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THE STATE OF THE INDIGENOUS FOREST IN BURA, TANA RIVER DISTRICT

A background paper for the Kenya  
Forestry Research Institute

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## Preface

The present report was prepared during the field phase of the Bura Forestry Research Project (Bura-FORP) carried out as part of the Bura Fuelwood Plantation Project (BFPP), which is supported by the Government of Kenya and FINNIDA. Forestry research under the BFPP is jointly implemented by KEFRI (the Kenya Forestry Research Institute) and the Department of Silviculture, University of Helsinki. The author is indebted to Dr. J.A. Odera, Director of KEFRI, for arranging a possibility to work with the Bura-FORP, and to Professor Olavi Luukkanen for comments on the manuscript of the present paper. During the field work valuable assistance was received from Mrs. Gunilla Alakoski-Johansson, who is presently preparing a report on the traditional uses of trees and shrubs among the Malakote and the Orma for the Bura-FORP, Mr. Stig Johansson, Mr. Jackson Mulatya, Mr. Felix Ngunjiri and Mr. James Gitonga.

## 1. INTRODUCTION

### 1.1 General considerations

One of the major problems in monitoring changes in the natural vegetation in Kenya is the lack of information regarding the distribution of plant species. Continuous monitoring of the vegetation is of course an immense task and requires vigilant concerted efforts of the local people, botanists, foresters and other specialists who are not always readily available. It is unfortunate that this first group, i.e. the local people, is most often overlooked or considered least important with regard to such studies.

Before we can find out whether a plant species is threatened, we need to know its name, its habitat, distribution and uses. The practical field worker usually knows best the distribution and uses and hence the conservation needs for each species in a particular area.

In addition to their contribution to the diversity of species and to the maintenance of an ecological balance, trees often form the core of our natural environment and are therefore sensitive indicators of environmental change. A particular tree species may, however, be slowly eliminated from a particular site through over-exploitation without any alarming signals being noticed in good time. Such species may finally become extinct.

This paper is an incidental by-product of discussions, interviews and botanical surveys concerning a checklist of indigenous trees and shrubs of Bura, Tana River District. As a result of the increasing human population in the area, pressure on the natural

vegetation has also increased with potential serious consequences on both the flora and the fauna. This paper examines the problems and their causes and proposes remedial measures that could be taken to revert the adverse trend in environmental degradation in this area.

## 1.2 The study area

The geographical location of the study area is in the Bura Division of the Tana River District, Coast Province, Kenya (Fig. 1). It is located on latitude 1° 06' S. and longitude 39° 56' E. at an elevation of 100 m above sea level. Bura is 50 km north of Hola which is the administrative centre of the district and 110 km south of Garissa. The important Garissa-Hola road, which is under repair, passes through Bura. The area can be reached overland from Nairobi either via Garissa or Hola and Malindi. There is also a dry-weather airstrip in Bura, and telecommunications have been improved considerably in 1986.

