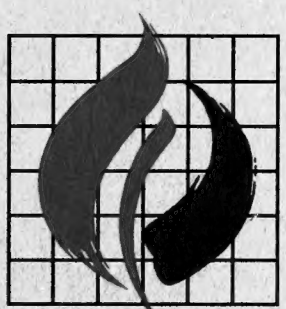
Conservation and Sustainable Management of Trees

Report of the First Regional Workshop

held at the
Jameson Hotel, Harare, Zimbabwe

9-11 July 1996



WORLD CONSERVATION
MONITORING CENTRE

The **World Conservation Monitoring Centre**, provides information services on the conservation and sustainable use of species and ecosystems and supports others in the development of their own information systems.

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Introduction

This Workshop was convened by the World Conservation Monitoring Centre (WCMC) as part of the joint WCMC and IUCN Species Survival Commission (SSC) project entitled the *Conservation and Sustainable Management of Trees*, funded by the Government of the Netherlands.

The Workshop had three objectives:

- to review existing information on the conservation status of African tree species and to collect additional information on species of conservation concern;
- to advise on the development of a *Tree Conservation Information Service* appropriate for national, regional and international needs;
- to plan for the establishment of an SSC African Tree Specialist Group.

The Workshop Agenda is given in Annex 2 to this report and the participants list is provided in Annex 3.

The Workshop was chaired by **Sara Oldfield** who welcomed participants on behalf of WCMC and SSC and thanked them for their input to the project over the past six months. She pointed out that good progress had been in the collection and exchange of information on the conservation status of African trees and that the Workshop provided an excellent opportunity to take this process successfully forward and plan future collaborative activities.

Sara Oldfield informed participants that the Forestry Commission of Zimbabwe had communicated that they welcome the Workshop because it addresses very pertinent forestry issues. The National Botanic Garden and Herbarium of Zimbabwe had generously offered the use of their facilities to Workshop participants during their stay in Harare.

Four background documents were introduced to aid discussions during the Workshop:

Document 1	Tree Conservation Information Service - data management issues.
Document 2	Guidelines for the application of the 1994 IUCN red list categories to trees. This addresses some of the problems raised at the project's Technical Workshop held in Wageningen and is designed to be read in conjunction with the *IUCN Red List Categories* booklet.
Document 3	A preliminary list of globally threatened trees of Africa.
Document 4	Draft species conservation profiles of widespread heavily utilised tree species for evaluation of conservation status.

Presentations

1 Introduction to the Project - Sara Oldfield

The *Conservation and Sustainable Management of Trees* project is a three-year project funded by the Government of the Netherlands. WCMC and SSC are the main collaborators, and we are working with a wide range of other national, regional and international organisations. The goal of the project is to provide a reliable and up-to-date information service on the distribution, conservation status, local uses and economic values of tree species worldwide, in order to assist countries in the planning of sustainable forest management and biodiversity conservation, through appropriate international or intergovernmental processes.

This is clearly an ambitious goal but should be fully achievable given the existing strengths of WCMC and SSC. To ensure that the project is a success it will be necessary to continue working effectively with a wide network of experts. At an international level, collaboration has been established with FAO and IPGRI. Collaboration with IPGRI will be discussed further by Dr Abdou-Salam Ouédraogo in a presentation to the Workshop.

Conservation data at WCMC is gathered from a wide variety of sources, it is managed and maintained in a series of databases and made available to Governmental, Intergovernmental and Nongovernmental users worldwide. Databases maintained at WCMC include:

The Animals database which is used to compile the *IUCN Red List of Threatened Animals* in collaboration with SSC.

The WCMC *CITES Trade Database*, maintained on behalf of the CITES Secretariat

The *Biodiversity Map Library*, a geographical interface which allows rapid access to a wide range of mapped information on the world's biodiversity. Global coverage of tropical moist forests is, for example, maintained and the collection of data on tropical dry forests is a current priority. The integration of species distribution data is being developed with a particular focus on trees.

The *Protected Areas Database* which has over 37,000 records and nearly 5000 individual site sheets.

The WCMC *Plants Database* which currently records information on the distribution and status of over 100,000 plants; 30,000 of which are globally threatened. Information stored in the WCMC Plants Database is the starting point for information collection in the *Conservation and Sustainable Management of Trees* project. There are currently records of about 15,000 tree species; about half of which have been added or annotated as trees since the start of the project. The procedure adopted is to review this data, checking taxonomy and distributions of the existing tree species records, and adding further endemic species records on a country or generic basis, following expert advice or literature review. More detailed information is then collected on threatened tree species, using a standard data collection form, as described by **Sam Kanyamibwa**, and the new IUCN categories of threat are applied.

The proposed outputs of the project by the end of 1997 are:

- A world list of Threatened trees using the new IUCN threat categories
- A report on the sustainability of tree utilisation
- A world tree database made available to users in electronic format
- On-line access to tree conservation information service
- Development of an SSC tree network

These products are being developed in collaboration with SSC's network of experts worldwide. The mission of the SSC is to conserve biological diversity by developing and executing programs to save, restore and manage wisely species and their habitats. The existing SSC Groups for trees are the Temperate Broadleaved Trees Specialist Group and the Conifer Specialist Group. One of the aims of this project is to develop further SSC Tree Specialist Groups.

The Conifer Specialist Group has evaluated the conservation status of all conifers and filled in standard data collection forms as a contribution to the project. The Temperate Broadleaved Trees Group has adopted a generic approach. At a meeting earlier this year experts were identified to work on the various genera. The project has funded two issues of the Group's newsletter and the mapping of threatened species of *Magnolia*, *Betula* and *Quercus*.

For African trees we have been working with experts in 16 African countries, some of which have been able to join us at the Workshop. Document 3 provides a working list of African tree species which are of global conservation concern, derived from the WCMC Plants Database. Species which have been evaluated using the new IUCN categories of threat as part of the current project are indicated on this list. Standard data collection forms have been, or are in the process of being, annotated by experts for trees of Côte d'Ivoire, Ghana, Kenya, Madagascar, Mozambique, Nigeria, Somalia, Tanzania and Uganda. National projects to mirror the aims of the *Conservation and Sustainable Management of Trees* project are being developed in Kenya and Uganda.

Discussion

It was agreed that more discussion was needed on the preliminary list of globally threatened trees of Africa, prepared as a draft for the Workshop. The definition of "tree" was also discussed. A strict definition has not been adopted for the purposes of this project. Information collected on woody species which are not included in the final project outputs can be made available to other groups.

2 Tree Conservation Information Service - Sam Kanyamibwa

Sam Kanyamibwa presented Document 1 *Tree Conservation Information Service*, which is provided in full as Annex 4 to this report. General principles of data management covered in the presentation included the use of standards to facilitate data compatibility and exchange; data quality; data custodianship and collaboration. The importance of people's contributions to the project in terms of expertise and information was highlighted.

The steps taken so far in the design and development of the *Tree Conservation Information Service* were described focusing on the user needs survey, consultation with key organisations and use of the standard data collection form. **Sam Kanyamibwa** explained that a prototype database had been developed based on the standard data collection form and that this was available for review at the meeting.

Discussion
The design of the standard data collection form was discussed and various revisions to this suggested to enhance ease of use. The different sources of information, for example, herbarium specimens, field observations were discussed in relation to data quality and the need to specify data sources. The value of the different types of information on species, their habitats, ecology, utilisation and conservation status were discussed and the need to share information between different potential users including those involved in tree exploitation and conservation. The value of local information was recognised and the need to link local and national datasets with a global overview database on trees, as being developed through this current project.

3 IUCN Red List Categories and Guidelines - Charlotte Jenkins

Charlotte Jenkins presented Document 2 *Guidelines for the application of the 1994 IUCN red list categories to trees*, which is provided as Annex 5 to this report. In her presentation Charlotte drew attention to the following points and discussed the new IUCN threat categories in the context of tree species.

IUCN threat categories serve as standards to indicate how concerned we should be about the status of a species. The old categories have been used by IUCN for over 30 years. The new categories, adopted in 1994 and described in the *IUCN Red List Categories* given to Workshop Participants, indicate specific criteria which must be fulfilled and applied to global population of a species. When designing the new system the main objectives were to: have a system that was repeatable, in other words different people would get the same result if given the same data, to improve objectivity by provide clear guidance, to facilitate comparisons of taxa across different kingdoms, and to give people a better understanding of how individual species were classified.

The new categories of threat are **Extinct, Extinct in the wild, Critically Endangered, Endangered** and **Vulnerable**. There are other categories which may be applied but do not indicate that the species is threatened. These are **Lower Risk** which is subdivided into **Conservation Dependent**, **Near Threatened** and **Least Concern**. This last category is equivalent to the old "not threatened". There are also categories, **Not Evaluated** and **Data Deficient**. Inclinations to add species to **Data Deficient** are often strong. It is more useful, however, to employ available data to its full and apply a category of threat wherever appropriate.

It is recognised that precise information on the status of rare species is, in itself, scarce. It is stressed that although the criteria are quantitative and well-defined a large degree of projection and assumption will be required in order to establish appropriate species as

threatened. The IUCN pamphlet on the Red List Categories reads "In cases where there are evident threats to a taxon through, for example, deterioration of its only known habitat, it is important to attempt threatened listing, even though there may be little direct information on the biological status of the taxon itself."

As people attempt to assign categories to tree species the paucity of necessary data becomes very evident. Different appliers will inevitably perceive varying amounts of flexibility in the interpretation of criteria and the definitions involved. The guidelines presented have been prepared from the comments and questions which have arisen. They are intended to help equate the different evaluations of tree species around the world and to highlight various aspects of the application process particularly pertinent to trees.

In order to assign a species to a threat category one of five criteria needs to apply. The criteria are the same for each category except that they differ in degree. For instance, Criterion A applies to species which have experienced or which will experience a considerable reduction in population numbers, habitat or range. To apply a category of **Critically Endangered** the reduction should be in the form of an 80 per cent population loss over the last 10 years or 3 generations. For **Endangered** the reduction should be 50 per cent and for **Vulnerable** it needs to be 20 per cent. The other four criteria differ similarly over the different categories.

It is extremely important to emphasize the role of the criteria in the new system. Categories indicate the severity of threat but it is the criteria that give some sense of why the species is threatened. It is the criterion assigned that will enable people to see whether it is exploitation or its localisation that has caused the listing of a species as threatened. To illustrate this it is worth outlining each criterion and how they apply to species with different biologies and different threats.

Criterion A is useful to assess species which are widespread and not generally rare but which have experienced serious declines in their numbers, distribution or the habitat to which they are confined. This is the only criterion which does not require some degree of rarity in the species. With regards to trees, here, it should be clear that precise estimations of generation time and population declines are not essential. Three generations in non-pioneer trees always exceed 10 years. In some cases they total more than 300 years. It is, however, declines influenced by human activities which are most important to consider. It is often appropriate to give general estimates of population or habitat declines in the last century for most tree species.

Criterion B applies to species which are restricted in range. It is not often that information on tree species localities is sufficiently plentiful to measure the "area of occupancy" of a species. Frequently, however, tree species range or habitat, excluding discontinuities, can be estimated to cover less than 20,000km^2 or two degree squares. This will be a common way to assign a category of threat to tropical tree species where information on the precise species location and population numbers are poorly known but the habitat to which species are specific is rare and restricted and probably has declined or been degraded over the past century.

Criterion C applies to species with low population numbers. The operative word in the description of this criterion is "mature individuals". Estimates of population should only include individuals which are effective at reproduction. They should, therefore, not include parts of the population where for instance individuals are so isolated that they are incapable of reproducing sexually, or where populations are not regenerating or where the dominance of one sex results in parts of the population becoming ineffectual in terms of reproduction. Individuals which are not fully mature should also not be counted. Estimates of population numbers in a canopy species should include only individuals which are of canopy height. This criterion often works best for the severely threatened species where population estimates are possible.

Criterion D is the only criterion which does not imply a decline in the species population. Numbers or populations need only be small or confined to one or a few localities. This is where trees "only known from the type locality" belong or those confined to areas such as mountain tops. In many cases these species are not threatened so it is of great importance that they can be discerned from threatened species by the allocation of the D criterion.

Criterion E can only be assigned when quantitative analysis has been carried out.

To conclude, the new process of applying threat categories to species is not a simple one but it is an informative one. Specific criteria, which at first encounter appear to be highly quantitative and well-defined, must be fulfilled in order to assign a category of threat. The criteria, however, can be applied in multiple ways in order to deal with the many instances where good data are lacking. It is important to recognise the criteria may be useful in illustrating different types of threat. The new system may now distinguish species threatened by exploitation from those which are relatively safe but confined to one locality.

4 Application of the new IUCN threat categories to tree species of Mozambique - Salomão Bandeira

As a contribution to the *Conservation and Sustainable Management of Trees* project, the standard data collection forms were filled in for 42 tree species of Mozambique, with the new IUCN categories of threat applied in each case. An overview of the botanical situation in Mozambique was presented as an introduction to this task and the results of the species conservation status evaluation given.

In Mozambique there is currently minimal concern for the conservation of flora. Some areas are conserved as National Parks and reserves, but the focus has been on the conservation of fauna. There are an estimated 5,500 plant species in Mozambique. Many localities within the country have not been collected. Mozambique has three main phytogeographic regions according to White's classification, with approximately 80 per cent falling within the Zambezian Regional Centre of Endemism. Within the country there are seven broad vegetation types, the largest of which is miombo followed by mopane woodland and coastal mosaic. Woody vegetation covers 71 per cent of Mozambique; 49.2 per cent of the vegetation is mixed forest, 21.7 per cent grassland, 0.6 per cent mangroves and 0.1 per cent artificial forest. Important forest products include five key species for roundwood production:

Afzelia cuanzensis, *Pterocarpus angolensis*, *Millettia stuhlmannii*, *Dalbergia melanoxylon* and *Spirostachys spinosa*.

In comparing the new IUCN categories with the previous system it is clear that the old categories were highly subjective whereas the new categories use quantative criteria. The category DD (Data Deficient) is very well defined compared to old version of using Indeterminate and Insufficiently Known. Concerns over the new categories of threat system are that "not threatened" and "out of danger" have not been replaced, therefore is seems that every species could be near to threat, and "Rare" is no longer available as a category.

Examples of species which are evaluated according to the new threat categorisation system are *Raphia australis* - Critically Endangered, a species distributed in few parts of Mozambique, and close to Maputo occurring only at Bobole Special Reserve (about 100 individuals); and *Warburgia salutaris* Enangered, a species heavily used for medicine (bark) and charcoal. Over half the species have been evaluated as Data Deficient.

Problems encountered in applying the new IUCN categories of threat can be summarised as:

- deficiency in current data - there are many remote areas in Mozambique that have not been collected
- lack of taxonomic expertise within the country
- insufficient ecological and ethnobotanical information
- lack of resources for current literature and manpower

Discussion
The sources of data for assessing the conservation status of trees in Mozambique were discussed. **Salomão** pointed out that he had based his conservation assessments both on field knowledge and herbarium specimens. This is noted on the standard data collection forms. The use of remote sensing was discussed and it was agreed that this had limited value in assessing the conservation status of individual tree species. The need for more fieldwork was emphasised. The application of the new threat categories to "rare" species was also discussed and the difference between species rarity and threat status.

5 Application of the new IUCN threat categories to threatened trees of Eastern Tanzania - Phil Clarke

Phil Clarke reported on application of the threat categories undertaken for the project at the University of York, led by Dr Jon Lovett. A full paper on this work will be presented at the XVth AETFAT Congress.

Abstract

Restricted range tree taxa in eastern Tanzania are concentrated in the forests of the Eastern Arc and Coastal forests, and in the arid Eastern Arc rain shadow. Habitat loss, rather than over exploitation, is the main threat to taxa in eastern Tanzania and so provides the basis of defining IUCN threat categories for individual taxa. However, in compiling a list of threatened forest trees and assigning IUCN categories to them, a number of problems were encountered. Variables that required clarification included size, taxonomic rank, habit and distribution pattern. In this study we divide a list of restricted range tree taxa into three height classes according to the tallest record of the tree: <10 m tall, 10-20 m tall and >20 m. Four levels of taxonomic rank were recognised: genus, species, subspecies and variety. Two growth habits were recognised: shrubby tree and tree. Four patterns of restricted range distribution were used: restricted to a few specific localities in Tanzania and one other country; a widely disjunct population of a taxon occurring elsewhere. The results are discussed in relation to conservation priorities for sustainable management of trees in eastern Tanzania.

Application of threat categories

Positive aspects of applying the new categories are that they highlight the degree of threat and also being required to list the criteria by which the categories are applied is useful. It would, however, be more useful to find a way to make the criteria more descriptive rather than recording letter codes. For example, for forest fragment species, it could be useful to record "single-location, declining".

The new categories can be used for species that are targeted for exploitation or for non-selective reduction. For relatively widespread targeted species there is likely to be a smooth population decline. For restricted range species which are threatened by habitat destruction it is more likely that species will "jump" categories as habitat is lost. There has been relatively little change in extent of area of Tanzanian Forest Reserves over the past 90 years. As soon as some locations are lost however, species restricted to them can immediately move into the Endangered category.

Species can go directly from Near-threatened to endangered, for example, a species with an area of occupancy of less than 500km^2 (Endangered B), severely fragmented or known to exist at no more than n locations and a continuing decline projected in the extent of occurrence (Endangered B.2.(a)), area of occupancy (Endangered B.2.(b)) area, extent and quality of habitat (Endangered B.2.(c)) numbers of locations or subpopulations (Endangered B.2.(d)) and number of mature individuals (Endangered B.2.(e))

If $n > 5$ but < 10 Near threatened, but....
as soon as $n << 5$ then Endangered without progressing via Vulnerable

Some species can go directly from Vulnerable to Critically Endangered, for example, a species with a population that is very small or restricted in the form of an acute restriction in its area of occupancy (typically less than 100km^2) or in the number of locations (typically less than 5) (Vulnerable D.2.).

If that species is formerly known from two sites and then is known from just one site, then it becomes Critically Endangered. If its area of occupancy falls to less then $10km^2$, then it becomes Critically Endangered.

The category Conservation Dependent can be difficult to interpret and to apply to tree species in Forest Reserves. The Rondo plateau, for example, has possibly 50 endemics in an area of $50Km^2$. Some species are Vulnerable and not declining at present because of conservation activities, but if these were removed the species might become Critically Endangered. Such species are Conservation Dependent as per the definition: "In cases where it is only conservation action that prevents the taxon from meeting the threatened criteria, the designation of Conservation Dependent is appropriate".

However the following should be noted:

- for many species that would be classified as Vulnerable since their population is very small or restricted in the form of an acute restriction in their area of occupancy (typically less than $100km^2$) or in the number of locations (typically less than 5) [Vulnerable D.2.] the removal of existing conservation initiatives would immediately shift their classification to Critically Endangered due to a reduction of at least 80 per cent, projected or suspected to be met within the next ten years or three generations, whichever is the longer, based on a decline in area of occupancy, extent of occurrence and/or quality of habitat [Critically Endangered A.2.(c)].

- Such species may then appear to be of low conservation priority but would immediately become a very high conservation priority if existing conservation measures are removed.

Another difficulty in application of the categories is the concept of location and how this should be defined. Taking the definition 'A geographically or ecologically distinct area in which a single event will soon affect all individuals of the taxon present', should this represent:

A contiguous block of forest?
A forest reserve?
A mountain?
A mountain chain?

An example was given of two close locations cited as two different ones, but which are almost linked, and could then be considered one location. The two locations have different species. The area described consists of the Pugu and Kazimzumbwi Forest Reserves.

Discussion

The conservation status of the forest fragments was discussed in relation to land use policy and practice in Tanzania. **Phil Clarke** pointed out that land shortage is not a problem in Tanzania but the fact that forest clearance is relatively easy does put pressure on the reserves. In general only a few species are targeted for pitsawing within Tanzanian forest

reserves. There is some harvest of small trees for use as poles in areas close to cities but this pressure is not specific to particular species.

Abdou-Salam Ouédraogo emphasised the need to look at different level of forest conservation focusing on ecosystem conservation, in which case individual species might be lost, and also species, population and genotype conservation. IPGRI's work at an intra-specific level is fully complementary with the species focus of the current project.

6 Conservation status of Nigerian trees: application of IUCN threat categories - Jonathan Okafor

Nigeria has a wide diversity of habitats represented by the diverse vegetation zones which range from the coastal swamps to arid areas. The wide range of habitats is also associated with great species richness. However, these habitats, together with their consistent species are subjected to severe modifications or outright destruction in all segments of the ecological range in the country.

One major factor of global concern and interest, which affects the conservation status of Nigerian trees is deforestation; described as the temporary or permanent removal of forest cover for agricultural or other purposes. The rate of forest destruction in Nigeria has been great over the past three decades. Ola-Adams and Lyamabo (1977) estimated that about 26,000 ha were destroyed annually in the forest zone along, during conversion of natural forests to artificial plantations and other forms of land development. Recent estimates are that over 90 per cent of the natural vegetation has already been cleared in Nigeria (WWF, 1989), and up to 350,000 ha of forest and natural vegetation are still being lost annually over the whole country (Nest, 1991).

Okafor (1993) has suggested that the factors which have contributed to such alarming rate of forest loss include:

a) intensification of cultivation, employing extensive shifting cultivation system, usually described as slash and burn agriculture

b) uncontrolled burning of natural vegetation

c) lumbering and over-exploitation of forest and tree resources, involving extensive damage to vegetation and modification of habitats

d) poorly planned and poorly implemented urban, industrial and infrastructure development, often destroying trees of ethnobotanical importance in villages.

e) rapid population growth averaging 3.1 per cent annually, resulting in stretching the natural resources beyond their expected carrying capacities.

