A Field Guide to Valuable Trees and Shrubs of Kaya Mudzi Muvya Forest in Kilifi County, Kenya

KEFRI

WORLD BANK

GEF

KCDP

A FIELD GUIDE TO VALUABLE TREES AND SHRUBS OF KAYA MUDZI MUVYA FOREST IN KILIFI COUNTY, KENYA

March 2016

Contributors: Francis Gachathi, Musingo T.E. Mbuvi, Linus Wekesa, Chemuku Wekesa and Nereoh Leley

Cover Caption: Rabai Cultural Village

Photographs by: Francis Gachathi and Saidi Chidzinga

Published by:

Kenya Forestry Research Institute,

P.O. Box 20412-00200, Nairobi, Kenya.

Tel: +254-7247259781/2, +254-722-157414, +254-20-2010651/2

Email: director@kefri.org

Website: www.kefri.org

Designed and Printed by: Treeagama

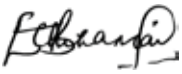
FOREWORD

Kaya Mudzi Muvya is a coastal lowland dry deciduous forest which is protected and gazetted as a national monument under Antiquities and Monuments Act Cap 215 and placed in the World Heritage List by the UNESCO World Heritage Committee in 2008. Trees and other plants within the Kaya and surrounding forests have been an integral part of life of the Rabai community living around Kaya Mudzi Muvya and are an invaluable source of historical and scientific information. The plants form an integral part for social and economic development for the Rabai's cultural identity and practices. A good number of the indigenous trees in Kaya Mudzi Muvya are of cultural significance and the gradual disappearance of such tree species will inevitably lead to cultural erosion.

Indigenous knowledge as embedded in the local experience and historic reality makes it possible for Rabai community to live harmoniously with their environment for generations. Indigenous knowledge guides the community on how to sustainably utilize their natural resources through a variety of innovations. This role of indigenous knowledge in biodiversity conservation and sustainable management is immense. However, due to increasing disregard for traditional values and practices and unsustainable exploitation of natural forest resources, the other Kaya forests surrounding Kaya Mudzi Muvya are faced with threats of extinction. While the loss of plant resources may be irreversible, it can be avoided. Therefore, it is important to integrate management and conservation of natural resources with conventional and traditional practices building on local indigenous knowledge. Any management practices should be introduced and implemented in consultation with the Kaya Elders.

Kenya Forestry Research Institute has recognized Kaya Mudzi Muvya forest for its cultural, biological and economic values. The Institute will partner with Rabai community and relevant local, national and international research and development partners to generate forestry technologies for rehabilitating degraded sites within the Kaya Mudzi Muvya, surrounding Kayas and in farmlands. This strategy aims at complementing nature-based and ecotourism activities initiated by other development agencies for the benefit of the local communities to protect and conserve Kaya Mudzi Muvya forest.

The content of this booklet is based on an ethno-botanical survey that documented trees, shrubs and herbs that are of value to the local communities around Kaya Mudzi Muvya forest. This field guide recommends the rehabilitation of Kaya forests using popular and priority endemic species. The field guide also emphasizes that any interventions in the rehabilitation of the Kayas and farmlands be undertaken in partnership with the local communities to enhance conservation.



Ben E. N. Chikamai (PhD)
Director, Kenya Forestry Research Institute

ACKNOWLEDGEMENT

The authors wish to acknowledge the financial support from the World Bank (WB) and Global Environmental Facility (GEF) through Kenya Coastal Development Project (KCDP). Furthermore, the authors acknowledge the technical support provided by Coast Eco Region Research Programme (CERRP) – Gede in partnership with National Museums of Kenya (NMK) under the Coast Forest Conservation Unit (CFCU). We acknowledge the support given by the Kaya Mudzi Muvya elders and the Rabai community through their willingness to share their knowledge. We are particularly indebted to the local participants: Mohammed Kadilo, Jindwa Ndara, Arnest Chikuro, Chama Jindwa, Mwikandi Hazizi, Fondo Bendago, Lois Gadi, Sidi Tsui, Hadija Mdzomba, Faki Hiha and Mariam Mwanyoka. We also thank Mwalimu Alex of KEFRI-CERRP for invaluable contribution during data collection. Finally, we acknowledge KEFRI staff; Paul Tuwei, Riziki Mwadalu, Dorothy Ochieng, Josephine Wanjiku and Albert Luvanda for their editorial input.

TABLE OF CONTENTS

LIST OF FIGURES

SUMMARY

Kayas are remnant forest patches mainly found on the lowland hills along the Kenyan Coast that are considered sacred by the Mijikenda community. The Kaya forests were revered as sacred as they provided spiritual and environmental protection. The Kayas were managed by enforcement of traditional rules mainly through a system of taboos, curses and other spiritual sanctions. Currently, the Kayas are under threats due to increasing disregard for traditional values and practices and increased demand for forest products. It is further argued that climate change has adverse negative impacts on the plant structure and composition within the Kayas.

The Kenya Forestry Research Institute (KEFRI) through Coast Eco-Region Research Programme conducted an ethno-botanical survey to document flora of value to the local communities in Kaya Mudzi Muvya. Kaya Mudzi Muvya is located in Rabai Location of Kilifi County, an area inhabited by the Rabai sub-group of the Mijikenda community. Work began through a series of community workshops to raise awareness among local leaders and community members for sustainable utilization and management of the forest resources within Kaya Mudzi Muvya. Field work was carried out within the Kaya Mudzi Muvya forest with selected members of the local Rabai community including Kaya Elders. Transect walks using established footpaths were made, stopping for consultation whenever the team members came across a new plant of social, economic and cultural importance to the local community.

The findings revealed that there were a total of 98 species of trees and shrubs that were identified and recorded using scientific and local names. These plants were mainly used for timber, construction materials, firewood, wild fruits and herbal medicine. The study recommends a rehabilitation programme that incorporates the needs of the local community surrounding Kaya Mudzi Muvya forest by integrating traditional and conventional management practices based on the local indigenous knowledge. Seed collection and propagation of valuable and commonly used species is recommended for establishment of tree nurseries to raise seedlings for rehabilitation of degraded sites in the forest as well as on-farm planting. It is also recommended that development of low-impact eco-tourism and training of selected young people as para-taxonomists and tour guides should be encouraged. The study proposes that similar studies be replicated in other Kaya forests.