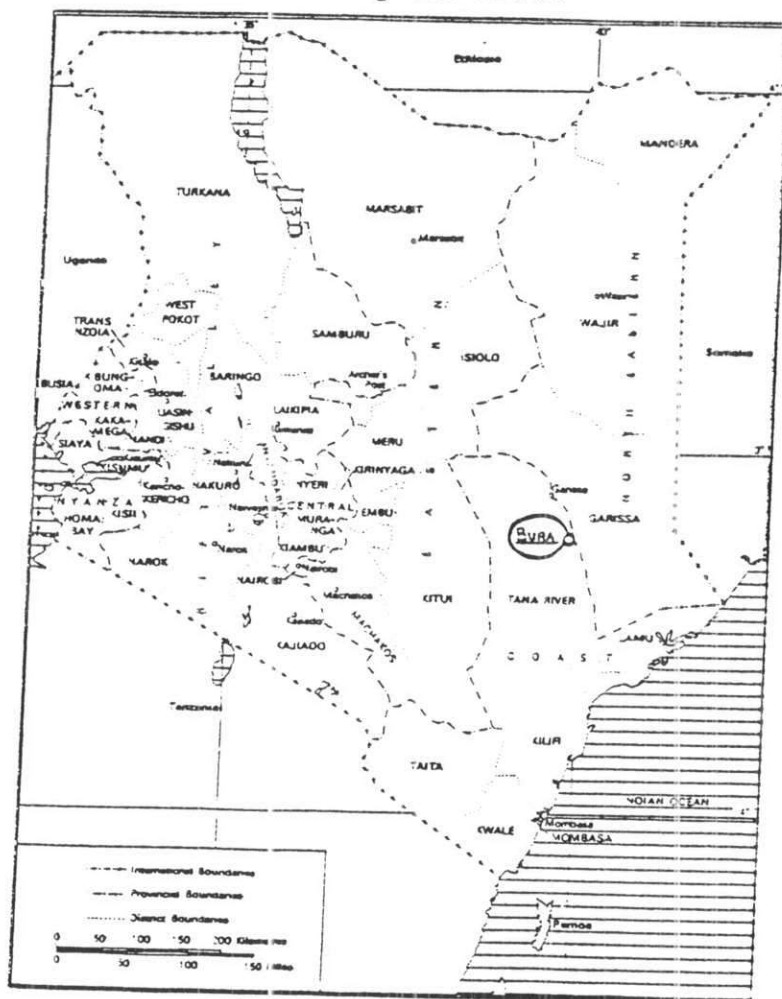


Figure 1. Map of Kenya showing the location of the study area.

### 1.3 Climate

Bura is located in the semi-arid climatic zone. Mean annual rainfall is approximately 400 mm, distributed over two rainy seasons in April-June (long-rains) and in October-December (short rains). The rains are, however, erratic and years with practically no rain at all, such as in 1983-84, are not uncommon. Furthermore, the rains are often unevenly distributed over a particular year or rainy season, appearing as heavy showers over a short period and resulting in strong sheet and finally gully erosion (Muigai and van der Pouw 1978). Temperatures are high throughout the year, with a monthly minimum of 20.0 C (August) and maximum of 35.8 C (February) and a potential evaporation of approximately 2 500 mm/a (NIB 1985).

### 1.4 Vegetation

#### 1.4.1 General characteristics

The overall natural vegetation is very sparse, except for near the river where tall evergreen forest is sustained. The vegetation consists mainly of thorny bushland or wooded grassland of varying density and species composition. However, the predominant vegetation type is Acacia-Commiphora dry bushland (Pratt et.al. 1966). The ground cover usually consists of tufted grass or the salt-resistant shrub Salsola dendroides. There are, however, quite distinct differences in vegetation between the various physiographic dryland units. The whole area may be conveniently divided into main vegetation types as follows:

- (1) Riverine forest,
- (2) Transitional zone (between the riverine forest and the dry bushland), and
- (3) Dry bushland, including the lagas (ephemeral streams).

#### 1.4.2 Riverine forest

The riverine forest is mainly evergreen and extends for approximately 1-3 km on either side of the river. Many of the trees are those typical of riverine and ground water habitats which primarily depend on floods and seepage from the river (Marsh 1978). Trees and shrubs occurring in the riverine forest are listed in a separate paper (see Gachathi 1987).

The high-canopy species include Acacia elatior ssp. elatior, Acacia robusta (A. clavigera), Trichilia emetica (T. roka), Populus ilicifolia, Newtonia hildebrandtii and Diospyros mespiliformis. The middle canopy layer consists of Spirostachys venenifera, Kigelia africana (K. aethiopum), Tamarindus indica, Mimusops fruticosa, Sorindela madagascariensis and Ficus sycomorus. The ground cover is dominated by

shrubs and woody climbers. These include Hippocratea africana, Combretum paniculatum, Harrisonia abyssinica, Capparis tomentosa, Thespesia danis, Diospyros abyssinica, Lawsonia inermis and Rinorea elliptica.

Populus ilicifolia, commonly known as Tana River Poplar, is an endemic riparian tree occurring in small patches along the Tana, Athi and Ewaso-Nyiro river systems (Dale and Greenway 1961). It is classified as threatened by the IUCN (International Union for Conservation of Nature and Natural Resources).

#### 1.4.3 Transitional zone

As one moves from the dry bushland towards the riverine forest the vegetation gradually gets denser and taller. From the forest towards the bushland the vegetation gradually becomes scarce and short. This strip of land lying between the two main vegetation types is unique in that it consists of most of the species that are found in the two main zones. Characteristic species are Acacia tortilis, Dobera loranthifolia, Lawsonia inermis, Grewia plagiophylla and Terminalia brevipes.