Factors affecting conservation status of trees in Nigeria

a) Deforestation: This is the single most important factor affecting conservation of trees. Deforestation is now resulting in substantial loss of plant/tree diversity of indigenous germplasm in Nigeria. Ola-Adams (1975) had suggested that there is real possibility of extinction of many Nigerian trees through over exploitation. The estimate in this regard is that up to 484 plant species in 112 families of the 4,600 plant species in the country are endangered (Abile et al. 1981).

b) Endemism: About 205 of the 484 species mentioned above are said to be endemic species and their loss will therefore mean extinction from the earth. The factor of endemism is unarguably an important consideration. However, species with widespread distribution which are intensively and/or destructively collected or harvested such as *Irvingia gabonensis* and are also endangered or vulnerable: fruits of *I. gabonensis* are intensively collected and cracked to produce Agboro kernels.

c) Over-utilisation or exploitation: Widespread species of high cash income are prone to danger of future extermination, except if consciously conserved for example *Dennettia tripetala*, *Maesobotrya spp.* and *Chrysophyllum albidum*. Destructive methods of harvesting can also be considered here (for example, cracking of fruits).

d) Recalcitrant species: Seeds of many forest trees often lose viability early and therefore fruit to germinate or regenerate in the wild. This factor is also linked with over-exploitation in which the fruits are not given the chance of germinating in the wild. *Chrysophyllum albidum* is an example.

e) Under-utilised tree crops: These include species which are generally neglected and are fast disappearing in various parts of their distribution range. Danger of fruit fall may also be a deterrent for conservation for example *Treculia africana*. Such tree crops are therefore conservation dependent for example *Pentaclethra macrophylla* and *Dacryodes edulis*.

f) Uneconomic timber species concept: Forest management practices had for long placed emphasis on economic timber species with the result that useful uneconomic or non-timber forest species are usually felled or 'poisoned' during silvicultural operations under the Tropical Shelterwood System (TSS).

g) Lack of adequate policy measures: This results in the continued neglect of indigenous trees in research, development utilisation and conservation with preference and higher priority placed on exotics. This, therefore, results in exotics replacing the indigenous, unjustifiably in many cases. The vast distribution of *Eucalyptus* can affect the Miombo woodland species in Zimbabwe.

Comments on the application of IUCN Red List categories

The introduction and factors affecting conservation status of Nigerian trees, presented above, provide a useful background for this section. Furthermore, the document titled 'IUCN Red

List Categories' prepared by IUCN/SSC especially the Preamble definitions, specific categories and the criteria for CR, EN and VU represents an authoritative and explicit text that should be carefully studied and followed in the application of the IUCN threat categories to taxa in any country.

An attempt to fill standard data collection forms for about 34 Nigerian tree species was undertaken as a contribution to the project. As already discussed by other speakers, detailed information and data are necessary for each of the three sections (nomenclature and occurrence; conservation status, and uses and ecology) to be filled. From the selection of the 34 species, it was clear that most of them are either rare with localised distribution in Southeastern Nigeria or are insufficiently known. The categories of DD and NE are therefore widely applicable to them, requiring a field appraisal for the species before they can be assigned threat categories.

Other observations on filling in the forms:

- The cultural observance of trees as sacred/religious trees should be listed under Uses and Ecology, and this is covered by 'social' use.

- Indications of destructive methods of harvesting, for example, uprooting and large scale seed collection and cracking, where applicable, may also be included to evaluate threat even in species which do not appear to be presently threatened.

- Information on species associations, light tolerance and frequency of occurrence requires field studies.

- Ethnobotanical studies are also essential to obtain valuable information on uses and ecology.

- Herbarium notes can provide useful information on species uses and ecology.

In all, the difficulty of assigning an appropriate threat category to a taxon relates more to lack or insufficient data rather than difficulty of definition or classification of the categories themselves.

Priority list of under-utilised and/or fast disappearing (threatened) trees in the Nigerian flora

The following species require conservation action (*in situ, ex situ*), because they are progressively threatened due to over-exploitation, habitat modifications and general neglect in research and development.

Forest Zone

Beilschemeidia mannii
Blighia unijugata
Chrysophyllum albidum
Dacryodes edulis
Cola accuminata
Cola lepidota
Cola pachycarpa
Garcinia kola
Garcinia mannii
Irvingia gabonensis
Monodora myristica
Pentaclethra macrophylla
Treculia africana
Synsepalum dulcificum
Xylopia spp.
Myrianthus arboreus
Spondias mombin

Savanna zone

Adansonia digitata
Afzelia africana
Balanites aegyptiaca
Borassus aethiopum
Detarium microcarpium
Ceiba pentandra
Parkia biglobosa
Irvingia smithii
Prosopis africana
Tamarindus indica

Phoenix reclinata
Vitellaria paradoxa

The above species are of national importance for ecological, socio-economic and cultural reasons. The propagation techniques and infra-specific delimitations to enhance their conservation should be studied and adopted.

Discussion

The importance of regeneration studies and plantation development were considered and it was noted that many valuable exploited species are not within plantations.

A general point of discussion was the use of information collected on the conservation status of species. It was suggested that information on management requirements should also be assembled so that practical measures could be taken to enhance the survival of the species. The role of farmers and cultural practices in conservation of tree species was also emphasised. It was agreed that an overview project of this nature could not provide fully detailed information on all tree species but that it could pull together existing information and help set priorities.

7 Tree species conservation status in Uganda - Anthony Katende

Uganda has an area of 236,578 km^2; 28 per cent of the land surface is cultivated, 21 per cent is pasture and 25 per cent is forest/woodland. The population of Uganda (1989 data) is 17,008,000, of which 81 per cent is rural.

The biogeographic affinities of the country are predominantly Lake Victoria Mosaic with Sudanian in the north, Somalia Masai in the extreme north-east, Guinea-Congolean in the south-west and Afromontane in the mountains. The vegetation consists of grassland and cultivation lowland forest, *Commiphora* thickets and grasslands and montane forest, bamboo, heath and moorland. There are extensive wetland and floodplains.

Uganda is a relatively small country with a rich diversity of species and habitats. Until the early 1970s, Uganda had a well organised and successful conservation effort. Since then, 15 years of political instability have taken a heavy toll on the country's protected areas system and the flora and fauna therein. Large portions of forest reserves were encroached upon and timber logging and charcoal burning were done illegally. There are now encouraging signs that both conservation and security are improving. Tree species are protected in both forest and savanna reserves. The government of Uganda has a clear policy on protected forest reserves. For the last ten years all people who had encroached on forest reserves have been evicted. Six forest reserves of great concern have been declared National Parks.

There are more than 5,000 species occurring in the country, but endemicity is low numbering about 30 species. The flora is extremely diverse for a small country, because of the number of biogeographic regions. Within this rich flora erosion of genetic resources is experienced. A list of trees which have been heavily exploited was presented for consideration. This is given in Annex 7 to this report.

The Uganda Forest Department has carried out inventories of trees and shrubs in all the forest reserves. Checklists have been compiled and stored in their databases. The same department has studied the woody biomass throughout the country and the results are also stored in the databases. The Institute of Environment and Natural Resources of Makerere University has carried out studies of higher plant distribution in Uganda and is checklisting plant species and storing the information in the databases. WWF is sponsoring studies in ethnobotany of native plants and making checklists.

The work of consolidating the knowledge and conservation status of tree species in Uganda is not complete. The forest reserves in western Uganda occur in an area known as the Albertine Rift of the western rift valley and are said to be within a refugium similar to that of the Gulf of Guinea in west Africa. More research work is needed. Researchers who have visited these areas recently have found new records of plant species.

8 IPGRI Forest Genetic Resources Programme - Abdou-Salam Ouédraogo

Abdou-Salam Ouédraogo welcomed the opportunity to attend the meeting, emphasising that the work of IPGRI and WCMC is complementary and will have more impact if we work together and assist national programmes.

The mission of IPGRI is to encourage, support and engage in activities to strengthen the conservation and use of plant genetic resources worldwide, with special emphasis on the needs of developing countries. To do this we are working in partnership with national and international programmes.

IPGRI has four objectives:

- to assist with assessing and meeting the needs of plant genetic resource conservation
- to promote international collaboration
- to develop and promote improved strategies and technologies for plant genetic resources, and integrated methods of conservation
- to provide an information service on plant genetic resources

The distinguishing features of forest genetic resources were outlined in the presentation highlighting the differences between forest genetic resource conservation and conservation of the crop genetic resources of crop species. Biological characteristics of forest plant species are recognised as being more diverse. In general there is a lack of information on genetic diversity of forest species and on how genetic diversity is distributed within forest ecosystems.

When considering the conservation of forest genetic resources we have to look at a wide range of uses to fulfil different functions such as material and cultural needs. Forest genetic resources look beyond a single species through an ecosystem approach. However, because we are dealing with such a huge number of species, it is necessary to set priorities. This is why we are meeting here to select species using clear categories and criteria.

Forests are one of the most valuable natural renewable resources and are increasingly vulnerable. Major threats to forests include: conversion for agriculture, urban development and fire. Conservation efforts must occur at national and international levels. In terms of sustainable management it is important to promote the wise use of harvesting and extraction.

Information Service
The information system currently in use for forest genetic resources is TREESOURCE which is being developed jointly by IPGRI, ICRAF, CIFOR and FAO. A central coordinating unit has been developed with data maintained at regional and national levels. Information on the particular location of different species is stored only at local level. Around 11,000 tree species are currently recorded in TREESOURCE. Functional links in data management are being developed with FAO and WCMC. The current priority is to enter data into the system.

Genetic resource location and assessment
Various projects are underway to locate genetic resource diversity focusing on selected species. Work has started in Thailand and, in India, methodology has been developed. Areas of forest have been identified for conservation.

***In situ* conservation and sustainable use**
It is important to know where a species is located and what is important to conserve.
Studies are in place to look at the impact of deforestation, fragmentation and selective logging and management practices, working collaboratively with CIFOR. Study sites are located in Malaysia, India and Thailand.

***Ex situ* conservation and sustainable use**
A project is currently underway on recalcitrant species, with 22 countries involved. Guidelines are being provided for germplasm movement and in vitro conservation techniques.

The priorities for IPGRI's work in forest genetic resource conservation are to:

- collect information and make accessible to partners, particularly in the countries
- assess needs and priorities at both national and regional level
- consolidate national/regional strategies
- develop methods and procedures that national programmes adopt

9 Management and sustainable use of tree species - Sara Oldfield

One of the main outputs of the project is a report on the sustainability of uses of trees. The work undertaken so far on this topic has been carried out by Dr Adrian Newton, under contract to the Species Survival Commission.

Adrian Newton was asked to:

a) Examine the different definitions of sustainability including:
sustainability in terms of maintaining the production of key products (for example, timber, medicine, fruits); maintaining the regenerative capacity, abundance and age structure of target species; sustainability in terms of the impacts on non-target species (broader impacts that uses have on biodiversity); sustainability in terms of maintaining essential ecological services; cultural and social impacts on local people; the institutional mechanisms in place to manage trees; sustainability in terms of the true economic viability of different utilisation practices.

b) Examine the different types of uses that are made of trees, what part of the plant is collected, the reaction of the tree to harvesting, and the intrinsic likelihood of sustainability of such uses. The uses to be considered should include:

   ii) timber
   ii) non-timber products
   iii) indirect benefits

c) Consider the relationship between sustainability and threat and genetic erosion and threat in relation to tree species, with specific reference to the new IUCN threat categories.

d) Evaluate the options for developing simple indices of sustainability for potential inclusion in the World Tree Database.

A draft report covering the above topics and concentrating on definitions of sustainability, was presented at the project's Technical Workshop in Wageningen last December. Based on

discussions at the meeting and comments subsequently received from experts a second draft was produced in February this year and copies are available for review.

Sustainability is clearly a complex issue and is currently subject to very active international debate particularly with a focus on forest management at the ecosystem level. In general there has been much less consideration of sustainability at a species level, for example, at the level of individual tree species which may or may not occur within a forest ecosystem. A notable exception has been the work of Charles Peters outlined in the publication *Sustainable harvest of non-timber plant resources in tropical moist forest - an Ecological Primer*. This describes six steps to sustainability based on 1) species selection; 2) forest inventory; 3) yield studies; 4) regeneration surveys; 5) harvest assessments and 6) harvest adjustments. Peters points out that species selection will be based largely on social and economic criteria. A third criterion that should also be considered is the overall potential of the resource to be managed on a sustained-yield basis. "Although the fact is frequently overlooked, some forest species are inherently better able to withstand the continual perturbations caused by resource extraction than others." It is this issue that we would particularly like to develop in the context of this particular project.

Looking at the various definitions of sustainability as reviewed by Adrian Newton for the project, it is clear that all aspects of sustainability are relevant both at the ecosystem and species level and more consideration needs to be given to the latter.

The study is now concentrating on tasks two, three, and four outlined above and Adrian Newton has asked for specific input from this Workshop. Discussions have also been held with Tony Cunningham, Co-Chair of the SSC Medicinal Plant Specialist Group on issues of sustainable use and threat status at the species level. The harmonised collection of data to help establish priorities for the conservation of tree species and other medicinal plants was discussed in this context and it is intended to develop these ideas further at the XVth AETFAT Congress.

In his report Adrian Newton has noted that the impact of use of a tree will depend on the part of the species used and the method of harvesting. For each plant part used, the impact on growth and survival of the species can be considered. In general, for example, removal of exudates, flowers or fruit has minimal impact on growth and survival of the tree (although this needs some qualification, as for example, many fruits and seeds are needlessly harvested by felling the tree) the effect of the removal of the stem is likely to be far more detrimental to the individual tree, and would therefore have a much lower likelihood of being sustainable.

The impact of use of different plant parts on the environment can also be considered. Again this is likely to be more marked when stems rather than any other plant part are harvested, with the possible exception of roots. Harvesting of tree stems (trunks) usually results in soil compaction during harvesting, which may increase run-off and surface erosion.

Impact of use on the reproductive processes of the species also depends on the part of the plant harvested as does the impact of use of plant parts on other organisms. The assumption here is that as most organisms dependent on particular tree species are generally associated

with fruits or flowers, as dispersers or pollinators, removal of these parts would be expected to be relatively deleterious to associated species. Similarly the tree stem may be an important habitat or substrate for many other species, and its removal would have a relatively large impact on them.

The relationship between use of plant parts and cultural value assumes that most medicinal products used by forest dwelling people are derived from fruits, bark or exudates; other tree parts such as flowers or wood products may have cultural significance for the production of religious artefacts etc. The relative value of different plant parts will obviously differ significantly from species to species, although it may perhaps be suggested that roots and branches generally have less cultural importance than other parts of the tree. Similarly it is assumed that forest products with economic value are generally derived from fruits, exudates or stem wood.

The overall intrinsic likelihood of sustainability is based on an overall assessment of the different components of sustainability in relation to the plant use. For example the removal of tree stems will have a high impact on growth and survival of the tree, as well as its reproductive ability and may also be expected to adversely affect associated species which depend on stemwood. Removal of tree trunks would also be expected to have relatively large impact on environmental aspects such as soil structure and carbon sequestration. The use of tree stems (for example for timber) therefore could be said to have a relatively low intrinsic likelihood of being sustainable. Similarly the relatively high cultural and economic value of fruits, together with their importance for other organisms and the reproductive ability of the tree itself, would reduce the intrinsic likelihood of their use being sustainable. In comparison the impacts of use of other plant parts might be expected to be relatively slight and have a higher chance of being sustainable.

It is emphasised by Adrian Newton that such assessments are highly generalised and relative. There is no guarantee that the harvesting of a particular non-timber forest product will be sustainable despite its higher intrinsic likelihood of being so.

At a species level we can collect basic biological information on different parts of the tree species: stem, bark, roots, flowers, fruits and leaves; that will help determine the intrinsic likelihood of sustainability. Stem characteristics, for example, such as mode of regeneration, ability to coppice are obviously important considerations. With regard to bark, in general removal is damaging to trees. Certain species are able to withstand bark removal more readily for example *Prunus africana* produces a gel which protects the cambium and likewise figs produce protective latex. At the other end of the scale species of *Podocarpus* (for example *Podocarpus henkelii* and *Faurea macnaughtii*) and Proteaceae are very vulnerable to bark removal. Another consideration is whether the tree is thick or thin barked. Most forest trees are the latter, and so if bark is removed the species will be prone to fire damage.

It is clearly important to look at the characteristics of individual species. As an example given by Cunningham, 1991, *Barringtonia racemosa* and *Warburgia salutaris* both are relatively slow growing trees with restricted distributions in Natal, both are popular sources

of herbal medicines. In *Barringtonia* use of abundant fruits poses little threat to the species, whereas commercial exploitation of *Warburgia salutaris* bark is considered to be the major threat to populations of this plant in South Africa, Zimbabwe and Tanzania.

Resource stock or population size, representing the product supply, and demand represented by the amount harvested will obviously be important considerations in species sustainability. As pointed out by Cunningham 1991, low stocks are likely to produce only small sustainable yields, particularly if the resource is represented by slow-growing species that take a long time to reach reproductive maturity. In general "scarce slow-growing forest species are particularly vulnerable to over-exploitation. Indigenous forests cover only 0.3 per cent of South Africa but are a source of over 130 commercially exploited traditional medicinal plants".

At the Wageningen Workshop, the information requirements for assessing degree of threat and sustainability were discussed and it was agreed that there is considerable overlap in the information requirements. To a certain extent the projects standard data collection form has been designed with this in mind, for example, indicating the part of the plant used and giving an indication of the level of trade. Tony Cunningham has suggested the addition of more information on the characteristics of the plant parts used along the lines outlined above which might help indicate likelihood of sustainability and provide a potential early warning system on the need for management.

It was agreed at the Wageningen Workshop that if indices of sustainability are to be developed for tree species as part of the *Conservation and Sustainable Management of Trees* project it will be important to decide what they will be used for, by whom and how they will be used. At this stage, we can suggest that the objective is to highlight those species where use is likely to cause conservation concern, given the biological characteristics of the species. The indices if developed will be applied by WCMC in association with experts (for example, SSC members) for inclusion in the World Tree database which will be distributed as an output of the project. Indices will be developed through the project through discussion with all interested parties.

Adrian Newton suggests that the IUCN Red list categories provide a suitable framework for the development of sustainability indices. The indices would therefore comprise different categories of sustainability to which individual species would be assigned, based on a set of criteria, which should be as objective as possible.

Reference

Cunningham, A.B. (1991). Development of a conservation policy on commercially exploited medicinal plants: a case study from Southern Africa. In: Akerele, O.; Heywood, V. and Syngh, H. (eds). *The conservation of medicinal plants*. Cambridge University Press, Cambridge, UK.

Discussion

The importance of biological information on species, including growth rate and phenology, in assessments of sustainability was emphasised. Inventory data is important and also

utilisation data. The role of long term monitoring was discussed. Straightforward field observation can sometimes be sufficient to assess whether regeneration is taking place, for example, in miombo woodland.

10 Options for sustainable harvesting of timber products from woodlands - Coert Geldenhuys

Coert Geldenhuys summarised ideas in a paper previously presented at the FC/SAREC International Conference on *Sustainable management of indigenous forests in the dry tropics.* Kadoma, Zimbabwe, 28 May to 1 June 1996. The abstract of this paper is given below.

In most cases products from the woodlands are harvested with no concern for management to secure regeneration, or to optimise and economise the utilisation of the trees that are felled, or to pursue multiple-use systems. Very few species are utilised, and some of the harvested species are relatively rare, or are over-utilized, and the management systems do not favour their regeneration. Sustained-use management of woodlands require the maintenance of (a) the essential ecological processes of disturbance and recruitment, and (b) the balance of species. If inventories are conducted, the timber volume of only the commercially useful tree species and sizes are recorded. However, appropriately planned inventories could be used to assess the resource status of all species, ie. the ratio between regeneration and mature trees, as well as indications of the appropriate management system to secure regeneration of canopy species. Two criteria are used for this assessment. Grain gives the relationship between the composition of canopy species in the regeneration and canopy of the same stand. The shape of stem diameter distributions of species in different stand types provides useful insights into the resource status and management requirements for the specific species. Examples from a forest inventory in miombo woodland in Sofala Province, Mozambique, are used to demonstrate the techniques used and their benefits. In particular the relative importance of fire-tolerant and fire-sensitive species in different communities require appropriate management with fire.

Discussion
The methods used for developing a working plan to regulate yield were discussed. The need for regional agreements on utilisation of miombo woodland was raised and the need for local people to benefit from woodland exploitation.

11 Conservation data and intellectual property rights - Dr Sue Edwards

Sue Edwards discussed the role of the Convention on Biological Diversity (CBD) in relation to the control of germplasm exploitation. In theory this should regulate the exchange of technology and finance for germplasm but the proposed new relationship is not working. The North continues to take biological resources from South although this may now be more covert, for example, through collection for botanic gardens. Patenting is another major area of concern in relation to germplasm, favouring the industrial corporations at the expense of countries of the South.

There is a great need for equitable arrangements and respect for the rights of local farmers and indigenous peoples. People in their teens and twenties are in great numbers in countries such as Ethiopia and education systems are designed in such a way that is makes it difficult to go back to farming after education. A system is needed to develop rural economies. In Ethiopia the urban society is still small. The rural society is most important; these people should be given the means to look after their biodiversity which they have been maintaining for centuries. The ancient agricultural system incorporates the knowledge of farmers in selection and improvement of crops. Farmers must be compensated for their work to improve crops at the expense of yield. Farmers rights should be properly recognised.