ABBREVIATION AND ACRYONMS

CEPF	Critical Ecosystem Partnership Fund
CERRP	Coast Eco Region Research Programme
CFCU	Coast Forest Conservation Unit
CMS	Church Missionary Society
FIRAD	French Institute of Research and Development
GEF	Global Environmental Facility
GoK	Government of Kenya
KCDP	Kenya Coastal Development Project
KEFRI	Kenya Forestry Research Institute
NMK	National Museums of Kenya
NWFPs	Non-Wood Forest Products
UNESCO	United Nations Educational, Scientific and Cultural Organization
WB	World Bank

1.0 INTRODUCTION

1.1 Background Information

Kayas are remnant forest patches mainly found on the lowland hills along the Kenyan Coast that are considered sacred by the Mijikenda people. The Kaya forests are sacred abodes of the Mijikenda ancestors. A powerful protective talisman referred to as a "Fingo", which the Mijikenda brought with them following their displacement was buried at a secret spot in the Kaya. In this regard, certain restrictions were placed on access and utilization of forest resources within the Kayas. Oral tradition relates that the community took refuge in these thick forests after dispersal from Singwaya in Northern Kenya where they were attacked by the neighbouring Galla people. In these forests, the Mijikenda built fortified villages for their refuge and protection. As conditions became more secure and their population grew, they moved out from the fortified villages spreading into surrounding lower grounds. They however maintained their abandoned settlements in the forests for use as burial grounds and for traditional ceremonies and sacrifices such as praying for good health, rain, good crop harvest and peace. The forests were revered as sacred because they provided spiritual protection. In the Mijikenda tradition, these forests were held in very high regard and were placed under the custody of the council of Elders (respected members of the community who have gone through various initiation rites).

Kaya elders are responsible for day-to-day administration of the Kayas. Formal legal designation serves to reinforce traditional rules and regulations administered by the Kaya Elders. For example, one of the traditional rules and regulations is ban on cutting of live trees and only allowing collection of dead wood in limited amounts on some sites by women for domestic use. Only wood that could be carried in their arms without use of a rope was collected. Enforcement of traditional rules was mainly through a system of taboos, curses and other spiritual sanctions which had a powerful effect in the rural communities associated with the Kayas. Infringement of rules and regulations of the elders attracts a fine. According to the indigenous belief systems, some tree species were protected by connotations that they would bring bad omen or misunderstanding if used. Grazing was forbidden due to the risk of disturbing ritual objects hidden in the forest. Livestock straying in the Kaya are at risk of capture and slaughter. Wildlife including large snakes are protected as they might represent spiritual beings. There are also rules and regulations protecting spiritual and ritual sanctity of the Kayas. Sorcery or witchcraft is strictly prohibited in the Kaya as it is considered to be destructive and anti-social activity. The same goes for all types of violence and shedding of blood within the Kaya forest. As a direct consequence, the biodiversity of the Kayas and surrounding forests has been sustained and are now almost the only remnants of the once extensive coastal lowland forests. The council of Elders meets once every week to deliberate on any current issues of the Kayas and also on matters relating to daily life of the Rabai community. They settle marital and family disputes, land disputes and spiritual, social and economic affairs thus providing valuable assistance to the government administration.

In the recent past, the Kayas have been under increased threats leading to decrease in size and loss of biodiversity. These threats include: increasing disregard for traditional values and practices; rising demand for land for cultivation and grazing; increased demand for forest products especially fuelwood and construction materials; and mining and sand harvesting. Climate change issues resulting in increased temperatures, erratic rainfall patterns and drought have had an adverse negative impact on plant structure and composition within the Kayas. According to National Museums of Kenya/Coastal Forests Conservation Unit Annual Project report of 2003, more than half of Kenya's rare plants are found in the coast region and many of these are endemic to the Kaya forests. The Kayas also protect many small but important watersheds of the coastal hinterlands. It is against this background that Kenya Forestry Research Institute (KEFRI) through Coast Eco-Region Research Programme conducted an ethno-botanical survey to document tree, shrub and herb resources that are valuable to the local communities within Kaya Mudzi Muvya. Value of the tree species was assessed in terms of timber, construction material, firewood, wild fruits and herbal medicine. The outcome of the survey would be useful in prioritizing tree species for rehabilitating degraded sites in Kaya forests and for tree planting in adjacent farmlands. Planting of trees on farms is aimed at reducing pressure on the natural vegetation of Kaya Mudzi Muvya Forest and contributing towards their preservation. This calls for intervention measures that integrates conventional and traditional management practices in conservation of natural resources. Incorporation of conventional conservation practices requires consultations with the Kaya Elders and the local community at large.

1.2 Forest Resources of Kaya Mudzi Muvya

Kaya Mudzi Muvya is gazetted and demarcated and it is well conserved and protected (Figure 1). The forest depicts a healthy status in terms of species structure, composition and good regeneration potential. The forest is of the coastal lowland dry evergreen type. It is characterized by trees species such as; *Manilkara sansibarensis, Dalbergia spp. Afzelia quanzensis, Albizia harveyi, A. versicolor, Ficus spp. Erythrina abyssinica, E. sacleuxii, Hyphaene coriacea, Cynometra webberi, C. suaheliensis and Brachystegia spiciformis. The common shrubs include; Memecylon spp. Croton pseudopulchellus, Buxus obtusifolia, Toddaliopsis sansibarensis, Uvaria spp* and *Vismia orientalis.*

The climax tree species which had attained dominance in the canopy include: *Brachystegia spiciformis* (Murihi); *Hymenaea verrucosa* (Mongolo); *Afzelia quanzensis* (M'bambakofi); *Julbernardia magnistipulata* (Msaphe) and *Parkia filicoidea* (Mnyenze). These trees are useful for provision of construction material, timber and dhow making. These climax species are legumes; useful as nitrogen fixers to boost soil fertility, and useful for honey bee forage. The species in the surrounding Kaya forests have been largely over-exploited by the local communities. Other highly valued forest trees species being exploited include; *Cussonia zimmermannii* (Mudzala), *Erythrina sacleuxii* (M'burutya) and *Bombax rhodognaphalon* (Mware). These species are useful for making beehives, dhows and drums. *Combretum tenuipetiolatum,* one of the endangered tree species, is endemic to East African Coast (Rabai, Mombasa and Tanzania) and an endangered species, *Bauhinia mombassae* found on the riverbanks of Kombeni River as well as six other vulnerable plant species that have been

recorded at this site (Bentje, 1988, 1994; CEPF, 2003). Some popular cultivated tree species found within Kaya Mudzi Muvya include; *Anacardium occidentale* (Mkanju or Mkorosho), *Cocos nucifera* (Mnazi) and *Mangifera indica* (Mwembe).