#### 1.4.4 Dry bushland and lagas

The bushland is dominated mainly by thorny shrubs with scattered wiry grasses and a few trees (see Gachathi 1987). It is in drought-dormant condition for much of the year, but leaves sprout immediately after or just before the onset of the rains. Characteristic shrubs are Acacia reficiens ssp. miseria, A. bussei, A. mellifera, Cadaba glandulosa, Commiphora candidula, C. campestris and Salsola dendroides. The few scattered trees include Acacia tortilis ssp. raddiana, A. zanzibarica, Euphorbia robeckii, Salvadora persica, Dobera glabra and Platyclaphium voense. Most of the larger trees have a restricted distribution along the few lagas where they form patches of small forests.

The main lagas are Hirimani, Walesa, Bilbil, Gelmadho and Tula. The dominant trees occurring along the lagas are Acacia tortilis ssp. raddiana, A. tortilis ssp. spirocarpa, A. senegal var. leiorhachis, Berchemia discolor (Phyllogelton discolor), Hyphaene compressa (H. coriacea), Tamarindus indica and Terminalia prunioides. Salvadora persica and Dobera glabra are evergreen species and hence conspicuous during the dry season.

#### 1.5 Local population

The riverine forest is inhabited by the sedentary agriculturalists, the Ilwana (commonly known as the Malakote), whose villages are located in the vicinity of the river. They grow crops on seasonally flooded low-lying areas for their food and also utilize the ox-bow lakes for the same purpose. The major crops



include maize, rice, green grams, bananas, sugar cane and mangoes. They also keep a few goats and chicken. Honey collection is fairly common.

The main pastoralist group in the dry bushland is the Orma but the Somali have also crossed the river for grazing and some of them now live among the Orma. These two groups are nomads and keep cattle, camels, sheep, goats and some donkeys. Their animals mainly feed on the deciduous shrubs and pods of some Acacia species. The pods of Acacia tortilis ssp. spirocarpa in particular are highly appreciated, while those of A. nilotica are said to cause abortion in goats. During periods of drought, these nomads drive their herds to the riverine forest in search of better grounds for grazing.

#### 1.6 BISP population

Within the dry bushland and neighbouring the riverine forest is the Bura Irrigation Settlement Project (BISP) with tenant farmers from all over Kenya. The tenants live with their families in villages constructed by the project. They grow cotton as a cash-crop and maize and beans for subsistence, all crops are irrigated. Although the planned villages are numbering 23, only ten villages have so far been developed and inhabited. The BISP staff lives in the rural centre where the administration is located, and small-scale traders have also established a small market there.

At the rural centre there are also the District Officers's headquarters and a police station. According to the DO, the composition of the estimated population of the Bura Division in 1986 was as follows:

Malakote	5 000
Pastoralists (Orma and Somali)	5 000
BISP	12 000
<u>TOTAL</u>	<u>22 000</u>

This population is increasing rapidly because of the better living standard within the scheme and particularly because of the provision of such social amenities as schools, dispensaries, post office etc.

#### 1.7 Wildlife

The riverine forest gives shelter and nourishment either directly or indirectly to a large number of wild animals including birds, reptiles and small mammals. Elephants, buffaloes, hippopotamus, waterbucks, bushbucks, warthogs, boars, monkeys and baboons are among the large mammals that occasionally also destroy crops in the Malakote farms.

The number of animal species sighted in the dry bushland far exceeds the number found in the riverine

forest. They include big cats and a number of large antelopes. Common animals are the giraffe, buffalo, elephant, zebra, eland, bushbuck, oryx, Grant's gazelle, lion, cheetah, hyena and the jackal. During periods of drought the riverine forest is the last sanctuary for the wildlife.

## 2. FACTORS CONTRIBUTING TO THE DECLINE OF THE INDIGENOUS VEGETATION

### 2.1. Firewood collection and charcoal burning

Firewood collection is by far the most important factor contributing to the disappearance of certain tree species. The choice of firewood is determined by its availability and quality. Availability here may also mean access which is in turn dictated by the distance to settlement. Most destruction is therefore prevalent along the roads leading to the riverine forest and near the tenant villages. The main access roads are presently those leading to Chewele, Shika-adabu and the Bridge-site (leading to Bura East on the left bank of the Tana River).

