



Enhancing Tree Conservation and Forest Restoration in Africa

Report of the regional workshop held in Entebbe, Uganda

30th July—1st August 2013



BGCI mission -

'To mobilise botanic gardens and engage partners in securing plant diversity for the well-being of people and planet'.

BGCI represents over 600 members in 118 countries. BGCI aims to support and empower our members and the wider conservation community so that the knowledge and expertise of botanic gardens can be applied to reversing the threat of extinction facing one third of all plants.'

'Brackenhurst Botanic Garden is proud to join forces with BGCI in creating a model forest restoration project. Our partnership is demonstrating that tropical montane forests can recover fast and bring ecosystem services that benefit communities at both local and regional levels'

- Mark Nicholson, Founder and Director of Brackenhurst Botanic Garden



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Enhancing tree conservation and forest restoration in Africa



The degradation and loss of forests across Africa is a major problem impacting on ecological stability and livelihoods. Tackling this problem requires a combination of approaches including improved management of production forests, strengthening protected areas and restoring native forests using indigenous species. Botanic gardens in Africa have an important role to play. BGCI is developing and promoting the work of African botanic gardens in tree conservation and forest restoration through a 3 year project *Enhancing tree conservation and forest restoration in Africa* supported by the Ashden Trust. This report summarises the discussions and results of a regional information exchange and planning workshop held in Entebbe, Uganda, from 30th July – 1st August 2013 for the project.

The workshop brought together 32 representatives from botanic gardens, international organisations, NGOs, national tree seed centres, national forestry services, universities and private companies, with a focus on Uganda, Kenya and Tanzania. The workshop provided an opportunity to exchange information about indigenous species, share knowledge, explore solutions to common challenges and outline next steps for increasing forest restoration focused on indigenous species in East Africa and new partnerships for action.

The workshop included a site visit to Entebbe Botanic Garden and the Uganda National Field Gene Bank, providing a demonstration of many of the conservation techniques and species discussed over the three days. The workshop highlighted a large amount of existing knowledge about the uses of indigenous species and the presence of small scale cultivation programmes for these species. As a result of the existing knowledge of workshop participants, suitable species for restoration projects, focusing on fast growing, ‘useful’ and/or restricted range species were identified. Inclusion in such projects will support their conservation.

Key outputs of the workshop are an outline action plan for scaling up forest restoration through new partnerships, with a list of priority sites for restoration in East Africa and a list of priority tree species for inclusion in restoration projects.

BGCI is keen to hear from additional organisations interested in being involved in or supporting this project. If you would like any further information about the project, the workshop or the information contained in this report, please contact kirsty.shaw@bgci.org



Introduction to the BGCI project: *Enhancing Tree Conservation and Forest Restoration in Africa*

In October 2012 Botanic Gardens Conservation International (BGCI) launched a project to support the conservation of native and endangered tree species and enable effective forest restoration across Africa. The three year BGCI project, funded by The Ashden Trust, is supporting practical tree conservation and forest restoration activities of botanic gardens in East Africa, promoting the use of indigenous species in forest restoration across Africa and gathering information on existing cultivation knowledge and *ex situ* living collections of indigenous tree species across Africa. This project will act as a catalyst to yield further funding, support and sharing of information to encourage informed forest restoration focused on native species, across Africa.

Why this project? Despite an increase in Sustainable Forest Management and an increase in tree planting, overall forest cover in Africa continues to decline, particularly primary forest. The latest Forest Resources Assessment (FRA) reports that of the approximately 675 million hectares of forest cover in Africa, 3.4 million hectares are being lost annually. The main causes are logging, clearance for agriculture and wood fuel collection (FAO, 2010).



A lot of current tree planting in Africa uses non-native species with limited benefits: In East Africa, *Eucalyptus* is the most commonly planted genus, followed by *Cupressus* and *Pinus*.

Degraded forest landscapes are becoming a common feature across Africa and hence there is a huge and growing need for forest restoration. A combination of targets and aims of Conventions can be met if restoration is carried out in an informed way. Benefits to biodiversity and local communities can be secured and economic opportunities can be created. Successful forest restoration can also mitigate climate change and secure environmental benefits. In

order to realise the maximum benefits, forest restoration must be done using appropriate species.

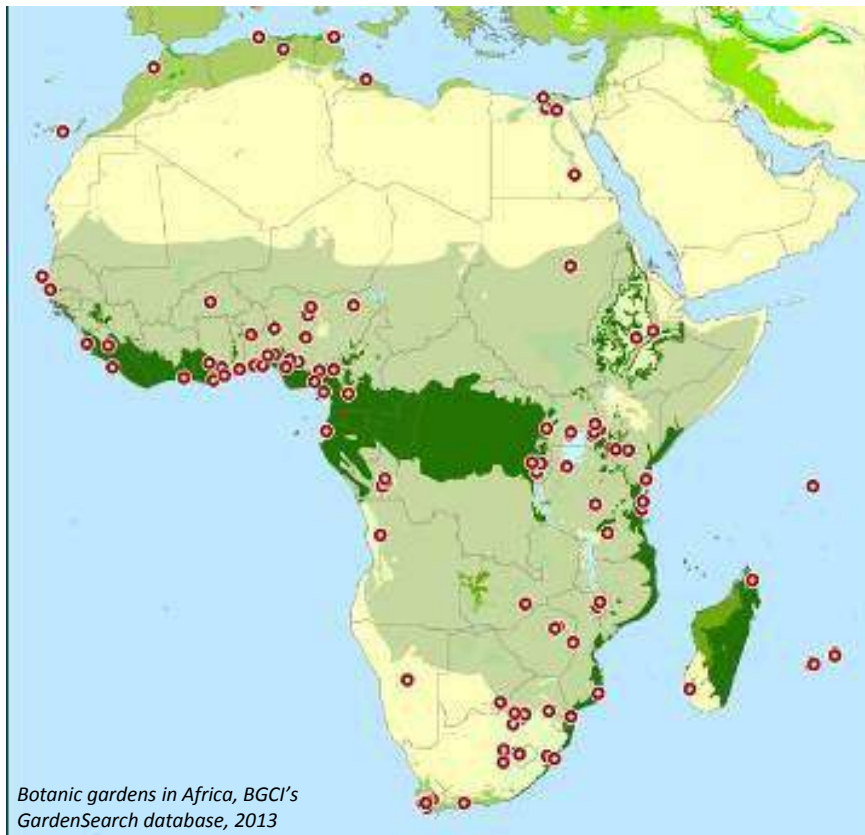
Why native species? Native species can provide ecosystem benefit. They are well adapted to the location where they grow and do not cause environmental damage, as is the case for many exotic species. Restoration using native species therefore has the potential to yield benefits in terms of protecting watersheds, improving soil stability and providing benefit to wider biodiversity, supporting the many species of flora and fauna that have adapted alongside native tree species.

Many indigenous tree species hold wider benefits in socio-economic terms, due to their valuable Non Timber Forest Products (NTFPs) providing medicines, food and economic opportunity. Including 'useful species' in restoration projects and providing access to local communities to sustainably harvest NTFPs can lead to increased valuing of planted areas and hence ensure the longevity of restoration efforts and protection of restored forests.

Why threatened species? Including threatened species in restoration projects, can lead to the successful conservation of these species, many of which do not currently have conservation measures in place.

The IUCN Red List includes 1,568 conservation assessments of tree species native to Africa, 1,161 are assessed as Vulnerable, Endangered or Critically Endangered (IUCN, 2013). In addition to this many more tree species have been assessed within a threat category, but not yet published on the IUCN Red List. These species could be effectively

Why botanic gardens? There is a lot of scope for botanic gardens to be involved to ensure restoration is done well. A study published in January 2011 by BGCI reported that botanic gardens in three African countries, Uganda, Kenya and DRC, were collectively growing over 30 African tree species listed as globally threatened on the IUCN Red List, as well as many other indigenous tree species (BGCI, 2011). This number has since increased with further indigenous and endangered species added to collections. There are over 150 botanic gardens and arboreta in Africa, many of which are linked to larger institutions elsewhere, which further enhances their knowledge and capabilities.



Botanic gardens contribute significantly to the *ex situ* conservation of native tree species and hold valuable expertise and plant material, available for use in forest restoration projects. Botanic gardens emphasize and practice science-based approaches. Encouraging botanic gardens to work in partnership with local communities and other organisations and stakeholders, something which many botanic gardens already do, will ensure the longevity of restoration projects.

The recently formed Ecological Restoration Alliance of botanic gardens (ERA), coordinated by BGCI, links large and small botanic gardens to share restoration experiences and expertise (see page 42 for more detail).

Project activities

Over the three year project time frame the following key activities are being carried out:

1. Supporting the expansion of forest restoration activities at botanic gardens in Africa

- Brackenhurst Botanic Garden in Limuru, Kenya, is extending the area of restored indigenous forest within the botanic garden grounds and further developing local training
- Tooro Botanical Garden in Fort Portal, Uganda, has identified three sites for forest restoration and is undertaking restoration using indigenous tree species cultivated at the botanic garden

The restoration work carried out by these two gardens will provide demonstration sites illustrating the benefits of undertaking forest restoration using native species. At both botanic gardens, survival rates, growth rates and success of restoration efforts will be monitored and reported upon. Monitoring and documentation of methodologies and results at these two partner gardens will allow for replication at other sites and with other partners across Africa. The results will be widely promoted and shared both locally through workshops and training, and more widely through the BGCI and ERA networks.



2. Undertaking a survey of existing native tree collections and knowledge held in African botanic gardens

BGCI is collecting information from botanic gardens across Africa to determine which native tree species are currently held in *ex situ* collections and their experience cultivating native trees and undertaking restoration using these species. The survey will identify which threatened species are currently lacking from *ex situ* collections, highlight them as priority species for conservation action and make recommendations for their conservation. The results of the survey will be used to promote the conservation work of botanic gardens in Africa. The survey will provide the basis for developing further forest restoration projects with other botanic gardens across Africa.

3. Developing partnerships for project expansion

During the three years BGCI will identify partners and sites across Africa for undertaking further forest restoration. As well as linking with botanic gardens through the native tree survey and the BGCI network, this will include encouraging partnerships with appropriate organisations such as local, national and international NGOs, private companies, national forestry services and tree seed centres.

During the first year of the project BGCI held a one day seminar in London, UK, and a three day regional workshop in Entebbe, Uganda. Both the seminar and workshop were important opportunities to introduce the project to potential partners and discuss opportunities for expanding the project. Both meetings highlighted the need for increased restoration efforts and a strong interest in developing partnerships to collectively address this and undertake forest restoration using indigenous species.

Anticipated project outcomes

As a result of close monitoring at the pilot project sites good practice guidelines for restoration will be developed. These will be widely disseminated to botanic gardens and other partners across Africa to encourage and inform future tree conservation and forest restoration efforts.

The pilot projects will act as demonstration sites for forest restoration using indigenous species. Community engagement and education are key elements of the restoration work and recommendations for incorporating these factors into future restoration projects will be included in the guidelines.

Priority tree species will be identified for forest restoration at a variety of sites and forest types across Africa. Cultivation protocols will be collated and disseminated widely .

The development of partnerships between local communities, organisations and private companies will ensure the longevity of projects following the end of external funding.



For the remainder of the project BGCI will develop proposals and seek further funding to expand project activities, working with additional partners from botanic gardens and other organisations to encourage effective forest restoration across Africa. Key next steps are outlined at the end of this report.

Enhancing tree conservation and forest restoration in Africa

BGCI Regional Workshop held in Entebbe, Uganda

30th July – 1st August, 2013

The regional workshop brought together representatives from botanic gardens, mainly in East Africa, government forestry departments, NGOs involved in tree planting and environmental projects, and the private sector. The workshop provided an opportunity for botanic gardens to share information on the identification, propagation and cultivation of indigenous and endangered tree species and highlight the value of including these species in restoration activities. The workshop also provided an important opportunity for partners to hear about each organisation's work and share experiences and knowledge with the aim to overcome current common challenges and develop partnerships for future projects.

Aims

Key aims of the regional workshop were to;

- Exchange experiences of tree conservation and forest restoration
- Discuss opportunities and constraints in the use of indigenous and endangered tree species in forest restoration
- Identify priority sites and species for restoration
- Strengthen existing partnerships and form new partnerships

The workshop involved presentations, discussions, working group sessions and a visit to Entebbe Botanic Garden and the Uganda National Field Gene Bank to demonstrate the conservation techniques and species discussed throughout the workshop.

Agenda

Day one:

- **Introduction – Forest restoration and new partnerships**
- **Tree conservation and forest restoration work in African botanic gardens**
- **Building capacity for forest restoration in Africa**

Day two:

- **Partner perspectives**
- **Conservation assessments and potential for including threatened species in restoration projects**
- **Prioritising sites and species for restoration projects**

Day three:

- **Site visit to Entebbe Botanic Garden and the Uganda National Field Gene Bank**
- **Partner perspectives cont.**
- **The Ecological Restoration Alliance of botanic gardens**
- **Summary and closing remarks**



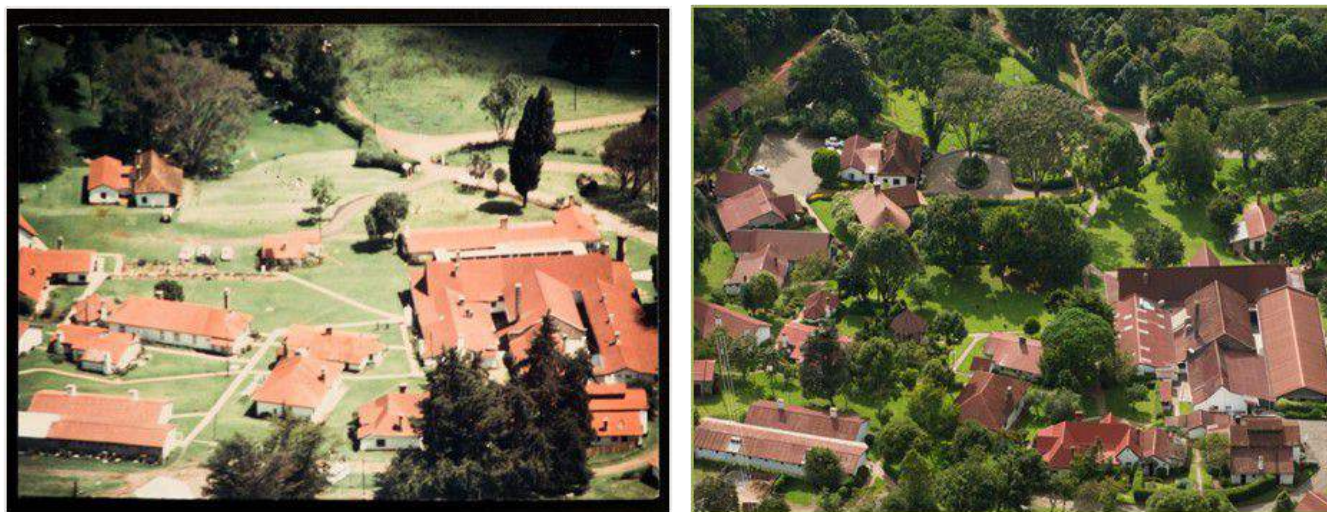
Presentation: Brackenhurst Botanic Garden, Kenya: An Ecological Restoration Project 2000 – 2030

Mark Nicholson, Founder and Director of Brackenhurst Botanic Garden

A large majority of Kenya's population live in the Lake Victoria basin. This region is crossed by major rivers that flow from the Mau Complex, an indigenous forest area that has high rainfall, is Kenya's largest 'water tower' and feeds Lake Victoria. In addition, the Mau Complex provides medicinal plants, firewood and environmental services essential to crop production including continuous river flow and favourable micro-climate conditions.

Land use in high altitude and high potential zones impacts upon stream flow. Forest conservation and restoration efforts are vital in these zones to maintain stream flow. But these areas are under great threat. A lot of land in these areas has been converted to tea plantations, with tree planting limited to the provision of windbreaks.

Forest destruction provides short term gain but long term loss. Kenyan forest cover is now 1.7% (2006) compared to 10% in 1963. 197,000 hectares of the remaining 3,467,000 hectares of forest in Kenya is primary forest.



Indigenous trees have been planted in the grounds of the conference centre at Brackenhurst Botanic Garden. Left image taken in 1990, right image in 2013.

The vision of Brackenhurst Botanic Garden is:

- To create an indigenous forest and botanic garden with high native plant (and associated non-plant) biodiversity for education, conservation, research, recreation and environmental restoration.
- To restore ecosystem services in the Brackenhurst valley, in particular perennial stream flow

Ecological restoration at Brackenhurst Botanic Garden aims to achieve biodiversity conservation, provide ecosystem services (water, carbon sequestration) and generate income (through sustainable timber and charcoal, nutraceuticals, vegetables, ecotourism)

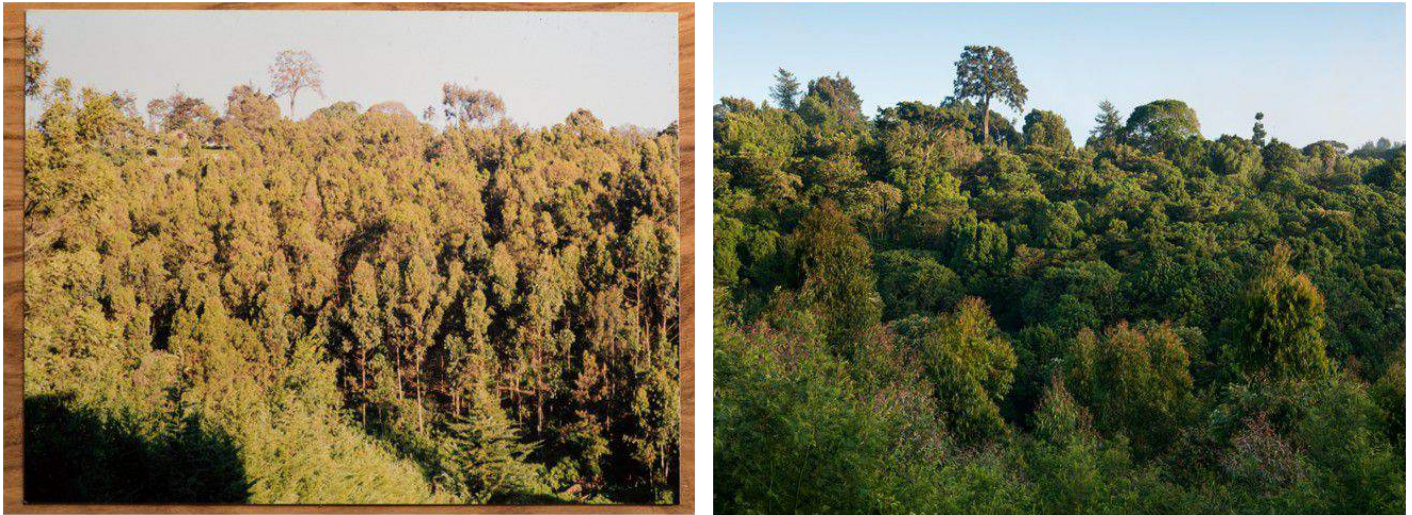
The following activities are undertaken at Brackenhurst:

- Seed/ propagule collection
- Seedling propagation at the indigenous tree nursery
- Maintenance of an indigenous flower garden
- Creation of 40 hectares of forest
- Removal of invasive plants
- Environmental education & ecotourism
- Plant biodiversity conservation
- Taxonomy & cladistics (Caricaceae, Apiaceae, Araliaceae)
- Income-generating activities (including charcoal, herbal medicines)
- Preparation of a Field Guide to the Upland Plants of Kenya (to be published shortly)

The process of indigenous forest restoration:

1. Removal of exotics – At Brackenhurst this involves clear felling non-native Eucalyptus and removal of other invasives
2. Hole preparation
3. Wild seed collection – Recent successful seed collections by Brackenhurst include *Chionanthus milbraedi*, *Polyscias kikuyuensis* and *Xymalos monospora*

4. Planting out
5. Removal of invasive regrowth – 60% of restoration budget at Brackenhurst is needed for invasive species management. Brackenhurst are striving to find uses for invasive species regrowth
6. Young forest establishment—Following 12 years there is a good amount of undergrowth and change of the local landscape.



Eucalyptus monoculture at the Brackenhurst site 1990 and the same site converted to indigenous forest 2013

Brackenhurst has partnered with a number of organisations to undertake forest restoration. As well as being involved in the current BGCI project *Enhancing tree conservation and forest restoration in Africa*, Brackenhurst also set up a Forest Restoration Research Unit (FORRU) in 2012 with the Royal Botanic Gardens Kew, Millennium Seed Bank Partnership. The FORRU project is a scientific study of techniques for indigenous species restoration. Brackenhurst is examining performance of 7,000 trees in three replicate sites, from pioneer species until closed canopy, measuring species growth and performance.

A 40 hectare forest has been restored so far at Brackenhurst since 2000. Restoration is not just about trees; since restoration work began the number of species of flora and fauna observed in the restored forest area has risen dramatically. Species present include the Kikuyu Three-horned Chameleon (*Chamaeleo jacksonii*), Von Hoehnel's Chameleon (*Chamaeleo hoehnelii*) and orchid species *Calanthe sylvatica* and *Eulophia stenophylla*.

180 species of bird have been recorded including the Eastern double-collared sunbird (*Cinnyris mediocris*), the Variable Sunbird (*Cinnyris venustu*) and the Mountain Buzzard (*Buteo oreophilus*). Staff are also enticing local mammals back into the forest, including Colobus monkeys and bush babies by providing food, but hope that soon the forest will provide enough food for them naturally. There is also evidence of and attempts to re-establish Bush pig, Civet cat, Genet cat, African clawless otter, multiple bat species, white-tailed mongoose, Black tipped mongoose, Porcupine, Hedgehog, Grey Duiker, Cane Rat and African Palm Civet.

What can a small botanic garden contribute to the big problem?

- Education
- A model for forest restoration
- A seed source from rarer trees

An example of a high priority species involved in the Brackenhurst restoration project is *Embelia keniensis* – A tree endemic to Tigoni and Mount Kenya with only 5 known adult specimens in the world. The IUCN Red List committee noted that:

'When [the Brackenhurst Botanic Garden] reintroduced subpopulation of >100 within the taxon's natural range becomes self-sustaining, this species' Red List status will change from CR D (<50 mature individuals) to EN D (<250 mature individuals), an accomplishment that should be celebrated with great fanfare!'

Many additional Kenyan tree species are involved in the Brackenhurst restoration work that are not available in seed centres or nurseries, including *Agarista salicifolia*, *Balanites wilsoniana*, *Balthasaria schliebenii*, *Celtis gomphopylla*, *Celtis milbraedii*, *Fleroya rubrostipulata*, *Ilex mitis*, *Fleroya rubrostipulata*, *Heywoodia lucens*, *Myrianthus holstii*, *Peddiea fischeri*, *Pleurostyliya africana*, *Premna maxiima* and *Zanthoxylum milbraedii*.

Enhancing tree conservation and forest restoration in Africa - current project activities at Brackenhurst BG

In the first year of this project, Brackenhurst has planted a further 6 hectares with indigenous trees raised at the nursery onsite. Over 40 indigenous tree species have been cultivated at the Brackenhurst nursery for this project. Around 14,000 trees were cultivated at Brackenhurst between late 2012 and April 2013, many of which were for planting on the 6 hectare project site. A number of rare and unusual species have been included in the species selection, including rare or locally endemic African species such as *Balthasaria schliebenii*, *Widringtonia whytei* and *Widringtonia cedarbergensis*, plus other Kenyan species that are rarely, if ever, propagated, such as *Cylicomorpha parviflora*, *Vepris glandulosa*, *Fleroya rubrostipulata*, *Myrianthus holstii* and *Obetia radula*.



The hillside area planted with the Ashden Trust funding has been named 'Mau', after the Kenyan water towers. The official site size is 6 hectares but the actual area of planting is greater as the trees propagated have also allowed for 'beating up' - replacement of dead trees and increasing density, in previously planted areas outside the 6 hectare site. Over the coming two years additional trees will be raised at the nursery and planted on the 'Mau' hillside.

Success of the restoration efforts undertaken at Brackenhurst will continue to be monitored and documented. This is essential for promoting the use of indigenous species in restoration efforts across Africa. During the subsequent two years, Brackenhurst will contribute to the documentation of methodology, preliminary results and good practice guidelines for use in development of similar approaches in other parts of Africa. Best practice guidance will be produced in collaboration with Tooro Botanical Garden and other experts and will be made available by BGCI.

Brackenhurst Botanic Garden already provides an important model for East African habitat restoration initiatives and BGCI will continue to promote this example as the project progresses.

Constraints to restoration work

- Invasive species management requires a lot of staff time and resources
- Funding is a constant issue – Brackenhurst has no core funds and relies on annual grants
- No support is received from the national government
- No support is received from private or corporate partners within Kenya to undertake restoration work at Brackenhurst

Regional vision for collaborative ecological restoration - A number of sites can be identified where restoration efforts are needed, including;

- Kakamega rainforest, Kenya, containing a number of rare species, that has undergone rapid deforestation in recent years
- Tsavo West National Park, Kenya, where Iltal spring requires protection through restoration of *Ficus sycamores* and *Acacia tortilis* woodland
- Coastal forest at Vipingo, Kenya
- Lambwe Forest in Homa Bay, Kenya
- Gullele Botanic Garden in Addis Ababa, Ethiopia, where the grounds of the garden could be planted (700 hectare plot), but there is a risk native species won't be selected unless appropriate advice and support is provided

The overall vision is for clean air, clean water and beautiful environments for future generations.

