A PARTICIPATORY SURVEY AND INVENTORY OF TIMBER AND NON TIMBER FOREST PRODUCTS OF THE TIKAR PLAIN

A REPORT FOR IR1/CARPE




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Table of Contents

List of illustrations

List of acronyms

CARPE	Central African Programme for the Environment
IR1	Intermediate Result 1
LFRMSs	Local Forest Resource Management Systems
NTFPs	Non-Timber Forest Product
DBH	Diameter at Breast Height
BA	Basal Area
GPS	Global Positioning System
PSP	Permanent Sample Plot
NGOs	Non-Governmental Organisation
NPEM	National Plan for Environment Management
NFAP	National Forestry Action Plan
PNVA	National Plan for Agricultural Vulgarisation
MINEF	Ministry of Environment and Forest

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ABSTRACT

The forest is a reservoir of biodiversity. Its destruction leads to the destruction of microclimates and consequently to the disappearance of plants and animal species. The carbon stock is also affected by the destruction of the forest. The stock of plant and animal species make up an important source of nutrition, human health and even a source of economic empowerment to an entire country hence their sustainable management is a duty of co-responsibility.

Recent legislation in Cameroon now means that forested base communities can, with technical assistance from the state, manage and legally take control of their own forest resources i.e. setting up community forests. However this set up is hindered because of few field based efforts and lack of methodologies for the development of suitable management plans.

Current work by CARPE has highlighted the potential of non-timber forest products to contribute to conservation and development initiatives when managed alongside timber resources.

This present work presents the results of a participatory survey and inventory undertaken in the Tikar Plain. The second of such studies to be undertaken by IR1/CARPE in Cameroon. Based on the ethnobotanical survey and interviews, key timber and non-timber forest resources were identified and enumerated in three strategic villages. Using an application of the refined methodology of Charles M. Peters (1999). The results obtained enable us to have the rate of destruction of the timber and NTFPs in the Plain. The distribution of these different species is not uniform and most of the products signaled in the country as important do not appear in the local important species list of this Plain. The restitution of the results obtained may help the population of the

Plain to better value their products and to set up management plans for greater sustainability.

I INTRODUCTION

I-1 BACKGROUND TO THE IR1/CARPE OBJECTIVES IN CAMEROON

The IR1 component of CARPE is concerned with 3 geographic regions in Cameroon: Mt. Cameroon in SW province, Tikar Plain which includes the Centre, West and Adamaoua provinces and Djoum in the South Province. These sites represent a cross-section of forest ecosystems which are ecologically representative of the key Congo Basin forest ecosystems viz.: mountain forest, congolian forest savannah transition zone and low-land evergreen rain forest respectively. These areas also contain respective forest based resources, which together with the ecological elements form the core of the IR1/CARPE's local forest systems. The idea to choose stratified zones was based on the belief that results from these strategic areas would be representative of social, cultural and ecological variables found in large areas of the Congo Basin.

IR1's notion is that its possible to enhance socio-cultural and socio-economic conditions that will divert the attention of the people from the forest hence reduce deforestation and promote biodiversity in key forest regions and habitats outside protected areas in the Congo Basin. In each program site IR1 is concerned with 3 activities: local forest resource management systems (LFRMS), forest resources, and incentives. The approach used seeks to identify strategies, methods and action research activities to determine how LFRMS can be strengthened to render successful the CARPE's objectives of reducing deforestation throughout the Congo Basin and maintain the region's biodiversity. IR1/CARPE is investigating the interaction between local institutions, forest resources and incentives in order to determine the kind of approaches which can be effective in mobilizing communities to adopt conservation actions. Through it approach, IR1 intends to determine what the component for a "sustainable forest utilization ethic" could be in the Congo Basin, identifying factors under which communities could contribute to a grassroots environmental advocacy consistent with CARPE's objectives in the region and establishment of management plans for

community forest systems' which however could be obtained as stipulated by the 1994 forestry law.

I-2 1994 FORESTRY LAW

Man has always behaved as if nature in general and the forest in particular had inexhaustible resources, hence he continuously exploits it in an irresponsible and unsustainable manner destroying the natural beauty of the landscape and reducing its biodiversity, not leaving out the demographic side effects. Conscious of the risk to which our forest patrimony is exposed, the Head of State in April 1992 created the Ministry of Environment and Forest. In January 1994, he promulgated law no. 94/001 creating regulation of forest fauna and fisheries. On the 23 of August that same year, the Prime Minister issued a decree fixing the modalities of forest management.

When we notice that the forest covers about 47% of our National territory and we discover in it precious plants that are suspected of curing complicated diseases it's of no doubt that the forest possesses high socio-cultural and economic value. In this light, sustainable forest management is an act of co-responsibility, hence the civic society and public opinion (rulers) must be in strong collaboration and should be established on the basis of common objectives. The text of application of the forestry law in 1995 also saw the creation of a National Plan for Environmental Management (NPEM or PNGE), National Forestry Action Program (NFAP), Land Use Plan and National Energetic Plan, National Plan of Agricultural Vulgarisation (PNVA). The main objectives were the protection of the environment and sustainable management of forest products.

A major breakthrough of the 1994 forestry law was the creation of a new category of forest - Community Forest - which were designed to increase the local population's participation in the planning and implementation of forest management programs with technical assistance from the state. According to article D 3, to establish a community forest, an agreement must be signed between a community and MINEF. By this agreement, the community is granted power over an area of national forest in their locality to manage, conserve and exploit the forest in the interests of the community concerned.

A management agreement is predicted on inventory work like the one carried out under the IR1 CARPE component leading to the preparation of simple management plan

(article D 29). A management plan for a community forest lasts as the agreement and must be revised at least once every two years (article D 30).

A major limiting factor in the development of community forests however is that they can exist only in areas of National Forest for which no exploitation rights or title have been granted (article D 27). Pre-emptive rights for local communities to national domain forest do not exist and timber concessions may be granted before local communities are organized to obtain a community forest. Another disadvantage is that no legal definition of local/village communities exist. Again, on their own local communities are in charge of the surveillance of community forest. Within the framework of locally developed management plans, the law provides room for the development of local regulatory and enforcement procedures and local by-law, which will serve in the conservation of local biodiversity. This is enforced by the local traditional authority (Chefs and Fons).

As a remark here it's has been noticed that because of the capital cost of forestry exploitation, the community benefits less from their forest since it can only be exploited by some few elites and expatriate companies.

II BACKGROUND TO THE TIKAR PLAIN

II-1 INTRODUCTION

The Tikar Plain covers four Provinces. It extends into the Northwest, West, Adamaoua and the Centre Provinces with the greatest portion in the Centre Province. This Plain is washed by the rivers Mbam, Kim and Mape. The Plain covers a land area of about 75,000km2. It is inhabited by about 300,000 people.

II-2 CLIMATE

Annual rainfall varies between 1500-2000mm in the Centre part i.e. in the Mbam et Kim and declines as you move northwest. There is a single rainy season between March and October. December, January and February are relatively dry except in areas close to the southern border where a small rainy season exists during the dry period. Here we have four partial seasons. A big dry season and a small one, a long rainy season and a short one. The annual mean temperature is 29 C throughout the plain.

II-3 GEOMORPHOLOGY AND SOILS

The Tikar Plain is situated between 650m to 750 m of altitude. The majority of the Plain is seated on granite deposits and the soils that predominate here are made up of non-volcanic metamorphic rocks with the soil having a grey and red colour: tropical red earth.

II-4 VEGETATION

The Tikar Plain represents a forest-savannah transition zone. The vegetation is dominated by forest in the southern part of the Plain while the Northern part is dominated by savannah. It is made up of semideciduous forest and savannah grassland with trees and scrubs (Collins-Longman). The savannah here is the sudannian type.

FAUNA

Cameroon covers just about 2% of the surface area of Africa buy it harbors half of the mammalian species found in the continent (Depierre et Vivien, 1992). Few countries around the world with the same surface area as that of Cameroon would present such a natural diversity. Though recent fauna inventories have not been carried out, the key species found in the Tikar Plain according to Depierre include: the Potamogale (*Potamogale velvox*), Pangolin (*Manis giganta*), Squirrels (*Funisciurus isabelle)*, Gambian Sun Squirrel (*Heliosciurus gambiana*), Striped Ground Squirrel (*Euxerus erythropus*), Lesser Cane Rat (*Tryonomys gregoriana*), Common Jackal (Canis aureus), Large Spotted Genet (*Geneta tigrina*), Kob (*Kobus kob*), Red-Flanked Duiker (*Cephalophus rufilatus*), Petas Monkey (*Erythrocebus petas*), African Bush Tail Porcupine (*Atherus africanus*) and Greater Cane Rat (*Tryonomys swinderianus*).

The above Mammalian species are under threat from continued hunting pressures. This is to meet the increasing demand of bush meat in the urban zones. Most of the above species have been forced to migrate due to increased hunting pressures.

In the course of the fieldwork mammals such as monkeys and squirrels were regularly sighted and cries of monkeys could be heard all day long in the forest at

Ngambe Tikar. It should however be noted that because this area is a forest-savannah transition zone most of the above mentioned species are not endemic to this area.

II-5 SOCIO-ECONOMIC AND HUMAN PERSPECTIVES

II-5-1 INTRODUCTION

The total population within the villages of the Plain is estimated at 300,000. In some of these villages a majority of these people depend on the forest to sustain their living. The indigenous peoples of the Plain are Tikars but we also find an important number of immigrants there mostly anglophones from Nkambe and Banso and some Bamiliki's. Some Malians have also settled in Bankim where they practice fishing.

II-5-2 LAND TENURE OR FOREST OWNERSHIP

Land tenure in the Tikar Plain as in many parts of Cameroon reflects the super imposition of modern law on traditional or customary law. Under customary law land ownership is vested on the village head on behalf of the local community. However there are portions of land owned and controlled by family heads who allocate areas to family members for farming and/or development. Although generally allocated on an annual basis, some areas are granted for permanent use. Virgin land or forested land owned by the native community and managed or administered by the Chiefs and elders (traditional authority) can be acquired by any member of the community who first clears or cultivate it. This results in more forest being cleared since people anticipate future shortages. Once cleared, the land is controlled by the family responsible for the original clearing. Mature unmarried young men can apply for land from the local community through the local authority and will own the land after one year of work on it. Therefore with sharply rising populations, families are understandably anxious to safeguard their future by clearing forested land. Leasing of farmland to non-natives is common in the Tikar Plain. Some of these immigrants acquire this land and establish claims, owning it as years pass by. In some areas of the Plain these immigrants farmers have been accused of forest clearance and disappearance (Bankim). Under modern forestry law all forest outside National Parks is subject to state legislation except in areas where a community forest has been created

but this only theoretical in most areas. In practice it is the local authority that controls the land.