The distance between the nearest tenant village to the edge of the riverine forest is approximately 3 km. Firewood is collected and transported to these villages and to the BISP rural centre for sale by bicycles and donkeys. Between the riverine forest and the tenant villages, wholesale clearing has already taken place, leaving the area denuded of any vegetation; hence the pressure on the riverine forest. Sale of firewood is becoming a lucrative business and gaining momentum at a fast rate. A donkey-cart load is currently selling at KShs. 100, a donkey load at KShs 25, while two pieces approximately 0.75 m long cost about 1 KSh. It is unlikely that this trend will be arrested, especially since the other fuel alternatives such as gas, electricity, paraffin etc. are beyond the means of the common 'mwananchi'.

Firewood is used mainly for cooking and lighting and to a lesser extent for smoking milk and water containers. Tree species preferred for cooking are those with dense and heavy wood which produce a lot of heat, good charcoal and keep the fire burning slowly for a long time without producing much ash (Appendix 1). Such species are Acacia elatior ssp. elatior, A. bussei, A. tortilis, A. reficiens, Cordia sinensis, Lecaniodiscus fraxinifolius, Maytenus senegalensis, Rinorea elliptica and Terminalia orbicularis.

Species used for lighting houses are those that burn quickly with a big flame. Species preferred for this purpose are Cordia sinensis, Platycelyphium voense and Premna resinosa.

Smoking of milk and water containers is mainly practised by the pastoralists. The process involves lighting several pieces of wood and immediately as



they start burning they are inserted into the container and then the container is shaken vigorously. The process is repeated several times. This "cleaning" of containers is a process that is repeated daily. It gives the milk a nice smell and taste and it helps to preserve it. The preferred species are restricted to the dry bushland. Commonly used ones are Cordia sinensis, Terminalia orbicularis, Cadaba ruspolii and Boscia coriacea.

Choice of species may also be affected by traditional beliefs. The riverine inhabitants for example never use the wood of Deinbollia borbonica and Sterculia appendiculata. The former is supposed to bring misunderstanding among the family members occupying the house where it is burning, while the latter is held as the dwelling of the evil spirits. Terminalia parvula which is quite common in the dry bushland is never used, as the smoke has a obnoxious smell. It is important, however, to note that in case of a surplus, the species chosen are few, but in a situation of scarcity, which is becoming the common case in Bura, most species will be used for different purposes.

Charcoal burning is relatively new to the inhabitants of Bura; it is normally produced for sale at the Bura rural centre only. Although the species chosen are few compared to those used for firewood, it is of major concern that the trees which are selected are the big and mature ones. The method used involves burning of the whole tree in open air and breaking off the charcoal as the tree is slowly burning. The pieces are finally covered with soil to extinguish fire. Apart from producing charcoal of very poor quality, the amount of wood and energy which is lost in the conversion process is immense. Tree species preferred for charcoal production are Acacia elatior ssp. elatior, A. bussei, A. tortilis, Cordia sinensis, Newtonia hildebrandtii and Terminalia brevipes.

## 2.2 Construction material

House construction within the riverine forest is a continuous process because of movement in search of better farming grounds and because houses are destroyed by termites. Shifting cultivation has been practised for many years among the Malakote, utilizing both sides of the river. It is not uncommon to find a whole village crossing or moving either upstreams or downstreams to open up new farming areas after the existing ones have been exhausted. In this process, fresh poles and rafters are continuously being cut for building.

Unfortunately the houses have a very short life span, rarely exceeding three years. This is usually the result of termite attacks. Relatively new houses collapsing is a very common occurrence. The termite-resistant Newtonia hildebrandtii is rare and difficult to work. Tree species commonly used for building poles

and rafters are Cordia sinensis, Securinega virosa, Terminalia brevipes and Hyphaene compressa (fronds for thatching). The same tree species are being cut and sold for building materials at the Bura trading centre, since no suitable trees grow in the dry scrub to provide poles.

The pastoralists on the other hand make simple huts requiring thin, long and flexible stems and a single central-pole. These wands are always treated with a red dye obtained from Acacia bussei and they are used for several years. Preferred species are Cordia sinensis, Grewia plagiophylla, G. stuhlmanii, Lecaniodiscus fraxinifolius and Securinega virosa. The huts are thatched with woven mats, grass or leaves of the doum palm, Hyphaene compressa. Cattle kraals are usually made of thorny or prickly species. The commonest shrub used for kraals is Acacia reficiens.

### 2.3 Canoe and beehive construction

Canoes are very important for fishing and transporting goods and farm produce along the river and across it. Although the use of a canoe is not restricted to its owner, at least every family living along the river owns one. Trees preferred for the dug-out canoes are the very big ones, some of which have a relatively short life span in water. Commonly used tree species are Diospyros mespiliformis, Mimusops fruticosa, Ficus sycamorus, Populus ilicifolia, Garcinia livingstonei, Trichillia emetica, Albizia gummifera and Kigelia africana.

