Combretaceae	Mushinda alume	Shrub	0	Indigenous
26	*Combretum schumannii* Engl.	Combretaceae	Mgurure	Tree	0	Indigenous
27	*Terminalia prunioides* M.A.Lawson	Combretaceae	Mwanga	Tree	0	Indigenous
28	*Commelina benghalensis* L.	Commelinaceae		Herb	Least Concern	Indigenous
29	*Bidens pilosa* L.	Compositae		Herb	0	Exotic
30	*Brachylaena huillensis* O.Hoffm.	Compositae	Muhuhu	Tree	Near threatened	Indigenous
31	*Launaea cornuta* (Hochst. ex Oliv. & Hiern) C.Jeffrey	Compositae		Herb	0	Indigenous
32	*Vernonia homilantha* S.Moore	Compositae	Munyinya	Shrub	0	Indigenous
33	*Cucurbita maxima* (Duchesne) Duchesne ex Poir.	Cucurbitaceae		Climber	0	Exotic
34	*Sansevieria kirkii* Baker	Dracaenaceae		Herb	0	Indigenous
35	*Diospyros cornii* Chiov.	Ebenaceae	Mkulu	Tree	0	Indigenous
36	*Croton macrostachyus*	Euphorbiaceae		Tree	0	Indigenous

	Hochst. ex Delile					
37	*Croton pseudopulchellus* Pax	Euphorbiaceae	Muyama/Muyama wa nyika	Tree	0	Indigenous
38	*Euphorbia nyikae* Pax ex Engl.	Euphorbiaceae	Tsatsa vunga	Tree	Vulnerable	Indigenous
39	*Euphorbia tirucalii* L.	Euphorbiaceae		Tree	Least Concern	Indigenous
40	*Flueggea virosa* (Roxb. ex Willd.)	Euphorbiaceae	Mkwamba	Shrub	0	Indigenous
41	*Manihot esculenta* Crantz	Euphorbiaceae	Manga	Shrub	0	Naturalized
42	*Ricinus communis* L.	Euphorbiaceae		Shrub	0	Uncertain
43	*Garcinia livingstonei* T.Anderson	Guttiferae		Tree	0	Indigenous
44	*Gyrocarpus americanus* (G. jacquinii)	Hernandiaceae	Muhoto	Tree	Vulnerable	Indigenous
45	*Hoslundia opposita* Val.	Lamiaceae	Mutserere	Shrub	0	Indigenous
46	*Ocimum americanum* L.	Lamiaceae		Herb	0	Uncertain
47	*Ocimum gratissimum* L.	Lamiaceae	Kavumbani	Shrub	0	Uncertain

48	*Acacia nilotica* Schumach. & Thonn.	Leguminosae		Tree	Least Concern	Indigenous
49	*Afzelia quanzensis* Welw.	Leguminosae	Mbambakofi	Tree	0	Indigenous
50	*Albizia anthelmintica* (A.Rich.) Brongn.	Leguminosae	Mdzapi/Mporojo	Tree	0	Indigenous
51	*Cajanus cajan* (L.) Millsp.	Leguminosae		Shrub		Exotic
52	*Cassia siamea* Vahl	Leguminosae		Tree	0	Exotic
53	*Cynometra suaheliensis* (Taub.) Bak. f.	Leguminosae	Mfunda Muche	Tree	Vulnerable	Indigenous
54	*Cynometra webberi* Bak.f.	Leguminosae	Mfundo	Tree	Vulnerable	Indigenous
55	*Dichrostachys cinerea* (L.) Wight & Arn.)	Leguminosae		Shrub	0	Indigenous
56	*Indigofera arrecta* Hochst. ex A.Rich.	Leguminosae		Herb	0	Indigenous
57	*Indigofera trita* L.f.	Leguminosae		Herb	Least Concern	Indigenous
58	*Millettia usaramensis* Taub.	Leguminosae	Mhamva	Tree	0	Indigenous
59	*Senna occidentalis* (L.) Link	Leguminosae		Herb	0	Indigenous