II-5-3 SUBSISTENCE AGRICULTURE

The main economic activity of the people of the Tikar Plain is agriculture. More than 80% of households are involved in farming both cash crops: cassava, egusi, coffee and for subsistence: cocoyams, yams, plantains, beans, corns, groundnuts. Close to the villages, the forest is occupied by small scale farmers mainly natives who grow food crops for consumption or for sale in small village markets or cash crops in order to sustain their living. The type of farming practiced by most of these farmer's is shifting cultivation whereby a parcel of land is cleared down and cultivated for about 3-4 years successively and then left fallow while the farmers moves to a new site where they clear the forest using slash and burn. This is so pronounced at Manda'ah who originally were a people of the forest but today have been forced to migrate to the savannah because of the swamp created on the construction of the dam over the river Mape. The swamp created by the dam is also a profound cause of forest destruction and disappearance in Manda'ah and Bankim but it must be mentioned that the traditional farming method where a piece of land is clear down, burnt and farmed for some time before moving to a new site is a major cause of forest destruction in the Tikar Plain. According to native farmers, farming is done seasonally: once a year and solely during the rainy season. When the forest is cleared for the first time, the land is farmed and planted with egusi followed by groundnut during the next planting season and the third year crops like corn, sweat potatoes, yam are then planted followed finally by cassava. After all these harvests another plot of forest is selected while the first is left to fallow. In most places (Manda'ah), since this process reduces soil fertility and vegetation cover, the farmers plant *Mucuna pruriens* on the abandoned portion of land in an attempt to remedy this situation. However, it is observed that Mucuna is invasive and destroys the vegetation cover.

II-5-4 COMMERCIAL AGRICULTURE AND PLANTATION DEVELOPMENT

Plantation development is less pronounced in the Tikar Plain than in other areas of Cameroon. Large-scale industrial plantations do not exist in this area. Small-scale

cocoa farms exist around Nditam and Ngambe Tikar while in Manda'ah and Bankim, large areas of forested land has been cleared for coffee plantations by natives. Around Ngambe , forest land is not yet significantly degraded by agricultural encroachment but for Manda'ah and Bankim it is noticed that in Bankim huge bands of forest land have been destroyed by: (1) crude timber exploitation, (2) the traditional slash and burn practices which follows most of the time this timber exploitation. The extended effect of bush fire has rendered the place empty such that birds lack places or trees on which to built their nests (picture 2 and 3). This implies disappearance of some species of birds hence a reduction in the biodiversity of the area.

II-5 5- HUNTING

Hunting is a major aspect of the plain. This is most noticable in Ngambe Tikar where many families rely on hunting for subsistence. Pressure on wildlife comes from local as well as immigrant hunters who use crude destructive and unsustainable methods such as wire traps in order to meet the high demand of local markets and traders from the Western Province. This market is well established in Ngambe Tikar but practically absent in Manda'ah and Bankim. This commercial aspect greatly reduces faunal diversity.

II-5-6 FISHING

Fishing is one of the greatest commercial activity in some parts of the Plain. Since it is washed by rivers and large streams inhabitants of the villages along the river take up fishing as a major economic activity. The local people here are not traditional fishermen but have been pushed to carry out this activity because of its lucrative nature and facilitated by the presence of the dam created over the river Mape at Bankim. Fishing in this dam is headed by immigrant Malians and some Musgum accompanied by few native Tikars. Fishing methods here are very local: use of nets, hooks, baskets and canoes locally contructed. It is worth mentioning here that Bankim and Manda'ah-magba posses the best types of mudfish which is consumed over the national territory and even exported out of the country.

III NON TIMBER FOREST PRODUCTS

A wide range of non-timber forest products are found in the Tikar Plain. Many are used at household level and only a few key products are exported or sold out outside the Plain. Management and control of the forest products varies. Most resources despite their value are “open access” resources and are collected by any person who visits the site. Some can be owned by individuals and this happens only when the resource is found on a piece of land farmed or owned by this individual. Many important NTFPs present in the Tikar Plain are not even exploited (chewstick) and some exploited only partially (*Elaeis guineensis*, canes). The exploitation of resources such as the *Ricinodendron heudelotii* (njansang) is carried out by women while the collection of fruits (cola nut, bitter cola) is carried out by men. As exploitation of NTFPs is concentrated in farmbush and secondary forest, certain products are becoming scarce and in order to havest them, people must go further into the forest. For this reason the number of women implicated in collection is reduced.

III-1 SPECIES SELECTION

The species to be mentioned in this report are based on those given by the villagers during village based consultation with the Chiefs, village elders, farmers and during the sensitazation campaigns organised in each village prior to the commencement of field work (Picture 3). Most of these species were noted for their importance by the villagers as we moved along the transects. Interviews carried out door to door also provided enough information on important NTFPs and their classification according to the importance accorded to them locally. The crew which carried out the inventory had natives who were traditional healers and were able to give the traditional uses of each plant encountered. Due to the destructive nature of logging and unregulated or poorly regulated harvesting due to limited control because the forest is owned by the local authority, the NTFPs tended to reduce in number as the days passed by.

Table 1. NTFPs identified as being important (classified in order of importance to the inhabitants).

	Vanecular name	Familly	Scientific name	Habitat
NGAMBE - TIKAR	Nditi	Euphorbiaceae	*Ricinodendron heudelotii*	Secondary forest
	Tsimbi tsimbi	Irvingiaceae	*Irvingia gabonensis*	Secondary forest and cocoa field
	Nsang	Dioscoreaceae	*Dioscorea sp.*	Primary and secondary forest
	Nguenyi	Guttiferae	*Garcinia kola*	Secondary forest
	Ngue	Sterculiaceae	*Cola accuminata*	Farm, cocoa, fallow and secondary forest
	Nsep meshoro	Piperaceae	*Piper guineensis*	Primary secondary forest
	Too	Apocynaceae	*Voacanga africana*	Farm, fallow and secondary forest
	Bongo tsofoi (kan)	Zingiberaceae	*Aframomum melegata*	Secondary forest and farm land
	Sea	Palmaceae	*Elaeis guineensis*	Farm, fallow and secondary forest
	Mpfa'a	Meliaceae	*Khaya grandifolia*	Secondary forest
		Leguminosae-caesalpiniaceae	*Tetrapleura tetraptera*	Secondary forest
		Olacaceae	*Olax subscorpoidea*	Secondary forest
	Rattans	Palmaceae	*Eremospatha wendlandiana Lacosperma secundiflorum*	Primary and secondary forest
MANDA'AH	Nditi	Euphorbiaceae	*Ricinodendron heudelotii*	Secondary forest
	Tsimbi tsimbi	Irvingiaceae	*Irvingia gabonensis*	Farm, secondary and primary forest
	Medouh	Apocynaceae	*Landolphia sp.*	Primary and secondary forest
	Nguenyi	Guttiferae	*Garcinia kola*	Primary forest
		Leguminosae-caesalpiniaceae	*Tetrapleura tetraptera*	Secondary forest
	Ngue	Sterculiaceae	*Cola accuminata*	Farm, cocoa, fallow and secondary forest
		Solanaceae	*Capsicum frutescens*	Farm and fallow
	Kimba	Annonaceae	*Xylopia aethiopica*	Secondary forest
	To'o	Apocynaceae	*Voacanga africana*	Farm, fallow and secondary forest
	Dzuing	Burceraceae	*Canarium schweinfurthii*	Primary and secondary forest
		Burceraceae	*Dacryodes edulis*	Farm and secondary forest
	Mewou	Annonaceae	*Annona senegalensis*	Savanna
	Chimbi	Bignoniaceae	*Spathodea campanulata*	Secondary forest
BANKIM	Nditi	Euphorbiaceae	*Ricinodendron heudelotii*	Secondary forest
	Tsimbi-tsimbi	Irvingiaceae	*Irvingia gabonensis*	Farm, secondary and primary forest
	Kimba	Annonaceae	*Xylopia aethiopica*	Primary and secondary forest
	Ngue	Sterculiaceae	*Cola accuminata*	Farm and secondary forest
	Chimbi	Bignoniaceae	*Spathodea campanulata*	Secondary forest
	Mpfa'a	Meliaceae	*Khaya grandifolia*	Primary and secondary forest
	Pkwe		*Lophira alata*	Secondary forest
		Marantaceae	*Maranthochloa sp.*	Swamp and secondary forest
	Rattans	Palmaceae	*Eremospatha wendlandiana Lacosperma sp.*	Primary and secondary forest
	Sea	Palmaceae	*Elaeis guineensis*	Farm, fallow and secondary forest
	Nguenyi	Gutiferae	*Garcinia kola*	Primary forest
	Nkouong	Leguminosae-Mimosaceae	*Tetrapleura tetraptera*	Primary and secondary forest
	To'o	Apocynaceae	*Voacanga africana*	Farm and secondary forest

III-2 GENERAL SPECIES ACCOUNTS

III-2-1 Important NTFPs harvested in the Tikar plain include:

1. *Ricinodendron heudelotii*. This ranks among the most important NTFPs of the Plain. It is a species of variable size. At maturity, it can attain 20-50m height. The fruits have seeds which constitute a condiment demanded nationally and internationally. The seeds possesses a spicy taste and smell which renders it good for pepper soup and stew. This product is exploited in a "first come first serve" manner. Since nobody owns the forest, the first person to visit a njansang tree gathers it and carries it home where it's packed in piles for subsiquent washing, boiling, cracking and drying respectively. The process of cracking is relatively strenuous. Gathering and removal of nuts is undertaken by both women and children and this takes place after it has been kept for a month and a half. The seeds can be stored for several years and this explains why this spice is exported with relative ease.
2. *Garcinia kola* (Guttiferae). This is a NTFP which also ranks high in term of value in the Plain because of the wide market that it possesses. It's an understory and mid-canopy tree often found in high forest. This product is consumed in and out of the Plain and even abroad. The nuts are sold to traders coming from other regions of the country. These nuts are believed to function as aphrodisiac and are also medicinal.
3. *Dioscorea* spp. (Doiscoreaceae). A forest climber commonly called forest or bush yam and is locally consumed almost thoughout the plain. It small tubers serve as an important source of subsistence to the pigmies inhabiting the Plain and most of the native Tikars. This item is also sold in the local markets.
4. *Piper guineensis* (Piperaceae). An important forest climber. It fruits serve as condiment mostly to people of the West and Northwest provinces who badly need it for their traditional yellow soup. This NTFP has a large demand in the markets in the above two provinces with traders visiting the Tikar Plain in search of it.
5. *Raphia monbutorum* (Palmaceae). Raphia palm is tapped for palm wind which most of the time is used to make the "african gin" which is sold in the villages and in the nearrest towns. The leaves are used locally for roofing. The roof material made from

these leaves are widely used as the price of the corrugated iron sheets is very high and small holders are unable to buy it. Most of this Raphia is found in the swamps.