With regard to tree crops, this is area of particular importance to women. As soon as influences are involved things became very difficult as women are no longer able to sell their traditional crops.

The outcomes of the recent Leipzig Conference, on Plant Genetic Resources had been disappointing in terms of new arrangements for equitable sharing of the benefits of genetic resources. No commitments have resulted or new financial undertakings.

The financial implications of germplasm resources should not be underestimated. In one example, yellow dwarf virus badly affected barley growers of the US. The world collection of barley is held by the USDA. Ethiopian barley had resistance to the virus. This is now worth 3.5 million USD/year because it has saved barley industry but none of this income is returned to Ethiopia.

In another example, Endod or the soap berry has provided a biodegradable moluscicide. Screening was carried out in Ethiopia. The scientist involved then went to the US, and although original work was carried out in Ethiopia, the product was patented in US. Again none of the revenue is returned to Ethiopia.

Throughout the Tropics, trees contain medicinal properties which can be exploited by pharmaceutical companies. So-called agreements exist with local experts for example in Amazon countries. However the local people have no control over the results of screening and commercialisation.

The next stage in the *Conservation and Sustainable Management of Trees* project should be to work out how to conserve trees species using the information collected. It is very important to involve local people as far as possible in this process. They have the genuine interest and genuine involvement. Enormous amounts of forest disappeared during the two Ethiopian Civil wars, but with political stability real conservation progress can be made.

Discussion

Abdou-Salam Ouédraogo commented that the issues raised are extremely important. In some countries there has been a lot of effort developing technical and scientific aspects, but these are constrained at the policy level. Information is gathered about tree species, but at national level and regional level, policy weaknesses can act as a bottleneck and the impact is limited.

If we look at criteria and different levels of sustainability, sustainability has a price. The cost is generally being paid by the farmers and local people who are directly involved in conservation of trees. Genetic material is of interest today and we forget about price paid by people in the past.

It should be recognised that no country in the world is self sufficient in genetic resources. There must be interaction between partners; those rich in biodiversity and those rich in financial resources and technology. There should be a two-way flow of information and resources with technical and training aspects included in national planning processes.

The importance of involving local people was discussed. It was agreed that information and material should not be collected without acknowledgement, but at a local level, there sometimes needs to be greater understanding of the value of resources. Support is needed for this and in some cases better organisation at a local level.

Cathy Rogers outlined Zimbabwe's work in community based conservation programmes, exemplified by Campfire. Frequently the local community pays the price for conservation, as in the case of elephant damage to crops and danger to people. In Zimbabwe it is recognised that these communities that live with wildlife and forests should get returns. This involves changing attitudes. Local people now benefit from elephant hunting and efforts are being made to extend the process to forest conservation.

12 The work of AETFAT - Jonathan Timberlake

Jonathan Timberlake summarised the work of AETFAT. The organisation has a loose membership, currently over 600 people and is open to all. There is a need to encourage more African botanists to join. A Congress is held every three years, and the next will be held in Zimbabwe, 3-7 February 1997. Details are available to Workshop Participants. The current AETFAT Secretary General is Professor Bruce Campbell, at the University of Harare. A permanent library for AETFAT is maintained at the University of Leuven.

13 The FFI Soundwood Programme - Sara Oldfield

Sara Oldfield outlined the work of Fauna and Flora International's Soundwood Programme drawing attention to the background material and videos available for participants. She highlighted the successful outcomes of the regional workshop for *Dalbergia melanoxylon* held in November 1995, as a result of a partnership between FFI and the Mozambique Centre for Experimental Forestry.

14 Networking and development of SSC - Nina Marshall

The Species Survival Commission (SSC) is one of six commissions or voluntary networks of IUCN, the umbrella organisation for the world's conservation agencies and NGOs. The SSC is the largest network in the world of professionals dedicated to the cause of conserving species and biological diversity. Membership in the SSC is voluntary. It offers an opportunity

for individuals to work with others to contribute to species conservation and be part of a well-respected and effective body of experts.

The SSC Secretariat is based at the Headquarters of IUCN in Switzerland. Activities of the various Specialist Groups are coordinated by the Secretariat. There are currently over 100 Specialist Groups with a combined membership of around 7000. Activities of the Groups include preparation and implementation of Action Plans, networking through newsletters, meetings and workshops, provision of advice to governments and inter-governmental organisations and helping to implement international conventions.

There are currently a range of plant Specialist Groups. To provide an example of one, the Medicinal Plant Specialist Group was recently formed and is successfully bringing together botanists, experts in medicinal plant utilisation and representatives from the pharmaceutical industry. The Group is coordinating collection of data on the conservation status, utilisation and trade in medicinal plants and is working closely with the Convention on International Trade in Endangered Species (CITES). The first full meeting of the Group will be held in conjunction with the 5th International Congress of Ethnobiology, to be held in Nairobi, Kenya from 2-6 September 1996.

Discussion

Participants in the Workshop unanimously supported the formation of an IUCN/SSC African Tree Specialist Group. A resolution on this, as agreed by the meeting, is given as Annex 1. Issues discussed included the possibility of sub-dividing the responsibilities of the Group on a taxonomic, product (timber, fruit tree), or regional basis and the need to involve forestry interests. It was also recognised that some administrative support would be necessary to ensure that the Group functioned effectively and start-up funding would be helpful. The potential value of the Group in assigning conservation categories, and coordinating data collection was agreed. The value of synthesising fragmented species distribution data as one aspect of this was discussed.

Working Groups

Three working groups were formed to discuss the conservation status of African tree species on a regional basis. The working groups used Document 3 (preliminary list of globally threatened tree species of Africa); and Document 4 (Draft species conservation profiles of widespread heavily utilised tree species for evaluation of conservation status) as a basis for discussion. A revised version of Document 3, incorporating information based on discussion during the Workshop and some additional information received subsequently is presented as Annex 6 to this report. The conservation evaluations of the heavily exploited species included in Document 4 are also listed in Annex 6.

Working Group A - Conservation status of East African tree species

Participants: Salmon O Achieng', Loutfy Boulos (rapporteur), Phil Clarke, Sue Edwards, Tony Katende, Nina Marshall

This group met twice during the course of the meeting to review the preliminary species list provided in Document 3, note additional species to be added to the list and to comment on the conservation status of the species listed. Additional standard data collection forms were filled in by members of the group. In general the format of the data collection forms was found to be helpful and some suggestions for improving the forms were made. Suggestions were also made fore refining the criteria for the IUCN threat categories. These suggestions can be proposed to IUCN.

Working Group B - Conservation status of widespread/heavily utilised tree species of West/Central Africa

Participants: Sam Kanyamibwa, Ndjele Mianda-Bungi, Dominique N'Sosso, Jonathan Okafor, Nicholas Songwe (rapporteur)

Working Group B worked through the species profiles for widespread, heavily exploited tree species provided as Document 4. Although representatives were not present for all the countries within the range of the species, members of the group drew on their personal knowledge and from literature they had brought to the meeting. They added notes to the species profiles and applied the new IUCN threat categories to all the species concerned (41 species). The categories were found to be easy to apply. Most species in the list fall in the Vu group because the potential for exploitation, and decrease in area of habitat, is great. Some species were evaluated as EN, for example, *Microberlinia bisulcata*, a species which is endemic to Cameroon.

Other species of conservation concern were suggested for evaluation notably *Khaya senegalensis*, *Anougeissus leiocarpus*, and *Pterocarpus erinaceus*.

Working Group C - Conservation status of Southern African tree species

Participants: Salomâo Bandeira, Bob Drummond, Coert Geldenhuys, Craig Hilton-Taylor, Charlotte Jenkins (Rapporteur), Alfred Maroyi, Patrick Phiri, Cathy Rogers, Jonathan Timberlake

All of the Southern African species listed in Document 3 were discussed. In some cases an IUCN category of threat was assigned. Other taxa were removed from the list either because changes had occurred in their taxonomy, or their status was considered to be safe and in some cases they were not considered to be trees. The status of the commercially important species, *Baikiaea plurijuga, Lovoa swynnertonii, Milicia excelsa, Prunus africana* and *Pterocarpus angolensis* was also discussed. All in this group except for *Lovoa swynnertonia* and *Milicia excelsa* were considered to be Low Risk, although it is evident that specific habitat types, for instance *Baikiaea* forests are heavily threatened. It was noted that *Lovoa swynnertonii* exists in small and fragile populations in Southern Africa but is more widely spread further north. The Zimbabwe population of *Milicia excelsa* is critically threatened by habitat degradation and lack of regeneration. In Mozambique, however, the populations appear to be regenerating and are actively being exploited at a local and commercial level.

Craig Hilton-Taylor agreed to coordinate the completion of standard data collection forms for the 65 South African species which are listed as threatened. Dr. Phiri identified and provided information on two Zambian species to add to the list. Bob Drummond and Tom Müller are preparing information on Zimbabwean species which should be included in the list. Salomâo Bandeira has also taken some additional data collection forms for Mozambique species which he will complete with reference to herbarium specimens.

A number of probably threatened taxa from Southern African countries also extend further north. Information on the status of northern populations is required before a global threat category can be assigned. Taxa included are *Bivinia jalbertii*, *Bombax rhodognaphalon* var. *tomentosum, Euphorbia lividifolia, Gardenia imperialis, Lovoa swynnertonii, Ocotea keniensis* and *Sterculia schliebenii.*

Closing remarks

Sara Oldfield thanked all participants for their contributions to a very productive Workshop, for generating the many positive ideas to emerge from the meeting and for the provision of information in support of the *Conservation and Sustainable Management of Trees* project. She summed up some of the key points of agreement to emerge from discussions including:

- The need for fundamental recognition of the importance of the knowledge and rights of farmers and local communities.

- The need to compile currently available species information in support of conservation and sustainable use initiatives at a national and regional level and to use this information in setting priorities for forest genetic resource conservation

- The need for WCMC to coordinate further consolidation of information presented during the Workshop, particularly for species with a relatively wide distribution, seek comments on the conservation evaluations and to make this available to the AETFAT Congress.

- The need for more field work to support the evaluation of tree species conservation status (for example, in Mozambique, Nigeria, Uganda and Zimbabwe)

- The need to establish an SSC African Tree Specialist Group to facilitate networking, data collection and data exchange.

On behalf of the Participants of the Workshop, **Coert Geldenhuys** thanked WCMC for organising the Workshop.

In conclusion, it was agreed that the positive developments for African tree conservation initiated through the project, and discussed during the Workshop should be taken forward on a collaborative basis involving all the Workshop representatives and a wider network of experts.

Annex 1

Resolution for the formation of an African Tree Specialist Group

Following the fruitful meeting of experts and professionals dealing with conservation and sustainable management of trees in the African continent, the need for the formation of an expert group to handle these issues was viewed to be urgent. Consequently, participants from the different regions of Africa (southern, eastern, northern, western and central) do hereby resolve as follows:

1 That an organisation to be known as 'African Tree Specialist Group' should be formed.

2 That WCMC and SSC should provide the administrative frame to actualise this formation.

3 That to satisfy the objectives of conservation and sustainable management of trees, a steering committee representing the various regions and interest groups/disciplines may be selected to draw up an initial plan for the development of the group.

4 That the African Tree Specialist Group will meet for the first time at the next AETFAT Congress.

Conservation and Sustainable Management of Trees

Regional Workshop

9-11 July 1996
at the
Jameson Hotel, Harare, Zimbabwe

Agenda

Tuesday 9 July

Morning (9.30am-1pm)

Registration

Welcome and introduction to the meeting

* Introduction to the project - **Sara Oldfield**
  the work of WCMC and SSC
  project aims, activities and progress

* Development of *Tree Conservation Information Service* - data management issues - **Sam Kanyamibwa**

* Discussion on project aims and activities

LUNCH

Afternoon (2pm-5pm)

* Introduction to the new IUCN categories of threat and overview of their use for trees - **Charlotte Jenkins**

* Case studies on the application of the new threat categories to African tree species

  Mozambique - **Salomâo Bandeira**
  Tanzania - **Philip Clarke**
  Nigeria - **Jonathan Okafor**

* Discussion on application of new threat categories to trees species

Wednesday 10 July

Morning (9am-1pm)

* The IPGRI Forest Genetic Resource Programme - **Dr Abdou-Salam Ouédraogo**

* Sustainability of uses of tree species - **Sara Oldfield**

* Options for sustainable harvesting of timber products - **Coert Geldenheys**

* Discussion

11.00 Working Groups to review the conservation status of selected tree species

Working Group A) review of conservation status information for East African trees

Working Group B) evaluation of conservation status of widespread and heavily utilised tree species - West/Central Africa species

Working Group C) evaluation of conservation status of Southern African species

LUNCH

Afternoon (2pm-5pm)

* Working Group discussions continued

3.30 Reports from the working groups

Thursday 11 July

Morning (9am-1pm)

* Conservation data and intellectual property rights - **Dr Sue Edwards**

* Networking and the development of an SSC Tree Group for African trees - **Nina Marshall**

* The work of AETFAT - **Jonathan Timberlake**

* The FFI Soundwood Programme and the conservation of *Dalbergia melanoxylon*

* Discussion on the development of the *Tree Conservation Information Service*

Afternoon (2pm-4pm)

* Discussion continued

* CONCLUSIONS

* Tour of Botanic Garden

Conservation & Sustainable Management of Trees
Regional Workshop
9-11 July, Harare, Zimbabwe

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Tree Conservation Information Service
Data management issues
June 1996

This paper outlines the development of the ***Tree Conservation Information Service***, which will, through the collaborative efforts of a wide range of individuals and organisations, provide access to high quality information relating to tree species. The service will aim to harmonise and enhance the value of the data collected and maintained by the expanding Species Survival Commission (SSC) Trees Network by facilitating its application to the conservation and management of trees at the local, national and international level.

The service will be of value to individuals and to key organisations whose decisions rely on access to accurate information. Access to high quality data and information will enhance capacity at all levels to make informed and well reasoned decisions. Whether determining the best use of local land or negotiating the obligations of an international treaty, authoritative data and information on tree species will inform the process and increase the likelihood that sustainable practices are employed and negative environmental consequences are minimised.

Background

The World Conservation Union (IUCN) has long recognised the importance of information management, integration and distribution. The Union created the Conservation Monitoring Centre in 1979 (later the World Conservation Monitoring Centre (WCMC) in 1988) to help manage and disseminate the wealth of data deriving from the activities of the IUCN Commissions. The importance of sound information management is now being expressed in the development of the Biodiversity Conservation Information System (BCIS). BCIS is a collaborative effort of IUCN commissions, programs and partners, including the IUCN SSC, and WCMC, with the broad objective of *supporting decision making and management practices that affect biodiversity and natural resources through the provision of data and information*. A process is now underway to plan the BCIS in detail, and partner reviews were undertaken during May and June 1996 and presented in a report titled *Partner needs and capability assessment*. The development of the SSC Trees Network and the formation of the Tree Conservation Information Service are complimentary to this ambitious project, and collectively they aim to enhance the conservation of biodiversity through the provision of accurate data and information.

Goal

To provide a reliable and up-to-date information service on the distribution, conservation status, local uses and economic values of tree species worldwide, in order to assist countries in the planning of sustainable forest management and biodiversity conservation, through appropriate international or intergovernmental processes.

Data harmonisation and data quality management

Data are widely distributed amongst individual experts, national, and international organisations. For these data to realise their full value, they need to be harmonised and presented in an integrated form. Indeed, whether presenting information for an action plan, a national survey, or to develop legislation, the supporting data will have greater impact if it is consistent. For example, when evaluating the status of a species, either regionally, nationally or internationally, it is essential to ensure that all potential sources have been identified, and that all the material being considered refers to the same taxonomic species.

The process of harmonising data can be reduced if data are collected along similar guidelines, and considerations also need to be given to the use of existing data standards. The application of appropriate standards facilitates **consolidation** and **communication** (exchange of data) and helps to ensure **consistency** within and between datasets.

The following will benefit considerably from standards:

- Taxonomy
- Geographic areas (for example Biological recording units - BRUs)
- Habitat or vegetation classifications
- Other standards (for exampleIUCN threat categories)

Although the service will aim to encourage the use of standards, the adoption of existing standards will depend on individuals, who will need to assess their suitability for use.

In addition to suggesting collection guidelines and identifying existing standards, the service will aim to promote and maintain excellent **data quality management**. Quality management refers to the overall process which governs the quality of a product from beginning to end. In the case of information the process begins with data collection and ends with user application. Quality control checks and quality assurance methods should be applied through all stages of the process.

There can be no absolute measure of the quality of a dataset. What may be "high quality" data for regional planning may be "low quality" for local decision making because of factors such as scale, detail, and error. Datasets may not be "100%" accurate, as the data are often based on subjective observation (such as deciding a boundary of a habitat), incomplete sampling (for example field observations), or indirect measurement (for example remote sensing). Even if it were theoretically possible to collect complete and accurate data, time and cost considerations often make this extremely difficult from a practical standpoint. Therefore, datasets will generally contain an element of error and uncertainty. "Quality" must be considered a measure of "fitness for use" and is therefore relative to the proposed or intended use. This is a very important consideration when data are being integrated and used for applications beyond the original purpose of data collection.

Quality management requires attention to quality assurance, integrity protection, and to the complete documentation of the dataset in terms of its quality, uncertainty, limitations, origin and intended purposes. Such descriptions will form part of the data maintained through the service.

Data custodianship

A key to good management of biodiversity data is to ensure that data are always maintained by the organisation best placed to ensure quality. "Custodianship" provides a framework under which responsibility for a dataset can be assigned and accepted by the most appropriate agency. It provides a mechanism to ensure that each information holding is established, maintained and made available by the agency best able to do so. The responsibilities of custodianship encompass data acquisition, management, and documentation, as well as determining under what conditions a dataset may be accessed and used.

As the Tree Conservation Information Service evolves, and more data are collected throughout the networks of custodians, accuracy will be maintained by relying on the individuals best qualified to comment on and maintain data doing so at the appropriate level. Indeed, custodianship should be recognised as being at the core of efficient and effective information management, and essentially provides a mechanism to ensure that each dataset is established, maintained and made available by the organisation best able to do so.

Licensing Agreements

Custodians may be responsible for management of the various licensing agreements, which can become very complex. Where appropriate, every effort should be made to develop relatively simple generic licences for data access and use within each jurisdiction. "Memorandum of Understanding" and similar high-level mechanisms that would allow the unrestricted flow of information between agencies may need to be negotiated. Successful biodiversity management requires ready access to many datasets from a wide variety of institutions. There should be an absolute minimum of administrative, cost and other impediments to the flow of information, consistent with the protection of copyright, intellectual property and other legitimate custodian rights. Any obstacles to the free flow of information will inevitably inhibit responsible decision making and sound biodiversity management.

The concept of custodianship can be very useful when attempting to build cooperative networks of information systems, whether linkages between the partners are electronic or informal. An important principle of the scheme is that all datasets are, in theory, accessible by all the partners. Designated custodians, however, have responsibility for collection and maintenance of the data and the sole right to update it and perform corrections. Varying conditions may be attached to data on the network. For example, data may be used for government decision making, public information or research purposes, but not for any commercial purposes, at least without specific permission.

Collaboration

Linking with other organisations is an important aspect of the information service, and will ensure that information collected through the project is compatible with other data gathering initiatives. Two important areas of collaboration have been developed: between WCMC and IPGRI and between WCMC and FAO. These relate to the following projects:

- **REFORGEN** database system, developed by the Forest Resources Division of FAO, is a global database system designed to house information related to the world's forest genetic resources.

- **TREESOURCE**, a global information system on forest genetic resources, represents a collaborative effort between FAO, CIFOR, ICRAF and IPGRI, and has been designed to provide readily, reliable and accessible information on forest genetic resources.

These collaborative links will also minimise replication of effort and promote exchange of data. Furthermore, wherever possible, the information service will adapt to support other initiatives for which the data may have a use.

Capacity Building

The service will not aim to maintain all the information potentially available on tree species. Central to the success of the service will be the development of regional capacity and in the development of the Tree Conservation Information Service, we are discussing with various national agencies their data management capacity and development needs. We would welcome your views on local needs during the course of the workshop, particularly as there is no single way to achieve improvements in the environment through the use of information. In all cases the approach has to be tailored to local conditions. Practically, WCMC can offer advise to agencies and individuals implementing their own priorities for information management. Topics covered, in a broad sense, include information systems development, database development, the role of quality management and its implications, techniques for information production and the role of information for decision support.

WCMC has been very active in supporting the development of in-country information management and is the hub of a network of organisations preparing guidelines and materials for capacity building. Documents developed for the UNEP-supported project *Development of Supporting Materials for Biodiversity Data Management and Exchange* are instructive in providing guidance on the conceptual processes, techniques and tools involved in the management of biodiversity information, and will provide valuable experience for the project.

- ***Guidelines for a National Institutional Survey*** (in the context of the Convention on Biological Diversity) - provides guidance to countries in the conduct of a survey and assessment of the capacity of existing national institutions to support biodiversity information management

- ***Framework for Information Management*** - guidelines meant to facilitate the development of capacity for information management and exchange as required by the ***Convention on Biological Diversity***

- ***Electronic Resource Inventory*** - represents a compilation of reference directories, guidelines, and standards relating to biodiversity information management

Characteristics of the information service

The Tree Conservation Information Service will be designed to be more than a simple catalogue of data, and will aim to provide benefits to individuals and institutions, at all levels. To serve the needs of this wide audience, the information service will have many different features, and central to its success will be the ability to provide practical solutions to **data collection**, **data storage** and **information dissemination**.