60	*Tamarindus indica* L.	Leguminosae	Mkwaju	Tree	Least Concern	Indigenous
61	*Strychnos henningsii* Gilg	Loganiaceae	Mbathe	Tree	0	Indigenous
62	*Strychnos madagascariensis* Poir.	Loganiaceae	Mkisakwa	Tree	0	Indigenous
63	*Lawsonia inermis* L.	Lythraceae		Shrub	0	Indigenous
64	*Abutilon mauritianum* (Jacq.) Medik.	Malvaceae		Shrub	0	Indigenous
65	*Corchorus olitorius* L.	Malvaceae		Herb	0	Uncertain
66	*Thespesia danis* Oliv.	Malvaceae	Mhoe	Tree	0	Indigenous
67	*Azadirachta indica* A.Juss.	Meliaceae	Mkilifi/Mwarobaini	Tree	Least Concern	Naturalized
	Azadirachta indica A.Juss.	Meliaceae	Mzirikita/Mzerecta	Tree	Least Concern	Naturalized
68	*Ficus sycomorus* L.	Moraceae	Mgandi	Tree	0	Indigenous
69	*Moringa oleifera* Lam.	Moringaceae	Mzungi	Tree	0	Exotic
70	*Vanilla roscheri* Rchb.f.	Orchidaceae		Climber	0	Indigenous
71	*Cocos nucifera* L.	Palmae	Mnazi	Tree	0	Naturalized
72	*Zea mays* L.	Poaceae	Matsere	Herb	0	Exotic

73	*Ziziphus mucronata* Willd.	Rhamnaceae	Mguguna	Tree	0	Naturalized
74	*Ziziphus mauritiana* Lam.	Rhamnaceae	Mguguna	Tree	0	Naturalized
75	*Dobera glabra* Juss. ex Poir.	Salvadoraceae		Tree	0	Indigenous
76	*Haplocoelum inoploeum* Radlk.	Sapindaceae	Mkokola	Tree	0	Indigenous
77	*Allophylus rubifolius* Engl.	Sapindaceae	Mvunza jembe	Shrub	0	Indigenous
78	*Majidea zanguebarica* J.Kirk ex Oliv.	Sapindaceae		Tree	0	Indigenous
79	*Manilkara sulcata* (Engl.) Dubard	Sapotaceae	Mtsedzi	Tree	0	Indigenous
80	*Harrisonia abyssinica* Oliv.	Simaroubaceae	Mrerengwa	Shrub	0	Indigenous
81	*Capsicum frutescens* L.	Solanaceae		Herb	Least Concern	Exotic
82	*Solanum campylacanthum* Hochst.	Solanaceae		Shrub	0	Uncertain
83	*Solanum nigrum* L.	Solanaceae		Herb	0	Exotic
84	*Sterculia africana* (Lour.) Fiori	Sterculiaceae	Morya	Tree	Near threatened	Indigenous
85	*Sterculia appendiculata*	Sterculiaceae		Tree	0	Indigenous

	K.Schum. ex Engl.					
86	*Grewia bicolor* Juss	Tiliaceae	Mkone	Shrub	0	Indigenous
87	*Grewia forbesii* Harv. ex Mast.	Tiliaceae	Mbavumbavu	Shrub	0	Indigenous
88	*Grewia plagiophylla* K.Schum.	Tiliaceae	Mkone	Shrub	0	Indigenous
89	*Grewia vaughanii* Exell	Tiliaceae		Tree	0	Indigenous
90	*Premna chrysoclada* (Bojer) Gürke	Verbenaceae	Mvumo	Shrub	0	Indigenous
91	*Lantana camara* L.	Verbenaceae	Mushomoro	Shrub	0	Exotic
92	*Cissus quadrangularis* L.	Vitaceae	Mchengo	Climber	0	Indigenous
93	*Encephalartos hildebrandtii* A. Br. & Bouché	Zamiaceae	Mtsapu	Tree	0	Indigenous

Appendix 2 Plant recorded on the farmlands and their economic Importance

Species	**Conservation status and uses**
Terminalia prunioides	*Food (gum), Fodder, Fuel, Timber Medicine, green manure (Improves soil fertility)*
Albizia anthelmintica	*Roots used as addititive in soups; medicinal, Agroforestry with good intercropping potential; tooth brush for oral hygiene; posts, poles, furniture, curvings, handles*