6. Canes (Palmaceae). Found in most forest patches, canes are harvested and the stems are used to weave a wide variaty of articles used in daily life in village-houses, roofs, furniture, storage containers, ladders, fish traps etc. Of these articles baskets have great economic importance. The collection, processing and trade of cane products (especially fish traps) provides a means of subsistence to many households. The species of canes found in this region are: *Eremospatha macrocarpa, Laccosperma secundiflorum, L. leave*.
7. Wrapping leaves. Leaves from several species in the familyof Maranthaceae are widely used both in houses and by food sellers as packaging material in preference to alternatives such as plastic or paper which takes a longer time to biodegrade while some are even non biodegradable. This greatly reduces the environmental hazard (pollution) often caused by these plastics. The plants are commonly found in disturbed and swampy sites. They are havested by women and used or sold in other markets.
8. *Garcinia mannii* (Guttiferae). Chewsticks for cleaning of teeth are abundant NTFPs in the Tikar Plains. Elsewhere in southern Cameroon and Nigeria, this species provides an important means of dental care for over 60% of the population (Sunderland and Tchouto, 1999). It is an understory and mid canopy tree found in high forest.
9. *Cola accuminata* (Sterculiaceae). The kola nut tree is a medium size plant between 5-15m tall. It is usually found in farm, cocoa farm and fallow fields and even around houses since it can be domesticated. This species is also cultivated for its fruits which are widely traded. Trade in kola nuts dates back to ancient times. Kola nuts vary considerably in colour ranging from white to dark red. Harvesting activities include the gathering of fallen fruits or pulling down mature fruits with hooks attached to long sticks. The green fruits are cracked and packed in baskets and the seed coat is finally removed by the market traders. This resource is heavily consumed in the northern part of the country.

10. *Elaeis guineensis* (Palmaceae). The seeds of thi splant are used in producing palm oil. It is a tree-let of 3-40m in height. The fronds are transformed locally into brooms which are sold in and out of the Plain, while the kenels can be transformed into a high value oil. The sap is also consumed as wine.
11. *Dacryodes edulis* (Burceraceae). This is a mid-canopy tree which is commonly found in secondary forest and old fallows. Trees are also cultivated around home gardens for shade as well as for their edible fruits. This plum is harvested and consumed at household level while some is also sold in the local markets. The fruits are roasted or boiled and eaten with plantain.
12. *Tetrapleure tetraptera* (Mimosaceae). A tree ranging from 15-30m tall possessing sharp conspicuous buttresses. This NTFP is closely associated to late secondary and closed canopy forest. The pod-like fruit characteristic of Leguminosae is widely used as an additive to soup and stew because of it odour. They can also impart extra flavour to palm wine and sometimes used as fish poison. Trade in this product is advanced in certain regions of the country; Northwest, West and Southwest provinces. This species is also used medicinally. The bark treats epilepsy.
13. *Annona senegalensis* (Annonaceae). This is a shrub found in the savanah and produces fruits which are edible and are consumed locally in the Plain. It is one of the most represented plants in the savannah.
14. *Aframomum latifolium* (Zingiberaceae). Found in the savannah, this species possesses fruits which when ripe are consumed at households level and even sold. It leaves are also used for packaging .

III-3 MEDICINAL PLANTS

Amongst the NTFPs of the Tikar Plain, medicinal plants constitute a sector of great importance. The rural population depends solely on this and there is a strong and steady market in plant medicines reflecting the reliance of people from the urban area on this. Knowledge of medicinal plants is not wide because local herbalists and tradipractitioners hold that it is something that is inherited. The trade in plant medicines appears to be more informal than that of other NTFPs and one that is often used as a

source of income in times of difficulties. Some of these plants include: *Bridelia ferruginea, Rauvolfia vomitoria, Lannea nigritana, Combretum hispidum, Cyathula prostrata, Acanthus montanus, Myrianthus arboreus, Margaritaria dicoidea, Phytolaca sp., Ficus mucoso, Abrus preckatorius, Crossopterix febrifugum, Aspilia africana, Allophylus africanus, Khaya grandifolia, Termilia glaucescens and Petersianthus macrocarpus.*

Other important NTFPs include:

1. *Citrus grandis orange* (Rutaceae). Fruits are consumed for the juice that they contain. The fruits are sold also in markets and can be used to process juicy drinks. This important NTFP is not found in large quantities in this area. It is mostly found in home gardens and in farm bush and fallow.
2. *Ficus exasperata* (Moraceae). It is a mid-canopy tree found in secondary formation. The leaves are used locally as sponge and it also serves as a good fuel wood.
3. *Vitex doniana* (Verbenaceae). This is a mid-canopy tree which can attain 40m in height. Fruits of this species are edible. The bark is used in traditional medicine.
4. *Polycias fulva* (Araliaceae). This is one of the most prefered carving tree. It's used to carve stools, xylophones (traditional dance instruments), traditional chairs and statues.
5. *Voacanga africana* (Apocynaceae). This is an abundant NTFP in the Plain. Its an average tree of farm and secondary forest. Its bears fruits which are commercialised. Once, many households depended on this resource for subsistence. There existed Both an international and national market existed. In the Plain, fruit of this NTFP were sold at 50 frs CFA per kg but today, there has been a steady drop in the market.
6. *Olax subscorpoidea* (Olacaceae). A mid-canopy tree and secondary forest. It produces fruits which are edible. An important portion of the population of the Tikar depend on this resource for their subsistence.
7. *Myrianthus arboreus* (Cecropiaceae). A mid-canopy and secondary forest tree which bears fruits which are edible.
8. *Canarium schweinfurthii* (Burseraceae). This is a tree of the primary and secondary forests. It is an important forest resource both for it fruits and wood. It is exploited as timber when mature. Fruits of this product resemble those of Dacryodes edulis but

with relatively small size. The fruits are largely consumed and even sold in the market.

III- 4 TIMBER PRODUCTS

- Commercial exploitation

This activity dates a long time in the Tikar Plain. Commercial timber exploitation has occurred in areas like Bankim and Manda'ah a long time ago on a rational selection bases. This activity could not last for long in these areas because the forest is not dense. Currently there is high or large-scale commercial exploitation of forest in Ngambe Tikar. There exists a distinct network of logging roads. Its is worth mentioning here that there exists a saw mill at Ngambe Tikar and the HASIM company which is in charge of the exploitation has offered many jobs to the unemployed youths. It must acknowledged however be that logging is a major cause of forest destruction here since the logs must be dragged by tractor from the forest to the saw mills where they are processed and then carried to the towns (exported or sole locally).

- Local timber exploitation

This is reduced in this area because of the presence of the HASIM company which in an attempt to protect its interests, sees that other exploiters obtain a license or felling permit. However a number of operators undertake illegal felling with no attempt to obtain a license. The majority of the wood processed by these individuals is sold locally or carried to the towns. Some wealthy elites often obtain permits from the local authority and the forestry department of the sector to fell desired trees. In many cases more than the authorized quantity is felled. Since there is a sawmill at Ngambe Tikar and many chainsaw operators, the logs are processed in situ and the planks are then head-ported to the roadside. Here machinery damage is avoided. To minimize costs, these operators exploit closer to vehicular road.

- Preferred or important timber products

The forest zone of Ngambe Tikar posses one of the most valuable timber products exploited in the country. There exist species such as *Canarium schweinfurthii* which have both NTFP and timber value. Some like *Khaya grandifoliola* have barks with high

medicinal values. Important timber such as Sapelli, Bibolo, Iroko, Padouk, Frake, Ayous, Tali, Eben and Ilomba exist.

Table 2. Important timber species found in the Plain

Village	Species	Family	Vernacular name	Forest type
NGAMBE TIKAR	*Diospyros sp.*	Ebenaceae	Zo'	Primary and secondary forest
	Gambea africana	Sapotaceae		Primary and secondary forest
	Afzelia pachyloba	Caesalpiniaceae		Primary and secondary forest
	Celti adolphu-friderici	Ulmaceae		Primary and secondary forest
	Mammea africana	Guttiferae		Primary forest
	Lovoa trichilioides	Meliaceae	Kwo' (bibolo)	Primary and secondary forest
	Pterygota macrocarpa	Sterculiaceae		Primary and secondary forest
	Milicia excelsa	Moraceae	Ndwon	Primary and secondary forest
	Sterculia rhinopetala	Sterculiaceae	Kponnzon (Nkana)	Primary and secondary forest
	Coelocaryon preussii	Myristicaceae		Primary and secondary forest
	Alstonia boonei	Apocynaceae		Secondary forest
	Entandrophragma cylindricum	Meliaceae	Shi'	Primary forest
	Lophira alata	Ochnaceae	kpwe	Primary and secondary forest
	Berlinia sp.	Mimosaceae		Primary and secondary forest
	Piptadeniastrum africanum	Caesalpiniaceae		Mid to high canopy forest
	Pterocarpus mildbraedii	Fabaceae		Primary and secondary forest
	Pycnanthus angolensis	Myristicaceae	Pwae	Secondary forest
	Terminalia superba	Combretaceae	Gean	Secondary forest
	Parkia bicolor	Mimosaceae	wang	High canopy forest
	Khaya grandifoliola	Meliaceae	Mpfa'a	Secondary forest
	Canarium schweinfurthii	Burceraceae	dzuing	Secondary and high forest
MANDA'AH	*Parkia bicolor*	Mimosaceae	wang	High canopy forest
	Khaya grandifoliola	Meliaceae	Mpfa'a	Secondary forest
	Milecia excelsa	Meliaceae	Ndwon	Primary and secondary forest
	Mitragyna stipulosa	Rubiaceae	Ntoum	Swampy forest
	Sterculia rhinopetala	Sterculiaceae	Kponnzon (Nkana)	Primary and secondary forest
	Lophira alata	Ochnaceae	kpwe	Primary and secondary forest
	Afzelia sp.	caesalpiniaceae		Primary forest
	Pycnanthus angolensis	Myristicaceae	Pwae	Secondary forest
	Lovoa trichilioides	Meliaceae	Kwo' (bibolo)	Primary and secondary forest
	Pterocarpus sp.	Fabaceae	Woucy	Primary forest

B A N K I M	*Canarium schweinfurthii*	Burceraceae	dzuing	Secondary and high forest
	Lovoa trichilioides	Meliaceae	Kwo' (bibolo)	Primary and secondary forest
	Diospyros sp.	Ebenaceae	Zo'	Primary and secondary forest
	Berlinia sp.	Mimosaceae		Primary and secondary forest
	Alstonia boonei	Apocynaceae		Secondary forest
	Piptadeniastrum africanum	Caesalpiniaceae		Mid to high canopy forest
	Pterygota macrocarpa	Sterculiaceae		Primary and secondary forest
	Pycnanthus angolensis	Myristicaceae	Pwae	Secondary forest
	Sterculia rhinopetala	Sterculiaceae	Kponnzon (Nkana)	Primary and secondary forest
	Terminalia superba	Combretaceae	Gean	Secondary forest
	Pterocarpus sp.	Fabaceae	Woucy	Primary forest

VI INVENTORY METHODOLOGY

IV-1 INTRODUCTION

This work sets out to quantify the number, size and distribution of important plant resources in the selected villages such that the results could be used to:

- asses the distribution and the density of a particular important forest product in each village in particular and in the Plain in general;
- examine the floristic composition and effect of habitat on the distribution of particular taxa;
- establish the relationship between resource use and village proximity;
- assess the rate of exploitation and regeneration status of forest resources.