Data collection will benefit from standards. Data storage will require an **operational database**, providing standard database functions such as add, edit and delete, coupled with comprehensive

reporting. The use of appropriate look-up tables and standards will ensure good data integrity. Dissemination of information will rely upon **presentation** functionality, with a strong emphasis on providing information on a selected topic in a range of forms. The media for this will vary, and will certainly take advantage of technologies such as the World Wide Web as well as a desk-top based presentation solution for those without Internet access.
The development of the information management system component of the information service will involve a number of distinct phases:

- User needs analysis
- Functional specification and prototyping
- System design and development
- Implementation
- Operation

The benefit of following a recognised path from concept to an operational system, often referred to as the **Structured Development Life Cycle** will ensure that the final product has been developed with appropriate consultation between prospective users and developers, and will therefore provide the necessary information management infrastructure to support the information service and its future maintenance and expansion.

User Needs Analysis

When building an information service, it is essential to identify clearly the requirements of the people who will be using the system, and to identify clearly the information products they require. These will provide clear direction for later phases in the development of the service itself, and ensure that the information service fulfils the objective of those involved.

To assist with establishing user needs, a tree and timber database questionnaire was prepared and mailed (July, 1995) to over 500 organisations in the following categories:

- National governmental forestry and conservation departments
- Bilateral and multilateral development agencies
- National and international NGOs
- Research organisations
- Forest product trade organisations
- Individuals

The questionnaire survey had two main aims:
- To collect information on existing databases
- To determine priority user needs for the *Tree Conservation Information Service*

Information on over 50 existing tree and timber databases has been received and is collated into a **meta-database**, which may itself become part of the information service. Where the appropriate consent has been given, details of the individual databases will be added to a larger database network, such as CIESIN (Consortium for International Earth Science Information Network) or UNEP GRID (United Nations Environment Programme Global Resource Information Database) meta-database. Information on priority information requirements has been provided by over 80 potential user organisations and individuals and these are summarised in table 1.

Table 1: Priority information requirements

Information Category	Response rate
Species scientific name	86%
Local uses	86%
Species distribution	85%
Commercial uses	83%
Conservation status *global*	77%
Level of exploitation	76%
Habitat type	74%
General ecology	73%
Management practice	73%
Maps	73%
Conservation status *national*	72%
Protected areas	72%
Indication of species abundance	70%
Conservation information *in situ*	69%
Vernacular name	66%
Growth & regeneration	64%
Species description	64%
National legislation	55%
Conservation information *ex situ*	52%
Species identification	50%
Certified timber sources	50%
Wood properties	43%

The range of information categories being considered lead to a number of possible questions which the information service could assist with:

- Is the species of conservation concern?
- Has the species been evaluated for the new IUCN threat categories?
  If so, what is the category and criteria by which it was assigned?
  What information is available to support the threat category?
- What is the distribution of the species?
- What are the uses of the species?
- Is the use of a species sustainable?

- What are the current levels of trade of the species?
- What are the types, levels and values of use that are being made of a species?
- Is the species legally protected - regionally, nationally, internationally?
- What are the administrative and legislative structures pertaining to the conservation/sustainable use/management of tree species in any particular context?
- What are the implications of specified human actions and/or natural phenomena?
- What current actions are being taken to manage tree species, and how effective are they in achieving their objectives?
- Which individual or organisation holds, has access to, or can generate the data or information relevant to a specific issue?

In addition to identifying key questions, the objectives of collecting the data must also be explored. Information may be required for a range of purposes, such as:

- To support policy development
- To support strategic decisions
- To develop effective legislation (for example, CITES)
- To be able to implement legislation
- To evaluate, compare and thus help determine priorities
- To identify what natural resources currently exist and where
- To identify where resources exist together (especially where in conflict; for example minerals and high biodiversity)
- To build scenarios of possible consequences of management actions
- To identify what changes are taking place, why and how fast
- To identify what actions will slow or reverse adverse changes
- To implement conservation measures
- To comply with international obligations

From the range of information categories, and the associated questions, certain data will be required and the following broad categories of data have been considered:

- Taxonomic (scientific names, authority, synonyms, common names)
- Distribution (point records, polygons, inferred)
- Conservation status (criteria and supporting references)
- Local Use
- Economic (trade figures, commercial use, level of exploitation)
- Ecology
- Habitat type
- Threats
- Legal structures
- Management practices
- Source of knowledge and expertise
- Links to other systems (Protected areas, legislation (ELC), land use

Through the views expressed in the questionnaire, discussion at the workshop in December 1995 and follow-up meetings with a number of organisations, including FAO and IPGRI, and

the two SSC specialist Groups, Conifers and Temperate and Broadleaved Trees, a **data collection form** (appendix A) was designed.

The data requested in the form can be summarised as follows:

Section 1: **Nomenclature and occurrence**
Section 2: **Conservation status**, including revised global IUCN threat category and criteria, threats and conservation measures
Section 3: **Uses and Ecology**, including habitat type

This form has been designed to collect species information from regional and taxonomic experts. Existing details of species name and distribution are provided from the WCMC Plants Database, and the partially completed forms are distributed to experts who are asked to assign the new IUCN red list categories and complete the form with details of species conservation status, uses, habitat and ecology. By providing a framework for data collection it is hoped that these forms will greatly assist the collection of information to be made available through the information service.

Over a thousand of these forms have already been completed by members of the SSC Specialist Groups for Conifers and Temperate Broadleaved Trees and by regional experts in Africa. Data for Asian and American tree species will be collected in the coming months.

The data collection form currently provides a framework for a number of data categories. These will be refined and extended to cover the other information categories as the project progresses, and importantly, ongoing consultation and collaboration with other organisations will be maintained and developed. One example of collaboration is illustrated by the Medicinal Plants Specialist Group, who have made some very useful comments on the data collection form and, in particular, how to make the data more relevant to sustainable use issues. It is hoped that this type of liaison will continue throughout the project.

Functional specification and prototyping

On the basis of the questionnaire results, and ongoing discussions with other organisations and SSC specialist groups, a functional specification of the desired information system can be drafted. In addition to this document, the development of a prototype promotes an interactive approach to development, and ensures that the proposed functioning system correctly addresses the requirements of the users. The development of a small version of the system, built quickly and inexpensively, allows discussion of the potential capabilities, and identifies, at an early stage, areas requiring refinement.

The prototype database provides the first draft operational database, and is focused on providing standard database functionality for the information being collected through the data collection form. It has been developed using Microsoft® Foxpro® 2.6 for Windows™. The decision for using this relational database management system to develop the prototype was

based upon the ease and speed of development offered by the product, and does not preclude the use of a different product for the final version. The prototype will provide the basis for review and comment from interested parties, and will be refined as part of the ongoing development.

During this phase, the following will be documented and produced:

- Precise information needs of intended users
- Conceptual and logical data models
- Process and data flow diagrams
- Description of all desired information products
- Inventory of key data holdings and information systems; this will involve the completion of the meta-database
- Functioning prototype

System Design and Development

In the system design phase, the functional requirements resulting from the previous phase will be translated into system specifications. The descriptions of data and processes will become the basis for database structures where computer databases are required, and the definition of procedures and programs. The inter-relationships of the modules and the transfer of data between them will be specified. It is at this phase that final decisions are taken on the overall system architecture, the hardware and software to be used. The prototype database developed in the earlier phase will provide invaluable guidance for this phase, and may be used as a starting point for the development of the functioning system. During design, although the major effort comes from the developers, continued user involvement and input is essential to ensure that the evolving system reflects correctly their needs.

The design specification defines the development tasks to be undertaken during the development phase. In this phase, again the major effort is from the developers, with essential input and guidance from users. The output of this phase is a functioning system which has been tested during development and should meet the requirements identified by the users.

Implementation and Operation

During these phases, the system is tested in an operational environment to ensure that it provides the expected functionality. Essentially, the functionality of the system is checked against the original user requirements as documented in the functional specification. Once approved, the system moves into an operational phase, which will continue for its lifetime. This will involve continual maintenance of the system, which may involve refinement and minor modification to adapt to changing requirements.

Summary

The information management component of the Tree Conservation Information Service will provide practical solutions to **data collection**, **data maintenance** and **information dissemination**. The development of a data collection form and the use of appropriate standards will promote consistency and guide the collection of data. Data storage will be served by an operational database, providing standard database functionality together with a comprehensive set of reporting tools. A prototype database has been developed, and will serve as a focal point for discussion, and will also guide the development phase. Information presentation will involve a number of media, and will certainly involve establishing a World Wide Web site for the project. Web pages will initially give project information, the list of temperate threatened tree species, and links to other related web sites. To serve those without Internet connection, other forms of presentation will be considered. In addition the Tree Conservation Information Service will aim to make available information on the following:

- Comprehensive information on species of conservation concern (including maps)
- Material on sustainable use
- Details of legislation
- Management Practices
- Collection methodologies
- Information management guidelines
- Application of the new threat categories

To make a significant contribution to the conservation and sustainable use of tree species, the information service will aim to address the following key points:

- Make information available to individuals and organisations at all levels
- Protect custodians' legitimate interests
- Ensure information is available in a timely manner
- Provide information in a form that is readily understood and easily communicated
- Ensure information is accompanied by an auditable trail so all underlying data and intermediate products can be scrutinised and independently reviewed
- Aid the development of regional capacity for information management
- Promote data exchange
- Develop collaborative links with other organisations
- Be responsive and flexible

Appendix A - Data Collection Form (reduced in size)

Section 1 - Nomenclature and Occurrence

Scientific name	
Other scientific name(s) in current use	
Family	
Common names	
Distribution at BRU* level (*Basic Recording Unit)	
Global IUCN threat category	
Uses	
Is the taxonomy above correct?	
Is the distribution complete? If not, in which additional countries or states can the species be found?	
If the species distribution is confined to a particular area? (for example a mountain range) Please give the details	

Section 2 - Conservation Status

Is this species of conservation concern in any part of its range? Please specify where	◻ Yes ◻ No
Revised global IUCN threat category (1994)	◻ EX ◻ EW ◻ CR ◻ EN ◻ VU ◻ LRcd ◻ LRnt ◻ LRlc ◻ DD ◻ NE
Criteria (e.g A.1.(d) etc.)	
Comment Please use this space to sum up the status of the species. Please include any information about the **population size or decline, restricted range, ecological or taxonomic uniqueness, characteristics of regeneration or reproductive strategy**, and any indications of the fragility of the state of the species, especially where **data are insufficient to assign a threat category**	
Threats If multiple threats please indicate order of concern - use 1 for the most serious threat(s)	[ ] Felling [ ] Grazing [ ] Exploitation of plant parts [ ] Fire [ ] Natural Disaster [ ] Pollution [ ] Pests & Diseases [ ] Invasive species [ ] Lack of dispersal/pollination agents [ ] Seed Predation [ ] Poor regeneration for unknown reasons [ ] Mining [ ] Tourism [ ] Industrial development [ ] Agriculture [ ] Forestry [ ] Expansion of human habitation [ ] Decline in soil water content [ ] Other major threat:
Conservation measures Please give the details of any on-going conservation activities, including **legal measures, presence in protected areas, management practices and *ex situ* conservation**, especially where the species is categorised as LRcd	

Section 3 - Uses and Ecology

Brief species description						
****Uses**	**Use**	**Part**	**Level**	**Use**	**Part**	**Level**
Please enter in the columns provided the appropriate letter and number corresponding to the part used and the level exploitation respectively Unspecified, Entire plant, SeeDling, Gall, STem, Bark, Leaf, Inflorescence, Fruit, Seed, EXudate, Root 1 Major International trade 2 Minor International trade (LKS) 3 National or Local trade 4 Local use only	**EXAMPLE** Medicine Timber Fuel Food Food additive Animal food Invertebrate food Bee plant Vertebrate poison	**T,B**	**2,2**	Non-vertebrate pois on Gum, resin, oil etc Fibre Gene source Social use Environmental use Ornamental Other (please specify)		

*****Habitat Type** Please tick whichever boxes describe the species natural habitat most appropriately.	☐ Closed forest ☐ Open forest ☐ Scrub ☐ Herbaceous vegetation ☐ Sparsely vegetated	☐ Lowland ☐ Submontane ☐ Montane ☐ Alpine	☐ Broadleaved ☐ Coniferous ☐ Mixed	☐ Cloud forest ☐ Mangrove ☐ Swamp forest ☐ Wetland ☐ Sclerophyllous ☐ Anthropic landscape
	☐ Temperate ☐ Tropical	☐ Seasonal ☐ Non-seasonal	☐ Moist ☐ Dry	

Please define habitat type further if necessary	
Species associations	
Regeneration guild	☐ Early pioneer ☐ Late secondary ☐ Primary
Spatial distribution	☐ Abundant ☐ Scattered ☐ Clumped
Obligative species dependencies	
Dispersal/pollination agents	
Altitudinal range in metres	Min Max
Status of the species in cultivation	☐ Plantation grown ☐ Widely cultivated ☐ Small scale ☐ None
Relevant references Please cite any references used to complete this form	

******Please indicate the uses of species only when relevant to human use for example only those plants eaten by invertebrates such as silkworms, lac insects etc. should be indicated as **invertebrate food**. **Bee plants** are those which are used for honey production. **Animal food** refers to those plants eaten by domesticated animals. **Environmental use** refers to shade trees, windbreaks and trees used in erosion control etc. Examples of plants of **social use** are narcotics, contraceptives, plants of ritual significance etc.

*****Closed forest** consists of trees with interlocking crowns. **Open forest** (woodland) contains trees with crowns not interlocking. **Herbaceous vegetation** is dominated by non-woody plants with scattered trees.

Your name	Date

Draft Document 2

Guidelines for the application of the 1994 IUCN Red List Categories to trees

These guidelines are for use in conjunction with the red pamphlet *IUCN Red List Categories (1994)*. They are intended to provide practical advice and examples of the application of the categories specifically to tree species. IUCN categories of threat have been in use for over thirty years. The 1994 revision represents the first step to make the categories more quantitative, objective and equable over all taxa (except for microorganisms). As from now, a category can only be assigned to a species if one or more of a choice of five criteria apply. However, despite the well-defined nature of these criteria it is recognised that many assumptions and projections will have to be made as long as information on threatened species remains so variable and limited. For this reason we recommend that you read these guidelines before assigning any categories to tree species.

Background

The revised IUCN categories are being applied to tree species as part of the *Conservation and Sustainable Management of Trees* project being carried out by the World Conservation Monitoring Centre in collaboration with the IUCN Species Survival Commission. Over 1200 tree species have already been evaluated. It is the aim of the project that all tree species of concern will be evaluated by the end of 1997 and it is envisaged that evaluations will continue as more information becomes available.

As part of the project, William Hawthorne was contracted to assign the categories to Ghanaian tree species and report on the process in comparison to the "Star system" which he developed for national use in Ghana. His report helps to illustrate where difficulties arise because of paucity of available data and the potential to interpret the criteria and definitions in various ways. Concerns have also been expressed that categories should not be applied by experts in isolation and some guidance and rationale should be given to qualify definitions such as those for projection, generation times, population sizes and declines, and area of occupancy. These guidelines have been developed from the recommendations made by William Hawthorne and from other comments made by botanists in their attempt to use the categories.

Sources of information for evaluating tree species

Evidence has to be provided to demonstrate that a species is experiencing, to various degrees, one of the following:

Criterion A. Population is declining or is expected to decline
Criterion B. Population is localised, fragmented and declining
Criterion C. Population is small and declining or fragmented or localised
Criterion D. Population is very small

Data are, therefore, required to illustrate population decline, localisation or population size. Few sources give direct estimates of any one of these but there are several sources of indirect evidence. **Population declines** can be estimated from declines in species recorded in Permanent Sample Plots, from historical field observations or herbarium specimens giving locations of specimens which have ceased to exist. In cases where species show habitat specificity it is more likely that population declines will be inferred from loss or degradation of species habitat. Much information on habitat specificity can be collected from autecological studies, forest and botanical inventories, sample plots, transects and field observations. Changes in habitat condition and habitat loss are provided by the more long term field studies and sample plots, and also by remote sensing. A more difficult approach would be to estimate population declines from levels of trade and utilisation. Although these statistics may give the degree to which species are utilised, very little can ever be inferred from changes in trade levels. **Population size** and **Population localisation** can rarely be directly estimated from anything other than specific field studies or collecting expeditions. It may, otherwise, be derived from details of species habitat type, distribution and species density, which may be found from much the same sources as mentioned above.

Applying the categories to tree species

It is important, initially, to note:

- The categories can be applied to any taxonomic level, including infra-specific taxa and microspecies;

- It is not expected that all the criteria will be appropriate for any one species. A tree species need only match the details in one criteria in order to be assigned a category of threat. Different criteria apply to different species according to the biology and habit of the taxon;

- Exact population figures or areas of occupancy are not essential in order to apply categories. It is possible to infer or project into the future the effects of current and potential threats. The situation known in part of population may also be sensibly extrapolated to assess the overall status of the species if it is unknown elsewhere. Population declines can also be estimated from habitat loss or levels of trade;

- DD species will not be included in listings of threatened species, although they may be listed separately;

- It is essential that the criterion and subcriterion applied are recorded with the category of threat (for example VU A1c,d). Lower risk species should be recorded as LRcd, LRnt or Lrcd;

- The category "Rare" from the previous version of the IUCN categories of threat no longer exists. There is no obvious equivalent of "Rare" in the 1994 version of the categories and few species which are naturally rare can be assigned a category of threat without showing signs of some population decline or loss of habitat. Species which are known from very few locations can be assigned to threat categories using the VU D2 criterion;

- The most serious category applicable should be assigned to the taxon.

The definitions defined for tree species

1. **Mature individuals** ("number of individuals known, estimated or inferred to be capable of reproduction"). The capability of reproduction in tree species varies widely and vaguely according to age/size class of individuals (for example *Bailonella toxisperma* first flowers at 50-70 years and doesn't fruit until roughly twenty years later, conversely *Sequoiadendron giganteum* may produce seed at less than 20 years of age and continue to do so for 3000 years). We suggest 80% of individuals in any age/class should be capable of fruiting in order to call them "mature". If little is known about age at fruiting, mature individuals should be counted as those of a typical size; for example canopy species should be canopy height etc. Clones of apomictic species and self-fertilizing species qualify as individuals.

2. **Generation time** ("average age of parents in the population"). We suggest that the age of species at maturity (see above) should be used as an estimate of their generation time. Where there is no information we suggest the following estimations: 50 years for most tree species, 5-10 for pioneer species or small trees, 100 years or more for slow-growing trees.

3. **Population** ("the total number of mature individuals"). These estimates should include only **mature individuals**. For most non-pioneer species an estimate considerably less than half the total population number should be derived.

4. **Extreme fluctuations** ("in a number of taxa where population size or distribution area varies widely, rapidly and frequently, typically with a variation greater than one order of magnitude"). Tree species are unlikely to experience extreme fluctuations. Therefore in order to qualify a species as threatened according to the B criterion the population must be fragmented or in ten or fewer locations and also declining or likely to decline.

5. **Extent of occurrence (EOO)** ("the area contained within the shortest continuous imaginary boundary which...encompasses all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy"). **EOO** can be initially estimated by counting the number of degree squares that the species occupies. In tropical regions, if the total population or the sum of disjunct subpopulations takes up (or probably takes up) the equivalent of approximately 2 degree square then this may qualify the species as having an **EOO** less than 20,000km^2. In more temperate latitudes around 2.5 degree squares can be occupied. **Endangered** and **Critically endangered** species should be assessed at a finer scale. Perhaps on a 1:1,000,000 map using grid squares of 50km x 50km. Estimating the area covered by the species habitat also helps in deriving **EOO**. An analysis of African species distribution within the vegetation types described in White (1983) is attached as an annex.

6. Area of occupancy (AOO) ("smallest area essential at any stage to the survival of existing populations"). This is intended to be a more accurate figure for the area or most likely area, to which species are confined. The estimate should take into account the habitat requirements of the species, whether these are specific pollinators, canopy height or climatic conditions.

AOO should be measured on a scale roughly ten times finer than that used to measure **EOO**. For more endangered species grids of 5 X 5 km and maps of 1:100,000 would be useful.

7. **Subpopulation** ("distinct groups in the population between which there is little exchange...one successful migrant..per year"). In the case of tree species we may define a subpopulation as an isolated population which experiences insignificant seed or pollen migration from other populations within a generation time.

8. **Extinct in the wild** ("exhaustive surveys in known and/or expected habitat...throughout its historic range have failed to record an individual..over a time frame appropriate to the taxon's life cycle and life form"): there is no suitable time frame in which to consider a tree species extinct if it has not been re-found. Few exhaustive surveys have been carried out for species suspected to be extinct. We suggest if the species habitat has disappeared or the site has been visited by trained botanists then the species can be considered as **Extinct**. If the site is restricted then a threat category should be assigned according to the criteria fulfilled. If the area is not restricted and has not been revisited by an appropriate expert or if the species is taxonomically poorly defined then the species should be considered **Data Deficient**.