Flueggea virosa	*Edible fruit, medicinal; Agroforestry (hedge), ornamental, indicator of ground water, dye (bark, leaves and fruits); ash for cleaning milk comtainers, gum for sealing envelopes, leaves as insect repellant, stem for making beds, traps, roof structures and graneries, shelves and split for bascketry; good fuel and makes charcoal, construction.*
Dichrostachys cinerea	*Edible fruits, medicinal, Agroforestry, (Has aggressive weedy character); bark yields strong fibre, debarked roots used for basketry, gum with potential for cosmetics, pharmaceutical and food industry, essential oil from the plant; larvicidal; energy crop, walking sticks, fencing posts, excellent firewood – burns slowly and non-toxic smoke.*
Thespesia danis	*Fruits edible, medicinal, bark used for tying, medicinal, flowers and fruits for dyes, stem for bows, arrows and fire sticks*
Markhamia zanzibarica	*Medicinal, building timber, poles, posts and handles, bedsteads, curving, fuel and charcoal*
Encephalartos hildebrandtii	*Ornamental, trunk and seeds edible, trapping water*
Lannea schweinfurthii	*Edible fruits, medicinal, Agroforestry (live fence), dye from the bark, source of tannin, bark used for making ropes, general purpose timber (*
Grewia similis	*Edible fruit, medicinal, hard wood for building poles, handles, bow, clubs, fuel*
Ziziphus mucronata	*Fruit edible, young leaves vegetables, seeds crushed and used as beverage (Coffee), Medicinal, Agroforestry, seeds used as rosaries, building poles, live fence and fishing equipment, good fuel and charcoal*
Uvaria acuminata	*Edible fruits, medicinal, twigs for building, bee forage, live fence, ornamental*
Adansonia digitata	*Fruit edible, leaves vegetable, fodder, bee forage plant (Apiculture), fuel, fiber, timber, gum, dye, alcohol, oil, medicine, poison for ants and insect repellant, ash for making soap, shell as a dish, vessel, rat traps, fumitory, pulp for hair wash*
Premna chrysoclada	*Fruits Medicinal plants Timbers*

Solanum campylacanthum	*Mostly as a weed of disturbed and overgrazed areas and road sides; fruits are poisonous and used as a traditional medicine for many ailments*
Hoslundia opposite	*Edible fruit, tender leaves used as vegetable, medicinal, agroforestry, hedges and boundary markers, essential oils recommended for perfumery, bee repellant (leaves), fuelwood*
Abutilon mauritianum	*Leaves and flowers edible as vegetables, medicinal, Agroforestry, good for forage bees, dyes, fibre for making ropes, stems as chew sticks, twigs for brooms, bark for baskets*
Lantana camara	*Invasive weed, aromatic leaves for making tea, ripe fruits edible, medicinal, Agroforestry, biocides (Herbicide-water hyacinth), firewood*
Ocimum gratissimum	*Leaves cooked and eaten as potherbs and tea, used for flavouring, medicinal, Agroforestry as a hedge plant, essential oils, insect repellants, chewing sticks*
Azadirachta indica	*Medicinal, food and vegetables, fodder, fuel, timber, gum (resin), dye (tannin), indica oils, toxic effects on fish and wildlife*
Senna occidentalis	*Seeds used as coffee substitute, young leaves and flowersas vegetables, immature seed pods as vegetables, medicinal,*
Achyranthes aspera	*Leaves cooked as vegetables, leaves burnt to make vegetable salt, seeds cooked and eaten with milk (Hunger food), Agroforestry species indicator of soil fertility, ash for cleaning teeth, washing clothes and source of dye*
Afzelia quanzensis	*Leaves cooked and eaten, important timber species (heavy construction, furniture, flloring and curvings), medicinal, Agroforestry, black seeds for necklaces and curio (adornment/ornaments), ornamental, dyestuff and fodder*
Harrisonia abyssinica	*Fruits edible, medicinal, Agroforestry, Timber, fuelwood*
Adenium obesum	*Ornamental, medicinal, Agroforesty (live fence) care taken as poisonous, fuel bur not always*
Commelina benghalensis	*Leaves and rhizomes cooked and eaten, medicinal, dye from flowers*