Presentation: Enhancing plant conservation and forest restoration in the Rwenzori region, Uganda
Godfrey Ruyonga, Director, Tooro Botanical Garden

The Rwenzori region of Uganda has been heavily degraded through poor farming methods, indiscriminate reclamation of surrounding wetlands and deforestation without replenishment. This has led to soil erosion, loss of soil fertility, silting of the rivers, frequent flooding, poor crop yields, food insecurity and disruption of livelihoods. As a result of degraded hill slopes, farmers have turned to farming wetlands and forest reserves, ignoring their invaluable ecological functions.

The above problem has been exacerbated by:

- Rapid population growth
- Increasing industrialization and pollution
- Abandonment of traditional agroforestry practices
- Increase in conversion of protected areas to farm land and exotic tree plantations hence threatening the integrity and survival of the remaining forest and native species

Within the Rwenzori region and across much of Uganda, gazetted Local Forest Reserves (LFRs) are no longer forested as they were felled, mainly during the 1970s, and never replanted. Illegal encroachment, settlement and cultivation of crops has occurred on many of these LFRs. Management of LFRs is the responsibility of the local government, whereas Central Forest Reserves (CFRs) are managed by the Uganda National Forestry Authority.

Tooro Botanical Garden (TBG) is situated in Fort Portal in Western Uganda. The garden was established in 2004 on a former Local Forest Reserve, which had been cleared and planted with eucalyptus. The majority of the eucalyptus was felled for timber 17 years ago. Remaining at the centre of TBG is the 'Eucalyptus mother garden', planted in 1953 by the Queen of England and providing seed for Eucalyptus planting in Uganda. Around the eucalyptus stand, pure stands of indigenous tree species have been planted to monitor and record growth rates and provide a seed source for future restoration efforts.

There is also an edible plant garden and a medicinal plant garden within TBG and a 20 acre arboretum containing over 60 indigenous tree species. As well as undertaking trials using indigenous tree species, TBG has previous experience carrying out restoration activities with indigenous trees and working with various local NGO partners. TBG is situated within the city of Fort Portal which allows outreach to local residents and tourists who stay in Fort Portal to visit nearby National Parks.

Main activities at TBG include

- Joint ethnobotanical research with traditional 'consultants' and recapturing lost indigenous ethnobotanical knowledge
- Domestication of useful wild edible, traditional medicinal, and craft species
- Sustainable utilization of plant resources
- Joint ecological restoration with local communities and government
- Conservation of traditional medicinal plants
- Indigenous tree species trials
- Tree conservation and forest restoration

Joint ethnobotanical research with traditional consultants and recapturing lost indigenous knowledge - Work is undertaken at TBG and community satellite centres have been set up as research stations. Trial plots have also been set up for domestication/cultivation potential and a herbarium to support identification and research.

Through TBG projects, community consultants come together with scientists to document important botanical information, share research and findings and compare information.

Domestication of wild edible, traditional medicinal and craft species - TBG are undertaking propagation and multiplication of wild utilised species that are hard to raise. This has involved the establishment of sample plots and mother gardens and has led to reduced time spent and less distance travelled to collect wild edible, medicinal and craft species. This has resulted in reduced pressure on wild populations and protected areas and increases in wild species populations.



Spathodea campanulata growing at TBG nursery

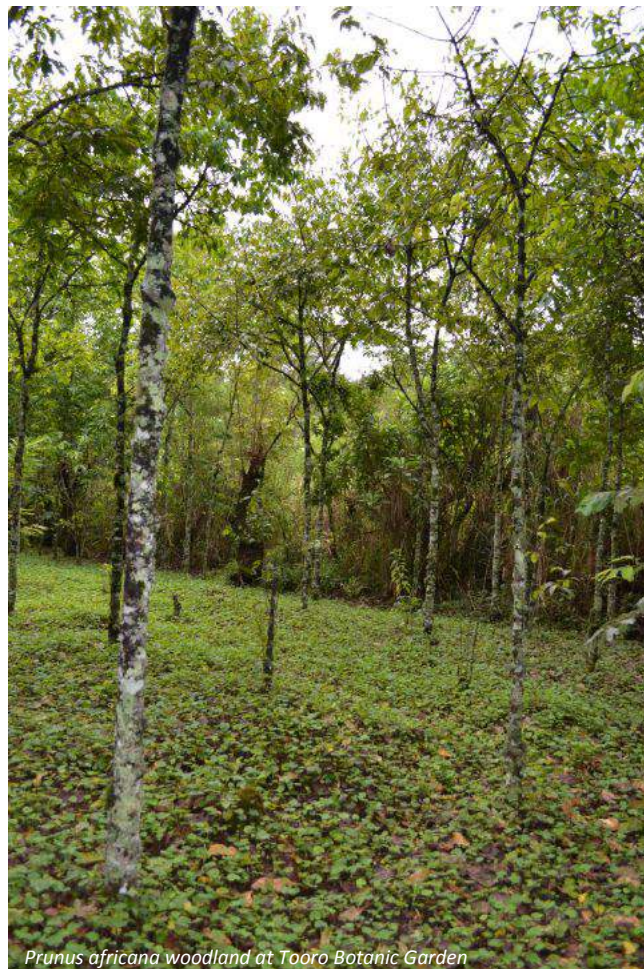
Traditional medicinal plant conservation - TBG work with local herbalists, on a voluntary basis, to identify, grow and conserve indigenous medicinal plants in TBG and home gardens. This involves undertaking medicinal plant field trials, and coordinating a medicinal plant information sharing platform between herbalists and western practitioners.

Sustainable utilization of botanical resources - TBG are involved in the promotion of sustainable harvesting, including conservation education programmes for children and women, training in the additional uses for other parts of plants harvested for specific purposes and training on harvesting sensitive plant parts without damaging the whole plant.

Tree conservation and indigenous tree species trials - A 20 acre arboretum has been established within the grounds of TBG containing over 60 indigenous species. The TBG nursery cultivate indigenous tree species for sale and planting projects.

Remaining at the centre of TBG is the 'Eucalyptus mother garden', providing seed for eucalyptus planting in Uganda. Around the eucalyptus stand, pure stands of indigenous tree species have been planted to monitor growth rates and provide a seed source for future restoration and planting efforts.

Also within the garden is a *Prunus africana* 'woodland', with *Centela asiatica* (a non native medicinal plant) planted beneath it. *P. africana* is commonly used by local communities for its medicinal properties, the woodland demonstrates a supply can be cultivated for sustainable harvesting.



Joint ecological restoration with local communities and government - Projects have involved restoring stone and sand mines and reforestation of the bank of Mpanga River (the biggest river in the region). 100 acres of degraded forest reserve was secured from the National Forest Authority, 30 acres of which have already been restored. Indigenous tree nurseries were set up and so far 180,000 tree seedlings have been raised and planted in the community and forest reserves. Over 40,000 agroforestry trees have been planted in the community and their benefits are already evident. To ensure sustainability and reliability of the project, a practical training centre was set up at TBG with a model home on a 2.5 acre piece of land.

Some of the formerly degraded areas are already agriculturally productive. The tree cover in the district has improved. The invasive species *lantana camara* has been greatly reduced through uprooting and burning. Soils on mountain slopes have been stabilized, erosion and river siltation reduced and productivity increased. The project has trained community process facilitators who have continued to scale up the project it in the community.

Enhancing tree conservation and forest restoration in Africa - current project activities

As part of the BGCI project *Enhancing tree conservation and forest restoration in Africa*, TBG is undertaking restoration of three degraded sites. One site is within TBG and the other two are Local Forest Reserves (LFRs) in the foothills of the Rwenzori Mountains. All sites were illegally cleared of natural forest cover between 1977 and 1979 for firewood and timber. Eucalyptus was then planted at the sites, which was subsequently felled. The site within TBG will provide local restoration and a demonstration site to botanic garden visitors. Neighbouring communities to the two sites outside of the garden have been involved in consultation and

All sites are bring cleared of invasive species, including Eucalyptus regrowth in preparation for planting. Indigenous tree species present within the sites will remain.

TBG has selected 34 tree species to be included in the project, 32 of which are indigenous to Uganda and 2 are naturalised species (have been present for >150 years). Seed and seedlings were collected for these 34 species and material for planting was cultivated at the TBG nursery.

Species selection criteria were as follows:

- Rare species
- Frequently used species – e.g. For timber, medicine – that are used at a fast rate but are not cultivated. (During a previous project TBG undertook a questionnaire asking local communities which tree species are used and which are planted. This information was used for species selection)
- Species known to have occurred on the sites previously
- Fast growing species



Following propagation in the nursery at TBG, initial planting commenced at the site within TBG in March 2013. Further planting was carried out at the TBG site and one of the Rwenzori foothill sites during September and October 2013. Further planting will be carried out at all three sites from March – May 2014. At the two sites outside of TBG, inter-planting of edible shrubs will be carried out to provide NTFPs available for harvesting by local communities.

Survival rates and growth rates will be monitored for a select number of trees at each site, generating valuable information for future restoration efforts. TBG will contribute to the documentation of methodology, preliminary results and good practice guidelines in collaboration with Brackenhurst Botanic Garden, for use in development of similar approaches in other parts of Africa. The best practice guidelines will be made available by BGCI.

A number of challenges to forest restoration work can be identified including;

- Inadequate financial and other resources for running the garden activities
- Not enough trained personnel in specialist areas such as taxonomy
- A negative attitude towards conservation on the side of the community
- Climate change



Presentation: Plant Genetic Resources Centre: Initiatives to conserve tree resources of Uganda
Joyce Adokorach, Entebbe Botanic Garden, Uganda

Entebbe Botanic Gardens was founded in 1898. The gardens are home to over 400 plant species. The Uganda National Gene Bank (UNGB) has recently opened, located at Entebbe Botanic Gardens. The UNGB currently holds around 3500 accessions of germplasm and has capacity and facilities to store genetic material for short and long term projects.

The Entebbe Botanic Garden and the UNGB together make up the Plant Genetic Resources Centre. The mission of the Centre is: *'To ensure the conservation, management and sustainable use of plant genetic resources for food and agriculture while optimising their potential in contributing to national development goals.'*

The strategic objectives of the Plant Genetic Resources Centre are:

- To collect and maintain stock of diverse plant germplasm
- To increase utilization of germplasm through characterization, evaluation and genetic enhancement
- To ensure availability of, and ease of access to, plant genetic resources information for a wider stakeholder base
- To promote community based conservation and better utilization of plant genetic resources
- To develop and promote an acceptable mechanism for germplasm exchange
- To enhance the role of botanic gardens in conservation through public awareness

Key species being conserved and propagated at the Plant Genetic Resources Centre include:

Garcinia buchananii Baker – an indigenous fruit tree widely distributed in Uganda. The roots and bark are widely used in herbal medicine, which has led to the species facing genetic erosion. A viable population threatened due to deforestation was identified in Bukaleba Central Forest Reserve. Fruits were collected and seedlings were raised and planted in Entebbe Botanic Garden and given to the local community at Bukaleba.

Warburgia ugandensis Sprague (Uganda's greenheart) – An indigenous evergreen medicinal tree, reported to have antimalarial, antifungal and antibacterial properties and also resistant to insect attack. It has been heavily exploited for both domestic and commercial purposes. Seeds were collected by Entebbe Botanic Garden staff, seedlings raised, distributed and planted around the country.

Senegalia Senegal Britton (formerly known as *Acacia senegal*) – The gum of this tree is known as gum Arabic, it is the most widely used natural gum and has been used by humans for over 5000 years. Entebbe Botanic Garden undertook a study to map the diversity distribution and identify hotspots for *in situ* conservation. The areas with the highest taxa richness, diversity and turnover were found to be in the Lake Kyoga basin.

Parinari curatellifolia Planch. ex Benth. – An indigenous wild fruit tree. The fruit has potential to improve nutrition, boost food security, foster rural development and support sustainable land management. A study to investigate seed germination of *P. curatellifolia* to improve its conservation was carried out with unsuccessful results. Alternative propagation methods must be found to safeguard and increase availability of the species.

Vitellaria paradoxa (C.F.) Gaertn (Shea tree) – An indigenous fruit tree, the fruit of which has potential to provide significant benefits to communities, and demonstrate the importance of biodiversity to the livelihoods of local communities. The shea nut also provides products to the global pharmaceutical industry. Felling for charcoal production is a major threat for shea trees in Uganda. *In situ* conservation efforts are underway.



Entebbe Botanic Gardens is also involved in education and awareness raising projects, including running educational tours and training students, communities and visitors.

Key challenges include difficulty in breaking seed dormancy of some species, such as *Parinari curatellifolia*, and a limited knowledge or available information about some indigenous tree species.

Key needs identified by the Plant Genetic Resources Centre are a need to undertake further research to gain a better understanding of seed physiology and behaviour of an increased number of indigenous tree species, especially recalcitrant species, and to enhance coordination amongst stakeholders in tree species conservation.



Presentation: Tree conservation and forest restoration efforts by Nature Palace Botanic Garden
David Nkwanga, Director of Nature Palace Botanic Garden , Uganda

Nature Palace Botanic Garden was founded in 2001 with a focus on conservation and sustainable production of medicinal plants that are crucial for the treatment of common ailments in the local community. These plants are becoming less accessible due to a number of factors including deforestation, agricultural expansion and urbanisation. The conservation priorities of Nature Palace Botanic Garden are largely informed by identified community needs.

Efforts in tree conservation:

Home medicinal gardens - This initiative is aimed at counteracting the rapid loss of plant resources, promoting participation of community members in conservation of species and improving their knowledge and appreciation of medicinal plants. Participating households were asked to identify the species they use most in the treatment of common ailments and these were selected as the focus of the project. The initiative involved a number of medicinal tree species.

Waste to energy - Firewood collection and charcoal remain a major driver of deforestation, providing around 93% of Uganda's total cooking energy needs. Nature Palace Botanic Garden is working on biomass waste conversion to energy. Providing an alternative energy source from waste material can sustainably respond to this challenge and reduce deforestation.

Efforts in forest restoration – Restoration in The Walumwany Forest Reserve

Nature Palace Botanic Garden is located at the periphery of Walumwany Forest Reserve (FR), which was badly degraded during the political turmoil in the 1970s and 1980s. In the early 2000s the government of Uganda started 'the reforestation of degraded forest reserves' program through which plots in such FRs were leased out to private individuals to plant trees for commercial purposes. Walumwany FR was allocated for Eucalyptus tree planting. The resultant transformation of the FR into monocultures of an exotic species had a negative impact on the biodiversity and totally altered the forest estate landscape.

The only patches showing original vegetation are *in situ* conservation efforts by Nature Palace. There are approximately 30 hectares of the FR next to Nature Palace that were not provided to private individuals. This was partly because of its unsuitability for commercial plantations as the soil has high sand content, but also because it is a catchment area for a stream that supports a number of community water sources. However, the area has since been mined and is highly degraded and resulted in pools where mining took place, threatening the survival of the stream. Nature Palace has initiated a program to restore this part of the FR with indigenous tree species and cover up the ponds left behind by sand miners. The goal of the project is to restore at least 30 hectares of degraded FR and ensure protection of the stream. This project is currently seeking funds.

Target tree species for the project include:

- Maesopsis eminii (Musizi)*
- Prunus africana (Ntaseesa)*
- Warburgia ugandensis (mukuzzanume)*
- Spathodea campanulata (Kifabakazi)*
- Kigelia africana (Mussa)*
- Albizia zygia (Nongo)*
- Albizia coriaria (Mugavu)*
- Tamarindus indica (Nkongge)*
- Piptadeniastrum africanum (Mpewere)*
- Ficus natalensis (Mutuba)*
- Milicia excelsa (Mvule)*
- Khaya sp. (Mahogany)*
- Newtonia buchananii (Mpewere)*



Biomass waste conversion to energy at Nature Palace Botanic Garden

Nature Palace Botanic Garden currently partners with a number of NGOs and associations and is keen to partner with additional organizations, botanic gardens and funders to pursue these aims.

Presentation: Tree conservation and forest restoration work of the Botanic Garden of the National Museums of Kenya

William Wambugu, Director of the Botanic garden of the National Museums of Kenya

Nairobi Botanic Garden (NBG) is situated 1.5 km from Nairobi city centre at the National Museums of Kenya. The living collection provides an opportunity for outdoor learning. Nairobi Botanic Garden contains some 600 indigenous plant species, including indigenous tree species.

The garden fulfils four main functions:

- Education
- Research
- Conservation
- Recreation

NBG promotes conservation through cultivation. The garden propagates and sells seedlings at the nursery, maintains species on display and provides information about these species.

NBG supports habitat restoration with partners around the country.

Partnerships and expertise

As NBG is part of the National Museums of Kenya, the garden is linked to research departments including botany, mycology and entomology departments. The National Herbarium is also located at the Museum. NBG therefore has access to a large amount of valuable information to undertake and support conservation and restoration projects.

The National Museum is also linked to multiple other museums across Kenya. As well as partnering with departments within the National Museums, NBG also has experience partnering with other organisations across Kenya, including Nature Kenya.

NBG recognises the great need for restoration in Kenya and East Africa more broadly, as well as the continued threats impacting indigenous tree species wild populations. NBG recognises a great need for conservation of indigenous tree resources and restoration of degraded areas. NBG is working with various partners and communities around Kenya to draw up restoration proposals.

A number of challenges can be identified, including limited funding for conservation and restoration initiatives. NBG also noted a lack of access to information about indigenous tree species as a key factor hindering further planting of these species. NBG highlighted the National Museums as an important information portal for indigenous species information.

NBG is keen to work with additional institutions and develop new partnerships to move towards establishment of further forest restoration projects and enhanced tree conservation across East Africa.



A large amount of tree planting focuses on monocrop plantations of non native species. Although such an approach *does* provide rapid accumulation of biomass for timber or fuel, rapid but short-term carbon capture and financial return on investment, it *does not* provide protection of soil and water resources, long-term carbon capture, a wide range of non-timber forest products, high biodiversity, resources for ecotourism, security against climate change or protection of cultural heritage. These benefits can be achieved through informed forest landscape restoration using a mix of indigenous species.

Indigenous species are often not selected due to:

- A common belief that they grow too slowly
- Limited knowledge of which species to grow or how to grow them
- Unavailability of seeds and seedlings.

There is little good data available comparing native species growth rates with exotic species, but anecdotal evidence shows growth rates for some species are comparable.

There is data available on propagation techniques for some indigenous species, such as *Melia* sp. but this information is not readily available for many indigenous species.

Forest Restoration Research Units provide a solution to these obstacles by generating information.



Forest Restoration Research Units (FORRU)

The first Forest Restoration Research Unit was set up in 1994 with the Biology Department of Chiang Mai University, in collaboration with the Royal Botanic Gardens, Kew (FORRU-CMU). The aim of a FORRU is to develop effective methods to accelerate natural forest regeneration for biodiversity conservation and environmental protection.

At FORRU sites, the Framework Species method of forest restoration is adopted. The method was first developed in Queensland Australia and was further developed by FORRU-CMU. This involves planting 20-30 indigenous forest tree species which enhance natural forest regeneration and accelerate biodiversity recovery. Species selection includes a mix of pioneer and climax tree species. Seedlings are planted approximately 1.8m apart.

At FORRU-CMU, bird diversity increased from 30 species (before tree planting) to 87 species (6 years after planting), representing 63% of the bird community of the nearest natural forest. Tree species richness has doubled within three years: after planting 30 or so framework species, seedlings of an additional 30 new tree species have become established. Within 8-9 years recruitment of an additional (non-planted) 72 tree species was observed (Sinhaseni, 2008)

After a long absence from the area, medium-sized mammals are returning to the restored forest, including pangolin, barking deer and wild pig. There is evidence of Hog Badger breeding in plots of 3 years or older. Five years after planting, there is evidence of the Large Indian Civet using the plots as a latrine. This species has the potential to disperse seeds over at least 10km from the forest into the plots.

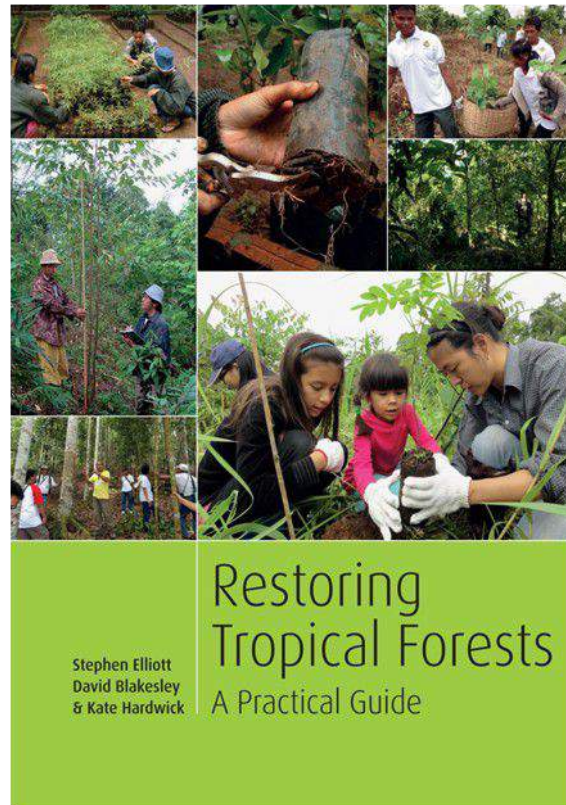
The Framework Species approach has been tested previously in Uganda, to conserve medicinal trees. The trial tested a combination of exotic and indigenous species and four indigenous trees were reported to be excellent Framework Species (Strangeland *et al.*, 2011); *Carissa spinarum*, *Markhamia lutea*, *Sarcocephalus latifolius*, *Terminalia schimperiana*

To accelerate natural forest regeneration, tree species are selected with high survival rates, rapid growth rates, dense spreading crowns to shade out weeds and ‘recapture’ the site and that attract seed dispersers. These selection criteria also lead to biodiversity recovery.

A FORRU undertakes research into phenology, studying seasonality of seed production in the natural forest. Herbarium data can provide coarse seasonality data but site specific information is vital in target areas. Nursery research is also undertaken to develop methods to grow potential Framework trees to be used in field trials. FORRUs use standard protocols for collecting data on seed handling and storage, germination treatments, seedling growth and survival in the nursery, propagation protocols, etc. Using standard protocols allows data from different sites to be collated. More than 420 species have been propagated in Thailand so far and 50 species in Cambodia. Field trial research is undertaken to compare performance among candidate Framework Species, to test silvicultural methods to enhance tree performance and to assess biodiversity recovery.

Community involvement is encouraged at FORRUs. This can include involvement in project planning, seed collection and growing trees in community tree nurseries, planting and caring for trees, monitoring and fire prevention.

FORRUs have been set up in Northern Thailand (FORRU-CMU), Southern Thailand (FORRU-KRABI), Gaoligongshan National Nature Reserve, Tengchong, China (FORRU-Gaoligongshan) and Siem Reap Province with the Forestry Administration of Cambodia (FORRU-Siem Reap) and recently at Brackenhurst Botanic Garden in Kenya.



FORRU-Brackenhurst

Brackenhurst Botanic Garden has recently designated part of their restoration project site for incorporating FORRU methodology. 57 species were planted in 2012 and around 30 species were planted in 2013. Start-up funding was supplied by RBG Kew and ongoing funding is now being sought. RBG Kew, Brackenhurst and BGCI are working together on a joint proposal to set up a regional FORRU programme in East Africa (further detail is provided on page 53). RBG Kew add value to the partnership through training and experience from other FORRU sites.

Disseminating the results

FORRU research and monitoring will yield valuable species data for future restoration efforts. The potential for disseminating these results and incorporating the information into existing databases or creating a new database for information dissemination is being explored. Potential channels for dissemination include the Millennium Seed Bank's Data Warehouse, BGCI's PlantSearch database, Dendropedia (RBG Kew are working with Harvard University, Yale University and Bioversity International to develop a tree-focused version of Wikipedia). Species dossiers will also be produced for the Framework Species being trialled (this is an approach adopted by RBG Kew for projects in other regions including Madagascar and UK Overseas Territories).

FORRUs have the potential to yield valuable data on species performance and can also support the seed supply system for native species, thereby helping address the current obstacles to undertaking forest restoration using native species. Short and long term plans for ensuring that East African FORRUs support the seed supply system include making species data available to national Tree Seed Centres, developing online tools for end-users to choose Framework Species, linked to seed ordering web-pages, developing mobile phone apps for seed ordering and scaling up seed production methods.

There is a great need to accelerate the supply of high quality seed. Seed supply for agriculture (mostly private) is already well developed, but this is lacking greatly for, and needs to be replicated for, diverse native species. The Millennium Seed Bank Kew is well placed to support development of high quality seed supply due to their existing experience and knowledge.

RBG Kew is a lead member of the Ecological Restoration Alliance of Botanic Gardens, set up to share expertise from larger to smaller institutions. (More information about the Ecological Restoration Alliance is provided on page 42)

Restoring Tropical Forests: A Practical Guide

An updated and globally relevant edition of the book 'Restoring Tropical Forests: A practical Guide' has recently been published, available in English, French and Spanish (Elliott, *et al.* 2013).