Figure 1: A section of Kaya Mudzi Muvya Forest

Kaya Mudzi Muvya has been the focus of a number of conservation initiatives aimed at addressing some livelihood challenges faced by the local people who are involved in various nature-based income generating projects. A conservation project under supervision of the National Museums of Kenya (NMK) with the assistance of the French Institute for Research and Development (FIRAD) has been working with local community to enable them use their heritage to improve their livelihood through; eco-tourism, bee keeping and farm forestry which provide alternatives to the exploitation of the Kaya. The ecotourism and information centre (Figure 2) was opened on 19th December 2009 and a substantial number of beehives have already been set in the forest.

Figure 2: The ecotourism information center at Kaya Mudzi Muvya

2.0 INFORMATION GATHERING TECHNIQUES

2.1 Legal Status and Location of Kaya Mudzi Muvya

Kaya Mudzi Muvya is one of the five Rabai Kayas. It is protected and gazetted as a national monument under Antiquities and Monuments Act Cap 215. In July, 2008, it was placed in the World Heritage List by the UNESCO World Heritage Committee together with Kaya Bomu and Kaya Fimboni. The Kayas form a prominent feature in the landscape of that region, clearly visible on the East of the Mazeras-Kaloleni road as forested ridge-top set above the farmlands. Kaya Mudzi Muvya which covers an area of 1.17 km^2 occurs along the southern and western banks of Kombeni River with Kayas Bomu and Fimboni located on the opposite side covering a total area of 4.09 km^2. Other Kayas within the Rabai community are Mudzimwiru (1.47 km^2) and Mzizima (0.2 km^2). According to Robertson and Luke (1993), Kaya Mudzi Muvya is among the most important Kaya sites in terms of conservation value along with Kaya Bomu, Fimboni and Jibana. Kaya Mudzi Muvya is located along the Rabai Ridge in Rabai Location in Kilifi County (Figure 3).

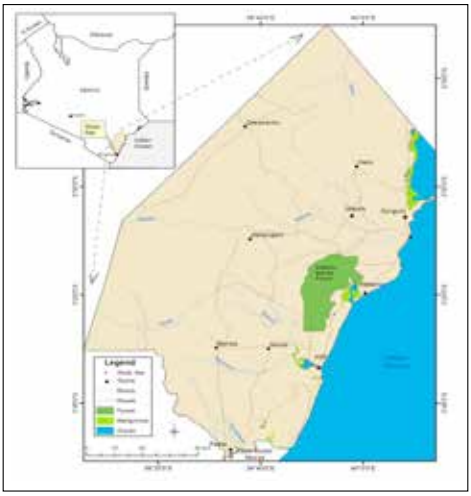


Figure 3: Location of Kaya Mudzi Muvya

Located close to the Kaya Mudzi Muvya forest is the first Christian Mission church established by the Church Missionary Society (CMS) in 1846 by Dr. Ludwig Krapf (Figure 4). Kaya Mudzi Muvya is also located close to the place where a number of freed slaves were settled after the ban of the Indian Ocean slave trade in the mid-19th Century. Rabai is thus a unique site in coastal Kenya where Christianity, Islam and the Mijikenda belief systems co-exist.

Figure 4: Rabai Mission Station in East Africa

2.2 Documentation and Categorization of Forest Resources in Kaya Mudzi Muvya

The ethno-botanical survey first entailed holding a series of orientation workshops with local leaders and community members. The workshops raised awareness in the community for the need of sustainable utilization and management of the forest resources surrounding Kaya Mudzi Muvya. This was followed by identification of forest resources within Kaya Mudzi Muvya with selected members of the Rabai community with good understanding of the forest and Kaya Elders. Transect walks were undertaken following established footpaths in the forest, stopping for discussion whenever the team members came across a new plant of importance to the local community.

3.0 USEFUL TREES AND SHRUBS OF KAYA MUDZI MUVYA FOREST

The survey identified and recorded a total of 98 highly valued species of trees and shrubs using their botanical and local names (Rabai language). The plants were scientifically named by the botanist and the names ascertained using the current botanical literature (Beentje, 1994). The identified species represent 79 genera in 46 plant families. The species were mainly used for timber, construction, firewood, wild fruits and herbal medicines (Appendix 1).

3.1 Dominant Tree Species

Kaya Mudzi Muvya forest had a healthy structure and high tree species diversity. Some of the climax tree species which have attained dominance in the canopy and are valuable to the local community for timber, poles, firewood and wood carving include the following:

Afzelia quanzensis (M'bambakofi)

Description: M'bambakofi is a dominant tree species in the Kaya. It grows to over 12 m. It is easily recognized by its grey-brown bark, flaking in large pieces leaving pale patches below. Its woody pods with shiny black seeds with a soft orange-red cup at their base makes it quite distinct. It has very hard, termite and fire resistant timber.

Uses: Its timber is traded under the name Mahogany bean, is in high demand for door frames and furniture. The wood is used for poles, canoes making and seeds for making necklaces. The leaves are food for butterfly larvae.

Propagation: M'bambakofi is easily propagated through direct seed sowing at the planting site or wildlings. There are 200-500 seeds per kg. Seeds do not require any pre-treatment but the soft orange-red aril should be removed before planting.

Bombax rhodognaphalon (Mware)

Description: Mware, commonly referred as wild kapok stands very distinct in the forest with its very straight yellow-green smooth bole. It can grow to a height of over 30 m. Its woody capsule splits open to set free many seeds in dark red-brown fluffy kapok.

Uses: Its soft timber is used to make carvings, dhows and troughs. Seeds are roasted and eaten while the fluffy kapok is used to stuff pillows and mattresses. Bark and roots have medicinal properties.

Propagation: Mware is propagated by seed or wildlings. There are 15,000- 20,000 seeds per kg.