IV-2 LAYOUT OF BASE-LINE INVENTORY

Prior to conducting the inventory the project staff consulted the draft of the map of the area which was currently being drawn. This enabled the staff to see where the transect will go through a maximum of land uses reflecting natural range of variation in forest types. The first step of fieldwork was then the cutting of transects into the forest prior to the demarcation of a baseline, reading of GPS and altitude. Two and a half km transects were cut at right angles to the baseline. Permanent marker pegs at 100m intervals divided each transect into twenty-five 100m long plots. Each of these plots was again broken down into 20m sub-plots.

Measurements were conducted in a 5 m wide band either side of the transect route (total width of 10m) giving each plot an area of 0.1ha.

Diameter (DBH) of all trees over 5cm were measured throughout each plot along with the height and recorded while sub-sample regeneration plots of 5mX5m were positioned at 100m intervals.

Trees with more than one stem at breast height were common in the forest. Each stem was measured separately. Buttressed trees were measured by climbing to where the buttress ceased to exist or by simple estimation. Parallel transects were cut in the forest in the direction west-east but the distance of 200m apart was not respected. The parallel transects were separated by large distances in order to touch a wide range of forest types.

IV-3 SLOPE CORRECTION

It was necessary to obtain correct horizontal distances through slope correction. Problems of relief and particularly rough terrain were resolve by using ropes with knots tied at positions were the slope changed. The use of the compass in cutting the transects reduced errors from slope.

IV-4 DEMARCATION AND ENUMERATION

Demarcation was conducted by three villagers and one forester with the supervisory assistance of the team leader. To insure that the lines cut were straight, poles made from saplings were aligned with each other on the booker's line after every 20m with the distances labeled on it. Each line was cut by 2 men, one to clear the line and the other to cut and align the poles. With this arrangement, a 2.5 km line could be cut in three days by two people. The compass person (forester) kept a check on the direction of the line re-establishing the bearing where necessary.

Once demarcation was completed the enumeration team followed or walked down the transect enumerating the trees on each side of the booker's line. The trees were identified by the team using local names. At the same time, the scientific names were given along side by the field botanists. No major difficulties in species identification arose from local names reasons being that most important commercial timber and non-timber forest products are all well known to the villagers.

The five meters distance on each side of the transect was periodically checked. The speed with which the skills were learnt by the villagers was most impressive that after some time all the field workers became adapted and competent in estimating which individuals were in the transect and which were outside.

Trees were measured for DBH, their height estimated and transect were divided in contiguous 10m X 20m plots and data recorded separately. Additional information such as state of exploitation or harvest was also noted. Each transect enumeration was completed within three to four days. In all, six transects were cut in the whole plain (15km) giving a total sample plot of 15 hectares.

TAGGING

Sample trees were painted red at the beginning and end of each transect line with the GPS reading taken at these two positions.

IV-5 REGENERATION

At 100m intervals along each transect 5m X 5m regeneration plots were established. On these plots all seedlings below 50cm of height were noted using the Brown Blanquet abundance-dominance scale:

+ = species is present;

1 = abundant individuals with a weak degree of recovery;

2 = individual covers at least 1/20 of surface;

3 = individuals covering between ¼ and ½ of the surface;

4 = individuals covering between ½ and ¾ of the surface;

5 = individual covers above ¾ of surface.

This regeneration plots permitted us to have an idea on the abundance of some NTFPs which were herbs or climbers. It gives also an appreciation of their frequencies along the transect.

IV-6 SITE SELECTION

The three village sites selected for the inventory work: Ngambe Tikar, Manda'ah and Bankim were selected based on their different gradation in vegetation and secondly due to their population. Their proximity to forest ranges was also a criteria.

Ngambe Tikar is found on the southern part of the Plain and is more related to the semi-deciduous rain forest zone now being exploited by a forest company. Manda'ah is found on the western part with it vegetation turning towards that of the grasslands of the west (no logging company, but the population were moved because of the creation of the dam) while Bankim is found at the northern edge and has a vegetation turning towards that of the savannah regions of the north where timber companies and crude timber exploiters had cut down many trees so many years ago.

VI-6-1 Minor area of Ngambe Tikar

- SONKOU gazetteer; it is a small quarter situated 2.6 km from Ngambe Tikar center along the road leading to the western province. The transect cut here was in the W-E direction and the GPS co-ordinates at the starting point and the end point were respectively 05 48 33 N, 11 21 24 E and 05 42 07 N, 11 30 04 E. The altitude was 710m.
- NKUEDABEH NGBEDABEH gazetteer; The base line is parallel to the road leading to Nditam. This gazetteer is situated at about 1.5 km from the Ngambe center and the booker's line of the transect is situated along a GPS of (05 46 85 N, 11 28 60 E) at the start and 05 49 61 N, 11 30 95 E at the end point. This area has an altitude of 670 to 720m.

VI-6-2 Manda'ah

- BUBUH (Backassi) gazetteer; this is a small deserted quarter situated 10km from the actual Manda'ah village square. The transect in this gazetteer maintained the same direction (W-E) and the transect line is seated on a GPS of 05 36 49 N, 11 49 11 E at the starting point and 06 14 88 N, 11 16 00 E at end point. The altitude here ranges between 690m to 740m.
- Ancient MANDA'AH gazetteer; this site is situated 13km from the present village site. The transect line here is on a GPS of 06 10 86 N, 11 09 10 E at 0m and 06 08 51 N, 11 06 59 E at 2500m. The altitude ranges from 700 to 710m at start and finish respectively.

VI-6-3 Bankim

- MOINKOING gazetteer; this is a small village situated 10 km from Bankim market square along the Adamoua-Foumban highway. In this area, the base line was parallel to the road. The transect line is on GPS of 05 41 08 N, 11 47 13 E at 0m and 06 08 55 N, 11 23 14 E at 2500m. The altitude ranges between 655 to 680m of height.
- NEW TOWN gazetteer; it is a quarter situated at 1.5 km from the road at Bankim market square. The transect cut here was on a footpath taken as base line and parallel to the main road. With the transect following the usual direction. The booker's line was on a GPS of 06 02 59 N, 11 30 81 E and 06 03 27 N,11 29 10 E at beginning and end point respectively. The altitude of the gazetteer ranges between 695m and 700m at start and finish respectively.

The direction of the transect was maintained in Ngambe Tikar and Manda'ah (W-E) but at Bankim this direction was changed because of the water of the dam which surrounded the town. It was also because of the fact that we needed a direction which may cover a maximum of land uses, mostly the forest as it was very difficult to find primary and secondary forests here. Due to this situation, a north-south direction was given to the transects here. Also to mention is the fact that significant land clearance by people practising the slash and burn farming method has disturbed the graded interface

between home-farm-farm-fallow and high forest in villages like Bankim and Manda'ah affecting hence the data.

IV-7 TRAINING AND SENSITISATION

All data recording was the responsibility of the project team working with the communities. The eventual aim is for the community to conduct all the inventory work. However, this is still a long way off. Educational levels are very basic with many of the older members being illiterate. This problem is exacerbated in some communities by the fact that the inhabitants do not understand any of the two national languages (French and English). When the team reached each village, a sensitization campaign was lunched in a forum involving the inhabitants at a venue arrange by the Chief. In most cases, these meetings took place at the Chief's palace. These meeting sessions were aimed at outlining the basic objectives of the inventory and explaining it importance to the public. These included:

- assessing what was left in the forest before or after exploitation;
- try to understand marketing situations of NTFPs;
- open up new markets for the NTFPs in future;
- encourage the domestication of important NTFPs which have disappeared;
- teach them how to manage their forest in a sustainable manner;
- educate them on community forest management, how to calculate cubage (volume of timber) and giving them prospects for setting up plans for community forest management.

During these meetings the basic methodology was explained to chase-away fears (of the population) of destroying their forest. After each meeting in each village five to seven community members were selected to work with the research team. Most of them were young men. Due to the time at our disposal it was deemed necessary that training in techniques used in this inventory should be conducted as we walk down the transects. It was also in course of this meeting that most species of economic importance were disclosed and a list drawn up.

It was found that community members quickly became proficient in the use of tape measures. However the use of compass proved difficult and much further training in

the field will be necessary before community members will be able to conduct this type of work without assistance. This aspect was single handedly carried out by civil servant from the forestry department of the sector.

Task allocation was rotated such that the team of community members had an opportunity of undertaking each activity. By the end of the fieldwork, each community member could undertake the majority of tasks required.

Despite the problems encountered, the project staff are confident that with more training and continued supervision community members will eventually be able to conduct inventory fieldwork on their own. In the course of this inventory 19 native Tikars were used with at least 15 who mastered the inventory methodology and purpose of each activity.

Women did not participate in this fieldwork. Given that literacy levels amongst women are lower than men it seems unlikely that women will play a more active role in the near future. However interviews were carried out in homes and women associations to classify the NTFPs according to their local importance.

IV-8 TASK ALLOCATION

A team of six core staff was used for the completion of this inventory. However extra support staff was recruited from each village as the team arrived in these various villages. An average of 12 people were at work each day.

Fieldwork was undertaken by male community members in association with the research team. Work was divided into two stages with separate teams specializing in and performing different tasks as follows:

- Team 1: transect cutting and measuring and slope correction
    - one compass operator;
    - two community members (responsible for cutting);
    - one community member (tape measurement and stake placement);
- Team 2: enumeration
    - one booker;
    - two data collectors (DBH measurement);
    - one porter (recording trees in Tikar);

- three botanists;
- Support staff: one driver.

The task allocated to community members were constantly changing in order to enable them grasp the inventory methodology and activities. The duty of the porter in team two was to identify the tree locally i.e. give the vernacular name and it utility if any. Scientific names were then given along side these vernacular names by the botanists. It must however be signalled that one person had to carry out more than one activity at a time because of the insufficiency of the support team. This is because community members were being paid for this work. Measurement of DBH was conducted by two persons at a time in an attempt to speed up the process. The two teams were jointly supervised by the Chief of Project.

IV-9 DATA ANALYSIS

Analysis of the data collected during this survey was undertaken using a number of computer programs. Data was entered and managed using BRHAMS (Botanical Research and Herbarium Management System), graphs and charts were produced using Excel.

V RESULTS

V-1 ETHNOBOTANICAL SURVEY

Forty-six species where signaled as being important in the three villages of the Tikar Plain surveyed. This survey indicated that species such as *Ricinodendron heudelotii, Irvingia gabonensis, Garcinia kola, cola accuminata* and *dioscorea* spp. where top ranking important NTFPs to almost all the villages of the Plain (table 3). These species found in the tally sheet were actually found and enumerated despite the fact that their number wasn't important in most areas.