Presentation: The New Forests Company: Growing Africa
Mark Chowles, Forestry Manager Uganda of The New Forests Company

The New Forests Company (NFC) is a private forestry company operating in Sub Sahara Africa. Operating in four countries; Uganda, Tanzania, Mozambique and Rwanda, 25,000 hectares have been planted and the company has a total land bank of 35,500 hectares. NFC supply value added timber products to local and regional markets. They grow timber species, mainly pine and eucalyptus, on leased, licensed and FSC certified lands.

Plantation name	Plantation development: New planting for this financial year		
	Pine (ha)	Eucalyptus (ha)	Total (ha)
Namwasa	420	180	600
Luwunga	550	250	800
Kirinya	0	200	200
Total	970	630	1,600

NFC is the largest tree grower in Uganda with 10,500 hectares planted across three plantations; Namwasa, Luwunga and Kirinya, all of which are certified. They also operate a pole treatment plant serving Uganda, Rwanda, Kenya and Tanzania.

New Forests Company Uganda plantations

In Mozambique, NFC has planted 3,500 hectares in the Niassa province and has plans to expand. In the South Eastern highlands of Kilolo district, NFC has planted 4,000 hectares and NFC’s second pole treatment plant has been established.

In Rwanda, NFC has 8,500 hectares of mature concession from the Government of Rwanda in the Nyungwe buffer zone.

NFC has three nurseries raising high quality imported seed for plantation development. At each plantation they undertake silviculture operations including land clearing, land preparation, planting, weeding, thinning and fire protection.

Environmental Management

NFC adopts environmental management practices based on the triple bottom line principles of sustainability (social, economic and environmental). As well as achieving FSC certification at their plantations and ISO certification at their Uganda pole treatment plant, NFC have undertaken detailed Environmental Impact Assessments for all plantations, re-audited by NEMA in August 2013. Biodiversity studies have been undertaken at Namwasa and Luwunga plantations. NFC are undertaking active management of high conservation value forests including Netullide Conservation Area, Dalamba Conservation Area and Homestead Forest.

NFC allocates 2.5% of their forestry budget to conservation activities including monitoring, weeding and protection. 177 bird species have been identified on Uganda plantations, including rare species such as Brown parrot. 33 species of wild animals have been recorded on the Uganda plantations, including rare Hyena and Aardvark.

Timber Harvesting

NFC have started harvesting their own plantations at Namwasa plantation for the pole treatment plant. 147 hectares will be harvested this financial year. NFC has budgeted 42,000 poles for supply. They have acquired the necessary harvesting equipment and personnel and will adhere to FSC principles and criteria in harvesting timber to preserve the environment – water, air, land, fauna and flora.

Social responsibility

As well as conserving the environment and biodiversity, NFC undertake social responsibility projects. This includes building schools, wells and developing self employment projects (beekeeping) so that local people conserve the environment, reduce their vulnerability to and adapt to climate change, develop sustainable livelihoods and reduce poverty, where possible within their line of operations. An integrated environmental management approach has been taken across the three NFC plantations in Uganda.

Collaboration

NFC is keen to undertake indigenous tree growth trials working with a local botanic garden partner on their Ugandan plantations (see page 53 for further details).

Presentation: Commoditising conservation: An opportunity for enhancing tree conservation and landscape restoration in Africa

Martin Noponen and Norman Mukuru, Rainforest Alliance

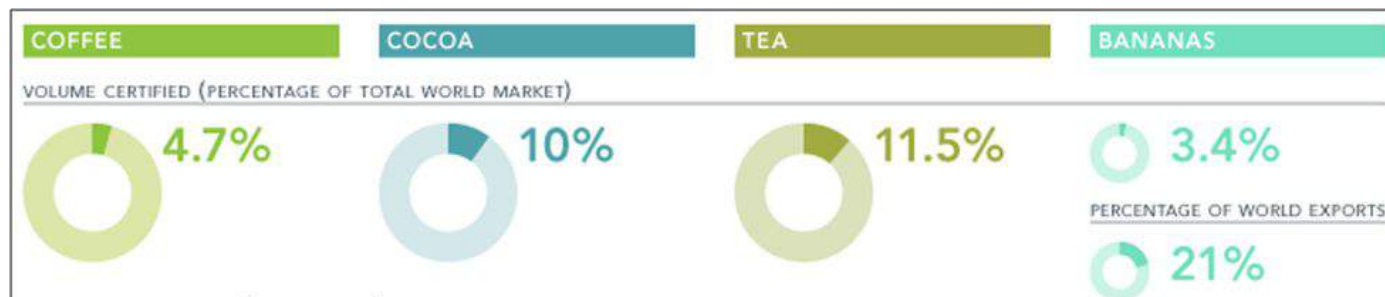
Rainforest Alliance is working in over 100 countries. The main commodities Rainforest Alliance deals with in Africa are:

Tea - Burundi, Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Rwanda, South Africa, Tanzania, Uganda, Zambia, Zimbabwe

Coffee – Ethiopia, Kenya, Malawi, Tanzania, Uganda

Cocoa – Cote d'Ivoire, Ghana, Nigeria, Tanzania, Togo, Uganda

Rainforest Alliance certified forest operations cover over 70 million hectares, 11.4 million hectares of which are set aside for conservation reserves. Certified farms cover over 1.5 million hectares.



Rainforest Alliance’s mission is to work to conserve biodiversity and ensure sustainable livelihoods by transforming land use practices, business practices and consumer behaviour.

The Sustainable Agriculture Network (SAN) consists of a number of national and international partners. Rainforest Alliance are an international partner., working to encourage and monitor compliance with the SAN standard.

The SAN Standard has 10 principles:

1. Social and Environmental Management System
2. Ecosystem Conservation
3. Wildlife Protection
4. Water Conservation
5. Fair Treatment and Good Working Conditions for workers
6. Occupational Health and Safety
7. Community Relations
8. Integrated Crop Management
9. Soil Management and Conservation
10. Integrated Waste Management

Each principle has a set of criteria within it. Principle 2 holds particular relevance for tree conservation and forest restoration, incorporating the following criteria:

- 2.1 All existing natural ecosystems, both aquatic and terrestrial, must be identified, protected and restored through a conservation program (including areas unsuitable for agriculture)
- 2.2 From the date of application onwards – the farm must not destroy any natural ecosystem. From Nov 1st 2005 no natural ecosystem must have been destroyed by the farm (this disqualifies the farm from certification). If a natural ecosystem has been destroyed between 1999 and 2005, some analysis and mitigation is needed to determine if the farm can qualify for certification.
- 2.8 Farms must (where appropriate) establish and maintain a permanent agroforestry system that meets the following requirements:
 - On average minimum 12 native species per hectare
 - Tree canopy that comprises at least two strata or storeys
 - Overall canopy density on the cultivated land is at least 40%

Where the original natural vegetation is not forest one must dedicate at least 30% of the farm area for conservation or recovery of the area’s typical ecosystems.

2.9 Farms must implement a plan to maintain or restore the connectivity of natural ecosystems through elements such as native vegetation along roadsides, watercourses, river banks, shade trees, live fences or live barriers

SAN climate module

The SAN climate module aims to add to the positive social and environmental impacts of the current 10 SAN Principles. The aim is to raise awareness about climate change and encourage adoption of best management practices that can help farmers and communities to better adapt to the challenges of a changing climate. This involves:

- Assessing the risks posed by climate change to their farms and communities
- Analysing practices to quantify and reduce greenhouse gas emissions generated by cultivation
- Carrying out improved soil conservation and water management
- Better adapting to altered growing seasons and other conditions

Practices to achieve this include:

- Regeneration of native vegetation on sites that are degraded or vulnerable to extreme weather events
- Enhancement of ecological functions by planting native species
- Maintenance and increase of carbon stocks by planting and/or conserving trees or other woody biomass

Collaboration

Botanic gardens could play an advisory role on the SAN Standard criteria, focused on conservation and landscape restoration. For example by:

- Providing expert knowledge and rigour in identifying approaches and suitable tree species to enable successful and enhanced fulfilment of critical conservation and restoration criteria considering climate change impacts
- Helping ensure that ecosystem-based as well as landscape-based methods are better incorporated into farm planting and maintenance schemes
- Developing greater opportunity for public-private partnership and interest in funding tree-focused programmes.

BGCI and Rainforest Alliance are in discussions about partnership for forest and landscape restoration through their networks of botanic gardens and certified farms.



*Presentation: Enhancing tree conservation and forest restoration: Contribution of Agroforestry
Clement Okia, ICRAF – Uganda*

ICRAF is one of 15 CGIAR centres. ICRAF focuses on agroforestry and generates science-based knowledge about the diverse roles trees play in agricultural landscapes and livelihoods. ICRAF addresses poverty and environmental poverty using tree-based solutions. ICRAF is working with partners to develop and test technologies, promote their adoption and monitor their implementation. ICRAF uses research to advance policies and practices that benefit the poor and the environment.

ICRAF focus: Inclusion of trees in farming systems and their management in rural landscapes to enhance productivity, profitability, diversity and ecosystem sustainability.

The following activities undertaken by ICRAF demonstrate how agroforestry contributes to tree conservation and forest restoration:

- Encourage and implement buffer-zone agroforestry to reduce pressure on remaining forests, for example at Mabira and Budongo Forests in Uganda
- On-farm cultivation of medicinal plants including *Prunus*, *Warburgia* and *Cordia* sp., which supports the conservation of threatened species
- Participatory domestication of priority tree species, such as fruit trees
- Development of novel products from trees, such as shea butter
- Establishment of platforms and grassroots institutions for collective tree conservation and forest restoration
- Develop briefs from policy and institutional arrangements
- Facilitate participatory processes to support tree conservation and forest restoration, such as bylaws needed on bush fires, planting and cutting and community management
- Capacity building for the development of quality tree germplasm and provide training on quality tree seeds and nurseries
- Provision of information materials, such as manuals on growing trees

A number of constraints and challenges to these activities can be identified, including:

- Current limited access to adequate tree germplasm
- Low seed quality and low species diversity in some areas, such as areas that have been extensively planted with *Eucalyptus*, *Calliandra* and *Grevillea*
- Parties currently work in isolation – multi stakeholder engagement must be facilitated to move towards increased tree planting on farms and conservation
- Land and tree tenure issues and gender implications
- The long-term nature of trees can lead to limited funding for tree growing and natural resources management versus agricultural crops
- Farmers are more interested in short term benefits – therefore involving a mix of shrubs and fruit trees is advised for agroforestry



Prunus africana

ICRAF is open to collaboration with institutions to further tree conservation and forest restoration aims. ICRAF can provide expertise in on-farm tree growing and biodiversity and has a wide range of partners both internationally and nationally that can provide additional support to agroforestry projects. ICRAF has a number of relevant ongoing projects. ICRAF notes a growing interest in and recognition of agroforestry and has developed an agroforestry strategy for Uganda for scaling up efforts.

ICRAF maintains online species databases and resources that are decision-support tools and provide practical information about agroforestry species. Links to these are provided in the resources section of this report (page 56).

Presentation: IUCN work on forest conservation and restoration

Richard Gafabusa and Ivan Ebong, International Union for Conservation of Nature (IUCN) Uganda

IUCN was founded in 1948. It is a union representing more than 1,200 state and NGO member organisations in 160 countries, with more than 11,000 experts and scientists. Overlapping focal areas for the work of IUCN include Forests and Climate Change, Marine and Coastal, Business and Biodiversity, Water and Wetlands, Conservation Areas and Species Diversity and Drylands.

Knowledge - IUCN provides the latest science and knowledge on ecosystems and biodiversity and their contribution to human well-being.

Action - IUCN runs hundreds of field projects around the world to better manage natural environments

Influence - IUCN helps governments, communities, NGOs and the private sector to develop environmental laws, policies and best practice.

37% of the more than 65,000 species assessed on the IUCN Red List of Threatened Species face extinction. Deforestation of tropical rainforests could account for the loss of as many as 100 species a day.

In 1990 Uganda had 4,900,000 hectares of Forest but by 2005 this had declined to 3, 627,000 hectares. 17% of the forest estate is in Protected Areas. About 65% is on Public land and that is where the highest deforestation and degradation is occurring, mainly for agriculture and meeting the 98% woodfuel needs for the country.

IUCN Uganda is contributing to tree conservation and forest restoration in Uganda, particularly in the Mount Elgon landscape through the following activities:

- Supporting awareness raising and providing training
- Setting up Protected Area structures
- Community participation in forestry conservation
- River bank protection and restoration
- Undertaking research and assessments
- Livelihoods enhancement
- Community/ecosystem resilience and adaptation to climate change

Landscapes and Livelihoods Strategy (LLS), 2007 - 2011

IUCN facilitated the negotiations between Uganda Wildlife Authority (UWA) and Benet (near Mount Elgon) for co-management of the forests adjacent to communities. Community Resource Management arrangements were discussed between UWA, local governments and communities. Enrichment planting was undertaken to ensure restoration of degraded areas of the protected area, with a focus on livelihood enhancement. 100 low income women were involved and household incomes increased from \$10 per month to \$100 per month. 90% of households have tried to diversify to engage in other sources of livelihood including buying goats, donkeys, chickens or trading. 50% of households have been able to lease land to grow crops of their own for both food and income. The honey and milk collection point in Kapchorwa provides a reliable market, over 500 beehives have been established in the Protected Area. UWA allocated about 300 hectares through 12 agreements to different community groups on a pilot scale. Illegal pit sawyers in the landscape declined by 80%. 26 hectares were fenced and planted with trees to protect the Kisito catchment.

REDD+ 2011 – 2012

As a result of the lessons learnt from LLS and the achievements in Mount Elgon, IUCN was officially recognized as a key partner in the REDD process for Uganda. IUCN was requested by the Uganda National Forestry Authority to undertake consultations in Benet for REDD in Mount Elgon, which will be integrated in the Uganda REDD strategy as a pilot project. IUCN is a member of the REDD Steering committee and REDD Working Group. IUCN are involved in mapping and understanding issues of the poor in relation to REDD. This has involved participatory assessment of drivers of deforestation in the Mount Elgon pilot project through applying the poverty-forest linkages toolkit. This project is developing an understanding of benefit sharing in Uganda's forestry sector and highlighting issues and options for REDD implementation in Uganda.



Altered run off as a result of deforestation

Ecosystem Based Adaptation to Climate Change (EBA) 2011 – 2015

This program focuses on the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people and communities adapt to the negative effects of climate change at local, national, regional and global levels. An element of the project is restoration of micro ecosystems to sustain the supply of ecosystem services, involving planting 160,000 indigenous trees. Mount Elgon forest and Protected Area has been identified as a key ecosystem for this project. Vulnerability Impact Assessments (VIA) are being undertaken of hot spot areas and Payment for Ecosystem Services has been piloted with 120 individual land owners. The project aims to demonstrate the value of ecosystems and undertake capacity building. Three tree nurseries have been set up with the potential to raise 300,000 tree seedlings.

Implementing a resilience framework to support climate change adaptation (RFCC) – 2012 – 2015

This project is generating scientific information on areas of concern in the landscape such as areas predicted to be adversely impacted by flooding, landslides, land degradation, temperature change and rainfall projections. Hotspot areas have been mapped. Adaptation actions will be implemented in selected hotspots. Adaptation actions may include forest restoration, soil and water conservation, promoting clean energy adoption and livelihood diversification.

Key constraints

A number of key constraints were identified as hindering progress, including:

- Unsustainable funding for long term programmes for forest restoration/conservation
- The balance between long term conservation benefits and immediate development needs
- Conflict over land ownership
- Corruption
- Mix between science and community perception and needs (traditional knowledge)
- The governance issue – right from the lowest level

Participation, selecting an appropriate time period and engaging relevant stakeholders were identified as key needs for addressing these constraints.

A number of opportunities were identified for collaboration including for research to match appropriate species and sites, linking with botanic gardens as a source of planting materials (particularly for threatened species) and the opportunity to use project sites to test and implement recommendations. Cross institution collaboration was seen as an opportunity to add credibility, data and local knowledge about issues at the landscape level. The opportunity to undertake joint fundraising for forest conservation and restoration programmes was identified as an advantage of cross institution collaboration.

*Presentation: Ensuring international trade in *Pericopsis elata* and *Prunus africana* products is not detrimental to their conservation in Africa*

Jean Lagarde Betti, CITES Project Africa Regional Coordinator, International Tropical Timber Organisation (ITTO)

Pericopsis elata (Assamela or Afrormosia) and *Prunus africana* (Pygeum or African cherry) are classified by the IUCN as Endangered and Vulnerable species respectively, which led to their listing in Appendix II of CITES.

A key requirement of CITES is non-detriment findings (NDF) made by the Scientific Authority of the range State prior to export, certifying that export is not detrimental to the survival of the species. This requires information on the location, stocking, growth and condition of the species and on its ecology, regeneration and subsequent protection. Such information is often lacking, incomplete or imprecise making a proper evaluation of the sustainable levels of utilisation difficult. The Scientific Authorities also face obstacles due to inadequately trained and under resourced staff.

Objectives of the ITTO – CITES programme:

- To ensure international trade in *Pericopsis elata* and *Prunus africana* is consistent with their sustainable management and conservation in the Congo basin
- To assist national authorities from Cameroon, Congo, and DRC to meet the scientific, administrative and legal requirements for managing and regulating trade in *Pericopsis elata*

Global overview of activities funded

17 activity proposals at both regional (3) and country (14) levels were submitted to ITTO for consideration under the Program in phase I (2008 – 2011) and phase II (2012 - 2015). This included; 9 completed activities (3 at regional level: Kribi, Limbé, Douala and 6 at country levels: Cameroon (3); Congo (1), DRC (2)), 3 ongoing activities (Cameroon, Congo, DRC) and 5 pending proposals.



Strategy in addressing Non-detriment findings (NDFs) in all countries

The scheme to follow for addressing NDFs is still in discussion among CITES experts, but despite that, the following elements can be identified as important for each tree species :

- Biological and ecological issues: Phenology, habitat, distribution areas, growth rate, dynamic,
- Sylviculture and management issues: inventories, stand stock, definition of quotas, Minimum Exploitable Diameter (MED), recovery rates,
- Law enforcement, control and monitoring aspects

The following steps can therefore be undertaken :

Step 1: Identification of thematic research areas or specific activities and recruitment of national experts (forest ecology, biology, inventories, policy, socioeconomic issues)

Step 2: Establishing state-of-the-art management, exploitation, transport, processing, and exportation of the species in question

Step 3: Verifying or conducting management inventories according to national standards

Step 4: Definition of national quotas on a scientific basis

Step 5: Establishment of an ad-hoc scientific expert group composed of researchers from universities, research institutions and field forest officers to draft the NDF document, based on the results obtained from different studies

Main achievements

- NDF reports available for all the three countries and the two targeted tree species including: *Pericopsis elata* in Cameroon and Congo and *Prunus africana* in Cameroon and DRC
- Minimum Exploitable Diameter revised for *P. elata* in Cameroon and Congo
- Sound inventory method proposed for the two species in the three countries
- The ban lifted for the two species in the three countries based on the work done
- The scheme and method for conducting management inventories and formulating NDF reports well understood by national authorities (e.g Congo partnership with SIFCO for *P. elata*, Cameroon partnership with trade companies for *P. africana*)

Impact of the project

National budget - The lift of the bans has a positive impact on the country's budget in terms of the taxes paid by trade companies, and also in terms of the price of buying the product (*Prunus* barks) from the local communities. For example, since 2010, the Cameroon Government has received more than 20,000 USD as the regeneration tax.

Social and environmental - Trade companies have contributed more than 300,000 USD to local communities in the North and South West regions of Cameroon, which encouraged local people to better contribute to the conservation of *P. africana* in their forests and farms.

Scientific - More than ten students from different universities have prepared MSc theses on the topic, four papers published in peer reviewed journals and many additional papers are in the process of publication and in preparation.

Challenges - Some activities encountered delays due to administrative procedures and security problems. The frequent changes of staff in implementing agencies constituted a big problem for the program.

Conclusions, recommendations and future work - To formulate an NDF document for a given species, it is good to conduct a fair and detailed review. ITTO encourage the mobility of experts within different countries. In DRC, many delays were observed. Future specific activities should focus on management of *P. elata* in forest concessions based on the Cameroon and Congo Brazzaville experiences (pending proposal) and development of a fair system of traceability for monitoring logging, processing, transport and trade on *Pericopsis* and *Prunus* products. It would also be beneficial to provide increased assistance to local authorities. Work is also planned to develop the sylviculture of *P. elata* (pending proposal), develop a database encompassing logging, processing, transportation and trade statistics components (ongoing activity) and train and sensitize forest and customs officers at different levels on CITES rules through CITES training workshops based on the DRC experience (ongoing activity).

Recommendations for all countries:

- Elaborate an arrêté (order) which establishes the list of species
- Integrate conditions for the management of *Pericopsis elata* in forest policy
- Increase knowledge of the stock of *P. elata* and *P. africana* in Protected Areas
- Improve knowledge on the wood quality of *P. elata*
- Provide adequate materials and logistics to forest officers for data collection and analysis
- Develop and implement similar projects/activities for other important timber species such as Bubinga (*Guibourtia* sp), Moabi (*Baillonella toxisperma*), Wengué (*Millettia sanaga*), Johimbé (*Pausinystalia johimbe*)
- Expand the program to other African countries including Côte d'Ivoire, Ghana, Central African Republic and Nigeria.

*Presentation: Green Resources - Busoga Forestry Company
Teddy Nsamba, Senior Plantation Manager, Green Resources*

Green Resources are located in Uganda, Tanzania, Mozambique and Southern Sudan. In Uganda, plantations are located in Bukaleba Central Forest Reserve in Mayuge District with a total area of 9,000 hectares and Kachung Central Forest Reserve in Dokolo District with a total area of 2,500 hectares. Green Resources, Busoga Forestry Company (BFC) acquired the tree planting licenses for these sites from the Uganda National Forestry Authority in 1996 and 2004 respectively.

The mission of BFC is to establish Africa’s leading Forestation Company with additional carbon offset, renewable energy and wood product operations for the benefit of its stakeholders.

The vision of BFC is:

- To establish large, sustainably managed forest and agroforestry plantations that will create the basis for the long term growth of the company and in order to store large amounts of carbon dioxide
- Use wood from the existing and new plantations to produce products that are satisfying the needs of our customers
- Follow the highest corporate standards including Forest Stewardship Council (FSC) certification for sustainable forest operations

Why plantations?

- To reduce pressure on the existing Natural forests
- Higher returns on investment
- Fast approach to restoration of degraded landscapes

<i>Plantation name</i>	<i>Bukaleba plantation</i>	<i>Kachung plantation</i>
<i>Total area available for planting (ha)</i>	4,725	2,020
<i>Area planted with pine (ha)</i>	3, 295	1,818
<i>Area planted with Eucalyptus grandis (ha)</i>	918	180
<i>Area planted with other hardwoods, including Maesopsis eminii, Khaya sp., etc. (ha)</i>	106	20
<i>Total planted area (ha)</i>	4,319	2, 018

Efforts towards conservation

3,500 hectares in Bukaleba plantation is left under conservation: 1,500 hectares considered High Conservation Value Forest (HVCF) providing habitat for many butterfly species, birds and one rare animal species (Buffalo) in the eastern region. 800 hectares are buffer zones to Lake Victoria and 500 hectares are wetlands and ridges within the plantation.

6,000 hectares in Kachung Plantation is under conservation.

Green Resources is geared at establishing indigenous species with a total of 180 hectares planted to date.

Challenges and the way forward

Challenges include:

- Pest and diseases
- Availability of indigenous planting materials
- Inadequate knowledge on indigenous tree species
- Political interferences as a result of personal interests
- Sabotage by neighbours
- Drought and other environmental phenomena
- Price for carbon credits reducing by day

To address these challenges, the following elements are needed:

- Available planting materials
- Adherence to conditions assigned by the national laws
- Sensitisation of masses including the political heads, cultural leaders and schools.



Presentation: Learning About Forests (LEAF) in Uganda Eco-Schools

Julian Katambi, Project Manager, Conservation Efforts for Community Development (CECOD), Uganda

Conservation Efforts for Community Development (CECOD) is a national NGO founded in 1999, implementing Sustainable Environmental Education Programmes to enhance the profile of education in Uganda. CECOD lead national environmental education programme standards ensured through a National Jury with representatives from NEMA, Uganda Commission for UNESCO, Child to Child KyU and CAN-E (a national Climate Change Action Network of Eco Schools which incorporates environmental education institutions, with over 500 schools registered to the scheme).

CECOD is a Foundation for Environmental Education (FEE) International Full Member NGO representing Uganda since 2009.

CECOD has also been accredited to the United Nations Convention to Combat Desertification (UNCCD) since 2003. The UNCCD announced CECOD among the 3 winners of International UNCCD Land for Life Award during Rio+10 in Brazil which was awarded in Doha in 2012. CECOD won Best Practice Award 4th Position out of 314 from the European Union Civil Society Capacity Programme in 2008.

CECOD work to promote Education for Sustainable Development in more than 250 primary schools, 3 Primary Teacher Colleges (PTCs) and more than 350 Eco community nodes at school level using the international Eco Schools Approach (2006-2016).