Commiphora edulis	*subspecies holosericea fruit edible,* medicinal, agroforestry, gum resin, ssp. *boiviniana are used for making fire by friction and fuel*
Vernonia homilantha	
Bourreria nemoralis	
Ficus sycomorus	*Edible fruit, leaves used in soups, wood ash is salt, latex coagulates milk, medicinal, Agroforestry, weaving fibre, dye sources, making mortors and pestle, bee hives, drums, stools, canoes, curvings and construction, firewood (used as a baseblock when making fire) and charcoal*
Cocos nucifera	*Coconut (Exotic) many uses (Crop)*
Anacardium occidentale	
Launaea cornuta	*Leaves used as vegetable, used as bitter flavor to beer, Medicinal, Used as hair wash to kill lice*
Ricinus communis	*Edible oil, oil with diverse uses, used in industry to add butter an nut flavor (used with caution), medicinal, agroforestry as flies and mosquito repellant, fibre for making ropes, cellulose stem for making cardboard paper*
Bidens pilosa	*Leaves are vegetables (raw or cooked), young shoot tips for making tea, medicinal, natural dyes, roots as paint brush*
Manihot esculenta	*Crop*
Ziziphus mauritiana	*Fruit is edible raw or preserved, seeds edible, medicinal, agroforesty (fixation of sand dunes and live fence), tannins from bark and root, dye, construction, furniture, wood has multiple uses*
Amaranthus dubius	*Leaves used as vegetable, seeds cooked whole and also ground to powder, medicinal, dye from the whole plant, ash source of potash.*
Zea	*Crop*
Corchorus olitorius	*Leaves vegetables, tea made from dried leaves, immature fruits as salads, medicinal, fibre from stem, stem used in making suphur matches.*
Moringa oleifera	*Vegetable, medicinal, Agroforestry, fuelwood (many uses).*

Mangifera indica	*Crop (tree)*
Asystasia gangetica	*Leaves eaten as Vegetables mixed with beans, saseme and grounduts, medicinal, agroforestry (intercrop), used as crop substitute.*
Cucurbita maxima	*Pumpkin (Crop) – Vegetable*
Annona senegalensis	*Fruit*
Carica papaya	*Fruit*
Capsicum frutescens	*Vegetable*
Solanum nigrum	*Vegetable*
Tamarindus indica	*Fruit, Food, Timber, Agroforestry*
Ocimum americanum	*Young leaves eaten raw or cooked, flavouring sauces, salads, soups, seeds used for sweets and beverage, medicinal, essential oils, used in soaps and cosmetics*
Indigofera arrecta	*Young leaves cooked and eaten s vegetables, medicinal, agroforestry (Cover crop green manure- suppresses weeds and improves soil fertility), source of blue dye, twigs for cleaning teeth.*
Cajanus cajan	*Crop- pulse*
Pupalia lappacea	*Leaves edible, medicinal, Agroforestry – Regarded as a serious weed (an indicator of soil fertility), fluffy seeds made into ball and used as filter for milk.*
Ozoroa insignis	*Fruits occasionally edible, medicinal, fruits used to scent hair, resin, wood for cabinet works, poles, curvings, firewood and charcoal, Charcoal can be used in making gun powder.*

Appendix 3 Useful plant species identified by elders from the forest during transect walk in Kaya Kauma forest

Local Names	**Scientific names**	**Uses**
Fagio grass/ maondo	*Mariscus dubius*	Broom grass
Kitsapu	*Encepharlatos hildebtrandtii*	Medicinal, fruit is famine food, harvesting rain water, making winnows,