Borassus aethiopum (Mugumo)

Description: Mugumo is a tall palm that grows to a height of 25 m with a bulge above the middle. Its fan-shaped leaves which can attain 4 m long by 3 m across is, divided into many leaflets.

Uses: Wood is used for firewood. Its leaflets can be used as a portable protection against rain, like an umbrella.

Propagation: Mugumo is propagated through direct sowing of the seed. The seeds are recalcitrant and should be sown directly after they have been removed from the pulp. There are 2-3 seeds per kg. Pre-treatment is not necessary although removal of seed coat by excision breaks dormancy and enhances germination percentage.

Brachystegia spiciformis (Murihi)

Description: This is a deciduous tree that can grow to a height of 25 m with the main stem producing large branches. The leaves are attractive pink-red when young.

Uses: The large branches can be used for firewood while the main trunk is used for timber. The local people also use the stem for building and the bark to make ropes.

Propagation: The species is propagated through direct sowing of the seed at the planting site. There are 2,500-3,000 seeds per kg. Seed germination is improved if the seed coat is nipped.

Cussonia zimmermannii (Mudzala)

Description: Mudzala is recognized by its dark brown, thick and corky bark and its palm-like compound leaves with 5 leaflets crowded at the ends of branches in large rounded clusters.

Uses: Mudzala is used to make traditional beehives and various utensils. Its fruits are edible.

Propagation: The tree is propagated through fresh seed or cutting.

Erythrina sacleuxii (M'burutya)

Description: M'burutya is easily recognized by its brownish thick and corky, deeply fissured bark, often bearing blunt, woody spines. It has red flowers, appearing when the tree is almost leafless and woody curved pods, much constricted between the seeds. Seeds are bright red with a black patch, round and shiny.

Uses: M'burutya tree is well known for making beehives, drums and timber. Bark and leaves have medicinal properties.

Propagation: M'burutya is propagated through seed. There are 6,500-6,800 seeds per kg. Germination may be boosted by nipping.

Hymenaea verrucosa (Mongolo)

Description: This is an evergreen tree that can grow up to 25 m with a clear bole.

Uses: The tree has many uses including construction timber, building poles, firewood, boat building and dug-out canoes. Its timber is traded under the name Mtandarusi or Gum Copal Tree.

Propagation: Mongolo is propagated by seed. To improve germination, seeds are immersed in hot water, allowed to cool and soaked overnight.

Julbernardia magnistipulata (Msaphe)

Description: Msaphe is dominant tree in the forest. It is easily recognized by its grey smooth bark and its compound leaves with large stipules.

Uses: Msaphe is commonly used for construction and firewood. Fibre obtained from its bark is used to make rope.

Propagation: Msaphe is propagated by seed.

Parkia filicoidea (Mnyenze)

Description: Mnyenze is a huge tree that can grow to a height of 30 m. It has smooth bark becoming rough with age. It is easily recognized by its pink flowers on club-shaped heads and long flat pods up to 60 cm long.

Uses: Mnyenze is used for timber and firewood. The seeds and young pods are edible. Bark contain tannin.

Propagation: The tree is propagated through seed, contained in a non-dehiscent pod. To boost germination, seeds are soaked in hot water.

3.2 Wild Fruits

Wild fruits are important non-wood forest products (NWFPs) that can be sustainably exploited. They make supplemental, seasonal and emergency contributions to household food security. Local communities exploit these resources for both subsistence and commercial purposes. Subsistence exploitation which involves collection of fruits for food and nutrition is common in times of food scarcity. Commercial exploitation involves collection for sale in local markets. Wild fruits are popular with women and children. Popular fruits sold in markets include: *Ancylobotrys tayloris* (M'bohoya); *Manilkara sansibarensis* (Mng'ambo); *Sclerocarya birrea* (Mufula); *Strychnos madagascariensis* (Mukwakwa); *Strychnos spinosa* (Mdzaje); *Syzygium cumini* (Muzambaraho); *Tamarindus indica* (Mkwaju) and *Vitex payos* (Mfudu).

Adansonia digitata (Muyu)

Description: Baobab (Muyu) is well known and striking tree of immense girth growing to a height of 25 m. Its large fruits with many seeds embedded in white-pink, dry, edible pulp are very popular.

Uses: Lumps of dry pulp with the seeds embedded within are dyed bright colours and sold as sweets. A refreshing drink is made from the fruit pulp. Seeds are roasted and eaten.

Propagation: Muyu is propagated through seed. There are 1500-2500 seeds per kg.

Ancylobotrys tayloris (M'bohoya)

Description: M'bohoya is a woody climber, with milky latex that can reach over 20 m in length. The fruits are round, 3-5 cm across, yellow to orange when ripe.

Uses: The fruits are sweet and very popular, also sold in markets.

Propagation: M'bohoya is propagated through seed. It requires support.

Annona senegalensis (M'bokwe)

Description: M'bokwe is a spreading shrub growing to a height of 5 m. It bears rounded fruits 2-7 cm across which turns orange-yellow with the smell of ripe pineapple.

Uses: These fruits are popular and are sold in local markets during the season.

Propagation: M'bokwe is propagated through seed, wildlings or root suckers. There are about 2,500-3,000 seeds per kg.

Grewia forbersii (Mubavu)

Description: Mubavu is a scandent shrub with rounded warty fruits about 1-1.5 cm across, ripening brownish yellow.

Uses: The fruits are popular particularly with women and children.

Propagation: Mubavu is propagated through seed.

Grewia similis (Mbugu)

Description: Mbugu is a struggling shrub, closely related to Mubavu, often climbing on other plants with 2-4-lobed fruits, ripening to orange-red.

Uses: The fruits are popular particularly with women and children. Its termite resistant stems are used for hut construction.

Propagation: Mbugu is propagated through seed.

Manilkara sansibarensis (Mng'ambo)

Description: Mng'ambo is well known and valued evergreen tree. The fruits are tough, oval or round, about 1.3 cm across, containing 1-4 flat shiny seeds. Ripe fruits have a milky sweet pulp which is eaten, the seed being discarded.

Uses: They are very popular and are known for its fruits, timber and firewood.

Propagation: Mng'ambo is easily propagated through cuttings or seed.

Sclerocarya birrea (Mufula)

Description: Mufula is a deciduous tree that can attain a height of 15 m or more. It bears rounded and fleshy fruits to about 3.5 cm across which tastes more or less like a mango and can make a refreshing drink. It contains a hard edible stone.