CECOD lead the Learning About Forests (LEAF) project to deepen the understanding of forests and diverse forest functions among the youth in 40 schools using outdoor and postive methods

Pillars of the Learning About Forests (LEAF) Programme

- Capacity building of teachers and partner NGOs in the Eco Schools environmental education IVAC approach (Investigation, Vision, Action & Change)
- School based micro project demos and development of micro project environmental education instructional materials
- School community cooperation and people-centred advocacy

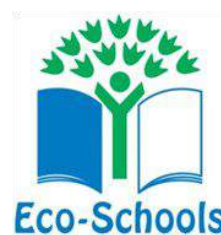
CECOD also run the Litter less campaign in over 45 schools in Central and South West Uganda and Community Based Climate Change Resilience through Schools (CBCRS) with WWF Uganda and UNDP in Isingiro District involving restoration of Lake Nakivare and River Kagera catchment.

Challenges

- Limited government support to schools
- A theory based education system in Uganda
- A need for more partners in environmental education

Opportunities for collaboration

CECOD have experience working with pupils, teachers, communities and NGOs. Under their Biodiversity theme CECOD promote medicinal and herbal gardens in schools for learning, community replication and species preservation. CECOD programmes also carry out and encourage tree planting as part of formal and non formal teaching. CECOD have valuable experience for future programmes based on conservation and environmental education.



Presentation : The Green Belt Movement’s work towards tree conservation and forest restoration in Kenya

Juliana Mugure, The Green Belt Movement

The Green Belt Movement (GBM) is an environmental organization that empowers communities, particularly women, to conserve the environment and improve livelihoods.

Vision: A values-driven society of people who consciously work for continued improvement of their livelihoods and a greener, cleaner world.

Mission: We strive for better environmental management, community empowerment and livelihood improvement, using tree-planting as an entry point.

GBM works with rural communities to help them address their needs for essential basic services such as water, fertile soil and a healthy ecosystem, through planting trees on critical watersheds. Most of GBM's work is driven by grassroots groups around the five water towers in which they work. The grassroots network facilitates the mobilization of communities around local development activities. The focus for GBM is environmental education, conservation and livelihood creation through three main areas of activities— Community Empowerment and Environmental Education (CEE), advocacy and tree planting.

Community Empowerment and Environmental Education (CEE)

Community Empowerment and Environmental Education (CEE) is the community engagement platform upon which all other GBM activities are built. CEE is vital for communities to understand the linkages between human activity and the health of the environment.

Communities are educated about the positive impacts of tree planting and provided with practical learning on how to create sustainable livelihoods.

CEE provides participants with the skills and resources to create a tree nursery group. It also encourages leadership for communities to feel empowered to speak up when rights are being violated.

Advocacy

GBM combines a grassroots approach with international advocacy. At the grassroots, GBM’s goal is to create climate resilient communities through restoration and protection of forest watersheds, and sustainable livelihoods for communities. GBM’s approach empowers communities to take action against climate change, the impacts of which are already being witnessed across Africa, through food security and water harvesting activities (adaptation) and planting the appropriate trees in appropriate places (mitigation).

Treplanting for Watersheds

The watershed approach is seen as a better way to identify where we need to work to conserve watersheds so that they continue to provide ecosystem services. A watershed is an area of land in which water drains to a common point. Wherever drops of rain fall in the watershed they will all eventually flow to the same stream, river or lake. The quality, quantity and consistency of that flow is greatly affected by tree cover within the watershed. By considering the whole area as a community, organisations can promote action that benefits all those who rely on the water within it.

To date GBM works with 4000 tree nursery groups with most of these groups supporting activities within the following key ecosystems; Aberdares, Mt. Kenya, Mau, Cherangani and Mt. Elgon.

Example projects: Name of project	Project Size (area of coverage/ number of trees)	Description of activities carried out
Community Based Forest Resources Conservation and Management (COMIFORM) 1	Maasai Mau Forest 500,000 trees planted in the forest 250,000 public lands	Establishing and raising the capacity of 12 community tree planting networks (groups at sub-location level) to establish tree nurseries, supply tree seedlings, conduct planting and tending of indigenous trees within the Maasai Mau forest area and on public/private land surrounding the Maasai Mau forest.
Community Based Forest Resources Conservation and Management (COMIFORM) 11	Maasai Mau Forest 150,000 trees	Development of PDD for the carbon-offset project Biomass assessment survey Workshops on Biocarbon

Challenges include; Low tree survival rate in the forest, conflict of interest by forest resource users, inadequate funding with limited grant periods and inadequate knowledge base.

Opportunities include; Forest restoration in priority watersheds, community awareness programmes to promote conservation of threatened species and exchange programmes between organisations and institutions to share knowledge and experiences.



Presentation: Enhancing tree conservation and forest restoration in Africa, the work of the Wangari Maathai Institute Professor Kiama Gitahi, Wangari Maathai Institute for Peace and Environmental Studies, Kenya

Professor Wangari Muta Maathai was former Head of Department of Veterinary Anatomy at the University of Nairobi, the founder of the Wangari Maathai Institute and Nobel Peace Prize Laureate, 2004. She also founded the Green Belt Movement.

From idea inception in 2008, a name was selected for the Wangari Maathai Institute for Peace and Environmental Studies (WMI) and plans were approved in 2010. Professor Wangari Maathai was appointed as the first Distinguished Chair. The University of Nairobi allocated 50 acres for the establishment of the Institute.

‘One aspect of a love of nature that we need to foster is experiential. Nature- and in particular, the wild- feeds our spirit and a direct encounter with it is vital in helping us appreciate and care for it. For unless we see it, smell it, or touch it, we tend to forget it, and our souls wither’ - From Replenishing the Earth, by Wangari Maathai

WMI vision: Excellence in experiential learning, transformational community outreach and research for a sustainable environment and cultures of peace.

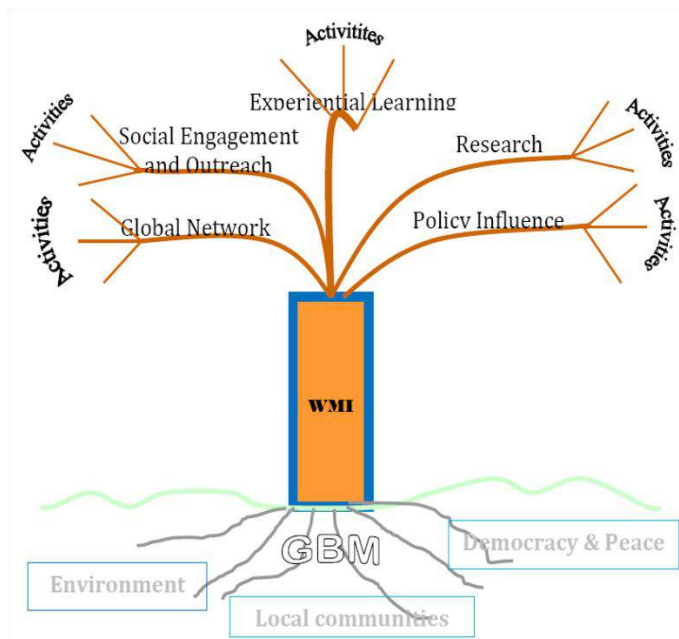
Objective - To Make WMI a centre for holistic environmental practices.

Key programmes at WMI include;

Doctor of Philosophy on Environmental Governance and Management

Master of Science in Environmental Governance

Project: Stabilizing Kenya Through Resolving Forest Related Conflicts (STAKE)



Strategic issues – GBM link to WMI

Ongoing activities

A botanic garden will be set up at the WMI for environmental education, research, conservation and recreation. A collaborative approach will be taken in designing the botanic garden, involving students, staff and local communities. A survey has been undertaken to identify which native trees already exist on the campus and collection planning is a key part of botanic garden development.

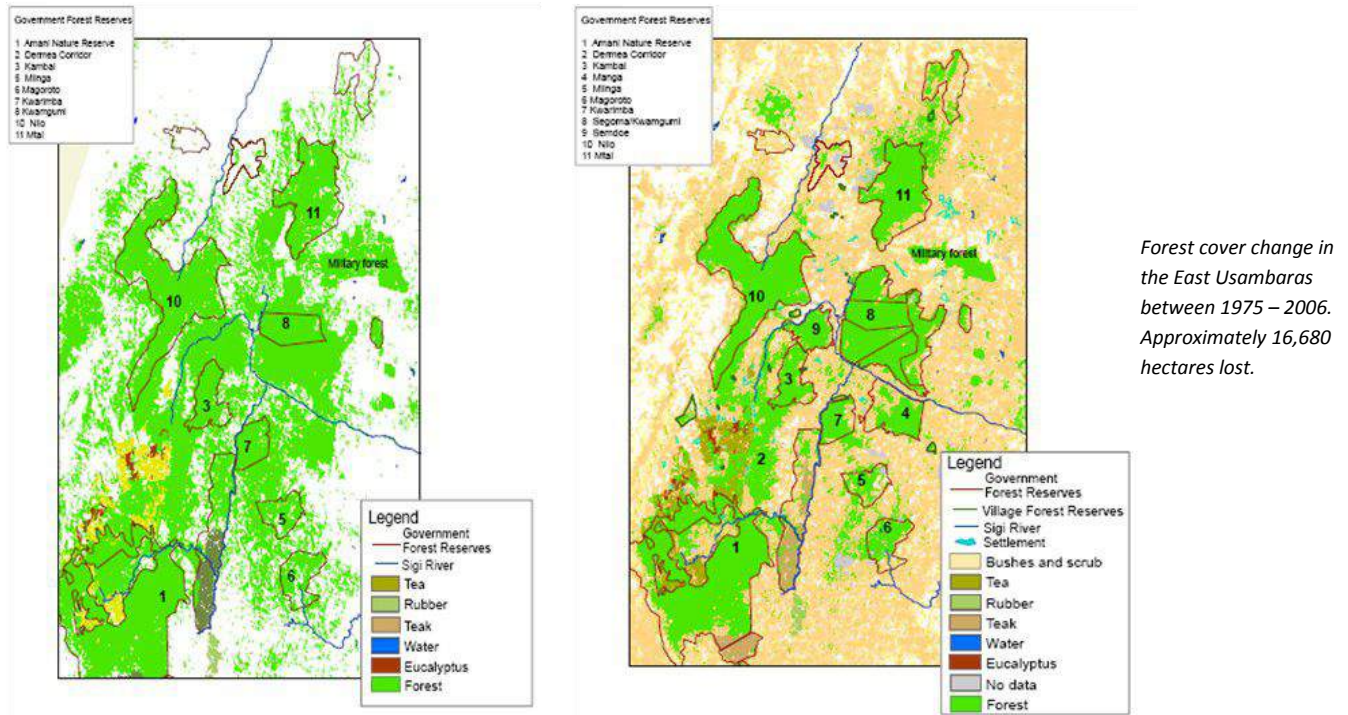
At the 18th Ordinary Session of the African Union, at the new African Union Headquarters complex in Addis Ababa, Ethiopia, all the Heads of States from Africa decided to recognize the life and work of Wangari Muta Maathai. The Summit also encouraged the AU Commission, to take all the necessary measures to support the Wangari Maathai Institute for Peace and Environmental Studies as an African Centre of Excellence, to encourage research on environmental governance and its linkages with peace, human rights and democracy in Africa.

Presentation: Forest Landscape Restoration / Connectivity: A case study from Tanzania
 Charles Meshack, Tanzania Forest Conservation Group (TFCG)

Vision: A world in which Tanzanians and the rest of humanity are enjoying the diverse benefits from well conserved, high biodiversity forests

Why East Usambaras? A priority site for conservation investment in Tanzania

TFCG’s work focuses in the East Usambaras which were globally identified as an ‘area of high endemism’ within the Eastern Afromontane ‘hotspot’. It is also listed as a national priority for conservation investment based on threat and biodiversity value.



The following threats are impacting upon the forests of the East Usambaras and are common drivers of deforestation in other regions:

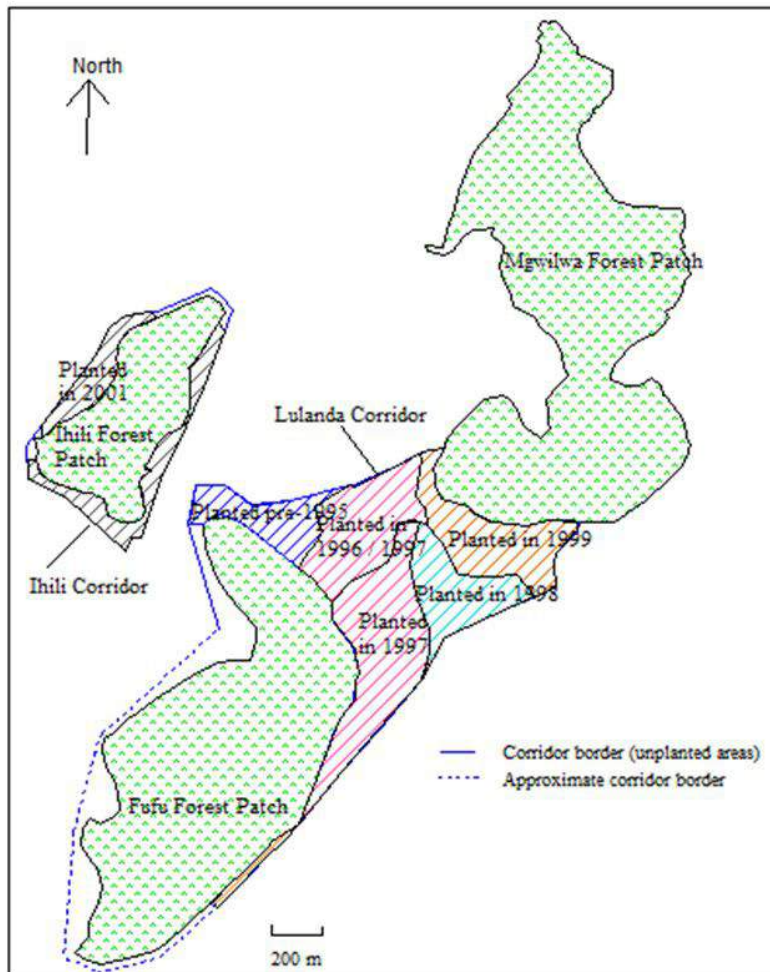
- Fire (slash and burn agriculture, hunting, wild honey collection)
- Fuelwood (for industry – tea curing, soap and textile factories)
- Household firewood
- Forest conversion to agriculture
- Gold mining
- Illegal timber harvesting
- Cardomom harvesting



TFCG are involved in a number of conservation programmes to protect the forests of the East Usambaras, including;
In situ restoration - A total of 18 Village Land Forest Reserves have been established, in which agroforestry and small scale afforestation is facilitated and specific restoration efforts are undertaken, focused on key gaps in the landscape.
Ex situ conservation – TFCG has been promoting indigenous species conservation including *Allanblakia stuhlmannii*, *Ocotea usambarensis* and *Dalbergia melanoxyylon*.

Figure X illustrates TFCG’s work to restore the Lulanda Corridor in Mufindi, one of their principal projects. Overall this project was very successful. A number of challenges arose for particular indigenous species for the following species;

- Parinari* sp. - germination difficulty
- Syzygium cordatum* - seeds required drying prior to germination
- Craibia brevicaudata* – germinated easily in the nursery but many seedlings died when they were planted out into the corridor



TFCG restoration of the Lulanda Corridor

A restoration strategy for tropical forest in abandoned or degraded forest land was developed from this project. The main aim was to protect the areas from fire and allow natural regeneration to produce secondary forest. This highlights the importance of maintaining the fire line.

The project also resulted in the development of a forest management plan and bylaws to guide forest managers on their daily activity. The project also promoted income generating activities which are connected to forest conservation work, such as beekeeping, fish farming and agroforestry. These activities supported the mobilization of communities. Another important aspect of the project was the opportunity to promote tree planting to farmers and primary school students.

Challenges

The following challenges can be identified to progress:

- Rapid population growth – resulting in pressure on forest land
- Poor agronomic practices – particularly the use of poor yielding cultivars and shifting cultivation
- Poor farming practices – resulting in widespread soil erosion
- Unsustainable land use practices – creating a threat of drying up of river tributaries
- Emerging forest threats such as fuel wood demand for industrial processing, sugar cane, tea out-growers.

Presentation: Tree seed production, conservation and use in Kenya, the role of KEFRI William Omondi, Kenyan Forestry Research Institute (KEFRI)

KEFRI's role in tree seed production involves; Identifying and registering private seed sources, Collecting, testing and distributing high quality seeds, Training owners of private sources and register them as seed suppliers and Intensifying genetic improvement of indigenous species. KEFRI is a member of OECD, ISTA and STAK.

Ex situ conservation through seed storage

In collaboration with partners (including the Millennium Seed Bank Partnership Kew's Seeds for Life Project), KEFRI have collected, documented, and stored seeds of tree and shrubs representing 120 families, 359 genera and 554 species indigenous to various regions of Kenya.

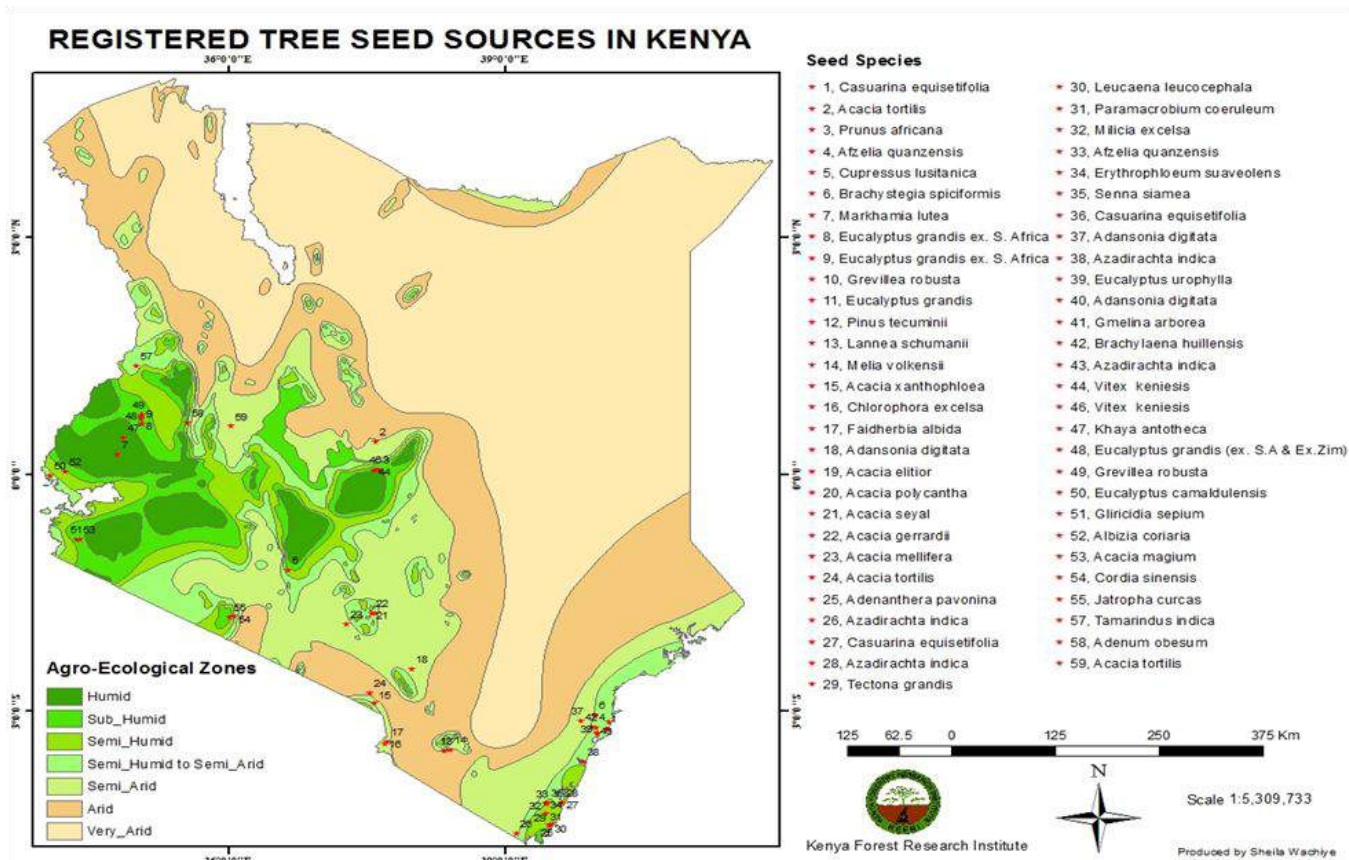
There are an estimated 51,000 wild species in Africa. Approximately 10,000 of which (20%) are securely stored in seed banks. KEFRI are involved in collecting, conserving and domesticating rare and endangered plants.

Development and application of seed handling protocols

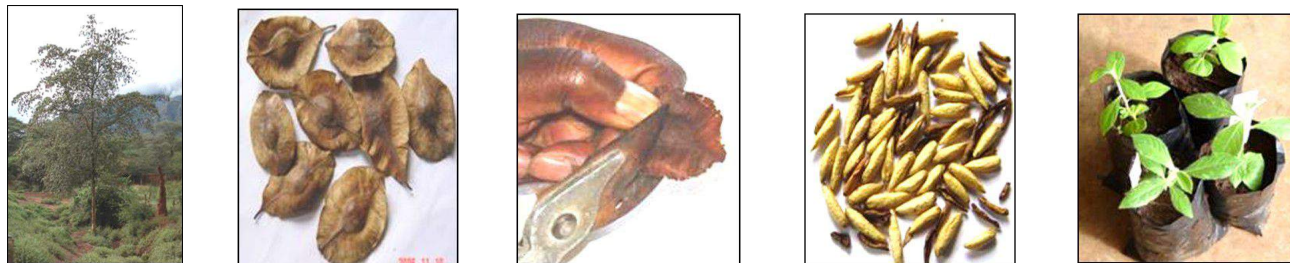
The focus of seed research is on storage and dormancy release. KEFRI have enhanced their understanding of storage and germination behavior of challenging indigenous species such as; *Melia volkensii*, *Polyscias fulva*, *Zanthoxylum gillettii*, *Terminalia brownie* and *Osyris lanceolata*. Germination protocols have been developed for these species.

Seed germination trials of *Melia volkensii* have yielded the following information;

- Seed is shed at high moisture content (42% +/-2%)
- Viability is lost at moisture content <10%
- The stony endocarp could be associated with minimizing seed desiccation in nature



Germination trials of *Terminalia brownii* have led to development of a germination protocol which involves cutting the seed casing to extract the inner seed:



KEFRI provides training and skill development support to seed stockists, community groups and laboratory technicians. KEFRI produces technical guidelines, provides academic training and is involved in curriculum development for colleges and universities. KEFRI are also involved in capacity building at the community level in practices such as seed handling and quality control to establish and manage group nurseries. Technical guidelines have been produced for the establishment of community seed stands and woodlots. This includes guidance on developing a management plan, site selection, tree species selection, sourcing plant material, nursery establishment and management, seed stand ownership and benefit sharing, product processing and marketing, data collection and management and management cost.

Challenges to seed production and use

- Slow rate of tree improvement
- Low funding for research limits capacity to develop more technologies
- High cost of procurement and maintenance of seed production and testing equipment
- Large number of species for which propagation methods are yet to be optimized
- Regulating the production and use of seeds of low quality
- Estimating seed demand is difficult – amounts and species

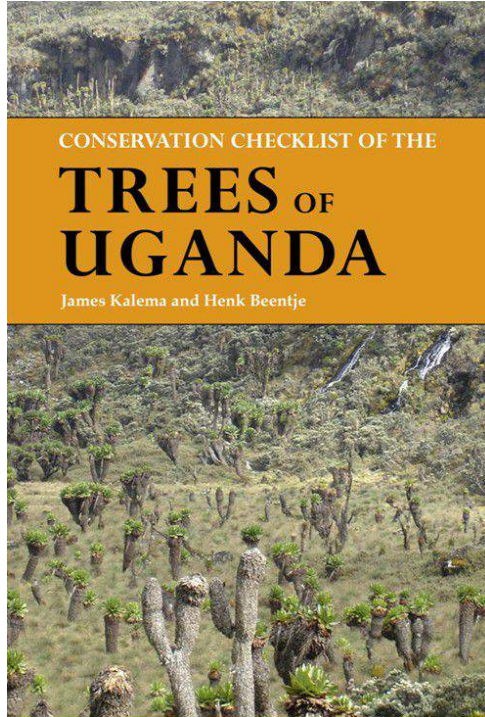
The development of appropriate technology can help solve seed problems such as overcoming seed dormancy, undertaking comparative ageing studies and post harvest handling.

The Seeds and Plant Varieties (Amendment) Act, 4th January 2013, provides for governance of forestry seeds and other species including domestication of wild plants and provides for the maintenance and propagation of varieties that are not commercially attractive to the private sector.

*Presentation: Conservation Checklist of the trees of Uganda and the work of Makerere University Botanic Garden
James Kalema, Author of the Conservation Checklist of the Trees of Uganda and curator Makerere University BG*

James Kalema from Makerere University, Uganda, and Henk Beentje from the Royal Botanic Gardens Kew, co-authored the *Conservation Checklist of the Trees of Uganda*, published in 2012. The aim of the publication was to support conservation in the country and whole region.