Maondo	Grass	Has hollow for broom, maondo not hollow; Dzengia siji- hollow seeds larger- straw; Maondo- Fagio- Bondo
Makonje tsaka		ropes
Mbambakofi	*Afzelia quanzensis*	Timber, medicinal, making mortar for pounding maize; - Pods used as shoes,Seeds to make necklaces - The size of pod was larger than it is today - It can be used for furniture, First class timber, curving; demand for nurseries
Mbanje Kuro	*Teclea tricocarpa*	Medicinal
Mbathe	*Strychnos henningsii*	Medicinal, building; Sitting place- (shoes removal point)It has glossy leaves; Its medicine for coughs(chew leaves); It's a lot but not outside the kaya; People harvest from the forest; It has seeds that grow easily
Mbavu ng'ombe		Medicinal
Mbavumbavu	*Grewia forbesii*	Fruits edible, medicinal
Mbelenga	*Lecaniodiscus flaxinifolius*	Fruits, medicinal
Mbunduki	*Boureria petioralis*	Firewood
Mchengo		Harvested for ropes because the inner of the rope does not rot easily and outer part for tighting firewood, wine trapping; The leaves are medicine for wound in water and drinknds; the leaves are put on fire slightly and the cuticle tissue put on the wound; Goat diarrhea- squeeze; The seeds are edible; Only found in the large forest; It is overutilized and no support
Mchirangómbe		The tree is harvested for firewood; Good for construction; The leaves are medicines; cures coughs; Found outside the kaya
	Aloe kilifiensis	Medicinal; I- Cultivated; Stem propagated
Mchumbu		medicinal

Mdhahabu/ Muladzo	*Ochna holtziana*	Medicinal
Mdala mwaka		Fruits are edible, yellowish in colour and sweet; Potentially cultivated and sold in malindi; Roots are medicinal
Mfidzo		Medicinal, making stirrer
	Craibia brevicaudata;	It has a straight pole; The roots are medicinal
Mfudzo	*Canthium kilifiensis*	Medicinal, fruits edible
Mfumba/ mrori	*Uvaria acuminata*	Medicinal/ fruits edible; It is common on farms; The roots are medicine for stomach ache, lower abdominal pain; It is mixed with mshinda'alume and mvunza jembe to cure aphrodaisic; The roots when mixed with mfumba forms a stimulant for both men and women
Mfunda Muche (big leaves)	*Cynometra suahelliensis*	Timber, firewood, building
Mfunga tsanzu		Medicinal
Mgongolo		Used with Mlindi start traditional fires/ flames using friction
Mguguna	*Ziziphus mucronata*	Fruits, charcoal burning, building, carving wood
Mgurure	*Combretum schumannii*	Firewood, medicinal, building poles; - Its hardwood; Used for construction, timber, firewood; It is rare, has seeds that are liked by people
Mngunguo		The roots are medicinal; It is a climber; Mixed and boiled with munyama, mjafari, mvunzajembe roots
Mgwada paka	*Caparis catilagii*	Medicinal
Mhamva	*Milletia usamarensis*	Building, medicinal; Not found outside the kaya; It is a straight tree; It is used for construction, furniture; Subsistuted by Azidarachta indica; Does well on clay soil; Nurseruy plant; It has multiple uses in Mavueni and Bamburi beach; Theseeds resemble beans

Mhoe	*Thespesia danis*	Firewood, building, fruits
Mkayukayu	*Ozoroa obovata*	medicinal; It is liked by birds such as weaver birds; Black seeds form during the short rains; It is used for construction and firewood; Seeds easily germinates; It is a common tree and grow anywhere at the coast
Mkokola	*Haplocoelum inoploeum*	Fruits edible; Its hardwood, white stemmed; Good for charcoal burning; The root is medicinal; Latitudes and Longitudes same as that of msasa; It is common; Associated with fungus; The roots are dug up for medicine
Mkone	*Grewia Plagiophyla*	Cultural tree, building, medicinal, burial, komas; - Fruits are edible; It's a folk song tree because it is trusted at the beginning of man interaction with trees; It is easy to germinate; Tree common in forests, - It can be collected by men and women
Mkonga	*Balanites wilsoniana*	Firewood, medicinal
Mkulu	*Diospyros cornii*	Charcoal, firewood, timber; The fruits are edible; Used for timber, furniture, medicine; the bark is burnt and used for scabies, ash can be used as soap; Seeds grow easily; Seed are eaten and are good for nurseries
Mkuro	*Hugonia castaneifolia*	Medicinal – snake bite, tsango (mshipa wa ndani)
Mkwaju Tsaka	*Dalbergia vaccinifolia*	Medicinal
Mkwamba	*Fluggea virosa*	Medicinal, firewood, building
Mlagakuku/ Mhalanda	*Markhamia zanguebarica*	Medicinal, make bows for hunting
Mlindi	*Comiphora pteleifolia*	Leaves medicine for eyes, used for starting traditional fires through friction
Mlishangwe	*Vitallariopsis kirkii*	firewood
Mng'ambo	*Mimosops riparia*	High quality timber, fruits