Uses: The tree has many other uses including general purpose timber, firewood and construction poles.

Propagation: Mufula is propagated through seed or large cuttings. It grows best on loamy sandy soils. There are about 400-450 seeds per kg, each with 2-3 seeds inside.

Strychnos madagascariensis (Mukwakwa)

Description: Mukwakwa is a small tree growing to 6 m high with pale grey bark. It bears large round fruits, resembling an orange, to 8 cm across with a hard rind, green but later turning orange-yellow on ripening. Fruits are popular and are sold in local markets.

Uses: The pulp can be dissolved in water and made into juice.

Propagation: Mukwakwa is propagated through seed which germinate easily. To boost germination, seeds are immersed in hot water. It does well on sandy or rocky soils.

Strychnos spinosa (Mdzaje)

Description: Mdzaje is closely related to Mukwakwa but its branches may be armed with short slightly curved spines. Fruits are also much larger and can be more than 12 cm across. Like Mukwakwa, Mdzaje is popular and also sold in local markets.

Uses: The tree is used for medicinal purposes (all parts of the tree). Its sweet-sour pulp is edible. The wood is used for furniture making.

Propagation: Mdzaje is propagated through seed. It is recommended to immerse seeds in hot water. There are about 1,800 seeds per kg. It does well on sandy or rocky soils.

Syzygium cumini (Muzambaraho)

Description: Muzambaraho commonly referred to as Jambolan or Java plum is not indigenous but from Tropical Asia. It has been naturalized in East Africa.

Uses: Muzambaraho is well known ornamental tree planted in towns and around homesteads also as shade tree. Its purplish sweet fruits are very popular and are sold in markets when in season. The tree is also used for timber, furniture, construction poles and firewood.

Propagation: Propagation is through direct sowing of fresh seeds at the planting site. There are about 500 seeds per kg. It grows best in areas with high water table and riverine systems.

Tamarindus indica (Mkwaju)

Description: Mkwaju, (Tamarind) can be a huge tree growing to over 25 m height with dense crown. The fruits are pale brown and sausage-like, cracking when mature to show the sticky brown pulp with brownish seeds.

Uses: Tamarind is well known for its juice, souring porridge and seasoning and for its durable timber and high quality firewood. It is quite common around Kaya Mudzi Muvya.

Propagation: Mkwaju is propagated through seed. There are 350-1000 seeds per kg. For better germination, seeds are soaked in cold water for about 12 hours. It prefers well-drained, deep alluvial soils. It is best in areas with high water table and riverine systems.

Uvaria lucida (Mdzala)

Description: Mdzala is a woody climber bearing ellipsoid monocarpus fruits 1-3 cm long.

Uses: Fruits are very popular particularly with women and children.

Propagation: Mdzala is propagated through seed, cuttings and wildlings.

Vitex payos (Mfudu)

Description: Mfudu is a deciduous small tree producing round to ellipsoid fruits, about 2.5 cm which turns black when ripe with soft skin. The fruits are sweet and are very popular, often sold in local markets. Seeds are enclosed in a stone, each containing 1-4 seeds.

Uses: The wood is used for firewood.

Propagation: Mfudu is propagated through seed, root suckers or wildlings.

Ziziphus mucronata (M'chakaya)

Description: M'chakaya commonly called buffalo thorn is a thorny shrub or small tree growing to about 7 m high. Fruits appear in bunches, rounded and up to 2 cm across, glossy dark-red when ripe with cream dry pulp surrounding a large stone.

Uses: The tree has many uses including; firewood, fodder, edible fruits, live fence, ornamental, bee forage and of high medicinal value.

Propagation: M'chakaya is propagated through seed. Germination is improved by soaking seeds in cold water for 6 hours.

3.3 Herbal Medicine

Medicinal plants are used to prepare herbal medicines for treating both human and livestock diseases. They included trees, shrubs, climbers and herbs. Commonly used medicinal plants include the following:

Abrus precatorius (Mumeto)

Description: Mumeto also referred to as Muluchiluchi by traditional healers is a climber, producing bright red and black seeds. It prefers rocky sites.

Uses: Leaves and roots are used in herbal medicines.

Propagation: Mumeto is propagated through seed.

Acacia nilotica (Mgundi)

Description: Mgundi is a thorn tree with flat or umbrella-shaped crown, yellow flowers and indehiscent cylindrical pods, constricted between the seeds.

Uses: Its bark and roots are used for medicine. The species also produce poles for hut construction.

Propagation: Mgundi is propagated through seed by direct sowing at the planting site. To promote germination, seeds are soaked in cold water overnight.

Acalypha fruticosa (Murusa-pungu)

Description: Murusa-pungu is a much-branched shrub usually about 2 m high with yellowish gland-dotted leaves which have resinous smell when crushed. Fruit is a 3-lobed capsule, 2 by 3 mm.

Uses: Murusa-pungu is used to treat fevers and colds, convulsions, stomach problems, snakebites, liver problems, toothache and conjunctivitis.

Propagation: Murusa-pungu is propagated through seed.

Azadirachta indica (Muzengereta)

Description: Muzengereta, Neem or Mwarobaini tree is popular throughout the coastal region. Though not indigenous, Muzengereta has been naturalized along the East African coast for many years mainly on account of its medicinal use.

Uses: Leaves and bark are used to treat various diseases.

Propagation: Neem is propagated through seed. Seeds should be sown while fresh. There are 4000-6000 seeds per kilo.

Cissus aphyllantha (Mwajere)

Description: Mwajere is a deciduous climber with swollen roots. It prefers rocky sites.

Uses: The roots are used to treat various conditions.

Propagation: Mwajere is propagated by cuttings.

Croton pseudopulchellus (Muyama)

Description: Muyama is a shrub or small tree 1-6 m high with dull green leaves on the upper surface and silvery on the underside dotted with brown.

Uses: Roots and leaves are used to treat various diseases. It is also used for construction and firewood.

Propagation: Muyama is propagated through seed.

Deinbollia borbonica (Mdala-mwaka)

Description: Mdala-mwaka is a shrub or occasionally a small tree with a crown of compound leaves at its top. It has yellowish round fruits.

Uses: Mdala-mwaka is a useful medicinal plant often occurring along the river-bed.

Propagation: Mdala-mwaka is propagated through seed.