Beehives are common in the riverine forest, as honey is one of the most useful commercial commodities among the inhabitants of the riverine forest. Trees preferred for beehives are those which are easy to work and they include Kigelia africana and Garcinia livingstonei.

### 2.4 Household utensils and other material items

Other major uses of trees include various household items like the mortars, water-troughs, and water and milk containers. All these require trees with fairly large trunks. The mortar is made of hard wood and used for grinding maize or threshing rice using a pestle. The tree most favoured for a mortar is Dobera glabra, while the pestle usually is made from Diospyros abyssinica.

Water troughs are necessary among the pastoralists for watering the herds and every family has at least one. As there are no permanent rivers, wells are dug along the lagas. Preferred trees for water troughs are Dobera glabra, Erythrina melanacantha and Garcinia livingstonei. Water and milk containers also require trees of sizable girth. These containers may also be used for several years. Commonly used tree species are Erythrina melanacantha, Commiphora campestris, Givotia qosai (root), Euphorbia robeckii, Spirostachys

venenifera and Trichilia emetica.

The use of Euphorbia robeckii first involves burning the tree while still green to dry the highly irritant milky latex. This process reduces the chances of regeneration.

## 2.5 Small-scale irrigation schemes

Currently some women groups along the river are organizing themselves to clear the indigenous forest for small-scale irrigation schemes. One group has already cleared and prepared the ground ready for planting. They intend to use water-pumps for irrigation with the river water. The cleared site is at Shika-adabu in Chewele location.

## 2.6 Domestic animals

In view of the prevailing climatic conditions, it is obvious that no rainfed agriculture is possible on savanna land. Extensive livestock grazing is the only use of the dry bushland. Unfortunately the number of animals kept is usually larger than what the land can sustain. Overgrazing of cattle, goats, camels etc. across large tracks of fragile land strips on these marginal areas constitute the main erosion factor by compacting the soil through trampling and devouring both the woody vegetation and the grass cover.

## 3. RECOMMENDATIONS TO HELP ARREST THE DESTRUCTION OF THE VEGETATION

### 3.1 Tree species requiring immediate protection

Some trees in the riverine forest urgently require some form of protection, because they are under the threat of becoming extinct due to over-exploitation and poor regeneration capability. These trees are found growing singly and thinly scattered. They include Populus ilicifolia, Albizia gummifera, Acacia roovumae, Diospyros mespiliformis, Mimusops fruticosa, Hyphaene compressa, and Newtonia hildebrandtii.

These species could be raised in a nursery and planted on the school compounds within the riverine forest where they could receive better protection. There are five primary schools in the area between Nanighi and Mikomani. The schools are located at Shika-adabu, Chewele, Ghamano, Tune and Nanighi.

The compounds surrounding the Chief's offices in Nanighi and Chewele, which are located at the edge of the riverine forest, could be ideal sites for the trees occurring in the transition zone in particular. Trees planted in these areas could be potential seed sources apart from serving other purposes (shade and ornamental trees etc). These trees should be planted with the involvement and participation of the local people. It is important to note that the only active

protection measure is presently exerted through the Chief's Act which gives the Chief power to regulate the utilisation of the riverine forest. He is as such effective in preventing major destructive cutting. His influence could be used to encourage reforestation and to protect the existing forest.

### 3.2 In situ gene conservation

In view of the rate at which the riverine forest is disappearing, it is important to consider conserving a convenient, undisturbed portion of the riverine forest as a nature reserve. One such area could be the Sukuni forest between Baretuma and Sukuni in Nanighi Location. Another would be the Gubeni forest between Malungeni and Nyojoni in Chewele Location.

These areas have dense forest stands extending right down to the river banks. Due to lack of low-lying riverbeds suitable for cultivation, people have avoided these areas. Now they should be used to protect the genetic diversity of the Bura region.

Since the riverine forest is not gazetted, its protection would probably require a dialogue between KEFRI, the Forest Department and the Tana River District Development Committee.

### 3.3 Possible trial species

#### 3.3.1 Plantation species

A number of indigenous species common in the riverine forest and in the surrounding bushland are worthwhile for trying either as plantation, shade or ornamental trees. Most of them have been observed to regenerate vigorously in their natural habitats.