The rationale for production of the book was that Uganda has a wide range of habitat, elevation and diverse flora as well as a heavy dependence on plant resources. Many of Uganda's trees are facing threats, extinctions or declines in abundance and range of distribution. The process of getting conservation assessments published to the IUCN online Red List is often slow, so the book provides the information without waiting for it to be reviewed and published online.



The *Conservation Checklist of the Trees of Uganda* provides updated and accurate information for tree conservation. The book uses the latest IUCN Red List Categories and Criteria - Version 3.1 (IUCN, 2001).

The book covers 829 taxa and the most species-rich families are; Fabaceae, Rubiaceae, Euphorbiaceae and Moraceae. The most species-rich genera are;

- Ficus* (41 species)
- Acacia* (21)
- Albizia* (15)
- Grewia* (14)
- Euphorbia*, *Ochna* and *Rytigynia* (with 9 species)

Moist forests are by far the richest in trees, followed by wooded grasslands and woodlands. Seven taxa covered in the book are endemic to Uganda.

Many more taxa covered in the book are restricted range species. 52 species are found only in Uganda or Uganda and adjacent parts of neighbouring countries. The book provides a full treatment including a description, high resolution image, graph on phenology, threats, habitats and altitudinal range and a distribution map.

Threat levels

Four species are assessed as Critically Endangered (CR); *Diospyros katendei*, *Encephalartos equatorialis*, *Encephalartos whitelockii* and *Ficus katendei*

Four taxa are assessed as Endangered (EN); *Uvariadendron magnificum*, *Ochna leucophloeos* subsp. *ugandensis*, *Gomphia mildbraedii* and *Encephalartos macrostrobilus*

Four taxa are assessed as Vulnerable (VU); *Vepris eggelingii*, *Dicranolepis incise*, *Desplatsia mildbraedii*, *Cyathea mildbraedii*

The most vulnerable species are those in the altitude range of 750-1500 m (ASL).

Sixteen of the taxa covered in the book are included in the Appendices of CITES, including four *Encephalartos* species (Appendix I), *Aloe volkensii*, *Prunus Africana*, four *Cyathea* species and six succulent tree *Euphorbia* species.

Threats

The main threats impacting on the species covered in the book are:

- Habitat loss and degradation – Cultivation, urbanisation, industrialization
- Over-harvesting – Charcoal, timber, medicine
- Introduction of alien invasive species
- Changes in climate patterns

Protection

Of the seven endemic tree taxa, only two (*Balsamocitrus dawei* and *Ficus katendei*) are in National Parks. Of the 12 globally threatened taxa, only *Ficus katendei*, *Cyathea mildbraedii* and *Desplatsia mildbraedii* occur in National Parks.

Recommended conservation efforts

Conservation is required for the tree taxa assessed as globally threatened in the book. A combination of *in situ* protection and *ex situ* conservation initiatives, such as botanic garden and arboreta collections and gene banks, are recommended for the globally threatened taxa.

The *Field Guide to the Moist Forest Trees of Tanzania* was published in 2006 (Lovett, *et al.* 2006). The field guide started life as a file card index prepared by Jon Lovett during field work in Tanzania from 1979 to 1992. Valuable input was added to content by students at the Botanical Museum of Copenhagen. Information on local names and uses was then added by Chris Ruffo and nomenclature was checked, updated and edited by Roy Gereau from Missouri Botanical Garden.

Within the book, moist forests are defined as evergreen and semi-deciduous closed canopy vegetation that ranges from lowland groundwater and riverine forests to elfin mist forests on the tops of high mountains. The book aims to enable field identification of moist forest trees by people who do not necessarily possess specialist botanical knowledge and who come from a wide range of cultural backgrounds. The book is available in printed format and online at (see Resources section for full reference and link). Additional outputs from the book include dual-language seedling guides (available in English and Swahili), which are laminated to allow their effective use in the field.

Rauvolfia caffra Sond.
Syn. FTEA: NC. **Syn. TTCL:** *R. goetzei* Stapf, *R. inebrians* K. Schum., *R. natalensis* Sond., *R. obliquinervis* Stapf, *R. ochrosioides* K. Schum. **Syn. other:** NR. **Local names:** Mkonga (G), Mkufi (Sw), Msesewe (C), Msumai (R), Mveriveri (H), Mweeti (S). **Bole:** Crooked/straight. Small/large. To 40 m. **Bark:** Grey/brown. Corky. Lenticellate/smooth/rough. **Slash:** Pale brown. Granular. **White latex:** Leaf: Simple. Whorled. **Petiole:** 0 - 6 cm. Channelled. **Lamina:** Medium/large. 2 - 50 × 2 - 15 cm. Elliptic/oblong. Cuneate. Acute. Entire. **Glabrous.** **Domatia:** Absent. **Glands:** Absent. **Stipules:** Absent. **Thorns & Spines:** Absent. **Flower:** White/pale green/pale yellow. Terminal many flowered cyme. **Hermaphrodite.** **Fruit:** Dark red. Lenticellate. One-two lobed. Globose 1 cm in diameter. **Ecology:** Montane forest. **Distr:** C, EA, N, LN, LT. Widespread in Tropical and Southern Africa. **Notes:** NR. **Uses:** The wood is used as timber which is suitable for simple doors, boxes, water troughs, spoons, bowls, milk pots, stools, grain mortars, beehives and drums. The bark from the stem and roots are used by many tribes for treating high blood pressure and intestinal worms. The WaChagga use the bark when preparing a native drink to make it strong and tasty. The bark is also used as medicine for pneumonia, rheumatism, allergy and body swellings. The tree is also used for shade, ornamental and as a bee forage.

The data gathered during production of the Field Guide has also allowed for the production of an online tool for Forest Regeneration in Tanzania available in English and Swahili, including online identification guides. The information has also been incorporated into the Encyclopaedia of Life and the African Tree Database (see Resources section for links).

Mwongozo wa Miche ya Miti, Vichaka na Mitambaa ya Milima ya Tao la Mashariki
Seedlings guide to Trees, Shrubs and Lianas of the Eastern Arc Mountains

Imetayarishwa na (created by): Henry J. Ndangalasi, Norbert J. Cordeiro, Luciana E. Mshana, Carrie E. Seltzer, Hannah E. Pilla, and Charles Challenge
 Department of Botany, University of Dar es Salaam, P.O. Box 35060, Dar es Salaam; Forestry and Beekeeping Division, P.O. Box 426, Dar es Salaam;
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Shukrani kwa (special thanks to): Roosevelt University, Rebecca Banasiak, John Bates, Thomas Challenge, Edna Davison, Robin Foster, Mathias Lema, Shedrack Mashauri, Bakari Mtui, Ellasy Mujiliah, Evarist Nashanda, and Bill Stanley.
 With support from Rainforest Conservation Fund; International Foundation;
 International Foundation for Conservation, Food and Health; The Field Museum; Idea Wild; Amani Nature Reserve;
 Forestry and Beekeeping Division in the Ministry of Natural Resources and Tourism (Tanzania), University of Dar es Salaam and Amani Parish.

© Field Museum & Department of Botany, University of Dar es Salaam, Tanzania Photos by: H. J. Ndangalasi, N. J. Cordeiro, and C. E. Seltzer

		
◆ Alangiaceae	◆ Anacardiaceae	◆ Anisophyllaceae
<i>Alangium chinense</i>	<i>Sorindeia madagascariensis</i>	<i>Anisophyllea obtusifolia</i>
Mmavimavi (K)	Mpilipili (K)	Msa-mti, Msala (S)
Mhondogogo; Mkondogogo (S)	Mkwingina (S)	

Where next? Future plans include;

- Production of an interactive identification guide, thereby finishing the original intention of the project
- Expansion of the content to cover trees from across Eastern and Southern Africa – from Cape to Cairo
- Increase accessibility of the guide – production of a number of additional formats that can be widely used
- Increase the applicability of the guide – by adding information for practical use

Ufunguo / Symbol Key

♥ madawa medicinal	t mti tree	(K) Kiswahili
🏠 ujenzi building	S kichaka shrub	(S) Sambia
◆ vifaa / zana tools	L mtambaa liana (woody vine)	(H) Hehe
🌳 mbaao timber	S/t kichaka / mti mdogo shrub or treelet	(Z) Zigua
🍌 chakula food	L/S mtambaa / kichaka kidogo liana or scandent shrub	(L) Luguru
	🏔 Hupatikana katika milima ya Tao la mashariki pekee	
	Endemic to the Eastern Arc Mountains	

*Presentation: Tanzania Tree Seed Agency – Establishment and present state
Ludovick Uronu, Chief Executive, Tanzania Tree Seed Agency (TTSA)*

The total forest area in Tanzania is 48 million hectares. 33% of the land in Tanzania is under legal protection. The estimated total volume of trees in Tanzania is 3,100 million m³, 97% comes from natural forest and 3% from planted trees. Deforestation in Tanzania is estimated at 412,000 hectares annually.

Forest rehabilitation - Rehabilitation of the degraded environment in Tanzania requires 440 million seedlings, which is equivalent to 40 tonnes of seeds per year.

Historical background of tree seed handling in Tanzania - Tree seed handling in Tanzania commenced in 1902, during German rule, at the Biological and Agricultural Research Institute (Das Biologisch Land Wirtschaftlichen Institut), Amani in Tanga region. In 1927 the Institute was renamed the East African Agricultural Research Station (EAARS). In 1948 the Amani Research Station was moved to Muguga, Kenya to form EAAFRO. A Silvicultural Research Station was established at Lushoto in 1951.

During the 1970's the government launched a national tree planting campaign and in 1989 a National Tree Seed Programme (NTSP) was established. NTSP was a joint initiative between the Government of Tanzania (GOT) through the Ministry of Natural resources and Tourism, and the Government of Denmark through the Danish International Development Agency (Danida). Danida support ended in 1999. The main aim of the development of NTSP was to improve wood production and rehabilitate the degraded environment to meet requirements for timber, fuelwood, fodder and shelter. The immediate goal was to improve sustainable provision of genetically high quality seeds as an input to seedling production and tree planting by other agencies.

The main inputs to the NTSP were personnel, buildings, vehicles and equipment, training and technical assistance. The main outputs of the project were well trained and highly skilled staff and an efficient and well functioning seed organisation, including a National centre and three zonal centres at Morogoro, Iringa and Lushoto. Many of the staff trained by the programme remained involved in the project after Danida funding. District forest officers were trained in seed procurement activities, and user-friendly seed information notes were prepared and distributed. Seeds from more than 138 different tree species were procured. About 140 tonnes of seeds were supplied to different customers through the period 1992 – 2003. A total of 360 seed sources were identified and 12 seed orchards established. The seed sources cover a large number of tree species, both exotic and indigenous species. A total of four provenance/progeny trials were established at an early stage of the project. Most of the seed sources serve a double purpose of seed production and gene conservation.

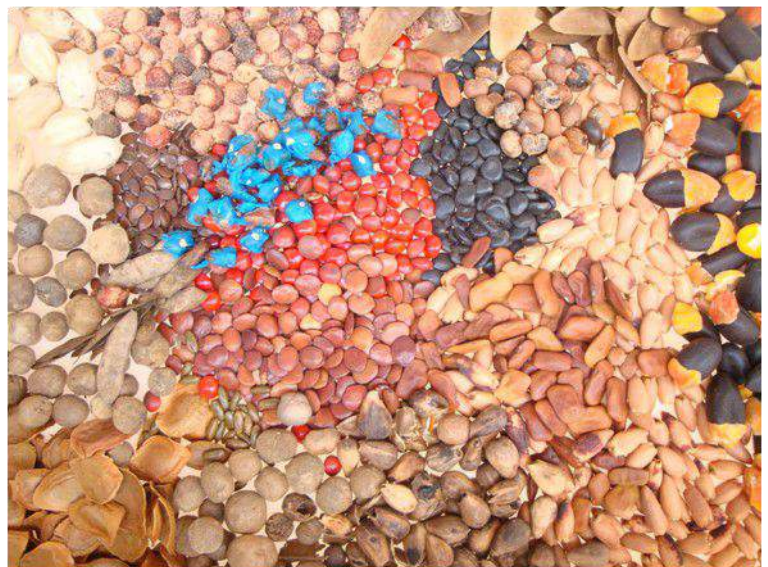
Direct beneficiaries of NTSP activities were: Government tree planting projects, large private companies and nurseries, NGOs, village groups interested in tree planting and forest professionals.

Transformation of NTSP to TTSA - As part of Public Service Reform Programme and in accordance with the Executive Agency Act No. 30 of 1997 the National Tree seed Programme was transformed to Tanzania Tree Seed Agency (TTSA) in January 2003 in order to maximize efficiency and effectiveness of the services delivered. TTSA is a semi autonomous body within the Ministry of Natural Resources and Tourism.

Objective of TTSA - To enhance sustainable supply of forest products and environmental conservation by producing, procuring and marketing high quality tree seed and other propagation materials.

Roles of TTSA - To provide high quality tree seed and other propagation materials for different end uses, to provide technical support for awareness creation and facilitation of customers in raising seedlings from seed supplied by TTSA, and to maintain a well-managed and financially self-sustaining agency.

TTSA sources of revenue - The core business provides revenue through the sale of tree seeds and seedlings. Additional revenue comes from running short courses in nursery techniques, forest botany field identification, advanced tree climbing, seed quality testing and consultancy services such as vegetation surveys, landscaping, forest nursery establishment and management and rehabilitation of degraded areas.



Seeds sales are the main source of TTSA revenue

T TSA has three seed laboratories, three tree nurseries and provides seed source for 360 species including indigenous species, such as *Khaya anthotheca*, *Pterocarpus angolensis* and *Albizia* spp. and exotic species such as eucalyptus, pine and teak. T TSA supplies an average of 12.5 tonnes of seed per year from 195 main tree species.

Since its establishment as an agency in January 2003, to June 2013 T TSA has supplied 102,838kg of seeds and 628,586 seedlings to various customers. All together this is estimated to provide for 642,738 ha (1,588,534 acres) of forest cover. T TSA performance can therefore be monitored not just in monetary terms alone, but rather on its input to environment conservation.

T TSA has more than 500 customers. Direct beneficiaries of T TSA activities are:

- Bilateral projects engaged in tree planting
- NGOs involved in tree planting
- National, Regional and District foresters
- Commercial plantations
- Private nurseries
- Forestry professionals
- Villagers and farmers

Community involvement - The involvement of local communities was not formulated as an official objective for T TSA, however, many local communities have indirectly benefited from T TSA seed sales. Approximately one third of the seed sources identified by T TSA are situated on land belonging to local communities. Part of the seed is eventually distributed to farmers through government agencies and NGOs who are customers at T TSA. These farmers can be seen as the end-beneficiaries. Seed collection is carried out in collaboration with the local communities and T TSA pays royalty to the community and salary to local workers involved in seed collection.



Collaboration - T TSA has experience collaborating with organisations both within Tanzania (including with Sokoine University of Agriculture, the University of Dar es Salaam and the Tanzania Forestry Research Institute, TAFORI) and outside of Tanzania (including Bioversity International, the University of Copenhagen and RBG Kew Millennium Seed Bank Partnership).

Challenges

Seed handling - seeds are perishable goods and some seeds are recalcitrant. Seed handling protocols for some indigenous tree species have not been developed; *Parinari curatelifolia* and *Vitex ptyos*, for example, are difficult to germinate.

Customers - Customers often do not order seeds with enough time for them to be planted. Farmers often buy tree seeds when they have already bought agriculture seeds and hence tree seed becomes less of a priority. Customers often mishandle seeds then complain they are not viable. Many customers have low purchasing power and cannot afford the seed offered. This can be addressed to some extent by selling seeds in smaller bags. Most people are still not aware of the existence of T TSA.

The cost of seed procurement is very high which can make seed business not profitable - T TSA currently rely on assistance from the government, but this contribution is currently inadequate and the budget is reduced annually.

T TSA has acquired land to establish a Zonal Centre at Mwanza City, but a lack of funds to develop the centre. This centre would serve the six regions around Lake Victoria. A total of Tsh 1,656,650,000 (USD 1,035,406) would be required to enable T TSA to overcome present challenges.

T TSA also requires financial support for training new staff. Currently T TSA has only 54 employees but requires 128.

Way forward - T TSA has identified six Distribution Agents across the country that will be their partners for introducing the system of distribution of tree seed in small bags. T TSA also have marketing strategies in place to raise awareness about T TSA and its work, including several types of promotional materials including advertisement in newspapers, leaflets, television, radio, yellow pages, etc. T TSA also visits their customers regularly.

Conclusion

Despite challenges, T TSA is proud to have established a good seed centre with well trained and committed staff, resulting in T TSA continuing to be one of the best seed centres in Africa.

Presentation: The Contribution of the National Forestry Authority to forest conservation in Uganda
Michael Malinga, National Tree Seed Centre, National Forestry Authority, Uganda

The Government of Uganda instituted forestry sector reforms between 1998 and 2003 due to the poor performance of the Forestry Department. The forest sector reforms constituted:

- A new Forestry Policy (2001)
- National Forest Plan (2002)
- National Forestry and Tree Planting Act (2003)
- The establishment of new institutional arrangements for the management of the forestry sector - one of the institutions was the National Forestry Authority, established in April 2004.

Vision - A sufficiently forested, ecologically stable and economically prosperous Uganda.

NFA mission - To manage Central Forest Reserves on a sustainable basis and supply high quality forestry-related products and services to Government, local communities and the private sector.

Work of NFA that contributes to forest conservation

Forest management - NFA are responsible for the management of Uganda’s Central Forest Reserves (CFRs). NFA manages 506 CFRs covering 1.2 million hectares. The 506 CFRs constitute 64% of Uganda’s Permanent Forest Estate. The Permanent Forest Estate is managed for:

- Protection of fragile ecological landscapes (including Lake Victoria, the River Nile and Lake Kyoga)
- Conservation of biological diversity
- Maintenance of environmental health
- Protection of watersheds

Eco-tourism – A number of eco-tourism sites have been set up within CFRs in Kaniyo – Pabidi, Mpanga, Kalangala Islands and Mabira Rainforest. Revenue from these sites contributes to forest conservation.

Forest restoration and plantation development is another key element of NFA’s work contributing to forest conservation.

Year	Degraded natural forest restored	Forest Plantations development
2007/2008	148,527	1,370
2008/2009	20	10,393
2009/2010	245	8,479
2010/11	226	1,400
2011/12	279	16,492
TOTAL	149,297	38,134

Commercial activities

Seed procurement - including collection, processing, storage and distribution of seed of good physiological and genetic quality. The National Tree Seed Centre (NTSC) procures up to 7.9 metric tonnes of seed per year, which has increased from 3 metric tonnes produced in 2004/2005.

Seedling production - Annual seedling production has increased to 4.6 million seedlings, compared to 70,000 in 2004/2005. This involves a total of 130 species of agroforestry, timber, fruit trees, medicinal and ornamental seedlings. NFA transferred management of regional nurseries to the NTSC. Production from these Nurseries is 8.6 million seedlings annually. They include; Kagoora (Kyenjojo), Gulu, Masindi, Soroti, Masaka, Arua, Mubuku, Mbale, Jinja, Mubende, Masindi and Katuugo.

Training – NFA provide training in nursery management, plantation development and vegetative propagation.

Non-commercial activities

The Public Good Delivery (PGD) programme under the Tree Improvement section of NFA is mandated to establish, improve and manage seed sources. It was initially funded by NORAD up to 2007 and is now funded by its own revenue collections. Due to insufficient seed production from old seed stands and high costs of importing seeds, NTSC established new seed orchards and identified new seed stands. 111 hectares of seed orchards and 516 hectares of identified seed stands have been established since the inception of the PGD programme.

Management of seed sources

Seed sources from existing forest plantations have been identified, selected and marked, including for *Maesopsis eminii*, *Pinus caribea*, *P. oocarpa*, *P. patula*, *E. grandis*, *Terminalia superba*, *T. ivorensis* and *Araucaria cunninghamii*. The selected seed stands are appropriately thinned and weeded. Protection of established seed stands involves fire line maintenance and regular patrols to protect against animal browsing and encroachment.

Progeny trial establishment - The Tree Seed Centre also carries out provenance trials of priority species which will be converted into seed orchards. A 5 hectare progeny trial of 20 families of local *P. caribaea* from Katuugo was established in Kasagala CFR in 2007. So far, its performance is comparable to an adjacent *P. caribaea* (Australia) seed stand. Other trials are planned.

Collaboration with private seed source farmers - NTSC collaborates with private owners of stands and seed sources, including Minani Fruit tree Project from which they collect high quality true to type cuttings of mangoes, private individuals in Kalangala for *Maesopsis* seed collection and Passion fruit and Orange cuttings in Busembatia. Institutional collaborations include with Busoga Forestry Company (Green Resources), that allow access to their *Maesopsis eminii* stands and VECO East Africa (Uganda programme) with which NTSC has an MOU to provide technical support in nursery management. Most recently NTSC have partnered with FIEFOC to establish Tree Seed stands in districts where FIEFOC operates. Other MOU's are planned with *Grevillea*, *Pinus*, *E. camaldulensis* and *Tectona grandis* tree farmers.

Future plans

Seed production from identified seed stands - By the end of 2013, NTSC will start collecting *Pinus* seeds from identified seed stands. Annual collections are estimated at approximately 10 tonnes. If seeds are priced at Ushs 600,000 per kg, it amounts to annual revenues of Ushs 6,439,200,000.

Joining OECD - By the end of 2013, NTSC will have joined the OECD and will be trading in the international seed market. NTSC will be importing at subsidized prices and will benefit when the established seed sources mature.

Seedling production - Seedling production is planned to increase to approximately 20 million seedlings with infrastructure improvement in regional nurseries. Clonal *Eucalyptus* seedlings are also being produced at NTSC, this commenced in 2012/2013.

Decentralized Tree Seed Centres - Originally, four regional seed centres had been planned, but were not founded. This idea should be reconsidered in order to ease access of planting materials.

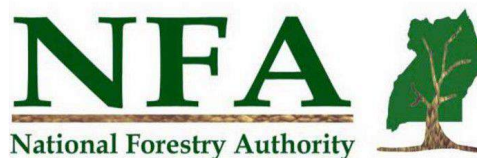
Modernizing the NTSC Tree Nursery - Introducing other seedling growth media and mechanizing operations.

Challenges

- Security of seed stands - Established seed stands are not secure as they have competing demands with timber and plywood production plus agricultural production. Vandalism of mother trees occurs, partly when unqualified seed collectors collect seeds by cutting the branches of mother trees, thus reducing subsequent seed production.
- Forest fires - Forest fires during the dry seasons make stand fire management expensive. Fire lines and 24 hour patrolmen have to be hired. During the last year NFA lost 50 hectares of seed stand to fires and many more hectares of plantations.
- Lack of funds – Funding is not easy to obtain.
- Lack of sufficient technical staff - Very few staff are currently trained and working in this area.
- Insufficient seed sources - The existing seed sources are insufficient to provide seeds/seedlings for tree planting. Thus Uganda has resorted to importing very expensive Pine seeds from Australia and Brazil.
- Bottlenecks in policies - The National Seed Board has not been fully constituted. This makes forest seed and plant certification in Uganda difficult. The timber licensing ban has also reduced the morale of tree planters and therefore sales are low.
- Insufficient land - The demand of tree seedlings and seeds would be higher, but clients do not have enough land for tree planting.

Areas for collaboration

- Collaborative tree improvement research for under-utilized tree species such as *Terminalia brownii*, *Entandrophragma utile*, *Markhamia lutea* etc. This could involve reducing rotations so as to achieve maturity in a significantly shorter time using vegetative propagation techniques.
- Forest restoration research
- Increased sharing of information
- Capacity building for technical staff in seed handling and other areas



*Presentation: An overview of tree conservation and planting in Kabarole District
Timothy Muhairwe, District Forest Officer Kabarole, Uganda*

In Uganda, Local Forest Reserves are managed by local government. Efforts towards tree conservation and forest restoration in Kabarole District include work towards the National Community Tree Planting Programme (NCTPP). This involves working with partners to support tree planting, including Tooro Kingdom Go Green campaign, Tooro Botanical Gardens, WWF, Trees for the Future and Protos. A bylaw on tree planting is being enforced every 6 months. Concept notes are produced for restoring degraded Local Forest Reserves and roadside tree planting.



Tree planting in Kabarole District

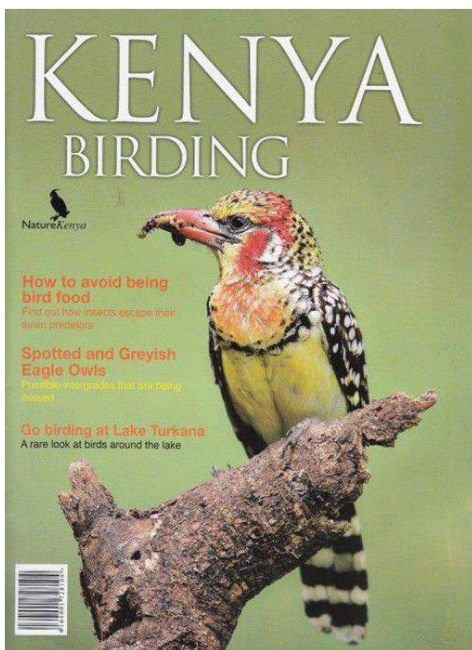
Constraints to current work include:

- A high rate of forest destruction for agriculture versus planting
- Encroachment of forest reserves
- Illegal activities such as logging
- Insufficient funds
- Weak legal framework
- Poor priorities for forestry revenues

Opportunities for collaboration

- Support can be provided to community groups to establish tree nurseries and to farmers with agroforestry seedlings.
- Effective partnerships to restore Local Forest Reserves and roadsides, for example the current work of Tooro Botanical Garden is restoring local government managed Forest Reserves
- Working in partnership to address research gaps on forestry on private land.