The criteria applied to tree species

Criterion A

This criterion is useful in applying the categories to species which are **widespread but whose habitat or population has been heavily exploited or degraded**, and for species which show **poor regeneration or slow maturation rates but are not particularly localised** and also for species which are **sparsely distributed and declining.** Other criteria (B, C or D) are more useful to assign categories to species which are low in numbers or highly localised. Some suggestions are made below as to how to use this criterion.

How to make estimates of population decline in the last 100+ years. The generation time of some tree species can exceed 100 years. This puts appliers in the difficult situation of estimating population declines from a point in time before which the species populations or even the species itself may have been recorded. In some cases declines may have been provoked by climatic changes. The most important thing to emphasize here is that the most significant declines, which are useful to record and which may be possible to reverse, are those that have been caused this century. We suggest, then, that declines should be estimated over the past hundred years or more according to the length of human or human-related influences. It should also be expressed that rates of decline are rarely known and more commonly assumed!

Should species which are widely spread but have experienced a general decline of 20% because of habitat destruction be Vulnerable? Many tropical forest species have experienced a 20% decline in their natural habitat over the past 3 generations. Some of these species, however, do have a wide ecological tolerance. It should be confirmed that the species is confined to the declining habitat and that regeneration is unsuccessful

outside of it. We would not expect species with an EOO greater than 250,000km^2 (or approximately 20 degree squares) to be assigned a threat category unless it is being specifically and heavily exploited.

When to use projections and extrapolations. A large degree of subjectivity will be unavoidable in applying categories using projection, assumptions or extrapolations. Case studies are listed further on to give examples.

Where species are regenerating poorly. If regeneration is known to be poor then the A criterion is probably the best one to apply to assign a category, using projected decline. Will individuals replace themselves in the next three generations? If the species is long living or depends on stochastic events it will be hard to project a decline. Alternatively, it is embedded in the definition of "mature individuals" that individuals should be effective at reproducing. Individuals which produce offspring which are not viable should not be counted in the population estimate. Situations such as these should be evaluated against the C or D criterion.

Where species are sparsely distributed. Where species do not occur in easily-recognisable clumps, from which **AOO** can be estimated, the only way to denote the species as threatened is through estimated or projected declines in population (criterion A) or in population numbers (criterion D).

Where species have experienced a genetic decline. In many cases for tree species there has been a tremendous genetic decline or loss of fitness in the population where the larger and fitter individuals have been harvested. If this is a significant proportion (20% or more) of the **mature population** then the taxon can be registered as threatened under criterion A.

Criterion B

This criterion is useful in order to assign categories to threatened species which are **regionally endemic** or **confined to a particular habitat**. Much of the necessary discussion concerning these criteria can be found under the definitions for **AOO** and **EOO** and also under **Extreme fluctuations**. Incidentally, it is expected that many threatened tropical tree species will be assigned under this criterion.

Criteria C & D

These criteria can only be used where **population numbers or locations, from which the species is known, are small or highly restricted**. It is also possible to assign these criteria to **species which are not regenerating.**

Where a species is known from only one location or the type locality. A species can be assigned a category of **Vulnerable D2** on this information alone. There does not have

to be any population decline. If there are serious threats to the permanence of the population or the locality then more serious threat categories should be assigned.

Where the species is not regenerating. Mature individuals which do not produce effective offspring should be discounted from any population estimates. This is discussed above under criterion A.

Criterion E

Few population viability assessments (PVA) have been carried out for tree species. We would be pleased to hear of any.

Category Lower Risk, conservation dependent (LRcd)

When should presence in protected areas be used as a means for applying LRcd? In some cases, if protected area boundaries were to be taken away the tree species inside would rapidly be wiped out and, where the ensuing declines in species population are significant, the species would register as threatened. If the current status of the species does not qualify as threatened, **LRcd** is the appropriate category to use in these cases. The effectiveness of protected areas in preventing declines in species populations is sometimes questionable or unknown. In these cases, species should be allocated a category of **LRnt** if not qualifying as threatened.

Category Lower Risk, near threatened (LRnt)

This category should contain species which narrowly miss the criteria for threatened species. It is also useful for species which appear not to suffer from serious threats but would quickly qualify as threatened if new pests, further exploitation or development of agriculture, forestry or human settlements were to occur.

Category Lower Risk, least concern (LRlc)

This is the appropriate categorisation of "not threatened" species.

Category Data Deficient (DD)

Much subjective thought must be involved in order to decide whether a species is threatened or **Data Deficient.** We will include within the *Tree Conservation Information Service* information on **Data Deficient** species if there is a reason to believe they are of conservation concern. It is possible that they will not be included in future regional or global red data lists. The Case studies below should help in the use of this category.

Case Studies

The examples of species evaluations below are provided by regional and taxonomical experts. They illustrate what information may be used to assign categories but it should be noted they are also based on intuition gained from a lifetime's field and herbarium experience. It is always preferable, of course, to use precise and quantifiable evidence. However, in many cases, as outlined above, assessments for tree species will be achieved with the use of less precise data or little information at all. The spirit of these evaluations are more easily appreciated with descriptive footnotes. The *Tree Conservation Information Service* will store comments, such as those below, along with the IUCN category.

* **Species for which there is very limited information but which are believed to be threatened**

  ***Amentotaxus argotaenia* (Hance) Pilg. - VU A1c** is known from two collections from two separate valleys in India and one collection in China. The species could be assigned to DD on the grounds that little is known about the dynamics of these populations or whether additional populations exist. However, deforestation is occurring in this region at a rate greater than 20% in 100 years which leaves the species in a highly susceptible position. A threat category has, therefore, been assigned.

  ***Agathis orbicula* de Laub. - VU B1 & 2c** is known from 5 localities according to specimen information. It is thought there can be no more than 10 localities in existence scattered in areas where forest exploitation is intense from Southern Sabah to Central Sarawak.

* **An Extinct species**

  ***Thuja sutchuenensis* Franchet - EX** was collected from a site, where it was possibly planted, near a temple in Sichuan in 1892. No-one has collected a wild specimen since, despite botanical visits to Sichuan.

* **A species displaying poor regeneration**

  ***Heritiera longipetiolata* Kaneh. - VU C1** consists of about 1000 trees on Guam, several hundred on Tinian and less than 100 on Saipan. Lack of regeneration on Guam is the major problem there. This may be caused by seed or seedling predation by ungulates or crabs. Habitat loss is a minor problem currently and the species status is not especially fragile. If the lack of regeneration is found to be a significant problem this species could easily qualify for a category of **EN.**

* **A mountain top species**

  ***Araucaria schmidii* de Laub. - VU D2** is known from one location on escarpments near the summit of Mt. Panié in New Caledonia. It is possible that individuals could be found on neighbouring mountains but this is a remote area and botanically less well known.

* **A Critical island variety**

  ***Cupressus guadalupensis* S.Watson var. *guadalupensis* - CR B2c** occurs solely on Guadalupe. Little regeneration of any vegetation is evident because of the abundance of

goats. There are approximately 200 individuals in one or two stands. How many of them may be mature is not presently known.

* **A widespread timber species**
  ***Fitzroya cupressoides* (Molina) I.M. Johnston - EN A1cd & A2cd** has been logged since the 1500's, particularly in the mid nineteenth century when Europeans eliminated all populations in poorly drained lowlands in Chile and Argentina. In the Andes clear-cutting and human-made fires have caused the loss of *Fitzroya* forests. Illegal logging and export of the timber continues despite national and international legislation banning it. The species' very slow growth and maturation (200 years) makes the prospects for sustainable management of the species highly unlikely.

* **African species**
  ***Warburgua salutaris* (Bertol.f.) Chiov. - VU B1&2e** is only known from Lebombo Mountains in Mozambique and in Natal, Swaziland, Transvaal and eastern Zimbabwe. Regeneration is reasonable but is being undermined by significant levels of utilisation of the bark for use in medicines and the wood for fuel.
  ***Cynometra filifera* Harms - CR A2, B1 & 2a,b,c,d,e,** is locally dominant in a patch of forest of about 0.25ha. It is only known elsewhere from another forest patch, 40km away, that has not been visited for 40 years, and which may no longer exist.

* **A Lower Risk but near threatened species**
  ***Agathis vitiensis* (Seeman) Benth. & Hook.f. - LRnt** is a timber species endemic to Fiji. It is found in low densities but is relatively unthreatened. If logging activities intensify in the area then the status of this species will become a concern.

* **Lower Risk least concern taxa**
  ***Dacrycarpus expansus* de Laub. - LRlc** is locally common or in pure or co-dominant stands in disturbed areas and on the edge of tree fern grassland in Irian Jaya and Papua New Guinea.
  ***Cordia sebestena* var. *caymanensis* - LRlc** occurs in all three Cayman islands. There is potential for hybridisation with nominate subspecies imported for landscaping. Restrictions on plant imports and increasing interest in local propagation may reduce this threat. Widespread habitat destruction is reducing the population size but the species is well represented in protected areas and often retained in landscaping.

* **A Data Deficient species**
  ***Glyphaea tomentosa* Masters - DD** is endemic to Mozambique. Information is inadequate. It is only known that the species has a small distribution range.

Evaluating species using habitat information

Population numbers are next to impossible to estimate for continental tree species in the tropics. Ghana has carried out one of the most extensive surveys of its forests in Africa and

yet it is impossible to collect sufficient details about rare species to validate a population estimate. The approach taken by William Hawthorne in assessing the status of tree species in Ghana involves estimating the likely **EOO** from the distribution of the species habitat and assuming its rate of destruction in the last few decades from published figures. The following is an extract from the working document prepared by William Hawthorne for the project's technical conference in Wageningen in November 1995.

Forest Types are those defined by Hall and Swaine (1981):
WE Wet Evergreen, **ME** Moist Evergreen

Wet forest species: General trends
[In Ghana] the decline in forest quality and quantity has been less dramatic here [in wet forests] than in drier forests, yet the statistics are rarely presented in a way which allows this to be quantified.

The greatest number of globally rare species in Ghana are wetter evergreen forest species, apparently restricted to these forests by a wetter climate/base-poor soil there, although there is also much speculation about their status as 'refugees' in or near Pleistocene refugia there (see summary discussion and references in Hawthorne, 1995). A sketch of enclaves of Wetter (evergreen) Guinean forest is shown in Parren and Graaf, 1995. A species restricted to this vegetation in Ghana has a maximum EOO of about 2000 km², but the internal variation is substantial and no rare species are found throughout. Many such species favour swamps or riverside forest, for instance. Much of this vegetation type in Ivory Coast is deforested. The total area in the Ghana and Ivory Coast Block is probably < 3000 km². A species restricted to this area would qualify as at least endangered (B1,B2), without further consideration. Most species occur outside this block, however, either in the Liberian block of WE forest or in the ME zone in Ghana and elsewhere. In Liberia and Sierra Leone, the remnant WE type zone is larger, possibly about 15000-20000 km² (from maps in Parren and de Graaf, 1995).

Some species are restricted to the WE zone, others extend various degrees into the drier ME zone. In Ghana the area of ME zone forest is about 2.5 times the WE area, but is more widely disturbed. Assuming the same trend for the Liberian block, we can estimate an effective ME area of the order of perhaps 30,000 km². Combined with the WE area, this sets a maximum area on Upper Guinean wetter-forest species.

White (1983) includes both WE and ME type forest in his mapping unit 1a ("hygrophilous coastal evergreen Guineo-Congolian rain forest"). The extent of this mapping unit in Lower Guinea is about twice the extent of that of Upper Guinea. Most Guinea-wide species (i.e. species in both Upper and Lower Guinea) have been filtered out from consideration; those that remain for consideration here are those like *Afrostyrax lepidophyllus* which seem restricted within these zones, so these total areas of Guinean Wet forest are much broader than the EOO (esp.AOO) of these species[1]

[1] Note that attempts to model AOO using known distribution and the environmental associations of such species would in most cases lead to a gross overestimate of AOO.

Although the area of this type of forest is limited, it seems that forest loss has not been as bad in such areas (especially the WE type) as in drier areas, because of negligible loss due to fire, lower densities of timber than in semideciduous forests and rather infertile (heavily leached) soils, although mining in the ME belt of Ghana has accounted for significant losses for example around Tarkwa. Cocoa farming has not been as great a factor in the WE zone as it as in the ME zone. Mining is a potential threat for deforestation in Ghana, with recent quarrying in Neung and Cape Three Points, and there has been significant forest loss on unreserved land in the WE zone (and in Western Region generally) since Ahn's (1959) summary of land-use patterns. Deforestation of Subri Forest Reserve and elsewhere due to industrial plantation is, being moderately optimistic, unlikely to expand much further.

Wet Forest species: Specific cases

It is hard to place with confidence any WE species as critically endangered, in spite of the limited range of many of them. Some potential contenders, like *Trichoscypha chevalieri* (found only a few times ever, in a limited total range) come very close, but our picture of this species' situation is a little too hazy to commit it to this alarming status. Instead, I propose to put the majority of such (locally and globally) rare, systematically declining WE species in the Endangered category, preferably with a hair-trigger, set to upgrade their status to critical if any more negative factors arise. Alternatively, any future records for example in Lower Guinea are liable to render the species merely Vulnerable. For species with a wider distribution, only *Monocyclanthus vignei* (from two main areas) attains endangered status. The others must therefore be defined as Vulnerable.

Wet forest species: tentative conclusions:

VULNERABLE (VU-B1&2c & A1c)

Tapura ivorensis
Drypetes afzelii (EN?)
Sapium aubrevillei
Cassipourea hiotou
Cola umbratilis
Placodiscus bancoensis
(P. bracteosus?)
Spathandra barteri
Trichilia ornithothera
Xylopia elliotii
Croton aubrevillei
Desmostachys vogelii
Drypetes afzelii
Amanoa bracteosa
Anthonotha vignei
Berlinia occidentalis
Cryptosepalum tetraphyllum
Dactyladenia dinklagei
Deinbollia molliuscula
Didelotia idae
Gilbertiodendron bilineatum
Gilbertiodendron splendidum
Isolona deightonii
Neostenanthera hamata
Ouratea amplectens
Pausinystalia lane-poolei
Pavetta mollissima
Phyllanthus profusus
Piptostigma fugax
Placodiscus oblongifolius
Rhaptopetalum beguei
Schumanniophytum
Synsepalum aubrevillei
Trichoscypha albiflora
T. beguei
T. cavalliensis
Afrostyrax lepidophyllus
Allexis cauliflora

Dasylepis assinesis
Amanoa strobilacea
Citropsis gabunensis
Crotonogyne manniana
Didelotia unifoliolata
Gluema ivorensis
Oricia suaveolens
Pellegriniodendron diphyllum
Piptostigma fugax
Pseudagrostistachys africana
Trichoscypha atropurpurea
Warneckea memecyloides

ENDANGERED (B1&2c)

Chrysophyllum azaguieanum
Dactyladenia hirsuta
Hemadradenia chevalieri
Hymenostegia gracilipes
Sericanthe toupetou
Trichoscypha chevalieri
Monocyclanthus vignei
Neolemonierra clitandrifolia This large tree probably a very long generation time. Its habit extends to Upland evergreen forest, which has declined more than the lowland variants.

(The following species are perhaps of less concern than the above; LRcd "Conservation dependent" (in Forest reserves), might be more appropriate.

Crudia gabonensis Probably well-buffered in lower Guinea.
T. oba
Raphia Palma-pinus Guinea-wide Swamp species often outside forest..
Uapaca paludosa
Xylopia rubescens
Magnistipula zenkeri
Anisophyllea meniaudii
Dichaetanthera africana Although rare in Ghana a pioneer of wet forest
Ehretia trachyphylla. Pioneer-ish, and well into ME zone
Ficus tesselata
(Homalium dewevrei & longistylum) Complicated taxonomy/variation pattern and distribution area. These appear to be widespread. ?Data deficient.

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Revised Document 3

Globally threatened trees occurring in Africa

This is a preliminary list of threatened or restricted-range tree taxa, occurring on the African mainland. All taxa are recorded with baseline information, including old IUCN threat categories, in the WCMC Plants Database. The species names in **bold** have been evaluated according to the criteria for the new IUCN Red List Categories. Species marked ** have been assigned a category of "Data Deficient". Currently available information is extremely limited for these species, for example, for those tree species endemic to northern Mozambique.

This is a dynamic list. It is expected that some species may be removed after further consultation and evaluation and other species added. At the WCMC/SSC *Conservation and Sustainable Management of Trees* project Regional Workshop in Harare, trees of particular concern were discussed, based on an earlier version of this list and amendments were made. Participants of the workshop and other botanists have been and continue to help in evaluating taxa for inclusion on the list. There remain, however, certain areas where more work is required. Some countries and areas are poorly represented on the list. These include Liberia and Sierra Leone, Angola and Gabon. It is also true that there may be a bias towards moist forest species and some dry forest and non-forest species may be missing. Your comments are essential for the improvement of this list. We would be grateful for any views as to areas which may be under-represented. Information on the status of these trees or any other globally threatened trees would be greatly appreciated.

Species	Distribution
Abies numidica	**Algeria (Mt Babor, Mt Tababor)**
Abies pinsapo var. marocana	**Morocco (Rif Mts)**
Abies pinsapo var. tazaotana	**Morocco (Mt Tazaot)**
Acacia ankokib	Somalia (north-east)
Acacia caraniana	Somalia (north)
Acacia cernua	Somalia (north)
Acacia condyloclada	Ethiopia
	Kenya (Rhamu)
	Somalia (northern)
Acacia densispina	Somalia (central)
Acacia flagellaris	Somalia (north-east)
Acacia gummifera	Morocco
Acacia hebeclada ssp. chobiensis	Botswana
	Namibia
	Zimbabwe
Acacia manubensis	Somalia (north-east)
Acacia mbuluensis	Tanzania (Kilimanjaro, Mbulu & Moshi)

Species	Distribution
Acacia moggii	Somalia (central)
Acacia montis-usti	Namibia
Acacia ochracea	Somalia (south-west)
Acacia origena	Ethiopia (Welo)
	Eritrea (west)
	N. Yemen
	S. Yemen
Acacia pachyceras var. najdensis	**Egypt (eastern Sinai)**
	Iraq (south)
	Kuwait
	Oman
	Israel (Negev)
	Jordan
	Saudi Arabia
Acacia permixta	Botswana
	South Africa
	Zimbabwe
Acacia prasinata	**Ethiopia (Wello Upland)**
Acacia pseudonigrescens	**Ethiopia (Kelafo)**
****Acacia purpurea***	**Mozambique**
Acacia robynsiana	Namibia
****Acacia schlechteri***	**Mozambique**
Acacia tanganyikensis	Tanzania (Mwanza, Singida, Dodoma)
Acacia venosa	Ethiopia (Tigray Upland)
	Eritrea (west)
Acioa cinerea	Cameroon (Bipindi)
Acioa dichotoma	Nigeria (Eket)
Acioa eketensis	Nigeria (Eket)
Acioa laevis	Gabon (Libreville)
Acioa pierrei	Gabon (Libreville & Tchibanga)
Adenopodia rotundifolia	Somalia (south)
	Tanzania (Lushoto and Pare)
Aerisilvaea sylvestris	**Tanzania (Morogoro District)**
Afrocarpus usambarensis	**Tanzania (Mbulu & Lushoto)**
Afrostyrax lepidophyllus	**Cameroon**
	Ghana
Afzelia bella var. glabra	Congo (Makoua-Owando)
Alberta magna	South Africa - Cape Province
	South Africa - Natal
Albizia aylmeri	Sudan

Species	Distribution
Albizia malacophylla var. malacophylla	**Ethiopia (Tigray & Gondar)**
	Eritrea (west)
Albizia obbiadensis	Somalia (central & south)
Albizia suluensis	South Africa - Natal
Albizia tanganyicensis ssp. adamsoniorum	Kenya (central)
Allanblackia stuhlmannii	**Tanzania**
Allanblackia ulugurensis	**Tanzania (Morogoro, Iringa)**
Allexis obanensis	Nigeria (Oban)
Allophylus agbala	Zaire (Ubangi-Uele)
Allophylus amplissimus	Zaire (Haut-Katanga)
Allophylus chirindensis	**Zimbabwe (east)**
Allophylus letestui	Gabon (Ayem & Koulamotou)
Allophylus melliodorus	Tanzania
Allophylus zimmermannianus	**Kenya**
	Tanzania (coast)
Aloe ballyi	Kenya
	Tanzania
	Zimbabwe
Aloe comosa	South Africa - Cape Province
Aloe eminens	Somalia (north)
Aloe fibrosa	Kenya
	Tanzania
Aloe khamiesensis	South Africa - Cape Province
Aloe nyeriensis	Kenya
Aloe pillansii	South Africa - Cape Province
	Namibia
Aloe ramosissima	South Africa - Cape Province
	Namibia
Alsodeiopsis schumannii	**Tanzania (Lushoto, Tanga, Morogoro)**
Amanoa bracteosa	**Ghana**
	Côte d'Ivoire
	Liberia
	Sierra Leone
Amanoa strobilacea	**Angola - Cabinda**
	Cameroon
	Ghana
	Liberia
Angylocalyx braunii	**Kenya**
	Tanzania
Aningeria superba	Angola