Euphorbia candelabrum (Mwatsa)

Description: Mwatsa is a familiar tree with a characteristic crown of massive ascending branches and with all parts producing copious very sticky white latex.

Uses: The latex has various medicinal uses although it is very toxic and may cause blindness when it comes into contact with eyes. It is used to treat coughs, tuberculosis, malaria and stomach problems among other medicinal uses.

Propagation: Mwatsa is easily propagated by cuttings.

Flueggea virosa (Mukwamba)

Description: Mukwamba is a much-branched shrub growing to 3 m high with erect or arching branches, lower branches often with thorny end. It has white, somewhat fleshy 3-lobed fruits containing 6 seeds.

Uses: The roots are used for medicinal purposes. It is also used for firewood.

Propagation: Mukwamba is propagated through seed.

Harrisonia abyssinica (Mvada-paka)

Description: Mvada-paka is a spiny shrub or tree 2-6 m high with straight or curved paired spines on the branches and compound leaves with a winged rachis and with 7-15 leaflets. It has red, globose or lobed fruits, 8-11 mm across.

Uses: This is among the highly valued medicinal plants.

Propagation: Mvada-paka is easily propagated by seed.

Lannea schweinfurthii (Mumbu)

Description: Mumbu is a deciduous shrub or tree growing to 7 m or more with compound leaves crowded on short branches. It has pinkish to red-brown oval fruits 1-2 cm long.

Uses: The bark has various medicinal uses.

Propagation: Mumbu is propagated through seed.

Maytenus buchananii (Muryasa)

Description: Muryasa is a spiny shrub or tree growing to about 6 m high with grey brown rough bark. It has a bi-lobed greenish red round fruit to 6 mm across, containing 1-2 reddish seeds covered by a soft white aril.

Uses: Roots of Muryasa are put to many medicinal uses and its good bee forage.

Propagation: Muryasa is propagated through seed.

Mkilua fragrans (Murua)

Description: Murua is a much branched shrub or tree growing to 8 m high. It is highly valued because of its yellow-orange flowers which have a very strong fragrance.

Uses: Murua is used in perfumary and is popular with ladies who mix with coconut oil and apply on their bodies, clothing as well as on bed.

Propagation: Murua is propagated by seed.

Synadenium pereskiifolium (Mutudi)

Description: Mutudi is a succulent shrub or tree 2-5 m tall with milky latex in all parts.

Uses: Its latex is poisonous but leaves are used to treat a number of human conditions.

Propagation: Mutudi is easily propagated from stem cuttings requiring little or no attention.

Terminalia brownii (Muguoguo)

Description: Muguoguo is a tree growing up to 12 m high with somewhat layered foliage and winged red to purple fruit. The bark is used to treat various diseases.

Uses: The tree is also used for construction, firewood and to make tool handles.

Propagation: Muguoguo is propagated through seed.

Vernonia hildebrandtii (Dzumbu)

Description: Dzumbu is a much spreading trailing shrub with somewhat sandpapery leaves which are aromatic when crushed. Dzumbu has cream flowers in heads.

Uses: Dzumbu is very popular as medicine for stomach problems. It is often planted near homesteads.

Propagation: Dzumbu is propagated by seed and stem cutting.

Ximenia americana var. caffra (Mtundukulwa)

Description: Mtundukulwa is a scrambling spiny shrub or small tree about 4 m high.

Uses: Mtundukulwa is well known for its fruits but roots are useful as medicine.

Propagation: Mtundukulwa is propagated through seed. There are about 1,400 seeds per kg. Planting of fresh seeds is recommended because they are recalcitrant.

Zanthoxylum chalybeum (Murungu)

Description: Murungu is easily recognized by its stem with large, conical, woody knobs with sharp prickles at the tip and its compound leaves which have strong lemon smell if crushed.

Uses: Murungu is well-known medicinal plant.

Propagation: Murungu is propagated through seed.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusion

Kaya Mudzi Muvya forest is relatively well conserved and protected and the forest is healthy in the structure, species diversity and regeneration. The Kaya is an asset for economic and social development and forms an integral part of the Rabai's cultural identity and practices.

Several tree species have attained dominance in the forest and are useful to the local people mainly for provision of timber and construction material. The dominant species include; *Brachystegia spiciformis* (Murihi), *Hymenaea verrucosa* (Mongolo), *Afzelia quanzensis* (M'bambakofi), *Julbernardia magnistipulata* (Msaphe) and *Parkia filicoidea* (Mnyenze). Trees within Kaya Mudzi Muvya are also important for provision of fruits, herbal medicine and socio-cultural values. Popularly cultivated trees found within Kaya Mudzi Muvya include *Anacardium occidentale* (Mkanju or Mkorosho), *Cocos nucifera* (Mnazi) and *Mangifera indica* (Mwembe).

4.2 Recommendations

- Any conservation intervention initiative for the Kaya Mudzi Muvya forest requires adequate consultation with the local community. Conservation of Kaya Mudzi Muvya should integrate conventional and traditional management practices building on the local indigenous knowledge.
- Local communities around Kaya Mudzi Muvya are endowed with indigenous knowledge which needs to be incorporated in decision making at all stages of community-based conservation projects formulation and execution. The process should involve all stakeholders including development partners and policy makers.
- Kaya Mudzi Muvya is faced with threats arising from unsustainable exploitation of its forest resources that require rehabilitation using appropriate tree species.
- Seeds of target species should be collected and used to raise seedlings for rehabilitating the degraded sites of Kaya Mudzi Muvya as well as planting in the farmlands neighbouring the forest.
- Sacred tree species such as *Brackenridgea zanguebarica* (M'tsonga-mahana) should be included in the rehabilitation plan of heavily degraded sites of the forest.
- Rehabilitation process of Kaya Mudzi Muvya and the other surrounding kaya forests could be guided by research using experiences from successful rehabilitation programmes.
- With an eco-tourism and information centre already in place, it is important to consider training some local tour guides and para-taxonomists. The trainings should be based on the findings of the ethno-botanical field guide or handbooks, which would provide a common platform for communication between tourists, technical personnel or experts and the local communities. Such field guides remain a valuable tool to a greater insight of the local community's role in management and sustainable use of forest resources and eco-tourism development. It recognizes and builds on efforts, which the Rabai community has put in conservation and protection of their sacred forests and traditional indigenous knowledge.
- The Kaya elders are encouraged to enter into partnership with reputable tour companies in low impact eco-tourism development for maximum benefits to the community.
- This ethno-botanical survey which provide useful information on biodiversity could be replicated in other Kaya forests with eco-tourism potential, involving the youth to produce field guide or handbooks for the Kaya forests while enhancing their capacity as para-taxonomists and/or tour guides.