*Presentation: Enhancing tree conservation and forest restoration in Africa, the work of Nature Kenya
Washington Ayiema, Nature Kenya*



Nature Kenya is a branch of The East African Natural History Society, the oldest conservation NGO in East Africa, which was founded in 1909. It is a membership society with just over 1000 individual members and 29 corporate members. Nature Kenya works in Important Bird and Biodiversity Areas. Nature Kenya works in collaboration with 25 Site Support Groups and is the Birdlife International partner in Kenya.

The aim of Nature Kenya is to promote study and conservation of the natural environment in Eastern Africa.

Mission - Connecting nature and people.

Nature Kenya strives to:

- Enhance knowledge of Kenya's biodiversity
- Promote conservation of key species, sites and habitats
- Encourage community participation in conservation through promotion of sustainable benefits
- Advocate policies favourable to biodiversity conservation
- Raise public awareness of biodiversity, for example through publications

National collaboration

Nature Kenya works in about twenty key biodiversity areas. Nature Kenya has experience providing support to the Government of Kenya and local communities to develop mid and long term plans, such as the Tana River Delta Strategic Environmental Assessment Scoping Report and the Tana River Delta Land Use Plan Framework.

Key challenges

- Competing interest and disputes among group leaders
- Speculative groups with no governance structures and focus
- High expectations of communities for the projects to address livelihood issues while most focus on biodiversity
- Frequent requests for funds for activities unrelated to project objectives and goal
- Frequent requests for allowances from local communities and partners, versus volunteer approach
- Community capacity to engage in joint management of habitats and natural resources
- Addressing gender participation in meetings and activities

Nature Kenya see an opportunity for partnership for forest restoration, where population growth and settlement, livelihood demands, agriculture and fuel requirements are causing high rates of deforestation.

Presentation: Nature Uganda's interventions for enhancing tree conservation Henry Mutabaazi, Nature Uganda

Nature Uganda is a national, membership non-profit making NGO. Nature Uganda is a branch of The East African Natural History Society - the oldest conservation NGO in East Africa founded in 1909.

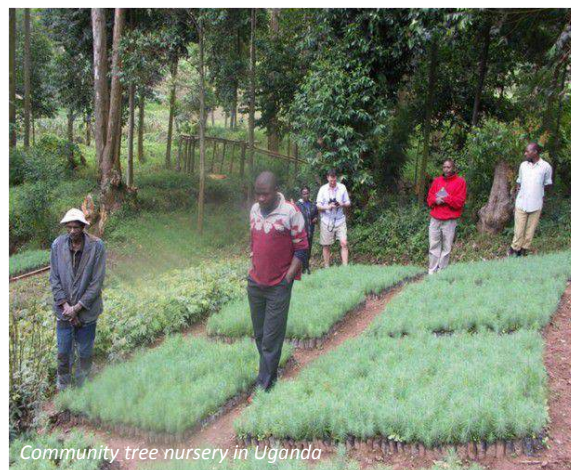
Mission - Promoting the understanding, appreciation and conservation of nature.

Nature Uganda strives to:

- Create a nature-friendly public
- Enhance knowledge of Uganda's natural history
- Advocate environment-friendly policies
- Take action to conserve priority species, sites and habitats

Nature Uganda's programme areas include:

- Conservation and community livelihoods
- Conservation partnerships and coalitions
- Awareness, publicity and advocacy
- Information/data sharing and networking
- Training and capacity building
- Improving management of Key Conservation Areas
- Monitoring and research in Important Bird Areas and other Key Biodiversity Areas



Nature Uganda's projects on tree planting and forest conservation - Key projects include:

- Echuya Forest Conservation Project: Echuya Central Forest Reserve (CFR) in Kabale and Kisoro districts
- Participatory Environmental Management (PEMA): Kasyoha-Kitomi CFR in Bushenyi, Rubirizi, Nsiika, Kamwengye and Ibanda
- Nature Uganda facilitated Collaborative Forest Management associations to restore 12 hectares of degraded forest in Kashoya-Kitomi CFR using *Markhamia lutea*, *Terminalia superb* and *Khaya anthotheca*.

Nature Uganda is involved in:

- The development of community nurseries for high value indigenous & exotic tree species including *Calliandra*, *Grevillea*, *Pinus patula*, *Prunus africana*, *Maesopsis eminii* and *Vernonia amygdalina*
- Agroforestry and plantation forestry
- Bamboo domestication
- Community livelihood improvement through tree planting
- Forest restoration and enrichment planting
- Wetland restoration
- Collaborative Forest Management with NFA and forest adjacent communities
- Environmental education through community drama, primary school environmental clubs, radio talk shows and publications and community meetings

- Development of energy saving cooking stoves which use 70% less fuel than a three stone stove, cook faster and produce less smoke
- Research on health of forest resources
- Lobbying and advocacy
- Monitoring of forest resource off-takes under Collaborative Forest Management

Challenges

- Conflicts between NFA and forest adjacent communities.
- High levels of poverty among forest adjacent communities
- Growing human population adjacent to forest
- Insufficient resources
- Inadequate planting material (indigenous trees)
- Development versus conservation

Opportunities for collaboration

- Partnership through organised community institutions and Collaborative Forest Management associations, for example as at Echuya and Kasyoha Kitomi landscapes where there is high demand for tree seedlings
- Joint research on declining forest resources at Echuya e.g. bamboo stock/medicinal trees
- Support to community ecotourism development to enhance conservation
- Environmental education and raising awareness
- Capacity building, including technical training and financial aspects

Presentation: Red Listing and potential for including threatened species in restoration projects Sara Oldfield, Secretary General, BGCI and Kirsty Shaw, Conservation Officer, BGCI

As outlined during presentations so far, the main threats facing the indigenous trees of East Africa include habitat loss and degradation, particularly as a result of clearance for agriculture, forest fires, overexploitation, particularly for timber, woodfuel extraction, climate change and invasive species. Despite important efforts to address knowledge gaps, the conservation of many tree species remains poorly understood and many are lacking formal protection.

Currently 9,553 woody plants have been assessed and published on to the IUCN Red List, 6,856 of which are considered to be globally threatened (including taxa assessed as Extinct in the Wild (EW) and Data Deficient (DD)).

The World List of Threatened Trees was published in 1998 (Oldfield, *et al.*, 1998) providing an initial assessment of tree species. This work involved around 300 experts. 8,753 woody taxa were assessed as globally threatened using 1994 IUCN Red List Categories and Criteria – Version 2.3. The main threats were restricted geographic range and fragmentation, with continuing decline or extreme fluctuations.

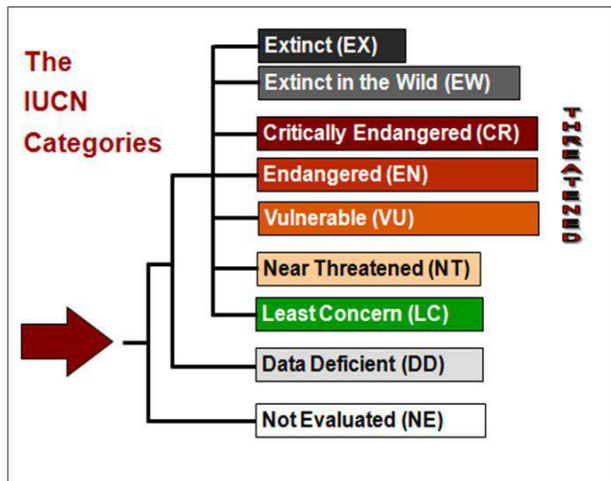
The assessments undertaken for this publication were incorporated into the IUCN Red List, but many have not been updated since their initial 1998 assessment. Many of the taxa evaluated that were not considered to be threatened have since experienced major declines in abundance.

Future Plans – A Global Tree Assessment

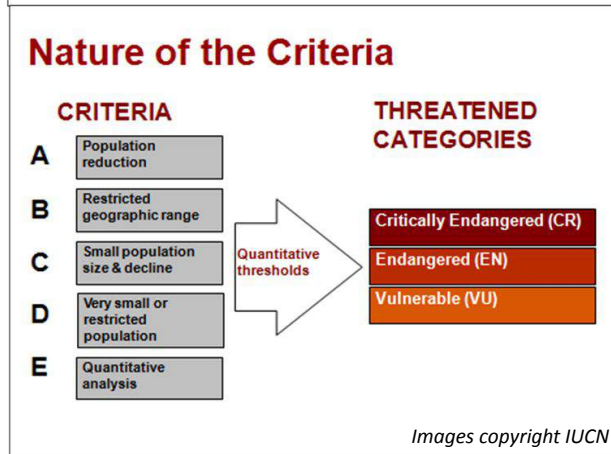
The IUCN/SSC Global Trees Specialist Group (GTSG) aims to carry out a complete assessment of woody plants by 2020 as a contribution to the IUCN Red List and to support global monitoring of forest biodiversity. This project will result in;

- A list of the world's tree species
- Distribution maps for each species
- IUCN Red List assessments carried out for each species
- Indicators for assessing trends
- A global tree conservation atlas
- Assessment of *ex situ* holdings and availability of material for ecological restoration

The IUCN Red List Categories and Criteria



All species assessed fall within one of the Categories illustrated here. The threat categories are highlighted: Critically Endangered (CR), Endangered (EN) and Vulnerable (VU).



The Criteria for assessment are illustrated here. Quantitative thresholds are stipulated and if taxa meet or supersede these thresholds they qualify for inclusion under one of the three threatened categories (CR, EN and VU).

Current status of tree Red Listing in East Africa

499 tree assessments are currently published on the IUCN Red List for Uganda, Kenya and Tanzania, 399 of which are assessed under a threat category. Many of these assessments were carried out in 1998 for *The World List of Threatened Trees* and need to be updated. The East African Plant Red Listing Authority (EAPRLA) have assessed an additional 208 woody plant taxa in the region, which have not yet been published on to the IUCN Red List. Many of these taxa occur in the Eastern Arc Mountains as this has been a key focus area for EAPRLA assessments. The work of EAPRLA has verified or updated 200 assessments, only 10% of which align with current published data. The EAPRLA identify 33 Critically Endangered tree taxa (CR), 92 Endangered tree taxa (EN) and 93 Vulnerable tree taxa (VU) in the region.

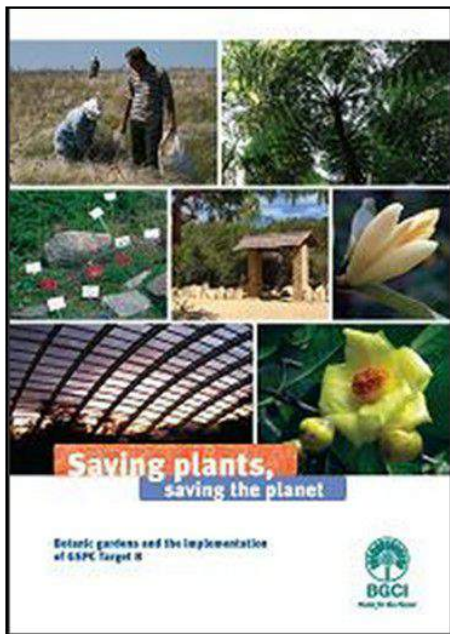
BGCI has a lead role in Red Listing. As well as providing the Secretariat for the IUCN/SSC Global Tree Specialist Group (GTSG) and actively working with partners towards a complete assessment of woody plants by 2020, BGCI is talking with partners to take forward Red Listing of East African trees and is supporting a recently commenced a project to produce a Red List Index for timber species.

Data on the conservation status of indigenous trees is essential to raise awareness of the scale of the problem, to develop and monitor policy and to prioritise action, including *in situ*, *ex situ* and integrated conservation measures, as well as restoration.

There is an urgent need for increased Red Listing efforts to inform policy and practical action. For information to be published to the IUCN Red List it must meet minimum documentation requirements, there is therefore also an urgent need for increased Red List training so more people are able to carry out such assessments. There is also a need for increased availability of data from additional sources to the IUCN Red List.

Various methods and data sources exist for carrying out Red List assessments, including;

- Field survey
- Literature review including online and herbarium data
- Forestry inventory data
- Mapping
- Workshops
- Use of the IUCN online Species Information Service (SIS) to record assessment data – thereby facilitating review and subsequent inclusion of information on the IUCN Red List
- Students, interns and volunteers can provide a vital staff resource and this also provides valuable training in undertaking Red List assessments



Botanic Gardens and ex situ conservation

Target 8 of the Global Strategy for Plant Conservation (GSPC) under the Convention on Biological Diversity (CBD), calls for:

'At least 75 per cent of threatened plant species in ex situ collections, preferably in the country of origin, and at least 20 per cent available for recovery and restoration programmes' – by 2020

Botanic Gardens have a vital role:

'In the face of an uncertain future, an urgent priority must be conservation through seed-banking and living collections for as many plants as possible, by way of an insurance policy' (BGCI, 2010)

BGCI maintain an online database called *PlantSearch* (www.bgci.org/plantsearch.php) which contains living collection lists from *ex situ* conservation institutions around the world. *PlantSearch* is widely used by researchers and conservation practitioners, allows users to identify how many institutions worldwide record holding a particular taxon of interest in their collection, and allows users to request plant material from these institutions for research and

conservation. *PlantSearch* is a confidential tool, thereby ensuring available data does not put threatened taxa at further risk. *PlantSearch* is the only tool for measuring global progress towards Target 8 of the GSPC. It can also be used for regional surveys.

As part of a previous BGCI project, *Grow Africa*, BGCI encouraged botanic gardens in Kenya, Uganda and the Democratic Republic of Congo to upload lists of their living plant collections to *PlantSearch*. Analysis showed that 30 tree species listed as globally threatened on the IUCN Red List were reported as held in botanic gardens collections in these three countries (BGCI, 2011). Since then, seed collecting and propagation has increased this number.

The results of the survey highlighted the valuable conservation work of botanic gardens and their ability to provide valuable support to restoration projects. This helped secure funding for the current project *Enhancing tree conservation and forest restoration in Africa*.

As part of the current project, BGCI is expanding this survey and collecting information on the living collections of botanic gardens and other *ex situ* conservation institutions across the whole of Africa. This information will be used as a basis for highlighting the potential for African botanic gardens to be involved in further restoration projects across the continent.

Recent ex situ conservation success story in Tanzania

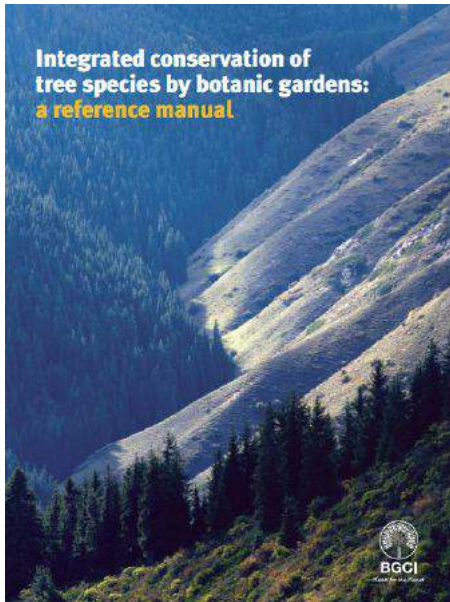
Erythrina schliebenii is a Critically Endangered tree species endemic to Tanzania. *E. schliebenii* was only known from herbarium collections dating from 1934 and 1935 and following unsuccessful searches for the species in the collection area, *E. schliebenii* was declared Extinct in The *World List of Threatened Trees* (Oldfield et al. 1998). The species was then collected in an area of unprotected forest 115km from the original collection locality in 2001. This area was then cleared and the species was thought to be Extinct again. It was since confirmed as still present, but known from a single locality. Individuals have since been successfully propagated by the Head Gardener at The State House, Dar es Salaam, a vital *ex situ* conservation measure to safeguard this species from extinction.



The value of ex situ collections

Ex situ collections are vitally important as an insurance policy against extinction in the wild. Furthermore, species held as well-documented, genetically-representative living collections have additional value, providing material for;

- Horticultural and field-based research (propagation, growth requirements, etc.)
- Propagation to remove or reduce pressure from wild harvesting
- Taxonomic and systematic research and reference for identification
- Display, education and community engagement activities
- Identification of taxa for introduction into the nursery trade, local agriculture and crop breeding programmes, amenity planting and local forestry
- Species reintroduction and habitat restoration programmes



In 2012, BGC I published *Integrated conservation of tree species by botanic gardens: A reference manual* (Oldfield and Newton, 2012), providing recommendations and a step by step guide for moving beyond *ex situ* collections to integrated conservation and ecological restoration. The guide is a valuable resource for all conservation institutions and restoration practitioners and is available online (see resources section for link).

Threatened species are included in the restoration work being undertaken by Brackenhurst Botanic Garden and Tooro Botanic Garden through the current BGC I project and there will be many more future success stories to come as the project expands to work with additional partners.

Summary – why include threatened species in restoration?

- **We have the potential to prevent extinctions**
 - To avoid loss of potentially valuable species – including un-researched medicinal species and keystone species that support wider ecosystems
 - To achieve conservation aims and meet the targets of relevant Conventions – this is the botanic garden and conservation organisation mandate
- To meet the recommendations of policy guidelines - ‘Where feasible, develop a program and introduce incentives to promote the restoration and rehabilitation of endangered forest flora and fauna species’ (ITTO, 2002) .
 - Current forest protection doesn’t always reflect important tree species – a species focused approach can address this
 - If we lose forest diversity, we risk losing ecological resilience - Resilient, well connected ecosystems suffer fewer ill effects from climate change than fragmented, overexploited ecosystems

*Presentation: Ecological Restoration Alliance of Botanic Gardens
Sara Oldfield, Secretary General, BGC I*

It is valuable to involve botanic gardens in restoration projects as they;

- Emphasize science-based approaches
- Already possess well-documented living plant, seed and voucher collections
- Act as stewards of rare and threatened species
- Generate knowledge of the genetic, physiological, horticultural and ecological characteristics of plants and their seeds
- Leverage expertise for teaching, training and outreach
- Collaborate through a global network (BGC I) that has operated successfully for decades, and now through the Ecological Restoration Alliance of Botanic Gardens (ERA)



Many botanic gardens around the world report they are undertaking ecological restoration.

Botanic gardens undertaking ecological restoration, BGC I’s GardenSearch database

Ecological Restoration Alliance of botanic gardens

The first Ecological Restoration Alliance of botanic gardens (ERA) meeting was held in March 2011 at New York Botanical Garden. Gardens on five continents, all undertaking ecological restoration, were represented at the meeting. A second meeting was held in October 2011 at Brackenhurst Botanic Garden in Kenya, to outline a 20 year programme, administrative structure, and a funding strategy. A Memorandum of Understanding was signed on 23rd May 2012 at the Royal Botanic Gardens, Kew, UK, which was celebrated in the House of Lords and endorsed by His Royal Highness the Prince of Wales.

The ERA is responding to the United Nations Convention on Biological Diversity (CBD) Aichi Targets:

Target 14: *By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.*

Target 15: *By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15% of degraded ecosystems thereby contributing to climate change mitigation and to adaptation and to combating desertification.*

And Target 4 of the Global Strategy for Plant Conservation (GSPC):

At least 15% of each ecological region or vegetation type secured through effective management and/or restoration by 2020.

The ERA aims to;

- Restore 100 damaged, degraded or destroyed ecosystems on six continents
- Build expertise and restoration capacity through collaborations between gardens, large and small, as well as with partners in academia, industry and government
- Improve the quality and quantity of restoration research, emphasizing the removal of obstacles to applied work on practical solutions rather than addressing theoretical questions or attempting to solve intractable problems
- Disseminate and advocate restoration knowledge, addressing global environmental problems on a broad and significant scale

The ERA is coordinated by BGCI. Current members of the ERA are:

- Royal Botanic Gardens Kew, UK
- Royal Botanic Garden Edinburgh, UK
- Missouri Botanical Garden, USA
- Brackenhurst Botanic Garden, Kenya
- Kings Park and Botanic Garden, Australia
- National Tropical Botanical Garden, USA
- Rio de Janeiro Botanic Garden, Brazil
- Royal Botanical Gardens, Canada
- The Eden Project, UK
- South China Botanical Garden, China
- Royal Botanic Garden, Jordan
- Korea National Arboretum, Korea
- Paignton Zoo Environmental Park, UK
- Instituto de Ecología, A.C. "Francisco Javier Clavijero Botanic Garden", Mexico
- Tooro Botanic Gardens, Uganda (pending signing of MoU)



ERA – Moving Forward

The following activities are ongoing or planned:

Additional botanic gardens are becoming members of the ERA, bringing further expertise to the ERA

An important next step is to prioritise sites for undertaking ecological restoration

There is a need to raise core funds for the ERA – this is the role of Alliance Executive - Missouri Botanical Garden; Kings Park and Botanic Garden and the Royal Botanic Gardens Kew

Form new partnerships

Promote restoration techniques

Exchange materials

The project *Enhancing tree conservation and forest restoration* is an important ERA project, linking the restoration expertise of large institutions around the world to smaller institutions in Africa.

Common themes from the presentations

The presentations provided participating organisations with the opportunity to demonstrate their work and expertise to other participants. This was a valuable opportunity for assessing ongoing work and raising awareness of the expertise that exist in specialist institutions.

The presentations highlighted the ongoing threats to biodiversity from forest clearance and the resulting loss of ecosystem services. This further highlighted a recognized need for forest restoration at a large scale across East Africa.

As part of the project *Enhancing tree conservation and forest restoration in Africa*, BGCI held a one day seminar in London in February 2013. The impact of restoration on water supply was identified as a key benefit for promoting restoration focused on indigenous species. This was seen as a more tangible impact that carbon capture and of visible benefit to communities close to restoration efforts.

The most important benefit for securing interest in restoration at the local level highlighted at the workshop in Entebbe was the need to highlight the provision of direct benefits to livelihoods from Non Timber Forest Products (NTFPs). Extraction of tree parts such as leaves or bark occurs commonly in Uganda, Kenya and Tanzania and was highlighted as a notable threat to many of the indigenous trees of East Africa. The medicinal value of many indigenous trees is well known to local communities, but the threatened status of many species, the impact of unsustainable harvesting and the knowledge of how to propagate a sustainable supply for consumption is greatly lacking.

Key constraint indicated by the majority of participating institutions included a lack of funding a lack of knowledge of propagation protocols for some indigenous species. The organizations represented at the workshop all demonstrated a willingness to cooperate and collaborate to undertake future restoration efforts, which would help mitigate these constraints by allowing for joint funding applications, information sharing between institutions and avoiding duplication of efforts.

Site visit to Entebbe Botanic Garden and the Uganda National Field Gene Bank

The third day of the workshop involved a site visit to the Entebbe Botanic Garden and the Uganda National Gene Bank. This provided workshop participants with the opportunity to see an example of the seed conservation and living accession conservation work of a botanic garden and gene bank. This was particularly valuable for participants from NGOs and private companies, less familiar with the work of botanic gardens. The visit provided an opportunity to see many of the techniques and species talked about over the duration of the workshop.



The Uganda National Gene Bank (UNGB)



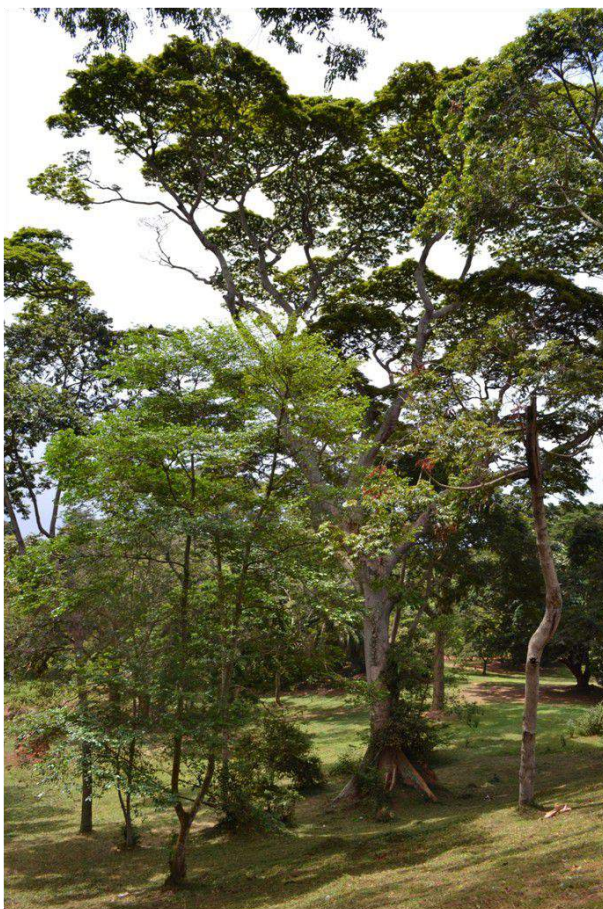
Seed cleaning and preparation for storage and distribution, following collection from the wild.