Table 3. Ethnobotanical survey (entire Tikar Plain)

Species			USE 1			USE 2			Comments
	LF	SC	TC	UC	VC				
Ricinodendron heudelotii	T	43	1	3	1				
Irvingia gabonensis	T	Seedling	1	3	1				Only seedlings were found
Garcinia kola	T	Seedling	1	3	1	3	4	0	Bark (intestinal worms)
Cola accuminata	T	93	1	3	1				
Canarium schweinfurthii	T	10	1	3	2	0	0	1	Fruit sold locally (50 fr/treep)
Xylopia aethioppica	T	5	1	3	1				
Piper guineensis	V	22	1	3	2				
Cola pachycarpa	T	38	1	3	0				
Landolphia sp.	V	8	1	3	2				
Voacanga africana	T	81	1	4	1				
Dacryodes edulis	T	9	1	3	2				
Uapaca spp.	T	24	1	3	0				
Pseudospondia microcarpa	T	45	1	3	0				
Myrianthus arboreus	T	281	1	3	0	3	4	0	
Piliostigma thoningii	S	224	1	3	1				
Tetrapleura tetraptera	T	81	1	3	2				
Nauclea latifolia	S	39	1	3	1				
Aframomum spp.	H	++	1	3	1	1	7	2	Used as condiment, medicinal
Elaeis guineensis	T	84	1	5	2	2	2	2	
Dioscorea spp.	V	++	1	3	0				Bush yam (non cultivated)
Mondia whetei	V	++	0	3	0				
Khaya grandifolia	T	2	3	4	2	0	0	1	
Annona senegalensis	S	251	1	3	0	7	4	0	Edible fruits, root cantreat tooh ach
Cordia platythirsa	T	89	1	3	2				3 fruits for 25 frs
Milicia excelsa	T	20	4	4	0	0	0	1	
Enanthia chloranta	T	++	3	4	1				
Spathodea campanulata	T	6	3	4	0				
Lophira alata	T	3	3	4	0				
Piptadeniastrum africanum	T	27				0	0	1	
Sterculia rhenopetala	T	148				0	0	1	
Pterocarpus sp.	T	4				0	0	1	
Terminalia superba	T	55				0	0	1	
Entandophragma cylindricum	T	55				0	0	1	
Pycnanthus angolensis	T	104				0	0	1	
Rauvolphia vomitoria	T	100	3	4	0	4	4	0	Treat stomach problems
Margaritaria discoidea	T	99	3	4	0				
Phytolaca sp.	H?	++	4	4	0				Treat ear
Terminalia glaucescens	T	95	3	4	0				
Aspilia africana	H	++	4	4	0				
Lannea nigritana	T	122	3	4	0				
Allophylus africanus	T	68	3	4	0				
Crossopteris febrifuga	S	231	3	4	0				Treat cough and tuberculosis
Parkia bicolor	T	7	0	0	1				
Garcinia mannii	T	19	2	7	1				Used as chewstick (local tooth brush)
Gambea africana	T	35	3	4	0				Treat epilepsy
Petersianthus macrocarpus	T	24	3	4	1				Cures Typhoid

[1]the species is classified as tree (T), shrub (S), vine (V), or herb (H).

[2]the tissue code (TC) list the part of plant that is used, where stems=o, fruits/seeds=1, leaves=2, bark=3, exudares=4, and roots=5
[3]the use code (UC) describes how the plant tissue is used, where timber=0, construction=1, cordage/weaving=2, food=3, medecine=4, oil=5, industrial compound=6, other=7
[4]the value code (VC) describes whether the product is currently use for subsistence purposes, sold commercially, or both, where subsistence=0, commertial=1, both=2, past commercial=3.
[5]additional descriptive details about uses listed as ‘’other’’ or information about market prices, fruiting seasons, or cultivation practices could also be noted.

V-2- VEGETATION

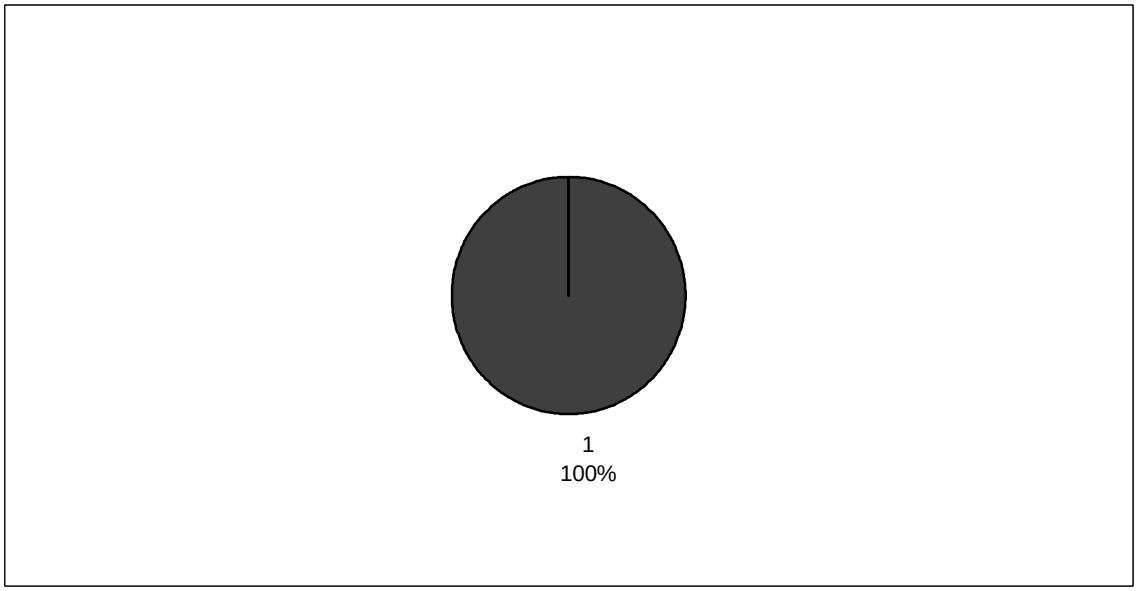
Based on the inventory work carried out in the Tikar Plain, we noticed that this forest-savannah transitional zone is made up of two forest types that integrate completely. For example around Ngambe Tikar and Manda’ah the forest is dominated by Euphorbiaceae and in Bankim its the Leguminosae which are dominant (table 4 and figure 2).

In Ngambe Tikar, of the 2621 individuals belonging to 70 different families, 355 are Euphorbiaceae and 289 belong to the large group of Leguminosae. Moving progressively north west of the Plain the savannah in dominant and is characterized by Annonaceae (*Annona senegalensis*) and Rubiaceae (*Crossopterix febrifuga*)

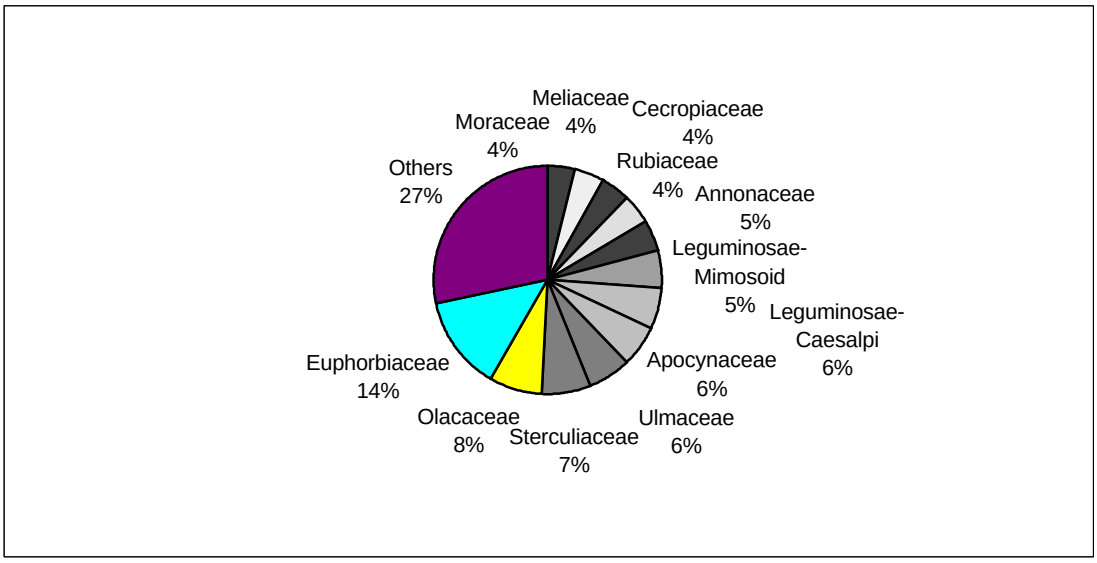
Table 4. Most important plant families of the Tikar Plain

Family	Ngambe-Tikar		Manda’ah		Bankim	
	No. Of indiv.	% trees	No. Of indiv.	% trees	No. Of indiv.	% trees
Euphorbiaceae	355	14	397	14	145	10
Olacaceae	198	8	137	5	-	-
Sterculiaceae	177	7	84	3	-	-
Ulmaceae	161	65??	68	2	-	-
Apocynaceae	153	6	-	-	-	-
Leguminosae-caesalpiniceae	151	6	47	5	65	4
Leguminosae-mimosaceae	138	5	255	9	160	11
Annonaceae	119	4	146	5	61	4
Rubiaceae	112	4	203	11	80	5
Meliaceae	110	4	-	-	-	-
Cecropiaceae	107	4	110	4	98	6
Moraceae	101	4	114	4	58	4
Leguminosae-fabaceae	-	-	130	5	66	4
Sapindaceae	-	-	93	3	-	-
Anacardiaceae	-	-	102	4	-	-
Compositae	-	-	80	3	78	5
Combretaceae	-	-	80	3	-	-
Palmaceae	-	-	-	-	78	5
Graminae	-	-	-	-	87	6
Others	562	27	664	23	583	35

Ngambe-tikar



Manda’ah



Bankim

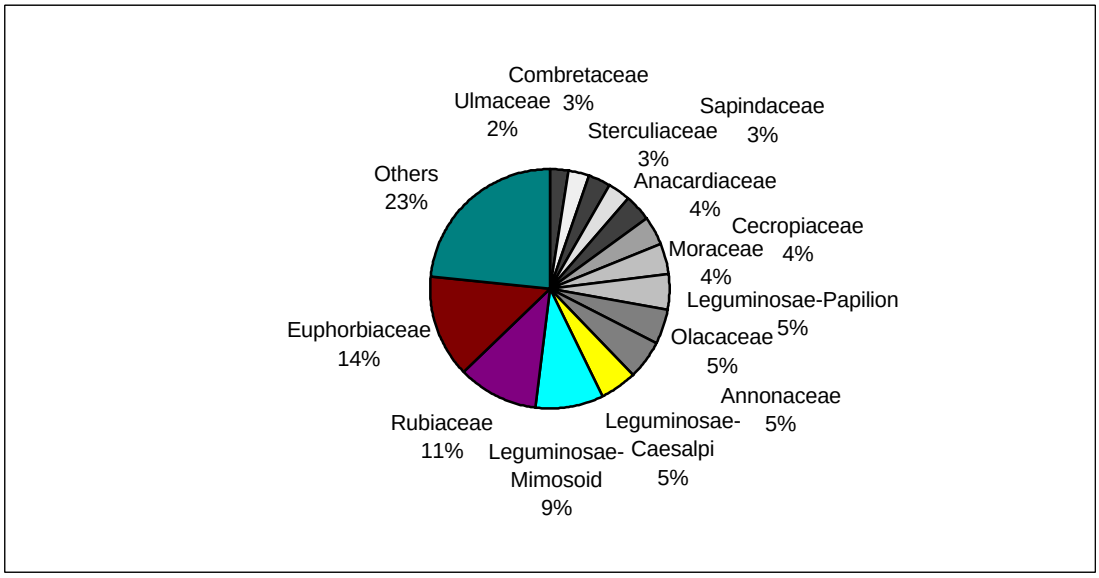


Figure 2: Plant families in the Tikar Plain in terms of number of individuals.