Mnago	*Manilkara sulcata*	It's hardwood and very large; Not harvested; Seeds impossible but to be tested for germination; The deadwood can be harvested for ceremonies instead and thereminder can taken away
Mngurure		Building, timber
Mnyala		Associated with maungu; Leaves are medicinal ; applied on cuts, crushed with salt and applied; on cuts; Birds like this tree such as gea, puji, kulukulu
Mnyumbu mulume	*Lannea elata*	Building, medicinal
Morya	*Sterculia africana*	Fruits, ropes , medicinal
Mporojo		Boats; The bark is mixed with Chizumulo(aloevera); Bark scrubbed on stone for kinonda
Mryambuzi		Building , Firewood
Msasa		Building, firewood; Used for construction; When mature, the bark peels. This happens every year for regeneration; The tree is not found in homesteads; The seeds are rare to find; It is good for furniture, burns well; Flowers not known.
Mtongazi	*Landolphia kirkii*	fruits
Mtaspu	*Encepharlatos hildebtrandtii*	It is commonly; Ornamental, decoration plant; Its corn is eaten by bush babies and komba; The stem eduxates a watery substance when cut; The seeds are broken and liquits on a stick(mshakiki); Shanga can also be made from seeds; Toys for children such whistling; The midrib is used to make uteo fronts; It grows easily in nurseries
Mtesdzi		Its hardwood; Not commonly seen outside kaya; Germinates easily; Associated with specific maungu
Mubathe mubomu	*Diospyros consolatae*	Building poles, medicinal

Mucherere	*Chazeliala abrupt?*	Medicinal
Muchira ng'ombe	*Combretum hereroense*	Medicinal, building poles
Mudimu tsaka	*Suregada zanzibarensis*	Medicinal, building
Muhoto	*Gyrocarpus americana*	Firewood, medicinal; It's a softwood; Used for construction and roofing; Mainly found on farms, near rivers; It is not good for firewood; The seeds are recalcitrant
Muhuhu	*Brachylaena hulliensis*	Medicinal, carving vigango and koma
Muhumba		Carving vigango, medicinal
Muhumba mutite	*Cassia afrofistula*	Making komas in the absence of Mkone the preferred species
Mulutswa	*Nectaropetalum kaesseneri*	Building poles, medicinal
mumangi	*Polyphaeria parvifolia*	Fruits, building, firewood
Mumasuzi/ Mugome	*Casiporia euroides*	Medicinal
Munyala	*Cussonia zimmermannii*	Medicinal, edible mabungo insects are harvested from this tree
Mushinda alume	*Combretum iliari*	medicinal
Mutsedzi	*Manilkara sulcata*	Fruits, building poles
Mutserere	*Holuslidia oposita*	Making bows, medicinal, firewood, building
Muyama	*Croton pseudopuchellus*	Medicinal ; A lot of the species found at the kaya and a few outside the kaya; Can be cultivated and is commercially done at Majengo,Mombasa; The roots are medicinal; boil and drink; Leaves are medicine for tight ribs, difficulties in breathing, , pneumonia, bathing ; Stem used in flavours for milk, burn stem, smoke put in chirenje; cooking stick; It chases away terminates from the coconut; Used for fencing; It is poisonous
Muyu/ Mbuyu	*Adansonia digitata*	Medicinal, sacred tree, leaves vegetable, fruit is spices
Mvumo	*Premna chrysoclada*	Making arrows, firewood, building poles

Mvunza jembe	*Allophyllus rubifolius*	Medicinal
Mwanga (Mwangani?)		Timber; - Associated with Ganoderma species (as sign of tree about to fall)
Mware	*Bombax rhodognophalon*	Marking kaya gates, graves, timber
Tsalakushe	*Asystacia gangetica*	Vegetables
Mwatsa	*Euphorbia*	Poisonous
Tsatsa vunga	*Euphorbia nyikae*	Medicinal