Demonstrating cryopreservation facilities to William Omondi from KEFRI and Michael Malinga from the NFA Uganda.



Maesopsis eminii (Musizi) mature specimen in Entebbe BG. This species is included in the restoration work being undertaken by Tooro BG as part of the current BGCI project.



Newtonia buchananii mature specimen in Entebbe Botanic Garden. This species was noted as a priority species for inclusion in restoration projects during the workshop.



Some of the participants of the three day workshop, in Entebbe Botanic Garden

Identifying priority sites and species for forest restoration

The workshop involved two parallel working group sessions on site and species selection for restoration.

Priority sites for restoration

Workshop participants were asked to identify priority sites for undertaking forest restoration in Uganda, Kenya and Tanzania. As participants were present from all three countries they were able to suggest areas they had direct experience working in and for which they had direct knowledge of the current situation and restoration needs. Participants were asked to identify priority sites and provide detail about why these sites had been selected.

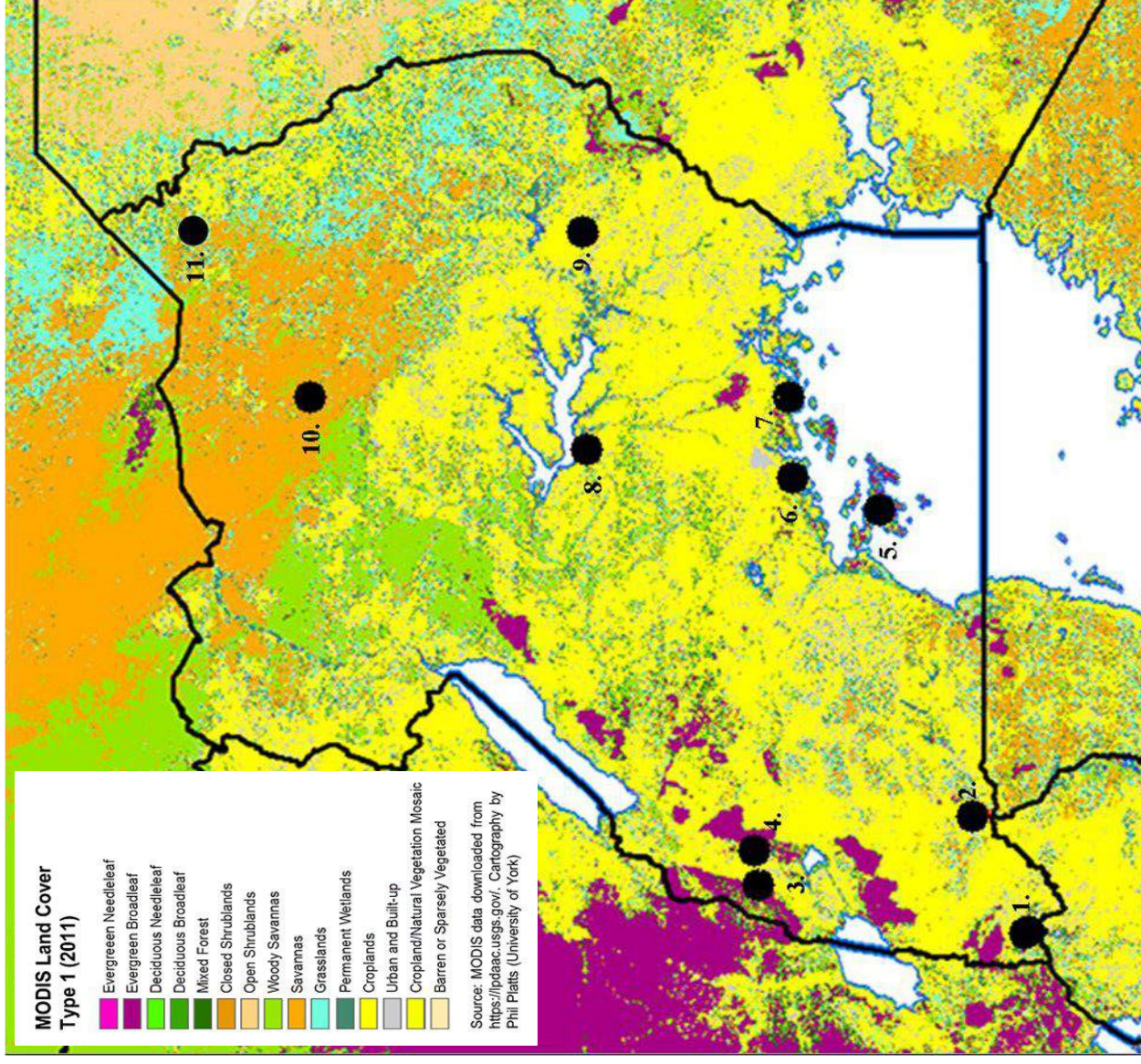
The following maps show the priority sites for restoration in each country.

The main reasons for site prioritisation were sites that:

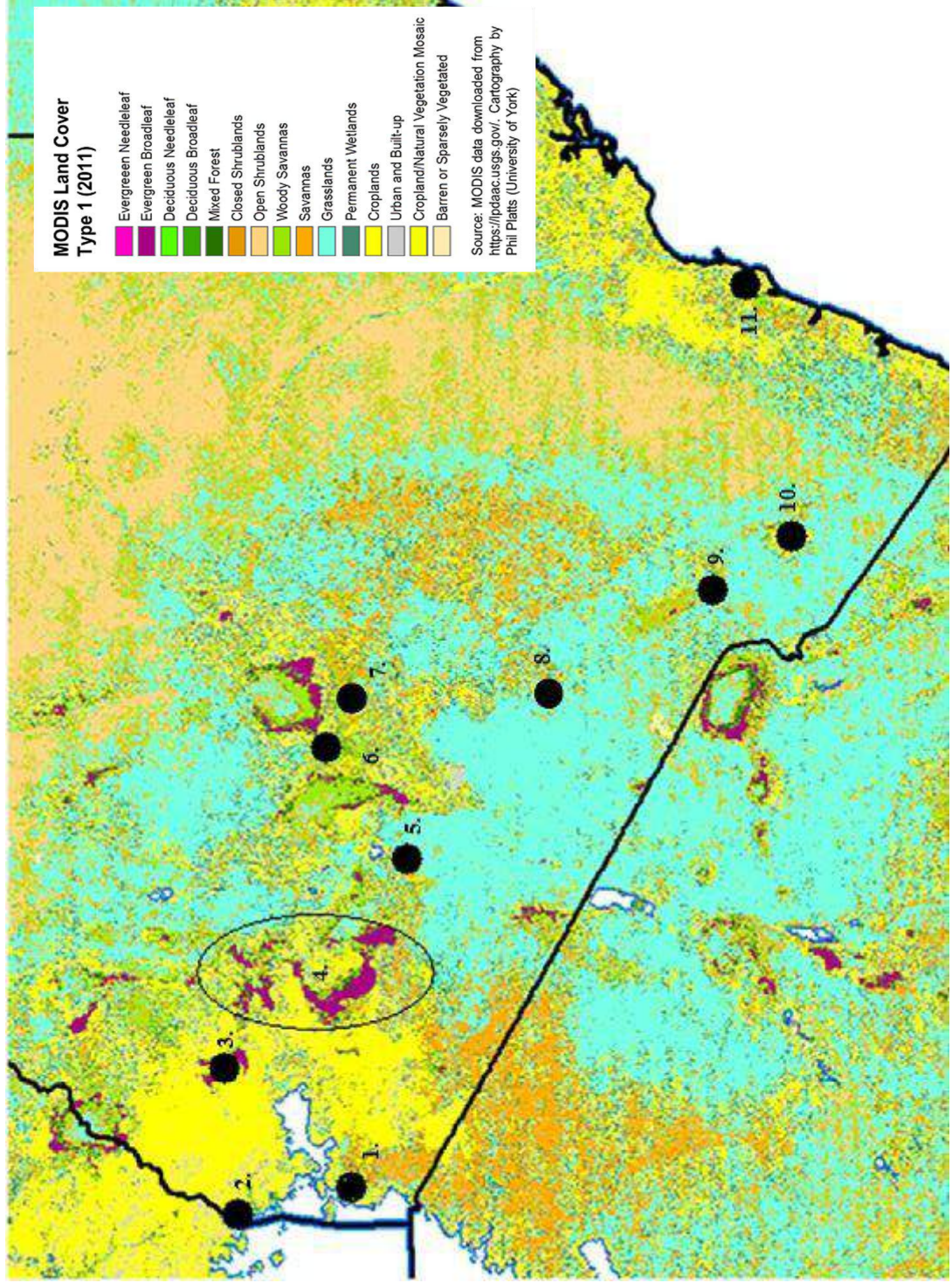
- Are heavily degraded
- Are threatened from agriculture, charcoal, high population
- Are important areas for animals
- Are fragmented
- Provide water supply - water towers
- Contain a lot of threatened species
- Have high endemism
- Have a good base of research already conducted
- Have great potential for education, e.g. through botanic garden creation or they are located close to communities

Priority sites for forest restoration in Uganda

1. Echuya Central Forest Reserve - Highly degraded forest, population pressure, water tower. (Species - *Prunus africana*)
2. Lake Nakivare / R. Kagea area Isingiro District - After government effort to eradicate Tsetse flies in 1960s, heavy degradation was carried out leaving the place bare of all/most indigenous species. (Species - *Prunus africana*, *Markhomia spp.*)
3. Rwenzori area - This is between Kibale National Park and Queen Elizabeth National Park. Heavy degradation has taken place in this area due to stone mining to feed Hima cement factory and frequent mudslides due to deforestation on Rwenzori Mountains and surrounding hilltops and wetlands
4. Nyakinomi Local Forest Reserve (LFR) and Nyakigumba LFR - Highly degraded by neighbouring communities. Important demonstration sites for forest benefits to the people of the district. (These are the sites being restored by Tooro Botanic Garden for the project *Enhancing tree conservation and forest restoration in Africa*).
5. Kalangala Islands (Bugala, Bubembe, etc.) - Much of the forest was cut down to make way for growing palm and many important island species were lost. The soils on these islands are also highly degraded.
6. Mabira Central Forest Reserve - Highly degraded by the local communities and at risk of being converted to sugar cane plantations.
7. Walumwanyi Forest Reserve - Highly degraded, Walumwanyi stream supplies local communities with water but the stream is now drying up because of deforestation on the banks. The Forest Reserve is located next to Nature Palace Botanic Garden.
8. Lake Kyoga basin - Extensive farming and agriculture and prone to fires. Restoration is important to preserve species, particularly *Senegalia Senegal*
9. Bukaleba Central Forest Reserve - Highly degraded
10. Woodlands of Northern Uganda - Highly degraded, important area for *Vitellaria paradoxa*
11. Kidepo Valley National Park - Highly degraded

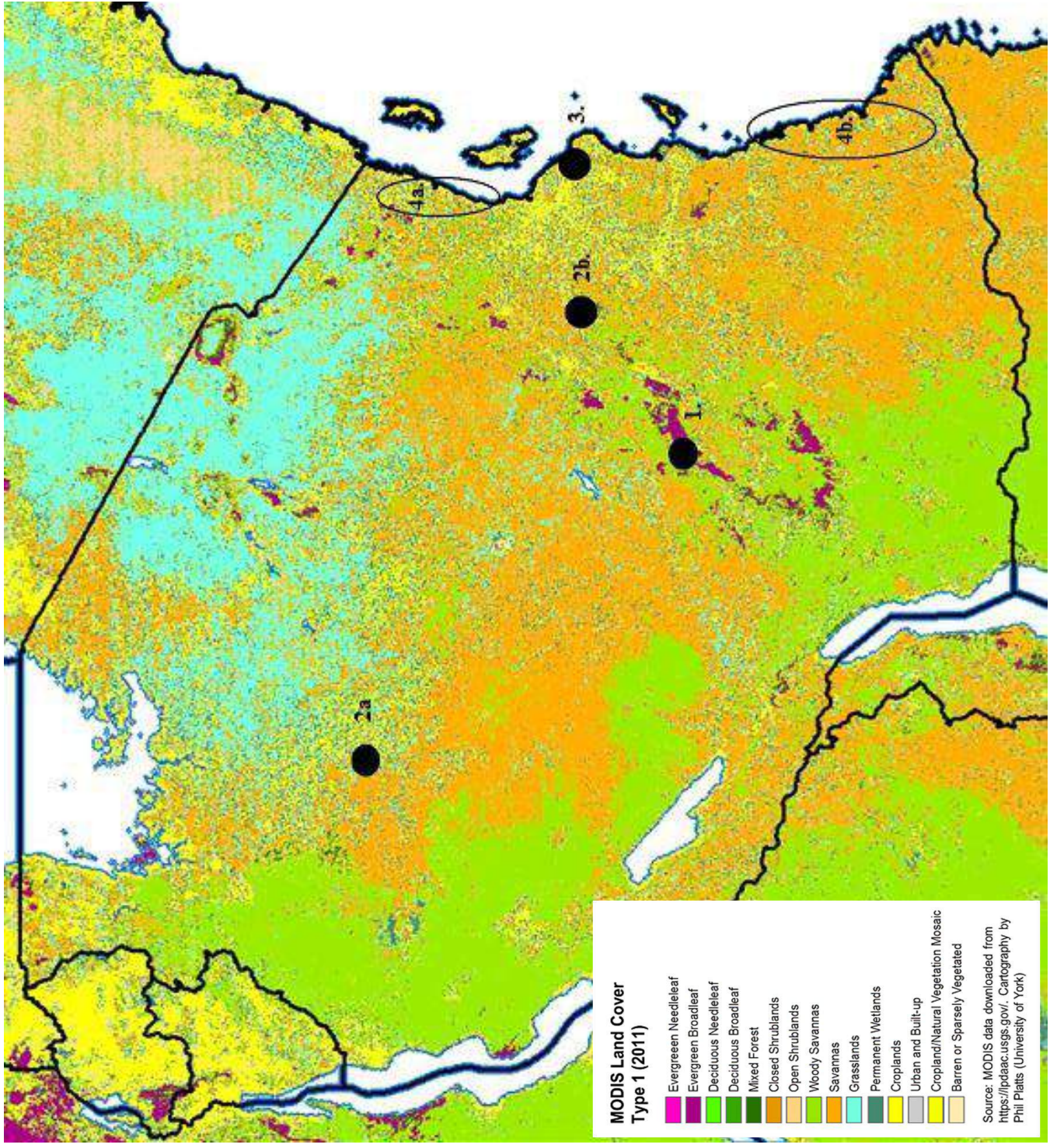


- Priority sites for forest restoration in Kenya**
1. Lambwe, Homa Bay. Lake Victoria basin—waste water pollution—needs plants to absorb pathogens
 2. Samia Hills
 3. Kakamega forest
 4. Mau – Kenya’s largest water tower
 5. Wangari Maathai Institute—Botanical Garden
 6. Central Highland conservancy – Kabiruni forest – degradation due to stone mining
 7. Embu Kirimiri Riverine Landscape
 8. Makueni – hill erosion - Kibauni Hill
 9. Tsavo West National Park – Ficus / Acacia tortilis degradation
 10. Taita Hills – Eastern Arc mountains - high endemicity
 11. Vipingo – Rare coastal forest species



Priority sites for forest restoration in Tanzania

1. Udzungwa Mountains – Mgeta corridor
– Elephant corridor, threatened by agriculture, adjacent to Udzungwas National Park
2. Tabora (a) and Morogoro (b) sites – woodland, particularly important for *Pterocarpus angolensis*
3. Dar es Salaam and Puga Hills—high population results in large threat. Great potential for education and growing threatened species in gardens
4. Coastal forests – hotpost, forest fragmentation, threatened by charcoal production



Priority species for restoration

Workshop participants were asked to identify priority indigenous species for inclusion in forest restoration projects and note the reasons why these species were suggested.

The majority of species suggested were selected as they are **restricted range species** (i.e. species for which inclusion in restoration projects would provide conservation benefit), **commonly utilised species** (i.e. medicinal, timber, edible species highly valued by local communities) or because they are **fast growing species**.

The suggested species are listed in Annex I. Notes on their conservation status, uses, growth rate and range are provided. Additional species have been incorporated into this list, which were either noted as priority species for restoration during the workshop presentations or have been selected as priority species for inclusion in the practical restoration work being undertaken as part of the current BGCI project by Brackenhurst Botanic Garden and Tooro Botanical Garden.

At the end of the three year project, the list of priority species will be refined, based on performance of species included in restoration work undertaken by Brackenhurst and Tooro and additional information obtained through consultation with other partners during the project.

A number of priority species for restoration are highlighted below.



Vitex keniensis - Meru Oak - very fast growing species endemic to Kenya.



Prunus africana - medium growth rate - highly valued for medicinal uses - VU on IUCN Red List, over-exploited



Cordia africana - very fast growing - timber, edible fruit, gum

Summary of workshop

The workshop provided an important opportunity for participating organisations to share capacities, experiences and knowledge and identify potential partners for future collaborative work. The workshop also highlighted the ongoing threats to biodiversity from forest clearance, extraction and the resulting loss of ecosystem services. This further highlighted a recognized need for forest restoration at a large scale across East Africa. There was a large amount of interest in further involvement in the project as well as an appreciation that, due to the large scale of efforts needed, cross-institution collaboration to fundraise and undertake practical restoration will be essential.

The following needs have been identified from the workshop and project activities so far:

Compilation of existing knowledge of indigenous species and increased sharing of information across institutions - This will allow for further prioritization of species for restoration and avoid duplication of efforts.

Increased communication of the benefits of involving indigenous species in restoration - Need to highlight that indigenous species can be fast growing and provide additional ecological and social benefits, to move away from the current focus of private companies, landowners and farmers on exotic species.

Improved supply of and access to indigenous seeds and seedlings - This is a key obstacle to achieving increased planting of indigenous species. Botanic gardens and national tree seed centres are key sources of indigenous seeds and seedlings and this must be highlighted and expanded upon.

Propagation protocols developed for species for which cultivation programmes do not currently exist - This is particularly important for threatened or restricted range species and species widely used by communities.

Education, training in sustainable harvesting techniques and cultivation techniques and a supply of indigenous tree material provided to local communities - This is essential for raising awareness of the impact of over-harvesting, creating a sustainable supply of material for harvesting and reducing pressure on wild resources.

Increased scientific evidence for restoration using indigenous species -

Compilation of existing information

Increased restoration trial sites and encourage **compatible monitoring** so information on survival rates, growth rates, and high performing species can be collated and shared widely

Increased and coordinated monitoring of the wider impacts of restoration projects, including on water supply, biodiversity, carbon capture and ecosystem services

Awareness raising and increased monitoring of the benefits to local communities from undertaking restoration using indigenous species

Increased involvement of local communities to encourage local ownership and valuing of restored areas

Development of tools for marketing restoration to the right investors

Increased financial support for restoration

Increased understanding of the pay-back period and long term benefits of undertaking indigenous species restoration

Increased engagement with the private sector

Increased engagement with governments, including forestry departments and more widely.

Further partnerships and alliances linking organisations with shared interest to act as a voice for forest restoration using indigenous species.

These needs will all be addressed throughout the project *Enhancing tree conservation and forest restoration in Africa* and through wider collaboration and adoption of an indigenous species approach by organisations and institutions across Africa. BGI has developed an action plan for moving towards addressing these needs over the remainder of the project timeframe and in to the future.

Action plan

Our overall aim is to scale up forest restoration across Africa through the development of a network of botanic garden led restoration sites across Africa that:

- **Generate information on cultivation techniques and performance of indigenous trees**
- **Demonstrate the value of using indigenous species in forest restoration**
- **Provide *in situ* conservation of threatened and commonly used indigenous species**
- **And provide for education, outreach and training**

In order to achieve this BGCI will:

- Continue to **support the current restoration work of Brackenhurst Botanic Garden and Tooro Botanic Garden** and promote these sites as models for replication
- **Continue to collate information on expertise of African botanic gardens**, highlighting the knowledge and value of their involvement in restoration projects
- Encourage **further linkages between botanic gardens through the Ecological Restoration Alliance of botanic gardens (ERA)**
- Seek funds to undertake **training for tree conservation and restoration** to build expertise within African botanic gardens and address any identified capacity gaps – focus areas include identification and collection of threatened species for *ex situ* conservation, propagation techniques, seed storage
- **Develop further partnerships for restoration** with NGOs, governments, private sector, universities and other relevant institutions, both at broad and local levels
- **Prioritise species for inclusion in restoration programmes** through continued collation of information on indigenous species collections, cultivation techniques and performance
- **Promote the use of indigenous species** in restoration programmes
- **Identify threatened and widely used indigenous tree species for which conservation and cultivation programmes are lacking, make recommendations and seek funds for botanic garden led projects to address these gaps**
- Highlight botanic gardens and restored sites as seed sources and encourage sharing of botanic garden knowledge on seed storage and propagation protocols with national seed centres to **support the development of a supply of indigenous material for restoration**
- Continue to liaise with in-country partners to **identify priority sites for restoration** and build into proposals
- Lead project proposal development and fundraising for **additional practical forest restoration sites**
- **Promote the results of restoration sites widely**, through the BGCI and ERA networks and additional forums
- **Develop and disseminate best practice guidance** for restoration using indigenous species. Disseminate this information through the ERA website, GSPC Toolkit website and by other appropriate means.

Priority sites for restoration will be those that:

- Were previously forested,
- Are now degraded
- And are located close to communities so they have outreach and education potential

Priority indigenous species for restoration will include those that:

- Are fast growing and create canopy closure quickly
- Are useful – provide value to local communities
- Are restricted range and threatened species
- Have high survival rates
- Previously grew at the sites



Key next steps that BGCI are undertaking to move towards achieving this aim include:

Prioritisation of sites

Refine the priority list of sites identified in this report and the feasibility of their restoration based on assessment of present status and partnerships.

FORRU – East Africa

BGCI and the Royal Botanic Gardens Kew, Millennium Seed Bank Partnership are developing a joint proposal to set up a series of Forest Restoration Research Units (FORRUs) undertaking practical forest restoration at additional sites in Uganda and Kenya and training staff in restoration techniques. Activities will be expanded at

Brackenhurst Botanic Garden and Tooro Botanic Garden and additional forest restoration plots will be set up with Nature Palace Botanic Garden and at Kakamega rainforest. At each restoration site, the Framework Species approach will be adopted and a field trial plot will be set up to monitor survival rates, growth rates and progress towards canopy cover.

This will allow for identification of high performing species to be prioritized for future restoration projects and will provide additional model sites demonstrating the benefits of undertaking restoration using indigenous species. Brackenhurst Botanic Garden and Tooro Botanic Garden will provide in-country support and training to further restoration projects in these countries. All sites will work with local communities to identify priority species for including in restoration projects and ensure restoration directly benefits these communities.

Ethiopia

BGCI hope to expand the project to Ethiopia. This would involve workshops to identify current expertise, potential partners and priority sites and species. It would also involve setting up at least one restoration site to test species performance and provide an additional model for replication, promotion and project expansion. This work would be undertaken in collaboration with the Oxford University Harcourt Arboretum, who are involved in capacity building and conservation work at Wondo Genet Arboretum in Ethiopia. BGCI are also in discussions with the newly founded Gullele Botanic Garden about their involvement in the project, through restoration of the land within the grounds of the garden, and/or training of staff.

Collaboration with the private sector

Growth trials of indigenous tree species will be undertaken on New Forest Company managed land in collaboration with a local botanic garden partner. BGCI will promote and communicate the results widely. The potential for expansion to additional New Forests Company sites is recognised and BGCI and the New Forests Company are currently in discussion to determine the scope of this partnership.

Partnerships with other private companies will be sought to promote and facilitate the planting of indigenous tree species.

Exploring the potential for agroforestry and trees on farms

BGCI and Rainforest Alliance are working together to encourage the use of botanic garden expert knowledge and rigour in identifying approaches and suitable tree species to enable successful fulfilment of conservation and restoration criteria at Rainforest Alliance certified farms. This is a multi-level partnership, linking BGCI and Rainforest Alliance, and local botanic gardens and certified farms.

Collaboration with ITTO

BGCI will work with ITTO to implement growth trials for selected indigenous tree species using the skills and expertise of botanic gardens. The trees selected will be those of livelihood value to local communities and proven value in restoration schemes.

Expanding the initiative to West and Central Africa

BGCI plans to hold a workshop in West Africa in 2014, similar to the Uganda workshop, bringing together botanic garden, NGO, government and private sector representatives involved in tree conservation, management of forest resources and restoration. We aim to hold a third regional workshop in 2015 in Central Africa.



Thank you

BGCI would like to thank all participants of the Uganda workshop for their valuable contributions through presentations and discussions across the three days. BGCI would also like to thank other organisations that have supported the project so far by attending the London seminar, contributing information about *ex situ* collections and restoration experience and promoting the project. We look forward to further collaboration with you.

BGCI are keen to hear from additional botanic gardens, organisations, government representatives and private companies interested in being involved in this initiative. Please contact kirsty.shaw@bgci.org

BGCI are extremely grateful to the Ashden Trust for supporting the current project which has provided valuable opportunity to develop model forest restoration sites for replication and strengthen and develop new partnerships to move towards expansion across Africa.