The probable (multipurpose) plantation species include Acacia robusta, A. senegal var. senegal, A. elatior, A. tortilis ssp. raddiana, A. tortilis ssp. spirocarpa, A. zanzibarica, Newtonia hildebrandtii, Terminalia brownii and T. prunioides.

Most of these trees are legumes commonly used for firewood, while their leaves and pods are excellent animal forage. There is a beautiful stand of Acacia tortilis ssp. spirocarpa at Garissa (near the bridge), and the number of domestic animals feeding on pods from these trees is a testimony to their usefulness. People are seen collecting pods for their animals at this site and elsewhere along the river and the lagas. The author also learned that the gum from Acacia senegal var. senegal is still sold at Garissa. This is the gum arabic which is used commercially by the industry for confectionary, medicines, adhesives etc., and it may be better exploited to eventually become an additional source of income also in Kenya as it has long been in the Sudan.



### 3.3.2 Shade and ornamental species

Some indigenous trees growing in Bura could be excellent as shade trees or ornamentals. These have been observed growing very well along the lagas and they could be tried around permanent dwellings, government offices and market places. In particular, the following tree species should be tried: Acacia ornilis ssp. raddiana, Berchemia discolor (Phyllogeiton discolor), Delonix elata, Dobera glabra, Tamarindus indica, Terminalia brownii, T. prunioides and Trichilia emetica.

Tamarindus indica and Berchemia discolor are evergreen fruit trees. Their fruits are highly valued especially among the pastoralists. They are sold in local markets and even in large groceries under the trade names TAMARIND and JAJAB respectively.

Mango trees which are doing extremely well in this area should be considered as possible shade trees as well in markets and public places. All fruit species genotypes should be selected according to their fruit quality.

## 4. CONCLUSIONS

The information contained in this report is largely based on the author's observations over a period of six months that he worked in Bura. The present observations have been confirmed in all cases by the local people who were his working colleagues throughout this period. The information may be used as baseline data in working out strategies aimed at preserving the riverine forest.

It must be perceived that the local people have been utilising the natural resources of this area for many decades without causing undue stress on the vegetation, but the Bura Irrigation Settlement Project has greatly altered the situation.

Direct factors causing severe depletion of the natural vegetation have been identified, but the problem is a very complex one. Such factors are firewood, house building poles, canoes and beehive construction, household utensils, small-scale irrigation schemes and domestic animals which, however, all are necessary for human survival. To arrest the situation or to at least reduce the rate at which the riverine forest is disappearing and to reverse the trend towards one of recovery of the forest, the following measures should be considered:

- (1) Alternative sources of firewood have to be considered seriously and should be aimed at balancing demand and supply.
- (2) The small-scale irrigation schemes currently in their initial stages should be encouraged to join the Bura Irrigation Settlement Project, so

- as to avoid further damage to the sensitive riverine forest.
- (3) Investigations on the natural vegetation, aimed at the selection of in situ gene conservation areas, should be urgently carried out, along with further vegetation and ecological studies to clarify the species composition and the ecological characteristics of major species.
  - (4) Forest guards should be stationed at Chewele and Nanighi, to assist the Chiefs in monitoring forest activities.
  - (5) Pastoralists living near the forest should be advised at keeping fewer animals to reduce the current grazing pressure. Alternatively, other dry-season grazing sites, apart from the riverine forest, should be developed.
  - (6) The local Chiefs should be informed on all factors contributing to the need to conserve and protect the indigenous forest through simple pamphlets pinpointing the species that are already threatened.



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# Appendix 1

## Firewood and charcoal tree preferences

Species	Habitat		Frequency		Wood used for			
	Forest	Scrub	Common	Rare	Cooking	Lighting	Smoking	Charcoal
Acacia elatior	X	X	X		X			X
A. bussei	" "	X		X	X			X
A. tortilis		X	X		X			X
A. reficiens		X	X		X			X
Boscia coriacea		X	X				X	
Cadaba ruspolii		X		X			X	
Cordia sinensis	X	X	X		X	X	X	X
Lecaniodiscus fraxinifolius	X			X	X			X
Maytenus senegalensis	X			X	X			
Newtonia hildebrandtii	X	X		X	X			X
Platycelyphium voense		X	X			X		
Fremua resinosa		X	X			X		
Rinorea eliptica	X		X		X			
Terminalia brevipes	X		X		X			X
T. orbicularis		X	X		X			