BIBLIOGRAPHY

Beentje, H. J. (1988). Atlas of the Rare Trees of Kenya. Utafiti, 1 (3); 71-123. National Museums of Kenya. Nairobi.

Beentje, H. J. (1994). Kenya Trees Shrubs and Lianas. National Museums of Kenya, Nairobi.

Critical Ecosystem Partnership Fund (2003). Annual Report 2003.

GoK (2005). Forests Act no 7 of 2005. KFS, Karura, Nairobi.

National Museums of Kenya/Coastal Forests Conservation Unit, (2003). Annual Project Progress Report, 2003. Nairobi Kenya.

Nyamweru, C., Kibet, S., Pakia, M. and Cooke, J. (2002). The Kaya forests of coastal Kenya: 'remnant patches' or dynamic entities? In: African Sacred Groves: Ecological Dynamics and Social Change.

Robertson, S. A and Luke, W. R. Q. (1993). Kenya Coastal Forests. World Wide Fund for Nature. Nairobi.

Appendix 1: Common Plants from Kaya Mudzi Muvya

NAME		HABIT	FAMILY	USE/VALUE										
BOTANICAL	LOCAL			B	R	BA	GR	D	BH	TB	Fi	T	M	F
Abrus precatorius L. ssp africana	Mumeto, Muluchiluchi	Climber	Papilionaceae										X	
Acacia mellifera	Chikwata	Tree	Mimosaceae	X									X	
Acacia nilotica	Mgundi	Tree	Mimosaceae				X						X	
Acacia robusta	Msaro	Tree	Mimosaceae										X	
Acacia zanzibarica	Mpiga-kululu	Tree	Mimosaceae	X							X			
Acalypha fruticosa	Murusa-pungu	Shrub	Euphorbiaceae										X	
Adansonia digitata	Muyu	Tree	Bombacaceae										X	X
Afzelia quanzensis	M'bambakofi	Tree	Caesalpiniaceae	X								X		
Albizia anthelmintica	M'porojo	Tree	Mimosaceae	X							X			
Albizia spp.	M'tsani	Tree	Mimosaceae	X								X		
Anacardium occidentale	M'kanju	Tree	Anacardiaceae								X	X		X
Ancylobotrys tayloris	M'bohoya	Climber	Apocynaceae											X
Annona senegalensis	M'bokwe	Shrub	Annonaceae	X									X	X
Azadirachta indica	Muzengereta	Tree	Meliaceae									X	X	

Key:

B-Building; R-Rope; BA-Bark; GR-Gums and Resins; D-Dhows; BH-Bee hive; TB-Tooth Brush; Fi-Firewood; T-Timber; M-Medicine and F-Food: fruits, tubers, nuts;

NAME		HABIT	FAMILY	USE/VALUE										
BOTANICAL	LOCAL			B	R	BA	GR	D	BH	TB	Fi	T	M	F
Bombax rhodognaphalon	Mware	Tree	Bombacaceae					X				X	X	X
Borassus aethiopica	Mugumo	Palm	Palmae								X			
Brachystegia spiciformis	Murihi	Tree	Caesalpiniaceae	X	X						X	X		
Brackenridgea zanguebarica	M'tsonga-mahana	Shrub	Ochnaceae											
Bridelia cathartica	Mutsere	Shrub	Euphorbiaceae								X		X	X
Capparis sepiaria	M'popolio	Shrub	Capparaceae								X		X	X
Cissampelos pareira	Chisikiropaka	Climber	Menispermaceae										X	
Cissus aphyllantha	Mwajere	Climber	Vitaceae										X	
Cissus rotundifolia	M'bugu	Climber	Vitaceae		X									
Cocos nucifera	Mnazi	Tree	Palmae	X		X					X			X
Combretum spp.	Mumbare	Climber	Combretaceae										X	
Combretum spp.	Munyanyani	Tree	Combretaceae	X							X			
Commiphora spp.	Mgongolo	Shrub	Burseraceae										X	
Commiphora spp.	Muswiswi	Shrub	Burseraceae	X										
Croton pseudopulchellus	Muyama	Shrub	Euphorbiaceae								X		X	
Cussonia zimmermannii	Mudzala	Tree	Araliaceae						X		X			X
Cynometra webberi	Mnyanyani	Tree	Caesalpiniaceae	X							X	X		
Dalbergia melanoxylon	Muphingo	Shrub	Papilionaceae								X	X	X	

Key:

B-Building; R-Rope; BA-Bark; GR-Gums and Resins; D-Dhows; BH-Bee hive; TB-Tooth Brush; Fi-Firewood; T-Timber; M-Medicine and F-Food: fruits, tubers, nuts;

NAME		HABIT	FAMILY	USE/VALUE										
BOTANICAL	LOCAL			B	R	BA	GR	D	BH	TB	Fi	T	M	F
Deinbollia borbonica	Mdala-mwaka	Shrub	Sapindaceae								X		X	
Dichrostachys cinerea	Muchira-wa-ng'ombe	shrub	Mimosaceae								X		X	
Diospyros squarrosa	Mupweke	Shrub	Ebenaceae	X							X			
Dovyalis spp.	Msindano	Shrub	Flacourtiaceae								X			
Encephalartos hildebrandtii	Mutsikitsi	Cycad	Cycadaceae			X								X
Erythrina sacleuxii	M'burutya	Tree	Papilionaceae						X			X	X	
Euphorbia candelabrum	Mwatsa	Tree	Euphorbiaceae										X	
Ficus bussei	Mugadi	Tree	Moraceae					X				X	X	
Ficus spp.	Mriro	Tree	Moraceae								X			
Ficus spp.	Mukuyu	Tree	Moraceae								X	X	X	
Ficus spp.	Mutudo	Tree	Moracea								X	X		
Flueggea virosa	Mukwamba	Shrub	Euphorbiaceae								X		X	
Garcinia livingstonei	Mufidzo	Tree	Guttiferae								X			
Grewia forbesii	Mubavu	Climber	Tiliaceae								X			X
Grewia plagiophylla	Mkone	Shrub	Tiliaceae	X							X			
Grewia similis	Mbugu	Shrub	Tiliaceae	X										X
Gyrocarpus americanus	Muphopho	Tree	Hernandiaceae					X			X			