V-3 LAND USE SYSTEMS DESCRIPTION

V-3-1 Primary forest

With regards to the physiognomy, this forest has the biggest recovery (90-95°%). The height stratum is compact. This includes a weak recovery of the medium stratum (40-50%). The under story is mixed with some herbaceous plants and some lianas. From the floristic point of view, the presence of shrubs in the under story of the Primary forest testifies to its old age. Among the most typical are: *Rinorea welwistschii, R. oblogifolia, Cola pachycarpa, Psychotria* spp. The most dominant large trees are: *Maranthes glabra, Drypetes gossweileri, Allanblankia* f*loribunda, Milicia excelsa, Santiria trimera, Petersianthus macrocarpus, Polyalthia suaveolens.*

V-3-2 Secondary forest

Physiognomically, plant density in this forest is higher than in the primary forest. As expected, lianas are abundant. We observe a great density of lianas. The recovery of the bigger trees vary between 70 and 80%. Herbaceous plants are also abundant. Its flora

contains big trees of the primary forest such as: *Petersianthus macrocarpus and Pycnanthus angolense.* The presence of the young stalks of *Polyatia suaveolens and Milicia excelsa,* which are the species of primary forest shows the dynamism of this forest in evolving towards the primary forest. The pioneer species *(Musanga cecropioides, Trema orientalis, Myrianthus arboreus,)* which have reached their climax in growth fall off or simply creates a shade permitting a better growth of the species of primary forest.

V-3-3- Fallow fields

They are physiognomically characterised by the presence of few large trees, the abundance of herbaceous plants and of young seedlings of shade tolerant species. The bigger trees cover only 10% of the total area, while the shrubs about 30 - 40%, and the herbaceous plants 90%.

The poor flora which is more or less a consequence of the recent slash-and-burn agriculture shows some outstanding large trees *(Terminalia superba, Triplochiton scleroxylon, Albizia* spp.) The herbaceous surface area is dominated by *Aframomum longicarpum* and *Chromolaena odorata* forming tufts.

V-3-4 Cocoa fields

It is essentially characterized by shade tolerant trees which are fruit bearing species planted afterwards. These trees cover about 25-30% of the surface. The cocoa trees cover about 90% while the herbs which are most often cut down cover only 5-10% when the plantation is well maintained.

The flora of the high stratum is dominated by *Pycnanthus angolense, Petersianthus macrocarpus, Distemonanthus benthamianus, Ficus exasperata, Albizia adiantifolia, Dacryodes edulis* and *Persea americana.*

V-3-5 The farmland

It is here that the impact of slash-and-Burn agriculture is most felt since it is most recent. The large trees are reduced to cover just 5%, the crops cover 60-80% while the shrubs disappear almost completely.

The flora is dominated by cultivated species: *Zea mays, Arachis hypogea, Manihot esculenta, Musa sapientum, M. parasidiaca, Carica papaya, Saccharum officinarum, Solanum macrocarpum, solanum nigrum* and weeds.

V-3-6 Coffee farm

The physiognomy of this land use is close to that of the cocoa farm. The stratification is made of a high stratum dominated by trees of about 40m height. The most dominant species are: *Albizia adiantifolia, A. glaberima, A. zygia , Vitex doniana, Pycnanthus angolensis*. The medium stratum, about 12m in height includes *Rauvolphia vomitoria, R. macrophylla, Voacanga africana, Persea americana*. The herbaceous stratum is dominated by ferns of the genera *Pteris and Arthropteris* .

V-3-6 The savannah

It is characterized by the dominance of grasses which form the essential part of the herbaceous stratum. The most represented genera are the *Andropogon, Pennisetum* and *Panicum*. The ligneous stratum, is dominated by fire resistant species such as *Terminalia glaucescen, Crossopterix febrifuga, Annona senegalensis, Nauclea latifolia* and *Bridelia ferruginea.*

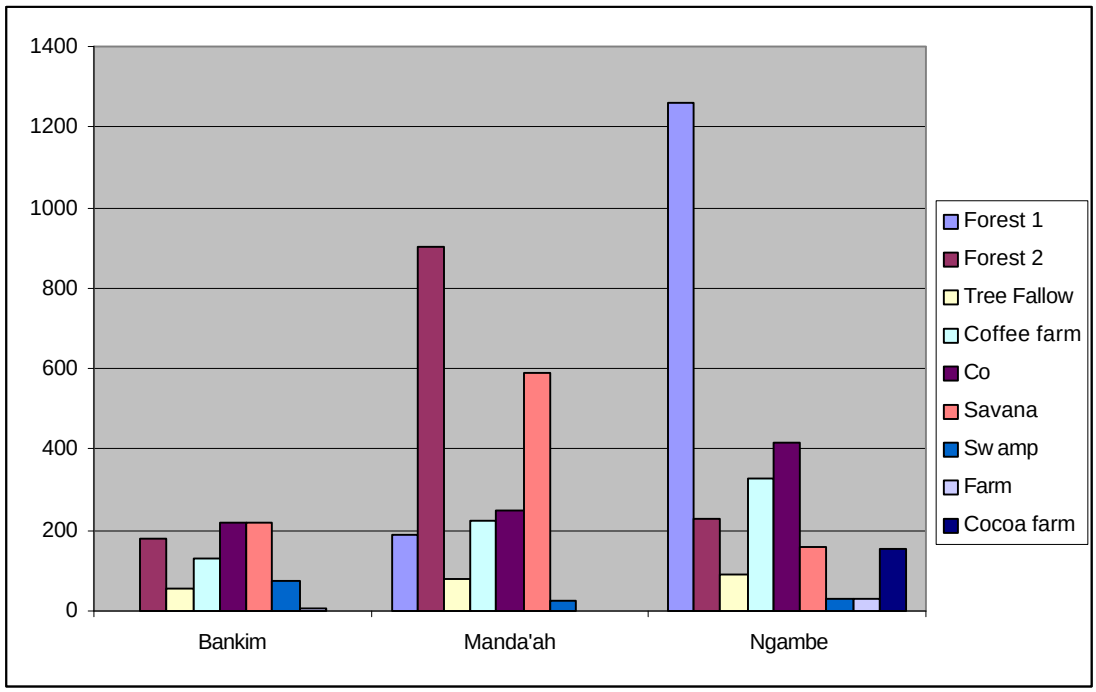
V-3-7 The swamp

This land use is heterogeneous in the Plain. Those found in Ngambe Tikar are dominated by *Raphia monbutorum* while in Manda'ah and Bankim they are mostly dominated by *Nauclea diderichii, Mitragyna stipulosa* and many smaller trees. The families of Cyperaceae, Maranthaceae and Araceae form the essential of the herbaceous stratum.

V-3-8 Land use system tree density

Figure 3 gives an indication of the density of trees in the different types of land uses identified along the transects. It also indicates how much forest land has been converted to other types of land uses by activities such as the slash and burn agriculture practice, fire made by shepherds for the sake of new pasture for their cattle and the logging activities.

The primary forest is highly represented in Ngambe Tikar, more so than in Manda'ah and much more than in Bankim. In Manda'ah secondary forest is dominant as regards the other villages of the Plain. Figure 3 shows also that Bankim is poor in terms of individuals with a DBH of 5 cm. The swamplands are very large and very poor in term of individuals. They are less represented in the entire Plain. The savannah is wide in Manda'ah followed by Bankim and lastly Ngambe Tikar. This is a clear indication that as you move northwest, the vegetation changes gradually from forest land to savannah.



V-4- Non timber forest products

The following tables (tables 5, 6, 7 and 8) and diagrams (figures 4-12 and picture 4) present a summary of results of the NTFPs encountered and enumerated as part of this inventory.

Species found in this paragraph are those which are most important in term of utility and abundance. They are mostly those signaled by the local community during the ethnobotanical survey.

Table 5: Summary of results of important NTFPs

GAZETTEER	Species	Total # of stem	# of stems / ha	Basal area (m^2/ha)
NGAMBE TIKAR	*Ricinodendron heudelotii*	34	6.8	12.691
	Cola spp.	73	14.6	1.493
	Voacanga africana	52	10.4	0.792
	Tetrapleura tetraptera	34	6.8	4.032
	Garcinia mannii	11	2.2	0.240
	Elaeis guineensis	6	1.2	1.338
	Canarium schweinfurthii	2	0.4	0.025
	Piper guineensis	10	2	-
	Annona senegalensis	77	15.4	0.991
	Xylopia aethiopica	1	0.2	0.047
MANDA'AH	*Ricinodendron heudelotii*	6	12	5.063
	Cola spp.	15	3	1.364
	Voacanga africana	19	3.2	0.141
	Tetrapleura tetraptera	27	5.4	0.785
	Garcinia mannii	8	1.6	0.112
	Elaeis guineensis	2	0.4	0.028
	Dacryodes edulis	9	1.8	0.994
	Canarium schweinfurthii	8	1.6	0.876
	Piper guineensis	11	2.2	-
	Annona senegalensis	116	23.2	1.357
	Xylopia aethiopica	3	0.6	0.457
BANKIM	*Ricinodendron heudelotii*	3	0.6	0.400
	Cola spp.	5	1	0.011
	Voacanga africana	17	3.4	0.012
	Tetrapleura tetraptera	20	4	0.064
	Garcinia mannii			
	Elaeis guineensis	76	15.2	1.353
	Piper guineensis	2	0.4	-
	Annona senegalensis	1	0.2	0.080
	Xylopia aethiopica	1	0.2	0.055
	Dioscorea spp.	20	4	-

Table 6. Quantification of the forest in term of NTFPs

Species	Total # of stems	Mean stem/ha	No. of harvestable stems/ha	Mean Basal area m^2/ha	Notes
Ricinodendron heudelotii	43	2.87	43	6,051	All trees enumerated where at havestable size
Cola spp.	93	6.2	10	0956	Trees bears fruits where small
Voacanga africana	81	5.4	81???	0.315	All trees enumerated where at havestable size
Dacryodes edulis	9	0.6	0.331	0.96	Individuals are fertile when reaching 10 cm DBH
Tetrapleura tetraptera	81	5.4	20	0.960	All trees enumerated where at havestable size
Xylopia aethiopica	5	0.3	5	0.186	All trees enumerated where at exploitable size
Annona senegalensis	251	16.7	200	0.809	Exploitable in dry season
Garcinia mannii	19	1.3	6	0.176	Trees exploitable have a DBH > 10cm
Canarium schweinfurthii	10	0.7	10	0.451	All trees enumerated where at havestable size
Elaeis guineensis	84	5.6	84	0.906	Stems exploited have a DBH > 10cm

Table 7. Harvestable rattans (including seedling and juveniles)

Species	Total # of clumps (stems)	No. of clumps/ha
Lacosperma secundiflorum	5	0.333
Eremospatha hookeri	3	0.20
Eremoapatha wendlandiana	4	0.267
Lacosperma lavae	6	0.400

Table 8. Stocking of *Piper guineensis* and *Dioscorea* spp.