Species	Distribution
Anisophyllea obtusifolia	Tanzania (East Usambara Mts.)
Anonidium usambarense	**Tanzania (Lushoto District)**
Anthonotha lebrunii	Zaire
Anthonotha nigerica	Nigeria (south-east)
	Zaire
*****Anthonotha obanensis***	**Nigeria (southern)**
Anthonotha vignei	**Ghana**
	Côte d'Ivoire
	Liberia
	Sierra Leone
Aoranthe penduliflora	**Tanzania**
Arbutus pavarii	Libya
Argania spinosa	Morocco
Aristogeitonia monophylla	**Kenya (Kilifi)**
	Tanzania (Tanga, Pangani & coast)
Asteranthe asterias ssp. asterias	**Kenya**
	Tanzania
Asteranthe asterias ssp. triangularis	**Tanzania (Lushoto & Handeni)**
Asteranthe trollii	Tanzania (Uluguru Mts.)
Atalaya capensis	South Africa - Cape Province
Atalaya natalensis	South Africa - Natal
Aubregrinia taiensis	**Ghana**
	Côte d'Ivoire
Bafodeya benna	Guinea
	Sierra Leone
Baikiaea ghesquiereana	**Tanzania (Rufiji & Kilwa Districts)**
Balsamocitrus camerunensis	Cameroon
Balthasaria shliebenii	Tanzania
Baphia abyssinica	Ethiopia
	Sudan (southeast)
Baphia cordifolia	Tanzania (Mpwapwa, Iringa)
Baphia dewildeana	Cameroon
	Nigeria (south-east)
Baphia keniensis	Kenya (Fort Hall)
Baphia kirkii	**Kenya**
	Mozambique
	Tanzania (Tanga, Uzaramo, Rufiji)
Baphia latiloi	Cameroon
	Nigeria (south-east)
Baphia leptostemma var. gracilipes	Cameroon

Species	Distribution
	Nigeria (south-east)
Baphia macrocalyx	**Mozambique (northern)**
	Tanzania (Lindi)
Baphia obanensis	Cameroon
	Nigeria (south-east)
Baphia pauloi	**Tanzania (Uluguru Mts.)**
Baphia puguensis	**Tanzania (Pugu & Kazimzumbwi)**
Baphia punctulata	**Mozambique**
	Tanzania
Baphia semseiana	**Tanzania (Morogoro & Ulanga)**
Bauhinia bowkeri	South Africa - Cape Province (Transkei)
Bauhinia loeseneriana	**Tanzania (south-east)**
Beilschmiedia ambigua	Zaire (Haut-Katanga)
Beilschmiedia bracteata	Zaire (central Forestier)
Beilschmiedia giorgii	Zaire (central Forestier)
Beilschmiedia kweo	**Tanzania (Usambara Mts.)**
Beilschmiedia mayumbensis	Zaire (Mayumbe)
Beilschmiedia vermoesenii	Zaire (Mayumbe)
****Berlinia coriacea***	**Nigeria (southern)**
Berlinia hollandii	**Nigeria (southern)**
Berlinia occidentalis	**Ghana**
	Côte d'Ivoire
	Liberia
	Sierra Leone
Berlinia orientalis	**Mozambique**
	Tanzania
Bersama swynnertonii	**Zimbabwe**
Bertiera pauloi	**Tanzania**
****Bombax mossambicense***	**Mozambique**
Bombax rhodognaphalon var. tomentosum	**Mozambique**
	Tanzania
Boscia foetida ssp. minima	Botswana
	South Africa - Cape Province
	South Africa - Transvaal
Boswellia ogadenensis	**Ethiopia (Harege)**
	Somalia (Webi Schebele River)
Boswellia pirottae	**Ethiopia**
Bottegoa insignis	Ethiopia
	Kenya
	Somalia (central & south)

Species	Distribution
Brachystegia angustistipulata	**Tanzania (Mahali Mts. & Mpanda)**
	Zaire
Brachystegia bakeriana	Angola
	Zambia
Brachystegia kennedyi	**Cameroon**
	Nigeria
Brachystegia nigerica	Cameroon
	Nigeria (southern)
Breviea sericea	**Ghana**
	Côte d'Ivoire
	Zaire
Brucea macrocarpa	Kenya
Bussea eggelingii	**Tanzania (Lindi)**
Bussea xylocarpa	**Mozambique (Zambezi River)**
Buxus obtusifolia	**Kenya (coastal)**
	Tanzania (Tanga & coast)
Byttneria ivorensis	**Côte d'Ivoire**
Calodendrum eickii	**Tanzania**
Caloncoba lophocarpa	Cameroon (Mt. Cameroon)
Camptolepis ramiflora	Kenya (east)
	?Madagascar
	Somalia (south)
	Tanzania
Campylospermum scheffleri	**Tanzania (Usambara & Uluguru Mts.)**
Canthium glaucum ssp. frangula	Kenya
Canthium impressinervium	**Tanzania (coast)**
Canthium keniense	Kenya
Canthium kilifiensis	Kenya
Canthium oligocarpum ssp. intermedium	**Kenya (Teita Hills)**
	Tanzania
Canthium racemulosum var. nanguanum	**Mozambique**
	Tanzania (Kilwa & Lindi)
Canthium robynsianum	Kenya
	Tanzania
Canthium rondoense	**Tanzania (Rondo Plateau)**
Canthium shabanii	**Tanzania**
Canthium siebenlistii	**Tanzania**
Canthium vollensenii	**Tanzania**
Casearia barteri	**Cameroon**
	Gabon

Species	Distribution
Casearia engleri	**Ghana**
Cassia aubrevillei	**Nigeria (south)**
	Tanzania (West Usambara Mts.)
	Gabon
Cassia fikifiki	**Côte d'Ivoire**
Cassipourea adami	**Côte d'Ivoire (south-west)**
Cassipourea eketensis	Guinea
Cassipourea firestoneana	Nigeria (Eket)
Cassipourea flanaganii	Liberia
	South Africa - Cape Province
	South Africa - Natal
Cassipourea hiotou	**Ghana**
	Côte d'Ivoire (south-west)
****Cassipourea obovata***	**Mozambique**
Cassipourea swaziensis	Swaziland
Cephalosphaera usambarensis	**Kenya (Shimba Hills)**
	Tanzania
Ceratonia oreothauma ssp. somalensis	Somalia (north)
Chassalia albiflora	**Tanzania**
Chlamydocarya anhydathoda	Gabon
Chlamydocarya soyauxii	Gabon (Libreville & Sibang)
Chrysophyllum azaguieanum	**Ghana**
	Côte d'Ivoire
Chytranthus longibracteatus	Tanzania
Chytranthus obliquinervis	**Kenya**
	Tanzania (East Usambara Mts.)
Citropsis gabunensis	**Ghana**
	Guinea-wide
Cleistanthus evrardii	Zaire (central Forestier)
Cliffortia arborea	South Africa - Cape Province
Coffea fadenii	Kenya (Mbololo Forest, Teita Hills)
Coffea lemblinii	**Côte d'Ivoire**
Coffea mongensis	**Tanzania**
Coffea mufindiensis ssp. mufindiensis	**Tanzania**
Coffea pseudozanguebariae	**Kenya**
	Tanzania
Coffea salvatrix	?Malawi
	Mozambique
	Tanzania (Rungwe)
	Zimbabwe

Species	Distribution
Coffea togoensis	Ghana
	Togo
Coffea zanguebariae	**Mozambique**
	Tanzania (Kilwa)
Cola attiensis	**Côte d'Ivoire**
Cola boxiana	**Ghana**
Cola bracteata	Uganda (Albertine Rift, Kalinzo Forest)
Cola clavata	**Mozambique**
Cola crispiflora	Gabon (Haut Ogooue)
Cola duparquetiana	Gabon (Lastoursville)
****Cola gigas***	**Nigeria (Oban)**
****Cola glabra***	**Nigeria (southern)**
Cola hypochrysea	Cameroon
	Nigeria (south-east)
Cola letestui	Gabon (Lastoursville)
Cola lourougnonis	**Cameroon**
	Côte d'Ivoire
Cola mossambicensis	**Malawi (southern)**
	Mozambique
	Zimbabwe
Cola nigerica	**Nigeria (southern)**
Cola octoloboides	Kenya
Cola porphyrantha	Kenya
Cola reticulata	**Ghana**
	Guinea (Mt. Nzo)
	Côte d'Ivoire
Cola scheffleri	Tanzania
Cola semecarpophylla	Cameroon
	Nigeria (south-east)
Cola ululoma	**Kenya**
	Tanzania (Pangani & coast)
Cola umbratilis	**Ghana**
	Côte d'Ivoire
Cola usambarensis	Tanzania
Colubrina nicholsonii	South Africa - Cape Province
Combretum mkuzense	South Africa - Natal
Combretum petrophilum	South Africa - Transvaal
Combretum tenuipetiolatum	**Kenya (coastal)**
	Tanzania (Tanga)
Commiphora acuminata	Tanzania (Ruaha Valley)

Species	**Distribution**
Commiphora alata	Somalia (south)
Commiphora albiflora	Ethiopia (Sidamo & Sidamo/Bale border)
	Somalia
Commiphora chaetocarpa	Kenya
	Somalia (central)
Commiphora ciliata	Ethiopia (southern)
	Kenya
	Somalia (central & south)
Commiphora corrugata	Ethiopia
	Kenya
	Somalia (central & south)
Commiphora guidottii	Ethiopia (Sidamo & Bale)
	Somalia
Commiphora hodai	Ethiopia (Harege)
	Somalia
Commiphora monoica	**Ethiopia (Bale)**
Commiphora obovata	Ethiopia
	Kenya
	Somalia (north & central)
Commiphora pseudopaolii	Kenya
	Somalia (central & south)
Commiphora sphaerophylla	Ethiopia (Harege)
	Somalia
Commiphora sulcata	Somalia (north & central)
Commiphora swynnertonii	Kenya
	Tanzania
Commiphora truncata	Ethiopia (Harege)
	Somalia
Commiphora unilobata	Ethiopia
	Kenya
	Somalia (central & south)
Cordeauxia edulis	Ethiopia
	Somalia
*****Cordia mandimbana***	**Mozambique**
Cordia mukuensis	Zaire (Haut-Katanga)
Cordia obovata	Oman
	Socotra
	Somalia (north-east)
*****Cordia stuhlmannii***	**Mozambique**
Cordia suckertii	Ethiopia

Species	Distribution
	Somalia (central)
Cordyla densiflora	Tanzania (Ruaha Valley)
Cordyla richardii	Sudan
	Uganda (W.Nile & Acholi)
Cordyla somalensis	Somalia
Craibia atlantica	**Cameroon**
	Ghana
	Côte d'Ivoire
	Nigeria
Craibia brevicaudata ssp. schliebenii	**Mozambique**
	Tanzania
Crateranthus talbotii	Nigeria (south-east)
Craterispermum longipedunculatum	**Tanzania**
Crotalaria exaltata	Ethiopia
Croton alienus	Kenya
Croton aubrevillei	**Ghana**
	Côte d'Ivoire
Croton dictyophlebodes	**Tanzania (West Usambara Mts.)**
Croton jatrophoides	**Tanzania**
Croton longipedicellatus ssp. austrotanzanicus	**Tanzania (coast)**
Croton megalocarpoides	Kenya
	Mozambique (northern)
	Somalia (south)
	Tanzania (Lindi & coast)
Croton talaeporos	Kenya
	Somalia (south)
Crotonogyne manniana	**Cameroon**
	Gabon
	Bioko
	Ghana
	Nigeria (Eket)
Cryptosepalum diphyllum	Nigeria (southern)
Cryptosepalum tetraphyllum	**Ghana**
	Guinea
	Côte d'Ivoire
	Liberia
	Sierra Leone
Cupressus atlantica	**Morocco (southern, near Tizi-n-Test)**
Cupressus dupreziana	**Algeria**
Cussonia bancoensis	**Ghana**

Species	Distribution
Cussonia gamtoosensis	South Africa - Cape Province
Cussonia kirkii var. bracteata	Tanzania (Lindi)
Cussonia kirkii var. quadripetala	Tanzania (Songea District)
Cussonia ostinii	Ethiopia (Gonder, Gojam, Welega, Kefa)
Cuviera migeodii	**Tanzania (coast)**
Cuviera schliebenii	**Tanzania (coast)**
Cuviera tomentosa	**Mozambique (north)**
	Tanzania (Kilwa)
Cynometra brachyrrhachis	**Tanzania (Tanga Region)**
Cynometra engleri	**Tanzania (Tanga Region)**
Cynometra filifera	**Tanzania (Lindi)**
Cynometra gillmanii	**Tanzania (Kilwa)**
Cynometra longipedicellata	**Tanzania (Tanga)**
Cynometra lukei	Kenya
	Tanzania (Selous Game Reserve)
Cynometra suaheliensis	**Kenya (Kwale, Kilifi)**
	Tanzania (Pangani)
Cynometra ulugurensis	**Tanzania (Morogoro)**
Cynometra webberi	**Kenya**
	Tanzania
Dacryodes igaganga	Cameroon
	Congo
	Gabon (Ngounie)
Dactyladenia dinklagei	**Ghana**
	Upper Guinea
Dactyladenia hirsuta	**Ghana**
	Côte d'Ivoire
Dahlgrenodendron natalense	South Africa - Cape Province
	South Africa - Natal
Dalbergia acariiantha	**Tanzania (Uzaramo, Lindi)**
Dalbergia eremicola	Kenya (Northern Frontier Province)
	Somalia
Dalbergia gilbertii	Zaire (Mayumbe)
****Dalbergia sambesiaca***	**Mozambique**
Dalbergia vacciniifolia	**Kenya**
	Tanzania
Dasylepis assinesis	**Ghana**
	Côte d'Ivoire
Dasylepis burtt-davyi	Malawi (Mt. Mulanje)
Dasylepis integra	**Kenya**

Species	Distribution
	Tanzania
Deinbollia acuminata	Zaire (Mayumbe)
Deinbollia longiacuminata	Zaire (central Forestier)
Deinbollia molliuscula	**Ghana**
	Côte d'Ivoire
Deinbollia nyasica	Malawi
Deinbollia rambaensis	Gabon (Ramba)
Delonix baccal	Ethiopia
	Kenya
	Somalia (south)
Delpydora macrophylla	Gabon (Libreville)
Dennettia tripetala	**Ghana**
	Guinea-wide
Desmostachys vogelii	**Cameroon**
	Ghana
	Nigeria
Dialium bipindense	Cameroon
	Gabon
Dialium holtzii	**Kenya**
	Mozambique
	Tanzania
Dialium orientale	**Kenya (Kilifi, Lamu)**
	Somalia (southern)
	Tanzania (Tanga)
Dichrostachys kirkii	Ethiopia (Harege)
	Somalia (south)
Dicraeopetalum stipulare	Ethiopia
	Kenya
	Somalia (central & south)
Dicranolepis usambarica	Kenya
	Tanzania
Didelotia idae	**Benin**
	Cameroon
	Ghana
	Côte d'Ivoire
	Liberia
	Nigeria
	Sierra Leone
	Togo
Didelotia unifoliolata	**Cameroon**

Species	Distribution
	Ghana
	Côte d'Ivoire
	Liberia
	Sierra Leone
	Zaire (central Forestier)
Diospyros amaniensis	**Kenya**
	Tanzania (Usambara Mts.)
Diospyros anitae	**Mozambique**
Diospyros barteri	**Cameroon**
	Ghana
	Nigeria
Diospyros capricornuta	**Tanzania**
Diospyros engleri	Tanzania (Pugu Forest reserve)
Diospyros feliciana	Guinea
Diospyros greenwayi	Kenya
	Tanzania
Diospyros kabuyeana	Kenya
	Tanzania (Tanga, coast & Mafia Is.)
Diospyros katendei	**Uganda (Kasyoka & Kitomi Forest)**
Diospyros magogoana	Tanzania (Rondo Plateau)
Diospyros occulata	Tanzania
Diospyros shimbaensis	Kenya
	Tanzania (coast & Mafia Is.)
Diospyros vermoesenii	Gabon (Tchibanga)
Diospyros wagemansii	Zaire
Diospyros wajirensis	Kenya
	Somalia
Diphasiopsis fadenii	Kenya
Dirachma somalensis	Somalia (central)
Dissotis angustifolia	Mozambique
Dissotis aprica	Tanzania
Dissotis arborescens	Tanzania (Iringa)
Dissotis bussei	Tanzania (Iringa & Kondoa)
Dissotis glandulicalyx	Tanzania (Mpanda District)
Dissotis humilis	Guinea
Dissotis johnstoniana var. strigosa	Malawi
Dissotis lanata	Malawi
Dissotis linearis	Guinea
Dissotis pygmaea	Guinea
Dissotis sessilis	Sierra Leone (Loma Mts.)

Species	Distribution
Dissotis splendens	Guinea
Dissotis sylvestris	Guinea
Dombeya amaniensis	Tanzania
Dombeya leachii	Mozambique
Dombeya rotundifolia var. velutina	Namibia
Dombeya sisyrocarpa	Tanzania (Uluguru Mts.)
Dombeya sphaeranthax	Tanzania
Dovyalis spinosissima	Malawi
Dracaena ombet	**Djibouti**
	Egypt (Gebel Elba)
	Ethiopia
	Somalia (northern)
	Sudan
	Uganda
Drypetes afzelii	**Ghana**
	Côte d'Ivoire
	Liberia
	Sierra Leone
Drypetes gerrardinoides	**Tanzania**
Drypetes laciniata	**Cameroon**
	Gabon
	Côte d'Ivoire (south-west)
Drypetes natalensis var. leiogyna	Kenya
	Somalia (south)
	Tanzania
Drypetes pellegrinii	**Ghana**
	Côte d'Ivoire
Drypetes sclerophylla	**Tanzania**
Drypetes singroboensis	**Ghana**
	Côte d'Ivoire
Drypetes usambarica var. mrimae	Kenya
Drypetes usambarica var. rugulosa	**Tanzania**
Drypetes usambarica var. stylosa	**Tanzania**
Drypetes usambarica var. trichogyna	**Tanzania**
Drypetes usambarica var. usambarica	**Kenya**
	Tanzania
Ehretia glandulosissima	**Tanzania (Lindi Region)**
Ellipanthus hemandradenioides	Kenya (Kwale, Kilifi)
	Tanzania (Tanga, Utete & Lindi)
Enantia kummeriae	**Tanzania (East Usambara Mts.)**

Species	Distribution
Englerodendron usambarense	**Tanzania (Lushoto)**
Erica caterviflora	South Africa - Cape Province
Eriocoelum oblongum	Gabon
	Nigeria (south-east)
Eriocoelum pungens var. inermis	Nigeria (Degema, Eket)
Erythrina greenwayi	Tanzania (Ruaha Valley)
Erythrina haerdii	**Tanzania (Ulanga)**
Erythrina sacleuxii	**Kenya**
	Tanzania
Erythrina schliebenii	**Tanzania (Lindi)**
Erythrophysa septentrionalis	**Ethiopia (Harerge)**
Erythrophysa transvaalensis	South Africa - Transvaal
Eugenia erythrophylla	South Africa - Cape Province
	South Africa - Natal
Eugenia tabouensis	**Côte d'Ivoire (Bas-Cavally)**
Eugenia umtamvunensis	South Africa - Cape Province
	South Africa - Natal
Eugenia verdoorniae	South Africa - Cape Province
	South Africa - Natal
Eugenia zeyheri	South Africa - Cape Province
Euphorbia betulicortex	**Ethiopia (Sidamo)**
Euphorbia bwambensis	Uganda (Bwamba Forest)
Euphorbia cussonioides	Kenya
Euphorbia doloensis	**Ethiopia (Sidamo)**
Euphorbia dumeticola	Tanzania (Ruaha Valley)
Euphorbia hubertii	Tanzania (Mwanza, Musoma)
****Euphorbia lividiflora***	**Malawi**
	Mozambique
	Tanzania (Mikindani)
	Zimbabwe
Euphorbia magnicapsula var. lacertosa	Kenya
	Sudan
	Uganda
Euphorbia nigrispinioides	**Ethiopia (Shewa Upland)**
Euphorbia noxia	Somalia (north)
Euphorbia pseudoburuana	Kenya (Masai)
	Tanzania (Masai)
Euphorbia quadrialata	Tanzania (Pare, Lushoto, Handeni)
Euphorbia sekukuniensis	South Africa - Transvaal (Lebowa)
Euphorbia somalensis	**Ethiopia**

Species	Distribution
Euphorbia tanaensis	Kenya (Witu Forest)
Euphorbia thulinii	Somalia (north-east)
Euphorbia uniglans	**Ethiopia (Sidamo)**
Euphorbia wakefieldii	Kenya (Mombasa-Kilifi)
	Tanzania (South Pare Mts.)
Euphorbia zoutpansbergensis	South Africa - Transvaal (Zoutpansberg)
Fagara brieyi	Zaire
Fagara mezoneurospinosa	**Côte d'Ivoire**
Faurea macnaughtonii	South Africa - Cape Province
	South Africa - Natal
	Swaziland
	South Africa - Transvaal
Fernandoa lutea	**Tanzania (Rondo Plateau)**
Ficus bizanae	South Africa - Cape Province
	South Africa - Natal
Ficus oreslia	Cameroon
Ficus ruspolii	**Ethiopia (Kefa)**
Fleurydora felicis	Guinea
Garcinia acutifolia	**Mozambique**
	Tanzania (Uzaramo)
Garcinia bifasciculata	**Tanzania (Morogoro District)**
Garcinia brevipedicellata	Cameroon
	Nigeria (south-east)
Garcinia echirensis	Gabon (Belinga Mts.)
Garcinia punctata	Gabon (Belinga Mts.)
Garcinia semseii	**Tanzania (Nguru & Uluguru Mts.)**
Garcinia staudtii	Cameroon
	Nigeria (south-east)
Gardenia transvenulosa	**Kenya**
	Tanzania
Gigasiphon macrosiphon	**Kenya**
	Tanzania (Usambara Mts. & Lindi)
Gilbertiodendron bilineatum	**Ghana**
	Côte d'Ivoire
	Liberia
	Sierra Leone
Gilbertiodendron klainei	Gabon (Libreville)
Gilbertiodendron pachyanthum	Cameroon
Gilbertiodendron robynsianum	**Côte d'Ivoire (south-west)**
Gilbertiodendron splendidum	**Ghana**