Key:

B-Building; R-Rope; BA-Bark; GR-Gums and Resins; D-Dhows; BH-Bee hive; TB-Tooth Brush; Fi-Firewood; T-Timber; M-Medicine and F-Food: fruits, tubers, nuts;

NAME		HABIT	FAMILY	USE/VALUE										
BOTANICAL	LOCAL			B	R	BA	GR	D	BH	TB	Fi	T	M	F
Harrisonia abyssinica	Mvada-paka	Shrub	Simaroubaceae								X		X	
Hymenaea verrucosa	Mongolo	Tree	Caesalpiniaceae	X							X	X		
Hyphaene coriacea	Mlala	Shrub	Palmae		X	X								
Julbernardia magnistip-ulata	Muzaphe	Tree	Caesalpiniaceae	X	X									
Lannea schweinfurthii	Mumbu	Tree	Anacardiaceae								X	X	X	
Lantana camara	Mushomoro	Shrub	Verbenaceae								X		X	X
Lonchocarpus bussei	Mtsani	Tree	Papilionaceae								X	X		
Manilkara sansibarensis	Mngambo	Tree	Sapotaceae	X								X		X
Markhamia zanzibarica	Mpalawada	Tree	Bignoniaceae	X							X			
Maytenus buchananii	Muryasa	Shrub	Celastraceae								X		X	
Maytenus mossambicensis	Mdungatundu	Shrub	Celastraceae								X		X	
Milicia excelsa	Muvure	Tree	Moraceae								X	X		
Mkilua fragrans	Murua	Shrub	Annonaceae				X				X			
Opuntia vulgaris	Tola	Shrub	Cactaceae								X			
Ormocarpum kirkii	Chitadzi	Shrub	Papilionaceae								X		X	
Ozoroa insignis	Mdagombe	Shrub	Anacardiaceae								X	X		X
Pandanus kirkii	Mkadi	Shrub	Pandanaceae			X							X	
Parkia filicoidea	Mnyenze	Tree	Mimosaceae								X	X		X

Key:

B-Building; R-Rope; BA-Bark; GR-Gums and Resins; D-Dhows; BH-Bee hive; TB-Tooth Brush; Fi-Firewood; T-Timber; M-Medicine and F-Food: fruits, tubers, nuts;

NAME		HABIT	FAMILY	USE/VALUE										
BOTANICAL	LOCAL			B	R	BA	GR	D	BH	TB	Fi	T	M	F
Piliostigma thonningii	Mutseketse	Shrub	Caesalpiniaceae	X							X			
Plectranthus spp.	Bandongo	Shrub	Labiatae										X	
Premna chrysoclada	Muvumo	Shrub	Verbenaceae								X		X	
Psydrax spp.	M'patsa	Climber	Rubiaceae								X			X
Salvadora persica	Mswaki	Shrub	Salvadoraceae							X	X			
Sansevieria spp.	Makonjemwitu	Shrub	Agavaceae		X									
Sclerocarya birrea	Mufula	Tree	Anacardiaceae								X	X		X
Spirostachys venenifera	Mutsotamatso	Tree	Euphorbiaceae	X										
Sterculia africana	Morya	Shrub	Sterculiaceae		X									X
Sterculia appendiculata	Mfune	Tree	Sterculiaceae	X				X				X		
Strychnos madagascariensis	Mukwakwa	Shrub	Loganiaceae	X							X,			X
Strychnos spinosa	Mdzaje	Shrub	Loganiaceae	X							X			X
Suregada zanzibariensis	Mkapu-wa-tsakani	Shrub	Euphorbiiaceae	X							X		X	
Synadenium pereskiifolium	Mutudi	Shrub	Euphorbiaceae										X	
Syzygium cumini	Muzambaraho	Tree	Myrtaceae								X	X		X
Tabernaemontana elegans	Munengeri	Tree	Apocynaceae								X			
Tamarindus indica	Mkwaju	Tree	Caesalpiniaceae	X								X		X

Key:

B-Building; R-Rope; BA-Bark; GR-Gums and Resins; D-Dhows; BH-Bee hive; TB-Tooth Brush; Fi-Firewood; T-Timber; M-Medicine and F-Food: fruits, tubers, nuts;

NAME		HABIT	FAMILY	USE/VALUE										
BOTANICAL	LOCAL			B	R	BA	GR	D	BH	TB	Fi	T	M	F
Terminalia brownii	Muguoguo	Tree	Combretaceae										X	
Thespesia danis	Muhohe	Shrub	Malvaceae								X		X	X
Tinnea aethiopica	Mwarika	Shrub	Labiatae								X			
Trichilia emetica	Munua-madzi	Tree	Meliaceae	X								X	X	
Uvaria lucida	Mdzala	Climber	Annonaceae											X
Vernonia hildebrandtii	Dzumbu	Shrub	Compositae										X	
Vernonia homilantha	Mlalapili	Shrub	Compositae										X	
Vitex mombassae	Mfudu-madzi	Shrub	Verbenaceae								X			
Vitex payos	Mfudu	Shrub	Verbenaceae								X			X
Ximenia americana var. caffra	Mtundukulwa	Shrub	Olacaceae										X	
Zanthoxylum chalybeum	Murungu	Tree	Rutaceae	X							X		X	
Ziziphus mucronata	M'chakaya	Shrub	Rhamnaceae	X										X

Key:

B-Building; R-Rope; BA-Bark; GR-Gums and Resins; D-Dhows; BH-Bee hive; TB-Tooth Brush; Fi-Firewood; T-Timber; M-Medicine and F-Food: fruits, tubers, nuts;

NOTES

KENYA FORESTRY RESEARCH INSTITUTE (KEFRI)
Head Office Muguga, off Nairobi Nakuru Highway
P.O. Box 20412 - 00200 NAIROBI | Tel: +254 722 157 414, +254 724 259 781/2,
Email: director@kefri.org Website: www.kefri.org

KEFRI is ISO 14001:2004 Environmental Management Systems Certified