Species	Total stem enumerated	No. of stems/ha	Comments
Piper guineensis	22	1.5	Length evaluation is difficult since it is a vine
Dioscorea spp.	45	3	Tubers are consumed as yam

Ricinodendron heudelotii

This species is a common component of the Tikar Plain. It is found scattered over the whole Plain but with greater affinities towards the southern part of the Plain. This product was atop most in the list of important NTFPs in all the villages. This species has a very rapid growth and produces fruits after about 5-8 years and is harvestable in the large size-classes. The product is found to be mildly exploited and the low impact of seed harvesting does not affect regeneration, hence this species cannot be considered as over exploited. Seed picking is common in areas nearer to zones of habitation i.e. mostly in tree fallow and secondary forest. So to an extent we can instead say this important NTFP is under-exploited in the Plain. Due to the increasing importance of this NTFP trials of domestication were noticed around Bankim in the northern part of the plain. About 7 individuals are found per hectare (figure 4).

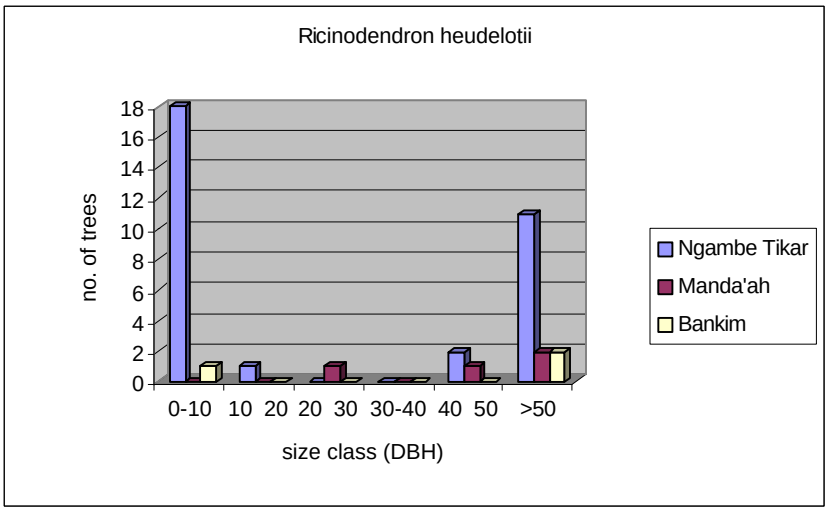


Figure 4. Size-class distribution for *Ricinodendron heudelotii*

Tetrapleura tetraptera

This NTFP though important in other zones of Cameroon has not yet drawn the attention of the people of the Plain. Seeds of this NTFP are not consumed by the people of the plain. The density per hectare varies from 4 in Bankim to 7 in Ngambe Tikar. It is mostly found in the secondary forest, cocoa and coffee farms. It was found in the market in small quantities and is used only by non-natives. The tree produces fruits at seemingly late age and they are picked under trees of higher size classes. This low impact of seed harvesting does not affects regeneration.

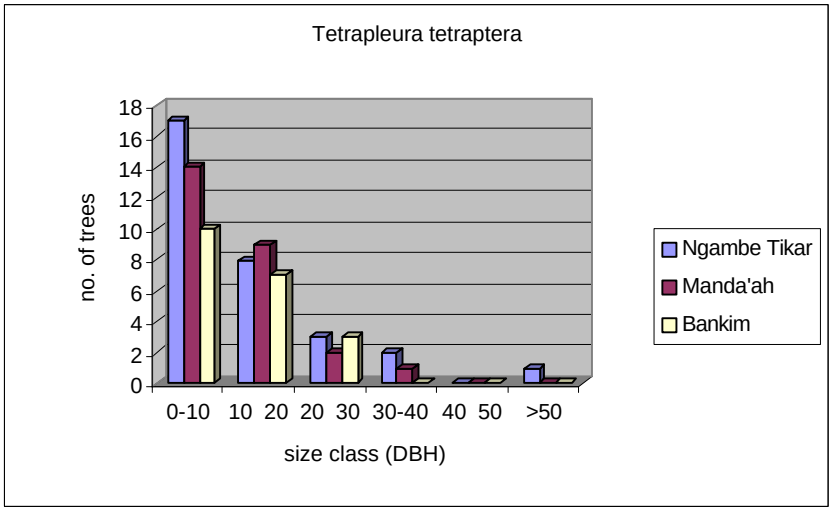


Figure 5. Size-class distribution for *Tetrapleura tetraptera*

Voacanga africana

It used to be of high value because of it medicinal importance and was even domesticated. Today its importance has declined in the Cameroonian market. The latex has alkaloids that are useful in the fabrication of medicines. Many individuals of the small size class were enumerated: about 52 trees in Ngambe Tikar, 19 at Manda'ah and 17 at Bankim where the people were discouraged from growing this species. This NTFP is present on farm land, cocoa and coffee fields, in the secondary forest and in the fallows. It is less exploited because of the lack of markets. However, local tradi-practitioners use it though in low quantities. The species is under-exploited.

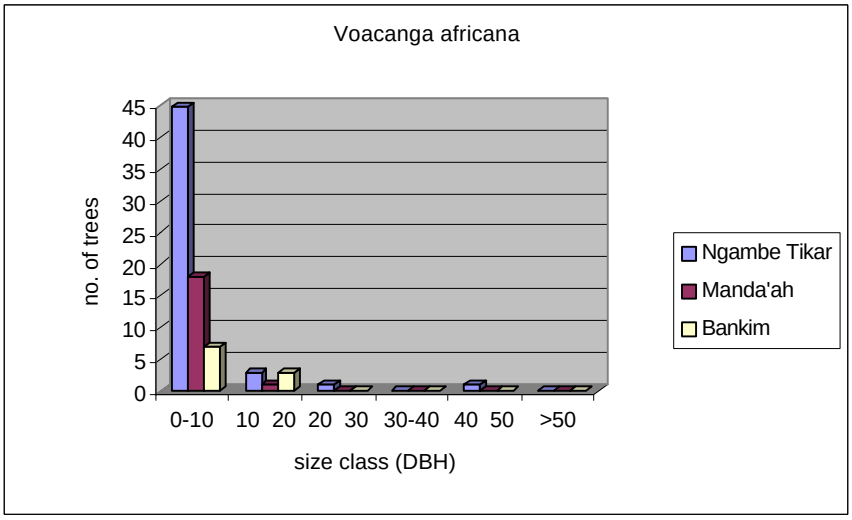


Figure 6. Size-class distribution for *Voacanga african*

Xylopia aethiopica

Because of the high medicinal value of this species, the bark is highly exploited locally. Most of the individuals encountered had their bark peeled about 2m from the ground. The density per hectare is around 0.047 in the whole Plain. In the course of this inventory, few individuals of small size class were encountered. Some of the trees were destroyed by this back harvesting practices. This species is found in high canopy forest. Fruits are used as spices and is not well known in the Plain. These fruits are harvested around January.

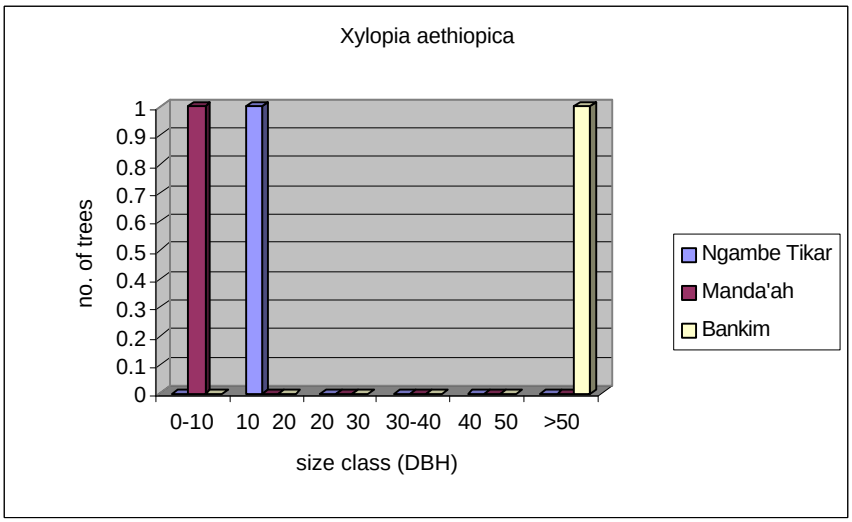


Figure 7. Size-class distribution for *Xilopia aethiopica*

Cola spp.

This include *Cola accuminata, C. pachycarpa. Cola lepidota* which were found in a very low density. They produce fruits at seemingly early age and some are harvestable even in smaller size classes as well as in large size classes. *Cola accuminata* is the only one that is exploitable amongst the species in the plain. The fruits are harvested or picked and sold in markets in the North Provinces. This species is found to be domesticated because of it economic power. *Cola pachycarpa* is less exploited. The pressure on the wild resource is low.

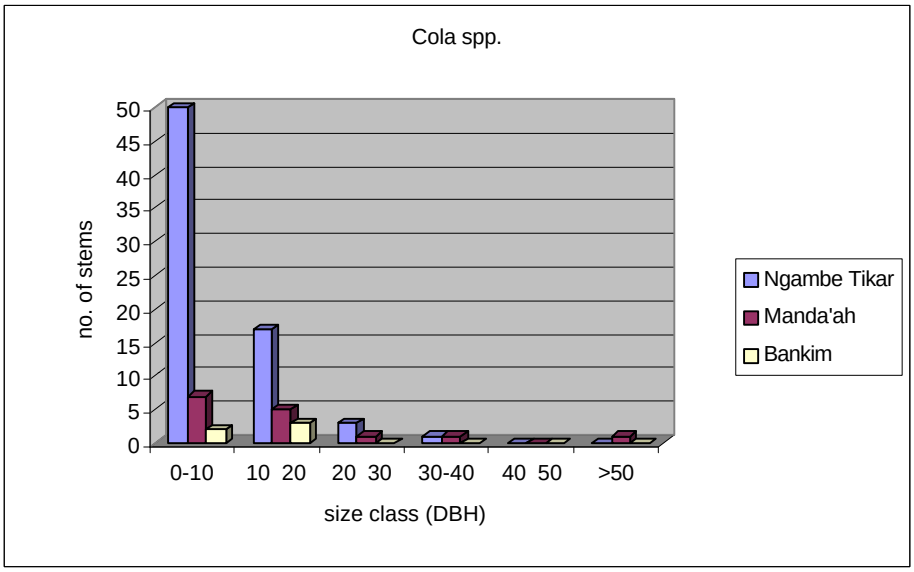


Figure 8. Size-class distribution for *Cola* spp.