Species	Distribution
	Côte d'Ivoire
	Sierra Leone
Gilletiodendron glandulosum	Mali (Kita Massif)
Gilletiodendron pierreanum	Cameroon
	Gabon
Gluema ivorensis	**Cameroon**
	Gabon
	Ghana
	Côte d'Ivoire
****Glyphaea tomentosa***	**Mozambique**
Greenwayodendron suaveolens ssp. usambaricum	**Tanzania (East Usambara Mts.)**
Grewia goetzeana	Tanzania
****Grewia limae***	**Mozambique**
****Grewia transzambesica***	**Mozambique**
Greyia flanaganii	South Africa - Cape Province (Ciskei)
Guibourtia schliebenii	**Mozambique**
	Tanzania
****Guibourtia sousae***	**Mozambique**
Gymnostemon zaizou	**Côte d'Ivoire (Sassandra & Cavally)**
Hannoa ferruginea	Cameroon
	Nigeria (Mt. Koloishe)
Hannoa kitombetombe	Zaire (Haut-Katanga)
Haplocoelopsis africana	Angola
	Kenya
	Tanzania
Haplocoelum mombasense	Kenya
	Tanzania
Haplocoelum trigonocarpum	Kenya
	Mozambique
	Somalia
	Tanzania
Heinsenia diervilleiodes ssp. mufindiensis	**Tanzania**
Hemandradenia chevalieri	**Ghana**
	Côte d'Ivoire
Hemandradenia mannii	**Eq. Guinea**
	Côte d'Ivoire (south-west)
	Nigeria
****Hexalobus mossambicensis***	**Mozambique (north)**
Hexalobus salicifolius	**Cameroon (south-west)**

Species	Distribution
	Côte d'Ivoire (south-west)
Hildegardia gillettii	Somalia (south)
Hirtella megacarpa	**Tanzania (West Usambara & Udzungwa)**
Holmskioldia gigas	**Kenya (Mwarakaya)**
	Tanzania
Homalium dalzielii	Benin (Dja & Kpoguidi)
	Nigeria (Lagos)
Homalium gracilipes	Tanzania (Luwira-Kiteza Forest reserve)
Homalium latoursvillensis	**Gabon (Lastoursville)**
	Côte d'Ivoire (west & south-west)
Homalium rufescens	South Africa - Cape Province
	South Africa - Natal
Homalium smythei	**Guinea**
	Côte d'Ivoire (south-west)
	Liberia
	Sierra Leone
Hoplestigma pierreanum	Cameroon (Mt. Cameroon)
Hunteria ghanensis	**Ghana**
	Upper Guinea
Hymenostegia aubrevillei	**Ghana**
	Côte d'Ivoire
	Nigeria
Hymenostegia bakeriana	Nigeria (Oban)
Hymenostegia gracilipes	**Ghana**
Hymenostegia klainei	Gabon
Hymenostegia normandii	Gabon
Hymenostegia talbotii	Nigeria (Eket)
Ilex mitis var. schliebenii	**Tanzania (Uluguru Mts.)**
Indigofera rothii	Ethiopia (Shewa Upland, Harerge)
Isoberlinia scheffleri	**Tanzania (Lushoto District)**
Isolona congolana	Uganda (Toro)
	Zaire (For. Central, Bas-Katanga)
Isolona deightonii	**Ghana**
	Sierra Leone
Isolona dewevrei	Zaire (Mayumbe)
Isolona heinsenii	**Tanzania (Lushoto & Ulanga Districts)**
Ixora albersii	**Tanzania**
Ixora scheffleri ssp. keniensis	Kenya (Mt. Kenya)
Ixora scheffleri ssp. scheffleri	**Malawi**

Species	Distribution
Julbernardia letouzeyi	**Tanzania**
Julbernardia magnistipulata	Cameroon
	Kenya
	Tanzania
Julbernardia unijugata	Tanzania (Kigoma District)
Keetia koritschaneri	**Tanzania**
Keetia purpurascens	**Tanzania**
Kirkia burgeri ssp. burgeri	Ethiopia
Kirkia burgeri ssp. somalensis	Somalia (north)
Kirkia dewinteri	Namibia
Kotschya platyphylla	**Tanzania (Iringa)**
Kraussia speciosa	**Kenya**
	Tanzania (Shimba Hills,Dzomba & Witu)
Lagynias pallidiflora	**Kenya**
	Tanzania
Lagynias rufescens ssp. angustiloba	**Tanzania**
Lannea asymmetrica	Tanzania (Mahali)
	Zaire
	Zambia
Lasianthus grandifolius	**Tanzania**
Lasianthus kilimandscharicus ssp. laxinervis	**Tanzania**
Lasianthus pedunculatus	**Tanzania**
Lasianthus wallacei	**Tanzania**
Lasiodiscus mildbraedii ssp. ferrugineus	Kenya (coastal)
Lecaniodiscus punctatus	**Cameroon**
	Ghana (Baku & Supong Forests)
Lecomtedoxa heitzana	Gabon
Lecomtedoxa nogo	Gabon (Fernan Vaz)
Leptactina delagoensis ssp. bussei	**Tanzania**
Leptactina papyrophloea	**Tanzania (Rondo Plateau)**
Leptonychia mayumbensis	Zaire (Mayumbe)
Leptonychia wagemansii	Zaire (Mayumbe)
Lettowianthus stellatus	**Kenya**
	Tanzania (Morogoro, Ulanga & Lindi)
Leucadendron argenteum	South Africa - Cape Province
Leucadendron discolor	South Africa - Cape Province
Leucadendron nobile	South Africa - Cape Province
Leucadendron strobilinum	South Africa - Cape Province
Lijndenia brenanii	**Tanzania**
Lijndenia greenwayii	**Tanzania**

Species	Distribution
Loesenera talbotii	Cameroon
	Nigeria (Oban)
Loesenera walkeri	Gabon
Lonchocarpus kanurii	Kenya
	Somalia (south)
Macaranga beillei	**Côte d'Ivoire**
Macaranga conglomerata	**Kenya (Teita Hills)**
	Tanzania (Magamba & Sungwi Forests)
Macaranga paxii	Cameroon
	Nigeria (south-east)
*****Maerua acuminata***	**Mozambique**
	Tanzania (Lindi)
*****Maerua andradae***	**Mozambique**
*****Maerua brunnescens***	**Mozambique**
Maerua elegans	Zaire (Bas-Katanga)
*****Maerua scandens***	**Mozambique**
Magnistipula butayei var. greenwayi	**Tanzania**
	Zaire (Haut-Katanga & Bas-Katanga)
Magnistipula butayei var. sargosii	**Ghana**
Mallotus oppositifolius var. lindicus	**Mozambique**
	Tanzania (Kilwa & Lindi)
Mammea usambarensis	**Tanzania (West Usambara Mts.)**
Manilkara nicholsonii	South Africa - Cape Province
	South Africa - Natal
Maytenus abbottii	South Africa - Cape Province
	South Africa - Natal
Maytenus acuminata var. uva-ursi	Malawi
Maytenus addat	Ethiopia
Maytenus arbutifolia var. sidamoensis	Ethiopia (Sidamo)
Maytenus bachmannii	South Africa - Cape Province
	South Africa - Natal
Maytenus harenensis	**Ethiopia (Bale)**
Maytenus oleosa	South Africa - Cape Province
	South Africa - Natal
Medusandra richardsiana	Cameroon
Memecylon bequaertii	Uganda (Impenetrable Forest & Kigezi)
	Zaire
Memecylon brenanii	Tanzania (Usambara Mts.)
Memecylon candidum	Cameroon
	Nigeria (south-east)

Species	Distribution
Memecylon greenwayii	Tanzania (Usambara Mts.)
Memecylon teitense	Kenya (Teita Hills)
Mesogyne insignis	**Sao Tome**
	Tanzania
Micrococca scariosa	**Kenya**
	Tanzania
Mildbraedia carpinifolia	**Kenya**
	Mozambique
	Tanzania
Millettia bussei	**Mozambique**
	Tanzania
Millettia conraui	Cameroon
	Nigeria (south-east)
Millettia elongistyla	**Tanzania (Morogoro & Ulanga Districts)**
Millettia eriocarpa	**Tanzania (Lindi & Newala)**
Millettia macrophylla	Cameroon
	Nigeria (south-east)
Millettia micans	**Tanzania**
****Millettia mossambicensis***	**Mozambique**
Millettia oblata ssp. intermedia	**Tanzania**
Millettia oblata ssp. oblata	**Tanzania**
Millettia oblata ssp. stolzii	**Tanzania (Rungwe District)**
Millettia oblata ssp. teitensis	Kenya (Teita District)
Millettia psilopetela	Uganda
	Zaire (central & east)
Millettia sacleuxii	**Tanzania (Lushoto & Morogoro)**
Millettia schliebenii	**Tanzania**
Millettia semseii	**Tanzania**
Millettia sericantha	**Tanzania (Morogoro District)**
Millettia stenopetala	Zaire (central Forestier)
Millettia usaramensis ssp. usaramensis var. parvifolia	**Tanzania (Kilwa)**
Millettia warneckei	**Ghana**
	Guinea
	Liberia
	Sierra Leone
	Togo
Mimetes arboreus	South Africa - Cape Province
Mimusops angel	Somalia (north-east)
Mimusops penduliflora	Tanzania
Mkilua fragrans	**Kenya**

Species	Distribution
	Tanzania
Monadenium parviflorum	Malawi (Nyika Plateau)
Monadenium spinescens	Tanzania (Chunya)
Monanthotaxis capea	**Côte d'Ivoire (Mudjika Forest)**
Monocyclanthus vignei	**Ghana**
	Liberia
****Monodora junodii var. macrantha***	**Mozambique**
****Monodora unwinii***	**Nigeria (western)**
Monopetalanthus compactus	Liberia
	Sierra Leone
Monopetalanthus durandii	Gabon (Monts de Cristal)
Monopetalanthus hedinii	Cameroon
Monopetalanthus richardsiae	Tanzania (Kigoma & Manda Districts)
	Zaire (Katanga)
	Zambia
Monotes lutambensis	**Tanzania**
Morinda asteroscepa	**Malawi**
	Tanzania
Moringa arborea	Kenya (Rhamu)
Multidentia castaneae	**Tanzania (coast)**
Multidentia sclerocarpa	**Kenya (Mkongani North Forest)**
	Tanzania (East Usambara Mts.)
Mussaenda microdonta var. microdonta	**Tanzania**
Mussaenda monticola var. glabrescens	**Tanzania**
Mussaenda monticola var. monticola	**Kenya**
	Tanzania
Napoleonaea lutea	Nigeria (Eket)
Napoleonaea parviflora	Nigeria (Oban)
Napoleonaea reptans	Nigeria (Eket)
Necepsia castaneifolia ssp. chirindica	**Zimbabwe**
Necepsia castaneifolia ssp. kimbozensis	**Tanzania**
Neoboutonia mannii	Cameroon
	Nigeria (south-east)
Neochevalierodendron stephanii	Gabon
Neohemsleya usambarensis	Tanzania (West Usambaras & Nguru Mts.)
Neolemonniera clitandrifolia	**Ghana**
	Liberia
	Nigeria (south-east)
	Sierra Leone
Neostenanthera hamata	**Ghana**

Species	Distribution
	Côte d'Ivoire
	Liberia
	Sierra Leone
Neostenanthera robsonii	Gabon (Lastoursville & Moumba)
Nesogordonia holtzii	Kenya
	Mozambique (Zambesi Region)
	Tanzania (Mafia Island)
Newtonia erlangeri	Kenya (Boni Forest & Tana River)
	Somalia
	Tanzania
Newtonia paucijuga	**Kenya**
	Tanzania
Nicotiana africana	Namibia
Nothospondias staudtii	**Cameroon**
	Gabon
	Ghana
	Côte d'Ivoire
	Nigeria
Nuxia glomerulata	South Africa - Transvaal
****Ochna angustata***	**Mozambique (central coast)**
****Ochna beirensis***	**Mozambique (central coast)**
Ocotea argylei	Kenya
Ocotea gabonensis	Gabon (Lastoursville)
Octoknema orientalis	**Tanzania (Udzungwa & Mahenge Mts.)**
Oddoniodendron normandii	Gabon
Oldenburgia grandis	South Africa - Cape Province
Olea chimanimani	Mozambique
	Zimbabwe (Chimanimani Forest)
Olea laperrinei	Algeria
	Morocco
	Niger
	Sudan
Olea schliebenii	Tanzania (Uluguru Mts.)
Ophrypetalum odoratum ssp. longipedicellatum	**Tanzania (Morogoro District)**
Ophrypetalum odoratum ssp. odoratum	**Kenya**
	Tanzania
Opilia campestris var. strobilifera	Ethiopia (Harege)
Oricia suaveolens	**Ghana**
	Guinea
	Côte d'Ivoire

Species	Distribution
	Nigeria
	Sierra Leone
	Zaire
Oricia trifoliolata	Cameroon (Limbe)
Oriciopsis glaberrima	Cameroon (Bertona)
Ormocarpum sennodes ssp. zanzibaricum	**Kenya**
	Tanzania
Ouratea amplectens	**Ghana**
	Liberia
Ouratea sacleuxii	Kenya (Shimba Hills)
	Tanzania
Ouratea schusteri	Kenya (Teita Hills & Kasigau)
	Tanzania (West Usambara & Uluguru Mts.)
Oxyanthus lepidus ssp. kigogoensis	**Tanzania**
Oxyanthus pyriformis ssp. brevitubus	**Kenya**
	Tanzania (Mt. Meru)
Oxyanthus pyriformis ssp. longitubus	Kenya
Oxyanthus pyriformis ssp. tanganyikensis	**Tanzania**
Oxystigma msoo	**Kenya (Pangani & Tana Delta)**
	Tanzania
Ozoroa namaquensis	South Africa - Cape Province
	Namibia
Ozoroa reticulata var. nyasica	Malawi (Mt. Mulanje)
Pachypodium namaquanum	South Africa - Cape Province
	Namibia
Pachystela subverticillata	Kenya
Pachystigma burtti ssp. burtti	Tanzania (central)
Pachystigma burtti ssp. hirtiflorum	Tanzania (Ruaha Valley)
Pachystigma gillettii	Kenya
Pachystigma loranthifolium ssp. loranthifolium	**Kenya**
	Tanzania
Pandanus embuensis	Kenya
Pandanus kajui	Kenya (central)
Paranecepsia alchorneifolia	**Mozambique**
	Tanzania (Selous Game Reserve & Ruaha)
Parkinsonia raimondoi	Somalia
Pausinystalia lane-poolei	**Ghana**
	Liberia

Species	Distribution
	Sierra Leone
Pavetta abyssinica var. usambarica	**Tanzania**
Pavetta axillipara	**Tanzania (Morogoro District)**
Pavetta comostyla ssp. nyassica var. matengoana	**Tanzania (Lake Nyasa)**
Pavetta comostyla ssp. nyassica var. nyassica	**Malawi**
	Tanzania (Rungwe)
Pavetta holstii	**Tanzania**
Pavetta intermedia	Uganda (Kibale Forest)
	Zaire
Pavetta johnstonii ssp. breviloba	**Tanzania**
	Zambia
Pavetta kyimbilensis var. iringensis	**Tanzania**
Pavetta kyimbilensis var. kyimbilensis	**Tanzania (Lake Nyasa)**
Pavetta linearifolia	**Kenya**
	Tanzania (coastal)
Pavetta lynesii	**Tanzania**
Pavetta macrosepala var. macrosepala	**Tanzania (Selous G.R. & Mikindani)**
Pavetta macrosepala var. puberula	**Tanzania (coast)**
Pavetta manyanguensis	**Tanzania**
Pavetta mollissima	**Ghana**
	Côte d'Ivoire
Pavetta nitidissima	**Tanzania**
Pavetta sepium var. massaica	**Tanzania (north)**
Pavetta sepium var. sepium	**Kenya (Loitokitok & Teita Hills)**
	Tanzania
Pavetta sparsipila	**Tanzania (Uluguru Mts.)**
Pavetta sphaerobotrys	**Kenya (Lower Tana River)**
	Somalia (southern)
	Tanzania (Tanga & coast)
Pavetta sphaerobotrys ssp. lanceisepala	**Tanzania (coast)**
Pavetta sphaerobotrys ssp. sphaerobotrys	**Tanzania**
Pavetta subumbellata var. subcoriacea	**Malawi**
	Tanzania (Iringa)
Pavetta tarennoides	Kenya (Shimba Hills)
Pavetta teitana	Kenya
Pavetta tendagurensis var. glabrescens	**Tanzania (coast)**
Pavetta tendagurensis var. tendagurensis	**Tanzania (coast)**
Peddiea kivuensis	Zaire (central Forestier)
Pellegriniodendron diphyllum	**Cameroon**
	Gabon

Species	Distribution
	Ghana
	Côte d'Ivoire
Phyllanthus inflatus	**Zimbabwe**
Phyllanthus profusus	**Ghana**
	Guinea
	Liberia
Pierreodendron kerstingii	**Benin (Bassila Peninsula)**
	Ghana
	Côte d'Ivoire
	Togo
Piptostigma fugax	**Ghana**
	Côte d'Ivoire
	Liberia
Piptostigma giganteum	Nigeria (Oban)
Piptostigma oyemense	Gabon (Oyem)
Pistacia khinjuk var. glabra	Egypt
	Israel
	Palestine
	Saudi Arabia
Pittosporum goetzei	**Tanzania**
Placodiscus amaniensis	Tanzania
Placodiscus attenuatus	**Ghana**
	Côte d'Ivoire
	Upper Guinea
Placodiscus bancoensis	**Ghana**
	Côte d'Ivoire
Placodiscus boya	**Ghana**
	Côte d'Ivoire
Placodiscus bracteosus	**Ghana**
	Côte d'Ivoire
Placodiscus oblongifolius	**Ghana**
	Upper Guinea
Placodiscus paniculatus	Zaire (central Forestier)
Placodiscus pedicellatus	Tanzania
Placodiscus pseudostipularis	**Ghana**
	Côte d'Ivoire
	Liberia
	Sierra Leone
Plagiosiphon gabonensis	Gabon (Lastoursville)
Platypterocarpus tanganyikensis	**Tanzania (Usambara Mts.)**

Species	Distribution
Polyceratocarpus scheffleri	**Tanzania**
Polyscias farinosa	Ethiopia
Polyscias kikuyuensis	Kenya (central)
Polyscias stuhlmannii var. inarticulata	**Tanzania (West Usambara Mts.)**
Polyscias stuhlmannii var. stuhlmannii	**Kenya (Teita Hills)**
	Tanzania
Polysphaeria macrantha	**Tanzania**
Populus ilicifolia	Kenya
	Tanzania
Pouteria pseudoracemosa	Tanzania
Premna grandifolia	**Côte d'Ivoire**
Premna maxima	Kenya
Protea aurea ssp. potbergensis	South Africa - Cape Province
Protea comptonii	South Africa - Natal
	Swaziland
	South Africa - Transvaal
Protea curvata	South Africa - Transvaal
Protea laetans	South Africa - Transvaal
Protea lanceolata	South Africa - Cape Province
Protea nyasae	Malawi (Mt. Mulanje)
Protea roupelliae var. hamiltonii	South Africa - Transvaal
Pseudagrostistachys africana	**Cameroon**
	Eq. Guinea
	Bioko
	Sao Tome
	Ghana
	Nigeria
	Fernando Po
Pseudosabicea sanguinosa	Gabon
Pseudosalacia streyi	South Africa - Cape Province
	South Africa - Natal
Pseudoscolopia polyantha	South Africa - Cape Province
	South Africa - Natal
Psoralea arborea	South Africa - Natal
	Swaziland
Psychotria albidocalyx var. mosambicensis	Mozambique
Psychotria alsophila	**Kenya (Teita Hills)**
	Tanzania
Psychotria crassipetala	Kenya (Teita District)
Psychotria cyathicalyx	**Tanzania**

Species	Distribution
Psychotria elachistantha	**Tanzania**
Psychotria goetzei var. goetzei	**Tanzania**
Psychotria goetzei var. platyphylla	**Tanzania**
Psychotria megalopus	**Tanzania**
Psychotria megistantha	**Tanzania**
Psychotria peteri	**Tanzania**
Psychotria petitii	**Kenya (Teita District)**
Psychotria pseudoplatyphylla	**Kenya (Teita Hills)**
	Tanzania (Mt. Meru; Mt. Kilimanjaro)
Psychotria taitensis	Kenya (Teita District)
Psychotria zombamontana	**Tanzania**
Psydrax faulknerae	**Kenya**
	Tanzania
Psydrax kibuwae	**Tanzania**
Psydrax micans	**Mozambique**
	Tanzania (Rufiji, Kilwa, Lindi)
Pteleopsis barbosae	**Mozambique**
Pteleopsis habeensis	**Ghana**
	Mali (Bandiagara)
	Nigeria (Yankari Game Reserve)
Pteleopsis tetraptera	Kenya (Mombasa, Kilifi)
	Tanzania (Tanga)
Pterocarpus brenanii	Mozambique
	Zambia
Pterocarpus mildbraedii ssp. usambarensis	**Tanzania**
Pycnocoma littoralis	**Tanzania (coast)**
Pycnocoma macrantha	**Tanzania (Pimbi Mts.)**
Pyrus mamorensis	Morocco
Quercus afares	Algeria
Rapanea gilliana	South Africa - Cape Province
Raspalia trigyna	South Africa - Cape Province
	South Africa - Natal (southern)
Rawsonia burtt-davyi	Malawi (Mt. Mulanje)
Rhaptopetalum beguei	**Cameroon**
	Gabon
	Bioko
	Ghana
	Côte d'Ivoire
	Nigeria (Ogoja & Calabar Forests)
Rhaptopetalum sindarense	Gabon (Ngounye)