Restored indigenous forest at Brackenhurst Botanic Garden

Uganda workshop participant list

Sara Oldfield	Botanic Gardens Conservation International (BGCI)
Kirsty Shaw	Botanic Gardens Conservation International (BGCI)
Mark Nicholson	Brackenhurst Botanic Garden, Kenya
Godfrey Ruyonga	Tooro Botanical Garden, Uganda
Joyce Adokorach	Entebbe Botanical Garden, Uganda
Rhona Arinaitwe	East African Breweries Ltd Foundation
Washington Ayiembra	NatureKenya
Mark Chowles	New Forests Company
David Nkwanga	Nature Palace Botanic Garden, Uganda
Ivan Ebong	IUCN
Richard Gafabusa	IUCN
Kiama Gitahi	Wangari Maathai Institute, Kenya
Kate Hardwick	Millennium Seed Bank Partnership, Royal Botanic Gardens Kew
James Kalema	Makerere University Botanic Garden, Uganda
Julian Katambi	CECOD - Conservation Efforts for Community Development, Uganda
Susan Komukama	Entebbe Botanical Garden, Uganda
Jean Lagarde Betti	International Tropical Timber Organisation (ITTO)
Jon Lovett	Leeds University, UK
Michael Malinga	National Forestry Authority, Uganda
Charles Meshack	Tanzania Forest Conservation Group
Juliana Mugare	Green Belt Movement, Kenya
Timothy Muhairwe	District Forest Officer Kabarole, Uganda
Norman Mukuru	Rainforest Alliance
Henry Mutabaazi	NatureUganda
Martin Noponen	Rainforest Alliance
Robert Njeru	TOTAL Kenya
Teddy Nsamba	Green Resources
Clement Okia	ICRAF - Uganda
William Omondi	KEFRI - Kenyan Forestry Research Institute
Nicholas Senyonjo	Uganda Environmental Education Foundation (UEEF)
Ludovick Uronu	Tanzania Tree Seed Agency
William Wambugu	Nairobi Botanic Garden, National Museums of Kenya

References and resources

- BGCI. (2011). Botanic gardens, endangered trees and reforestation in Africa. Available at: <http://www.bgci.org/files/Africa/pdfs/african-trees.pdf>
- Elliot, S, Blakesley, D and Hardwick, K. (2013). Restoring Tropical Forests: A Practical Guide. Royal Botanic Gardens Kew, Richmond, UK.
- FAO. (2010). Forest Resources Assessment. Food and Agriculture Organization of the United Nations. Rome. Available online at: <http://www.fao.org/forestry/fra/fra2010/en/>
- ITTO. (2002). ITTO guidelines for the restoration, management and rehabilitation of degraded and secondary tropical forests. International Tropical Timber Organisation. ITTO Policy Development Series No. 13.
- Kalema, J and Beentje, H. Conservation Checklist of the trees of Uganda. Royal Botanic Gardens, Kew, Richmond, UK.
- Lovett, J., Ruffo, C., Taplin, J. and Gereau, R. (2006) Field guide to the Moist Forest Trees of Tanzania. Available online at: http://www.cepf.net/Documents/Final_LovettRuffoGereau_FieldGuide.pdf. Online identification guides produced from the book are available online at: <http://archive.fieldmuseum.org/africaforest/index.html>.
- Meunier, Q, Arbonnier, M and Morin, A. (2008). Trees, shrubs and climbers valued by rural communities in Western Uganda. Kampala, Uganda.
- Meunier, Q., Lemmens, R. and Morin, A. (2010). Alternatives to exotic species in Uganda : Growth and cultivation of 85 indigenous trees. Kampala, Uganda.
- Oldfield, S., Lusty, C., MacKinven, A. (1998) The World List of Threatened Trees. WCMC, Cambridge.
- Oldfield and Newton. (2012). Integrated conservation of tree species by botanic gardens: A reference manual. BGCI, Richmond, UK. Available online at: http://www.bgci.org/files/Worldwide/News/SeptDec12/tree_species_low.pdf
- Sharrock, S., Hird, A., Kramer, A., and Oldfield, S. (2010). Saving plants, saving the planet: Botanic Gardens and the implementation of GSPC Target 9. BGCI. Richmond, UK. Available online at: www.plants2020.net/document/0180/
- Sinhaseni, K. 2008. Natural Establishment of Tree Seedlings in Forest Restoration Trials at Ban Mae Sa Mai, Chiang Mai Province. MSc thesis, Chiang Mail University, Thailand.
- Strangeland, T., Tabuti, J. And Lye, K.A. (2011). The framework tree species approach to conserve medicinal trees in Uganda. Agroforestry Systems 82: 275-284

Website links

- BGCI website:** <http://www.bgci.org/>
- Ecological Restoration Alliance of Botanic Gardens website:** <http://www.erabg.org/>
- BGCI GardenSearch database:** http://www.bgci.org/garden_search.php
- BGCI PlantSearch database:** http://www.bgci.org/plant_search.php
- Online guide to the Global Strategy for Plant Conservation:** <http://www.plants2020.net/>
- African Tree Database:** <http://www.africatreedatabase.com/>
- CITES information and Appendices:** <http://www.cites.org/>
- Encyclopedia of Life:** <http://eol.org/>
- Global Trees Campaign website:** www.globaltrees.org
- ICRAF Agroforestry Database:** <http://www.worldagroforestry.org/resources/databases/agroforestry>
- ICRAF Useful Trees for Africa:** http://www.worldagroforestrycentre.org/our_products/databases/useful-tree-species-africa
- ICRAF Tree Seed Suppliers Directory:** http://www.worldagroforestry.org/our_products/databases/tssd
- ICRAF Tree Seeds for Farmers** – a toolkit and reference source: <http://www.worldagroforestry.org/sites/default/files/Toolkit.pdf>
- ICRAF Tree Diversity Analysis** – a toolkit and reference source: <http://www.worldagroforestry.org/resources/databases/tree-diversity-analysis>
- ICRAF Agroforestry Species Switchboard:** http://intranet.worldagroforestry.org/our_products/databases/switchboard/
- IUCN Red List of Threatened Species:** <http://www.iucnredlist.org/>
- Millennium Seed Bank Data Warehouse:** <http://herbaria.plants.ox.ac.uk/bol/msbp>
- Potential Natural Vegetation (PNV) map for eastern Africa** - <http://www.vegetationmap4africa.org/>
- Vegetation and Climate Change in East Africa (VECEA):** Map covering seven countries in East Africa offering accuracy for tree species selection: <http://vegetationmap4africa.org/vegetation-map.aspx>

Annex I - Priority species for forest restoration in East Africa

Species name	Suggested at workshop	Included in restoration work of Brackenhurst/ Tooro BG	Conservation status	Notable uses	Growth rate	Range
<i>Acacia abyssinica</i> Benth.		Yes	LC (Kalema and Beentje, 2012)	Edible gum. Ornamental.	Medium	Widespread in Africa
<i>Acacia nilotica</i> (L.) Delile		Yes	LC (Kalema and Beentje, 2012)	Good for bees.	Medium	Widespread in Africa
<i>Acacia polyacantha</i> Willd.		Yes	LC (Kalema and Beentje, 2012)	Timber. Medicinal. Resin. Termite proof.	Medium	Uganda, Kenya, South Sudan, Ethiopia, DRC
<i>Acacia seyal</i> Delile		Yes	LC (Kalema and Beentje, 2012)	Fodder.	Medium	Widespread in Africa
<i>Azelia quanzensis</i> Welw.		Yes	Not Evaluated	Timber. Edible fruit. Fodder. Gum. Termite proof.	Slow	Tanzania, Zambia
<i>Albizia grandibracteata</i> Taub.		Yes	LC (Kalema and Beentje, 2012)	Timber. Carving.	Medium	Uganda, W Kenya, N Tanzania, S Sudan, DRC
<i>Albizia gummifera</i> (J. F. Gmel.) C. A. Sm.		Yes	LC (Kalema and Beentje, 2012)	Timber. Carving.	Medium - fast	Widespread in Africa
<i>Apodytes didimiata</i> Arn.		Yes	LC (Kalema and Beentje, 2012)		Fast	Widespread in Africa
<i>Balanites aegyptiaca</i> (L.) Delile		Yes	LC (Kalema and Beentje, 2012)	Timber. Fodder. Gum. Edible fruit. Termite proof.	Slow	Widespread in Africa
<i>Balthasaria schliebenii</i> (Melch.) Verdc.		Yes	LR/nt (IUCN Red List, 1998). LC (Kalema and Beentje, 2012)	Good for birds	Fast	Uganda, Tanzania, DRC, Rwanda, Burundi
<i>Brachylaena huiiensis</i> O. Hoffm.		Yes	LC (Kalema and Beentje, 2012)	Carving.	Medium	Widespread in E and S Africa. Rare in Uganda
<i>Bridelia micrantha</i> (Hochst.) Baill.		Yes	LC (Kalema and Beentje, 2012)	Timber. Carving.	Fast	Widespread in Africa
<i>Calodendrum capense</i> (L.f.) Thunb.	Yes	Yes	LC (Kalema and Beentje, 2012)	Oil from seed. Popular food for monkeys. Timber.	Medium	Widespread in Africa
<i>Calodendrum eickii</i> Engl.	Yes		CR (IUCN Red List, 1998)	Larger fruits than <i>C. capense</i>		Tanzania - W Usambaras
<i>Carapa grandiflora</i> Sprague		Yes	LC (Kalema and Beentje, 2012)	Timber.	Fast	Widespread in C Africa
<i>Celtis africana</i> Burm. F.		Yes	LC (Kalema and Beentje, 2012)	Timber. Carvings.	Fast	Widespread in Africa
<i>Celtis gomphophylla</i> Baker		Yes	LC (Kalema and Beentje, 2012)	Insect/snake repellent. Fodder. Food for monkeys	Fast	Widespread in Africa
<i>Chrysophyllum albidum</i> G. Don		Yes	LC (Kalema and Beentje, 2012)	Timber. Carving.	Medium	Widespread in Africa
<i>Cordia africana</i> Lam.		Yes	LC (Kalema and Beentje, 2012)	Timber. Carvings. Edible fruit. Gum. Medicinal. Shade for coffee.	V Fast	Widespread in Africa and Arabian Peninsula
<i>Croton macrostachys</i> Delile		Yes	LC (Kalema and Beentje, 2012)	Timber. Medicinal.	Fast	Widespread in Africa
<i>Croton megalocarpus</i> Hutch.		Yes	LC (Kalema and Beentje, 2012)	Timber. Medicinal. Shade provider.	Medium - fast	Widespread in E Africa
<i>Cyclicomorpha parviflora</i> Urb.		Yes	Not Evaluated	Beehives. Shade provider. Good for bees. Medicinal. Ornamental.	Fast	Tanzania, Kenya, Malawi
<i>Dalbergia melanoxylon</i> Guill. & Perr.		Yes	LR/nt (IUCN Red List, 1998). NT (Kalema and Beentje, 2012)	Timber – valuable hardwood. Carving and musical instruments	Slow	Widespread in Africa
<i>Diospyros abyssinica</i> (Hiern) F. White		Yes	LC (Kalema and Beentje, 2012)	Timber. Medicinal. Shade provider. Ornamental	Medium	Widespread in Africa
<i>Dombeya torrida</i> (J. F. Gmel.) Bamps		Yes	LC (Kalema and Beentje, 2012)	Timber. Good for bees. Carving.	Fast	Widespread in Africa and Arabian Peninsula
<i>Ekebergia capensis</i> Sparrm.		Yes	LC (Kalema and Beentje, 2012)	Timber. Carvings. Shade provider -for coffee and banana. Medicinal.	Medium	Widespread in Africa
<i>Englerophytum oblancoelatum</i> (S. Moore) T. D. Penn		Yes	LC (Kalema and Beentje, 2012)	Good for bees. Gum. Resin.		Widespread in Africa
<i>Entandrophragma angolense</i> (Welw.) C. DC.		Yes	VU (IUCN Red List, 1998). LC (Kalema and Beentje, 2012)	Timber. Carvings.	Medium	Widespread in Africa
<i>Erythrina abyssinica</i> (Delile) A. Chev.		Yes	LC (Kalema and Beentje, 2012)	Timber. Carvings.	Medium	Widespread in Africa
<i>Faidherbia albida</i> (Delile) A. Chev.		Yes	LC (Kalema and Beentje, 2012)	Timber. Edible seeds and pods. Fodder. Shade for coffee. Medicinal.	Fast	Widespread in Africa
<i>Ficus natalensis</i> Hochst.		Yes	LC (Kalema and Beentje, 2012)	Medicinal.	Medium	Widespread in Africa
<i>Ficus ovata</i> Vahl.		Yes	LC (Kalema and Beentje, 2012)	Ornamental. Fodder.		Widespread in Africa
<i>Ficus sur</i> Forssk.		Yes	LC (Kalema and Beentje, 2012)	Edible fruit. Medicinal. Ceremonial uses.	Fast	Widespread in Africa
<i>Ficus sycomorus</i> L.		Yes	LC (Kalema and Beentje, 2012)	Timber. Edible fruit. Good for birdlife.	Medium	Widespread in Africa and Arabian Peninsula
<i>Ficus thonningii</i> Blume.		Yes	LC (Kalema and Beentje, 2012)	Good for birdlife.	Fast	Widespread in Africa
<i>Fleroya rubrostipulata</i> (K. Schum) Y. F. Deng		Yes	Not Evaluated		Fast	E Africa and parts of C Africa
<i>Garcinia buchananii</i> Baker		Yes	LC (Kalema and Beentje, 2012)	Sap yields yellow dye. Edible fruits. Shade provider. Medicinal.		Widespread in Africa
<i>Gigasiphon macrosiphon</i> (Harms) Brenan		Yes	EN (IUCN Red List, 1998).	Timber. Ornamental. Good for bees.		Very rare Kenyan coastal species
<i>Hagenia abyssinica</i> (Bruce) J. F. Gmel.		Yes	LC (Kalema and Beentje, 2012)	Timber. Carvings. Medicinal.	Fast	Fairly widespread in NE, C and E Africa
<i>Juniperus procera</i> Hochst. ex Endl.		Yes	LC (IUCN Red List, 2013)	Timber.	Slow	NE, E and S tropical Africa
<i>Khaya anthotheca</i> (Welw.) C. DC.		Yes	VU (IUCN Red List, 1998)	Timber. Carvings. Medicinal. Shade provider. Ornamental	Medium	Across central Africa
<i>Khaya senegalensis</i> (Desr.) A. Juss		Yes	VU (IUCN Red List, 1998)	Timber. Carvings.	Medium	Across central Africa
<i>Kigelia africana</i> (Lam.) Benth.		Yes	Not Evaluated	Timber. Carvings. Medicinal. Ornamental. Good for bees.	Medium	Sub-Saharan to South Africa
<i>Kigelia moosa</i> Sprague		Yes	Not Evaluated	Medicinal. Beer making.	Medium	Kenya, Uganda, Tanzania
<i>Lovoa swynnertonii</i> Baker f.		Yes	EN (IUCN Red List, 1998)	Timber.	Medium	E and Southern Africa
<i>Macaranga angolensis</i> (Mull. Arg.) Mull. Arg		Yes	Not Evaluated			Across central Africa

<i>Maesopsis eminii</i> Engl.		Yes	Not Evaluated	Timber. Fodder. Shade provider. Ornamental.	Fast	Tropical W and C Africa, Uganda. Invasive in Usambaras, Tanzania.
<i>Markhamia lutea</i> (Benth.) K. Schum.		Yes	Not Evaluated	Timber. Carving. Good for agroforestry. Good for bees. Medicinal. Ornamental.	Fast	Uganda, Kenya, Tanzania, Ethiopia
<i>Melia volkensii</i> Guerke		Yes	Not Evaluated	Timber. Fruit good for goats. Fodder. Insect repellent.	Slow	Kenya, Tanzania, Somalia, Ethiopia
<i>Milicia excelsa</i> (Welw.) C. Berg		Yes	LR/nt (IUCN Red List, 1998)	Timber - durable in water.	Slow - medium	Widespread across Africa
<i>Millettia dura</i> Dunn		Yes	Not Evaluated	Timber. Fodder. Ornamental. Leguminous. Shade provider.	Fast	Uganda, Kenya, Tanzania, DRC, Ethiopia, Rwanda
<i>Monodora myristica</i> (Gaertn.) Dunal		Yes	Not Evaluated	Timber. Ornamental. Medicinal.		Tropical W Africa, E to Uganda, Kenya, Tanzania
<i>Myrianthus holstii</i>		Yes	Not Evaluated	Fruit.	Fast	Restricted to Mt Kenya
<i>Neoboutonia macrocalyx</i> Pax		Yes	Not Evaluated	Timber. Carvings. Paper.	Fast	E Africa
<i>Newtonia buchananii</i> (Baker f.) G.C.C. Gilbert & Boutique		Yes	Not Evaluated	Timber - durable in water. Carvings. Ornamental. Fodder. Shade provider. Nitrogen fixing	Fast	E, C and Southern tropical Africa
<i>Ocotea usambarensis</i> Engl.		Yes	Not Evaluated	Timber. Medicinal. Ornamental.	Initial fast, medium	C and E Tropical Africa
<i>Obetia radula</i> (Baker) Baker ex B.D. Jacks		Yes	Not Evaluated		Fast	Uganda, Kenya, Central Africa and Madagascar
<i>Olea europea</i> ssp. <i>africana</i> L. (Mill.) P.S. Green		Yes	Not Evaluated	Timber – sought after. Edible fruit.	Slow	Widespread in Africa, Mascarene Islands, Arabia, India to China
<i>Olea europea</i> ssp. <i>cuspidata</i> L. (Wall. Sx. G. Don) Cif.		Yes	Not Evaluated	Timber. Carvings.	Fast	Widespread in E and Southern Africa, Mascarenes, Arabian Peninsula, India, China
<i>Olea welwitschii</i> (Knobl.) Gilg & Schellenb.		Yes	Not Evaluated		Fast	Tropical and S tropical Africa
<i>Parinari curatellifolia</i> Planch. ex Benth.	Yes		Not Evaluated	Edible fruit. Kernel has high oil content.		Tropical and S tropical Africa
<i>Pistacia aethiopica</i> Kokwaro	Yes		LR/nt (IUCN Red List, 1998)	Timber. Gum. Bark is used to make tea.		N Ethiopia, N Somalia, Uganda, Kenya
<i>Pittosporum mannii</i> Hook. f.		Yes	Not Evaluated	Ornamental. Medicinal.	Fast	Tropical Africa
<i>Pittosporum viridiflorum</i> Sims		Yes	Not Evaluated	Good for birds. Medicinal	Fast	Tropical Africa, eastern South Africa, Arabia, India
<i>Podocarpus latifolius</i> (Thunb.) R. BR. ex Mirb.		Yes	LC (IUCN Red List, 2013)	Timber. Medicinal	Medium - fast	Sub-saharan Africa
<i>Polyscias fulva</i> (Hiern) Harms		Yes	Not Evaluated	Timber. Ornamental. Shade provider	Fast	Tropical Africa
<i>Polyscias kikuyuensis</i> Summerh.		Yes	VU (IUCN Red List, 1998)	Timber. Ornamental.	Fast	Kenya
<i>Polyscias stuhlmannii</i> Harms		Yes	EN (IUCN Red List, 2009)	Timber. Shade provider.		Endemic to Taita Hills, Kenya
<i>Pouteria adolfi-friedericii</i> (Engl.) A. Meeuse		Yes	LC (Kalema and Beentje, 2012)	Timber. Latex sap. Edible fruit.	Medium	Uganda, W Kenya, Tanzania, DRC, Rwanda, Zambia, Malawi
<i>Pouteria altissima</i> (syn. <i>Aningeria altissima</i>) (A. Chev.) Baehni		Yes	LC (Kalema and Beentje, 2012)	Timber		Widespread in tropical Africa
<i>Prunus africana</i> (Hook. f.) Kalkman	Yes	Yes	VU (IUCN Red List, 1998) NT (Kalema and Beentje, 2012)	Timber. Carvings. Medicinal.	Medium	Widespread in Africa and Madagascar
<i>Psorospermum febrifugum</i> Spach	Yes		LC (Kalema and Beentje, 2012)	Medicinal		Tropical Africa
<i>Pterocarpus angolensis</i> DC.		Yes	LR / nt (IUCN Red List, 1998)	Timber		E and Southern Africa
<i>Rauvolfia caffra</i> Sonder		Yes	LC (Kalema and Beentje, 2012)	Timber. Medicinal	Fast	Uganda, Kenya, Malawi, DRC, Tanzania, Zambia, South Africa, Zimbabwe
<i>Senegalia senegal</i> (L.) Britton	Yes		Not Evaluated	Gum		Tropical Africa
<i>Spathodea campanulata</i> P. Beauv.		Yes	LC (Kalema and Beentje)	Carvings. Medicinal.	Medium	Widespread in Africa.
<i>Syzygium cordatum</i> Hochst. ex Krauss		Yes	LC (Kalema and Beentje, 2012)	Timber. Medicinal. Edible fruit.	Medium	Widespread in Africa
<i>Tamarindus indica</i> L.		Yes	LC (Kalema and Beentje, 2012)	Edible fruit - source of tamarind. Timber. Fodder. Medicinal. Good for bees.	Slow	Uganda, Tanzania. Widespread in Africa and Asia
<i>Terminalia brownii</i> Fresen.		Yes	LC (Kalema and Beentje, 2012)	Timber. Fodder. Agroforestry. Medicinal. Drought resistant.	Slow - medium	Uganda, Kenya, Tanzania, Eritrea, Ethiopia, Somalia, Sudan
<i>Treulia africana</i> Decne ex. Trecul		Yes	LC (Kalema and Beentje, 2012)	Timber. Carvings. Medicinal. Edible seeds. Fodder. Ornamental	Medium	Widespread in Africa
<i>Trema orientalis</i> (L.) Blume		Yes	LC (Kalema and Beentje, 2012)	Timber	Fast	Widespread in Africa and Asia
<i>Trichilia emetica</i> Vahl.		Yes	LC (Kalema and Beentje, 2012)	Timber. Edible seeds. Fodder. Good for bees and birds. Medicinal.	Medium	Widespread in Africa
<i>Uvariopsis congensis</i> Robyns & Ghesq.		Yes	LC (Kalema and Beentje, 2012)	Branches used for bows. Medicinal.		Widespread, from Liberia east to W Kenya
<i>Vepris glandulosa</i> (Hoyle & Leakey) Kokwaro		Yes	EN (IUCN Red List, 1998)		Fast	Endemic to Kenya
<i>Vepris nobilis</i> (Delile) Mziray		Yes	Not Evaluated	Timber. Medicinal. Edible fruit. Ornamental.	Slow - medium	E and C Africa
<i>Vepris simplicifolia</i> (Engl.) Mziray		Yes	Not Evaluated	Timber. Medicinal.	Medium	Kenya, Ethiopia
<i>Vitellaria paradoxa</i> C. F. Gaertn		Yes	VU (IUCN Red List, 1998). NT (Kalema and Beentje, 2012)	Shea butter from nuts. Medicinal. Important oil crop in Africa	Slow	Widespread in Africa
<i>Vitex keniensis</i> Turill		Yes	VU (IUCN Red List, 1998)	Timber. Edible fruit	Fast	Kenya
<i>Warburgia ugandensis</i> Sprague	Yes	Yes	LC (Kalema and Beentje, 2012)	Timber. Medicinal. Fodder. Ornamental.	Medium	Uganda, Kenya, Tanzania, DRC, Ethiopia, Malawi, Swaziland and South Africa
<i>Zanthoxylum gillettii</i> (De Wild.) P.G. Waterman		Yes	LC (Kalema and Beentje, 2012)	Timber. Medicinal	Medium - fast	E, W and C Africa
<i>Zanthoxylum mildbraedii</i> (Engl.) P. G. Waterman		Yes	LC (Kalema and Beentje, 2012)	Medicinal.		Very rare in Kenya. Also in Uganda, DRC, Rwanda
<i>Ziziphus mucronata</i> Willd.		Yes	Not Evaluated	High vitamin C content		Tropical Africa

“I cannot live without the green trees, and nor can you”
- Wangari Maathai

Recommended citation

Shaw, K. and Oldfield, S. (2013). Enhancing tree conservation and forest restoration in Africa: Report of the regional workshop held in Entebbe Uganda. 30th July-1st August 2013. BGCI. UK.

Some facts and figures included in this report have been taken directly from workshop presentations. References are provided when these were included in presentations. For email addresses of participants, please contact kirsty.shaw@bgci.org

Acknowledgments

BGCI would like to thank members of the East African Plant Red Listing Authority for providing provisional conservation assessments to support the priority species selection working group session. Thanks also to UNEP-WCMC and Phillip Platts from the University of York for providing maps for the site selection working group session.

Image credits

Images included within presentation summaries were taken mainly from workshop participant’s presentations. Additional photos were taken by the author of this report.

Barney Wilczak, a conservation photographer supporting the Ecological Restoration Alliance of botanic gardens, provided the following images; Inside cover, pages 3, 4, 5, 6, 7, 8, 50 (*Vitex keniensis*), 54 and back cover.
www.wilczakphotography.co.uk



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