Species	Distribution
Rhipidantha chlorantha	**Tanzania**
****Rhodognaphalon mossambicense***	**Mozambique**
Rhus brenanii	**Tanzania**
Rhus glutinosa ssp. abyssinica	Djibouti
	Egypt
	Eritrea
	Ethiopia (SE & NW Highlands)
	Sudan
Rhus glutinosa ssp. glutinosa var. unifoliolata	**Ethiopia (Gojam)**
Rhynchocalyx lawsonioides	South Africa - Cape Province
	South Africa - Natal (southern)
Ricinodendron heudelotii ssp. africanum var. tomentellum	**Kenya**
	Tanzania
Rinorea convallarioides var. marsabitensis	Kenya
Rinorea djalonensis	Guinea
Rinorea keayi	Nigeria (Obudu)
Robynsia glabrata	**Ghana**
	Côte d'Ivoire
	Nigeria (south)
Rothmannia macrosiphon	**Kenya**
	Tanzania
Rytigynia adenodonta var. adenodonta	**Malawi**
	Tanzania (Ufipa & Rungwe)
	Zambia (Nyika Plateau)
Rytigynia adenodonta var. reticulata	**Malawi**
	Tanzania (Iringa)
	Zambia (Nyika Plateau)
Rytigynia binata	**Tanzania (coast)**
Rytigynia bugoyensis ssp. glabriflora	**Malawi**
	Tanzania (Kilosa & Songea)
Rytigynia caudatissima	**Tanzania**
Rytigynia celastroides var. nuda	**Tanzania (coast)**
Rytigynia eickii	**Kenya (Teita Hills)**
	Tanzania
Rytigynia hirsutiflora	**Tanzania**
Rytigynia induta	**Kenya**
	Tanzania (Loliondo, Kondo, Mt. Ufiomi)
Rytigynia lichenoxenos ssp. glabrituba	**Tanzania**
Rytigynia lichenoxenos ssp. lichenoxenos	**Tanzania**
Rytigynia longipedicellata	**Tanzania**

Species	Distribution
Rytigynia nodulosa	**Tanzania**
Rytigynia pseudolongicaudata	**Tanzania**
Sabicea caminata	Gabon (Belinga & Makokou)
Salacia miegei	**Côte d'Ivoire**
Salix antiatlantica	Morocco
Sapium aubrevillei	**Ghana (Atewa)**
	Côte d'Ivoire
Sapium leonardii-crispi var. leonardii-crispi	Uganda (Kayonza Forest Reserve)
	Zaire (Kivu)
Sapium triloculare	**Kenya (Pangani Rocks)**
	Tanzania (Uzaramo, Masai, Newala)
Savia fadenii	Kenya
Scaphopetalum parvifolium	Nigeria (southern)
Scaphopetalum talbotii	Cameroon
	Nigeria (south-east)
Schefflera lukwangulensis	**Tanzania**
Schefflerodendron usambarense	**Gabon**
	Tanzania
	Zaire
Schizocolea linderi	Côte d'Ivoire
	Liberia
	Sierra Leone
Schumanniophyton problematicum	**Ghana**
	Côte d'Ivoire
	Sierra Leone
Sclerocarya gillettii	Kenya
Scolopia oreophila	South Africa - Natal
Sericanthe odoratissima var. odoratissima	**Tanzania**
Sericanthe odoratissima var. ulugurensis	**Malawi**
	Tanzania (Uluguru Mts. & Mwakaleli)
Sericanthe toupetou	**Ghana**
	Côte d'Ivoire
Sesbania goetzei ssp. multiflora	Tanzania (Pare District)
Sesbania kapangensis	Zaire (Kasai)
Sibangea pleioneura	**Tanzania (Udzungwa Mts.)**
Sindoropsis letestui	Cameroon
	Gabon
Sorindeia calantha	**Tanzania**
Sorindeia mildbraedii	Cameroon
	Nigeria (south-east)

Species	Distribution
Spathandra barteri	**Ghana**
	Guinea-wide
Stadmannia oppositifolia ssp. rhodesiaca	South Africa - Natal
	South Africa - Transvaal
	Zimbabwe
Staudtia kamerunensis	Cameroon
Steganotaenia commiphoroides	Ethiopia (south)
	Somalia
Sterculia alexandri	South Africa - Cape Province
Sterculia schliebenii	**Kenya**
	Mozambique
	Tanzania
Strelitzia alba	**South Africa - Cape Province**
Strychnos chromatoxylon	**C. African Rep.**
	Cameroon
	Côte d'Ivoire
Strychnos mellodora	**Kenya**
	Mozambique
	Tanzania
	Zimbabwe
Strychnos millepunctata	**Côte d'Ivoire**
Stuhlmannia moavi	**Kenya**
	Tanzania (Handeni & Lindi)
Suregada lithoxyla	**Tanzania**
Symphyochlamys erlangeri	Somalia (south)
Synadenium compactum var. compactum	Kenya (Kamba, Embu)
Synsepalum aubrevillei	**Ghana**
	Côte d'Ivoire
Synsepalum glycydorum	Nigeria (south-east)
Synsepalum kassneri	**Kenya (Shimba Hills)**
	Mozambique (Manica & Sofala)
	Tanzania (coast & Lindi)
	Zimbabwe (east)
Synsepalum tsounkpe	**Côte d'Ivoire**
Syzygium pondoense	South Africa - Cape Province
	South Africa - Natal
Talbotiella eketensis	Nigeria (southern)
Talbotiella gentii	**Ghana**
Tannodia swynnertonii	**Mozambique**

Species	Distribution
	Tanzania
	Zimbabwe
Tapiphyllum schliebenii	**Tanzania (Lindi)**
Tapura ivorensis	**Ghana**
	Côte d'Ivoire
Tarenna drummondii	**Kenya**
	Tanzania
Tarenna luhomeroensis	**Tanzania**
Tarenna quadrangularis	**Tanzania**
Teclea borenensis	Ethiopia (SE Highlands)
	Kenya
Teclea carpopunctifera	**Côte d'Ivoire (Fresco)**
Teclea eggelingii	Tanzania
	Uganda (Itwara & Mabira Forests)
Teclea ferruginea	Mali (Sangali)
Teclea hanangensis var. hanangensis	Kenya
	Tanzania
Teclea hanangensis var. unifoliolata	Kenya
Teclea macedoi	Mozambique
Temnocalyx nodulosus	**Tanzania (Lake Nyasa)**
Tephrosia pondoensis	South Africa - Cape Province
	South Africa - Natal
Ternstroemia polypetala	Tanzania
Tessmannia burttii	Tanzania (Mpanda)
	Zambia
Tessmannia densiflora	**Tanzania (Rufiji & Kilwa Districts)**
Tessmannia martiniana var. martiniana	**Tanzania (coast)**
Tessmannia martiniana var. pauloi	**Tanzania (coast)**
Tetraberlinia moreliana	Gabon
Tetrorchidium ulugurense	**Tanzania (Morogoro District)**
Toussaintia orientalis	**Tanzania (Uzaramo & Ulanga Districts)**
Tricalysia acidophylla	**Tanzania**
Tricalysia africana	South Africa - Cape Province
Tricalysia anomala var. anomala	**Tanzania**
Tricalysia anomala var. montana	**Rwanda**
	Tanzania (Kwiro Forest Reserve)
	Zaire (Kivu)
Tricalysia concolor	Gabon (Belinga)
Tricalysia nyassae var. angustifolia	**Mozambique**
	Zimbabwe (Mozambique border)

Species	Distribution
Tricalysia obstetrix	Gabon (Belinga)
Tricalysia ovalifolia var. glabrata	**Kenya**
	Tanzania
Tricalysia ovalifolia var. taylorii	**Kenya**
	Tanzania
Tricalysia pangolina	Gabon (Nzoumou)
Tricalysia pedicellata	**Tanzania**
Tricalysia schliebenii	**Tanzania (coast)**
Tricalysia soyauxii var. pedunculosa	Gabon
Tricalysia soyauxii var. pilosula	Gabon
Tricalysia vignei	**Ghana**
	Côte d'Ivoire (west)
Trichilia lovettii	Tanzania (Udzungwa Mts.)
Trichilia ornithothera	**Ghana**
	Côte d'Ivoire
Trichocladus dentatus	Tanzania (Rungwe)
Trichocladus goetzei	**Tanzania (Uluguru Mts, Iringa, Rungwe)**
Trichoscypha albiflora	**Ghana**
	Liberia
Trichoscypha atropurpurea	**Ghana**
	Liberia
	Nigeria
Trichoscypha beguei	**Ghana**
	Côte d'Ivoire
	Liberia
Trichoscypha cavalliensis	**Ghana**
	Côte d'Ivoire
	Liberia
Trichoscypha chevalieri	**Ghana**
	Côte d'Ivoire
Trichoscypha liketensis	Zaire (central Forestier)
Trichoscypha mannii	Cameroon
	Nigeria (south-east)
Trichoscypha parvifoliolata	Zaire (Kasai)
Trichoscypha preussii	Cameroon
	Ghana
	Nigeria (south-east)
Trichoscypha ulugurensis ssp. submontana	Uganda (Kalinzu Forest)
	Zaire (eastern)
Turraea adjanohounii	**Côte d'Ivoire (south-west)**

Species	Distribution
Turraea fischeri ssp. eylesii	**Zimbabwe (Matopos Hills)**
Turraea kimbozensis	**Tanzania (Morogoro District)**
Umtiza listeriana	South Africa - Cape Province
Uvariastrum zenkeri	Cameroon
	Nigeria (south-east)
Uvariodendron anisatum	Kenya (Thika; Karura, Meru & Emali)
Uvariodendron gorgonis	**Kenya (Kwale)**
	Tanzania (Morogoro)
Uvariodendron kirkii	**Kenya**
	Tanzania
Uvariodendron magnificum	Uganda
Uvariodendron occidentale	**Cameroon**
	Ghana
	Côte d'Ivoire
	Liberia
	Nigeria
Uvariodendron oligocarpum	**Tanzania (East & West Usambara Mts.)**
Uvariodendron pycnophyllum	**Tanzania (East & West Usambara Mts.)**
Uvariodendron usambarense	**Tanzania (E.Usambara & S.Nguru Mts.)**
Uvariopsis bisexualis	**Tanzania (Udzungwa Mts.)**
Vangueria bicolor	**Tanzania**
Vangueria randii ssp. vollesenii	**Tanzania (coast)**
Vangueria volkensii var. kyimbilensis	**Tanzania (Lake Nyasa)**
Vangueriopsis longiflora	**Tanzania**
****Vepris allenii***	**Mozambique**
Vepris carringtoniana	Mozambique
Vepris glandulosa	**Kenya (Muguga; Ragati; Limuru)**
Vepris heterophylla	**Cameroon**
	Ghana
	Mali
Vepris mandangoa	Zaire
Vepris morogorensis var. morogorensis	**Tanzania**
Vepris morogorensis var. subalata	**Tanzania**
Vepris samburuensis	Kenya (Northern Frontier Provence)
Vismia pauciflora	**Tanzania (Lindi)**
Vismia torrei	Mozambique
Vitellariopsis cuneata	Tanzania (West Usambara Mts.)
Vitellariopsis dispar	South Africa - Natal

Species	Distribution
	Swaziland
Vitellariopsis ferruginea	Mozambique
	Zimbabwe (Beira)
Vitellariopsis kirkii	**Kenya**
	Tanzania (Pangani, Kisarawe)
Vitex amaniensis	Tanzania
Vitex keniensis	Kenya
Vitex zanzibarensis	**Kenya**
	Tanzania (Gongoni, Kinondo)
Warburgia elongata	Tanzania (Uzaramo)
Warburgia salutaris	**Mozambique (Lebomba Mts.)**
	South Africa - Natal
	Swaziland
	South Africa - Transvaal
	Zimbabwe (eastern)
Warburgia stuhlmannii	**Kenya (Kwale)**
	Tanzania (Msubugwe Forest)
Warneckea memecyloides	**Cameroon**
	Ghana
	Côte d'Ivoire
	Nigeria
Widdringtonia cedarbergensis	South Africa - Cape Province
Widdringtonia schwarzii	South Africa - Cape Province
***Xylia mendoncae**	Mozambique
Xylopia elliotii	Ghana
	Côte d'Ivoire
Xylopia latipetala	Tanzania (Rondo Plateau)
Xylopia talbotii	Nigeria (Eket, Oban)
Xylopia torrei	Mozambique
Zanthoxylum atchoum	**Côte d'Ivoire**
Zanthoxylum chevalieri	**Ghana**
	Upper Guinea
Zanthoxylum psammophilum	**Côte d'Ivoire**
Zenkerella capparidacea ssp. capparidacea	**Tanzania (Uluguru Mts.)**
Zenkerella capparidacea ssp. grotei	**Tanzania (Usambara Mts.)**
Zenkerella egregia	**Tanzania**
Zenkerella perplexa	**Tanzania (Uluguru & Malundwe Mts.)**
Zimmermannia capillipes	**Tanzania (Lushoto)**
Zimmermannia nguruensis	**Tanzania**
Zimmermannia ovata	Kenya

Species	Distribution
Zimmermannia stipularis	**Tanzania**
***Ziziphus pubescens ssp. glabra*	**Mozambique**
Ziziphus robertsoniana	Kenya

Additional commercially exploited timber species, evaluated according to the new IUCN Red List categories and criteria during the Regional Workshop

Species	Distribution summary
Afzelia africana	Benin, Burkina Faso, Cameroon, C.A.R., Chad, Congo, Côte d'Ivoire, Ghana, Guinea-Bissau, Guinea, Mali, Nigeria, Niger, Senegal, Sierra Leone, Sudan, Togo, Uganda & Zaire
Afzelia bipindensis	Angola, Cameroon, C.A.R., Congo, Gabon, Nigeria, Uganda & Zaire
Afzelia pachyloba	Angola, Cameroon, Congo, Gabon, Nigeria & Zaire
Aucoumea klaineana	Gabon, Equatorial Guinea, Congo & Cameroon
Autranella congolensis	Cameroon, Congo, Gabon & Nigeria
Baikiaea plurijuga	Angola, Botswana, Namibia, Zambia & Zimbabwe
Baillonella toxisperma	Cameroon, Congo, Gabon & Nigeria
Brachylaena huillensis syn. *Brachylaena hutchisonii*	Angola, Kenya, Mozambique, Tanzania, South Africa (Transvaal) & Uganda
Cordia millenii	Angola, C.A.R., Cameroon, Côte d'Ivoire, Gabon, Ghana, Guinea, Kenya, Liberia, Nigeria, Sudan, Tanzania, Uganda & Zaire
Cordia platythyrsa	Cameroon, Côte d'Ivoire, Liberia, Nigeria & Sierra Leone
Copaifera salikounda	Côte d'Ivoire, Ghana, Guinea, Liberia & Sierra Leone
Diospyros crassiflora	Cameroon, C.A.R., Congo, Gabon, Nigeria & Zaire
Entandrophragma palustre	Zaire
Eribroma oblonga Syn. *Sterculia oblonga*	Cameroon, Côte d'Ivoire, Equatorial Guinea, Gabon, Ghana, Liberia, Nigeria & Sierra Leone
Gossweilerodendron balsamiferum	Angola, Cameroon, Congo, Equatorial Guinea, Gabon, Nigeria & Zaire
Guarea cedrata	Cameroon, Congo, Côte d'Ivoire, Ghana, Liberia, Nigeria, Sierra Leone, Uganda & Zaire
Guarea thompsonii	Cameroon, Congo, Côte d'Ivoire, Gabon, Ghana, Liberia, Nigeria, & Zaire
Guibourtia ehie	Cameroon, Côte d'Ivoire, Gabon, Ghana, Liberia & Nigeria
Hallea ledermanni syn. *Mitragyna ciliata*	Angola, Benin, Cameroon, Congo, Côte d'Ivoire, Equatorial Guinea, Gabon, Ghana, Liberia, Nigeria & Zaire
Haplormosia monophylla	Cameroon, Côte d'Ivoire, Liberia, Nigeria & Sierra Leone
Khaya ivorensis	Angola, Cameroon, Côte d'Ivoire, Gabon, Ghana, Liberia & Nigeria
Lophira alata	Cameroon, Congo, Côte d'Ivoire, Equatorial Guinea, Gabon, Ghana, Liberia, Nigeria, Sierra Leone & Zaire

Species	Distribution summary
Lovoa swynnertonii	Kenya, Mozambique, Tanzania, Uganda, Zaire & Zimababwe
Lovoa trichilioides	Angola, Cameroon, Congo, Côte d'Ivoire, Gabon, Ghana, Liberia, Nigeria, Sierra Leone, Tanzania, Uganda & Zaire
Mansonia altissima	Benin, Cameroon, Congo, Côte d'Ivoire, Ghana & Nigeria
Microberlinia brazzavillensis	Congo, Gabon (& Cameroon?)
Microberlinia bisulcata	Cameroon
Milicia excelsa ***syn. Chlorophora excelsa***	Angola, Benin, Burundi, C.A.R., Cameroon, Congo, Côte d'Ivoire, Ethiopia, Equatorial Guinea, Gabon, Ghana, Guinea, Kenya, Malawi, Mozambique, Nigeria, Rwanda, Sao Tomé & Principe, Sierra Leone, Sudan, Tanzania, Togo, Uganda, Zaire & Zimbabwe
Milicia regia ***syn. Chlorophora regia***	Benin, Cameroon, Côte d'Ivoire, Gambia, Ghana, Guinea-Bissau, Guinea, Liberia & Senegal
Monopetalanthus heitzii	Gabon
Millettia laurentii	Cameroon, Congo, Gabon, Equatorial Guinea & Zaire
Nauclea diderrichii	Angola, C.A.R., Cameroon, Congo, Côte d'Ivoire, Gabon, Ghana, Liberia, Mozambique, Nigeria, Sierra Leone, Uganda & Zaire
Nesogordonia papaverifera	Benin, C.A.R., Cameroon, Congo, Côte d'Ivoire, Gabon, Ghana, Liberia, Nigeria & Sierra Leone
Pericopsis elata	Cameroon, Côte d'Ivoire, Congo, Ghana, Nigeria, Zaire
Pouteria altissima ***syn. Aningeria altissima***	Burundi, C.A.R., Cameroon, Congo, Côte d'Ivoire, Ethiopia, Gabon, Ghana, Guinea, Kenya, Nigeria, Rwanda, Sierra Leone, Sudan, Tanzania, Uganda & Zaire
Prunus africanus	Angola, Burundi, Cameroon, Ethiopia, Equatorial Guinea - Bioko, Sao Tome & Principe, Kenya, Madagascar, Mozambique, Rwanda, South Africa (Cape Province, Natal, Transvaal), Sudan, Swaziland, Tanzania, Uganda, Zaire and Zimbabwe
Pterocarpus angolensis	Angola, Botswana, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Transvaal, Zaire, Zambia & Zimbabwe
Swartzia fistuloides	Angola (Cabinda), Cameroon, Congo, Côte d'Ivoire, Equatorial Guinea, Gabon, Ghana, Nigeria & Zaire
Testulea gabonensis	Cameroon, Congo, Equatorial Guinea & Gabon
Tieghemella africana	Sierra Leone, Cameroon, Congo & Gabon
Tieghemella heckelii	Cameroon, Côte d'Ivoire, Gabon, Ghana, Liberia, Nigeria & Sierra Leone
Triplochiton scleroxylon	Benin, Cameroon, Congo, Côte d'Ivoire, Equatorial Guinea, Ghana, Guinea, Liberia, Nigeria, Sierra Leone & Zaire
Turreanthus africanus	Angola, Benin, Cameroon, Côte d'Ivoire, Equatorial Guinea, Ghana, Nigeria, Sierra Leone, Uganda & Zaire

Additional exploited tree species for conservation evaluation in Uganda

These species are generally "not threatened" at a global leval but have been suggested for conservation evaluation in Uganda because of utilisation within the country. Some of the species are threatened in Uganda.

Acacia hockii
Acacia gerardii
Acacia tortilis
Acacia albida
Acacia seyal
Albizia coriaria
Albizia gummifera
Albizia glaberrima
Aningeria altissima
Aningeria adolfi-friedericii
Beilschmeidia ugandensis
Baikiaea insignis
Celtis durandii
Celtis mildbraedii
Celtis zenkeri
Combretum collinum
Combretum molle
Dalbergia melanoxylon
Entandrophragma angolense
Entandrophragma utile
Entandrophragma cylindricum
Entandrophragma excelsum
Khaya anthotheca
Khaya grandifoliola
Khaya senegalensis
Lovoa trichilioides
Maesopsis eminii
Morus mesozygia
Podocarpus latifolius
Podocarpus usambarensius
Teclea nobilis
Trichilia dregeana

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WWF

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