Dacryodes edulis:

As this species is commonly encountered in semi-domesticated state in home gardens and compounds the pressure on the wild resource is therefore low. This resource is not abundant in the plain hence the inhabitants are less interested in it. Inhabitants of the western part of the plain domesticate this resource most frequently because of they lack substitute NTFPs. This habit is new and this explains why few individuals of large size-class were noted.

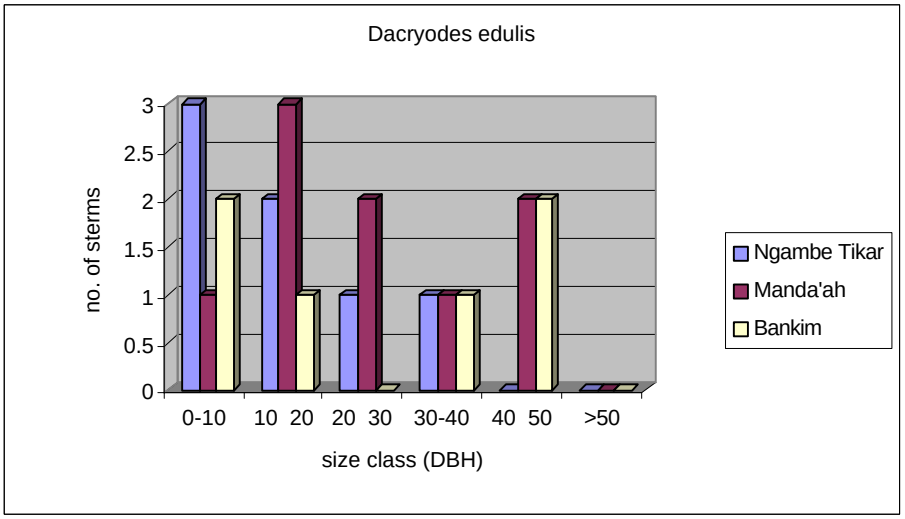


Figure 9. Size-class distribution of *Dacryodes edulis*

Annona senegalensis:

This is a shrub found in the savannah and produces fruits which ripen and are consumed during the dry seasons. This resource is important only locally and hence is exploited only in a subsistence manner. Fruits are sold just in the local markets and are hardly taken out of the Plain. The bark of this NTFP also serves as medicine for toothaches. This resource is a shrub and this explains why only individuals of small size-classes were found. The low harvesting rates has less effect on regeneration. Since this is a savannah product it stands the risk of being affected by yearly bush fires.

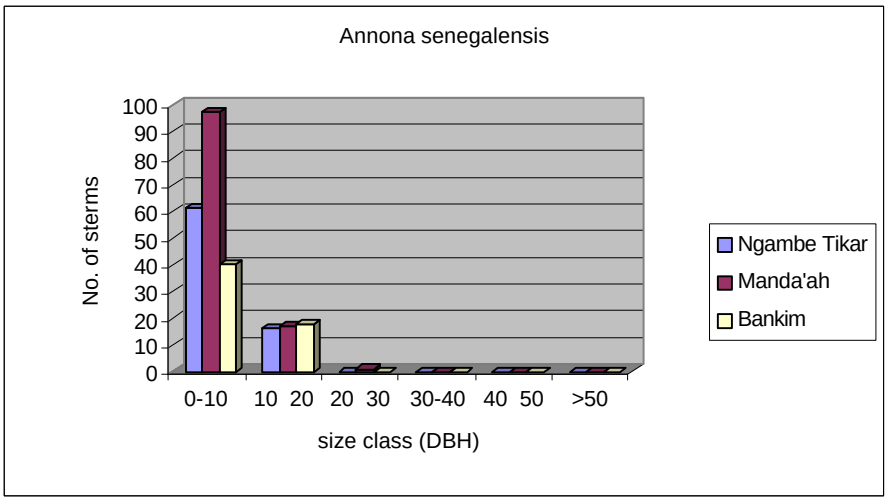


Figure 10. Size-class distribution for *Annona senegalensis*

Elaeis guineesis:

This constitutes a very important NTFP for the inhabitant of the Tikar plain. It is exploited at both subsistence and commercial levels. However, no plantations of this resource exist in the Plain. Beside the oil that is extracted (palm oil) from the seed, its sap is also tapped as wine (palm wine). It produces fruits at early stages and consequently the number of harvestable stems (dbh>10 cm) per hectare is also high. Harvesting of seeds is done in a sustainable manner, with the stems left intact. But this resource is not of large importance in the plain.

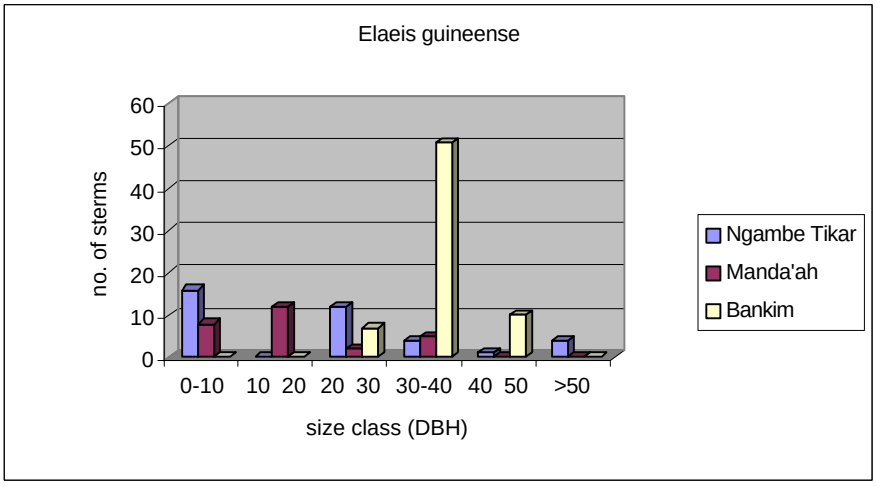


Figure 11. Size-class distribution for *Elaeis guineensis*

Garcinia mannii:

Contrary to the over-exploitation of this resource in other parts of the country (Sunderland and Tchouto, 1999) this product is not heavily exploited in the Tikar Plain because of the lack of knowledge on the commercial level of this resource. Some foreigners use it as a chewstick locally and since this product is wild (found in high canopy forest) pressures on it remain low. Species of lower size-classes were encountered most during this inventory and hence the regeneration status is good.

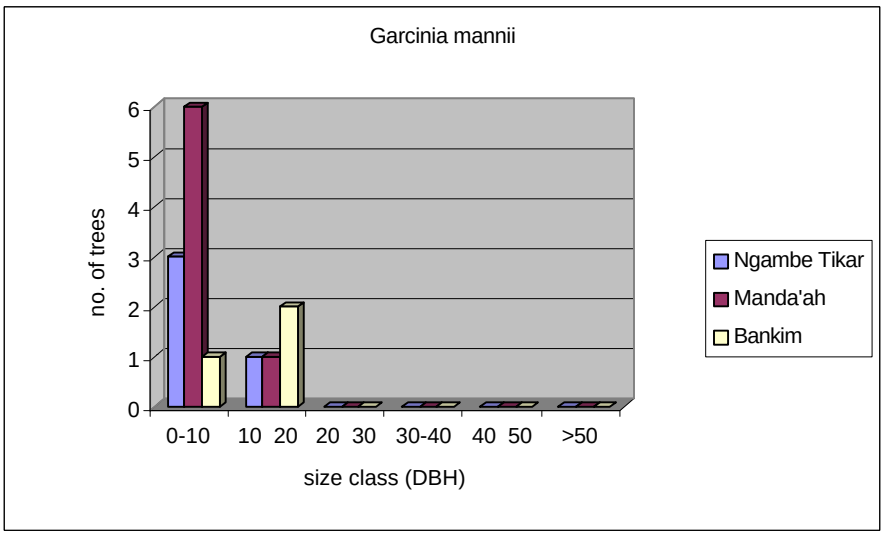


Figure 12. Size-class distribution for *Garcinia mannii*

Garcinia kola:

Besides *Ricinodendron heudelotii* (Njansang) this constitutes one of the most valuable and important NTFP of the Tikar Plain. However the exploitation of the forest is seriously affecting the population of this species since they are found in mid- canopy and high forest. This exploitation is of concern not only for the biological and sustainability implications but also because the local community actually benefits much from harvesting the seed of this resource. In the course of this inventory only seedlings of this product were found. No individual was found above the size limit enumerated during this inventory.

Irvingia gabonensis:

Commonly called bush mango this resource was identified as being one of the most important NTFP of the Tikar Plain because of its high commercial value. In the course of this inventory only two seedling of this product were encountered. One individual was also found but with a small size-class. The lack of seedlings and pole stages can be an indication of the unsustainable practice of the annual harvest of nearly each and every seed. Along the transportation routes of this product no seedlings exist indicating the stronghold of the population on this product. The reason for not encountering this species might also be due to sampling in a forest type not preferred by this species.

Canarum schweinfurthii:

This is a mid-late secondary and high forest species which represents both an important NTFP and timber product. The seeds of this tree are harvested and they are consumed as food after boiling in warm water. This resource is highly commercialized along the highway for travelers in the country. Since this resource is exploited for wood as well, individuals of larger size-classes were scarce in the sampled areas. The exploitation of this product as timber is a threat to its NTFP value and this situation has to addressed.

Rattans:

The stocking of rattans is less in high or primary forest than in secondary forest and common around swamps in secondary forest. Few clumps of rattans were encountered in the course of this inventory. People of the Tikar Plain are not traditional weavers and hence less pressure is mounted on this resource. However some are harvested and used in weaving fishing (baskets) traps. The method used in harvesting is having a detrimental impact on the exploited groups compromising their ability to regenerate. Spectacularly long rattans were not found in the forest as compared to elsewhere (Mokoko).

Piper guineensis:

This resource was most commonly met in the forest both primary and secondary. The individuals found were noted climbing on tree bark. Some individuals were also encountered in farm fallows and tree fallows. This bush pepper is highly commercial and is exploited widely. The sustainability of this resource is a course of concern for since it is a climbing plant to ease the task of harvesting collectors just cut it at the base and pull it down.

Dioscorea sp.:

This resource is a herbaceous NTFP whose tubers are widely consumed around the plain as bush yam. The high pressure on this resource from inhabitants of forested zone renders it scarce and therefore valuable in the local markets. Since no domestication attempts for this product exist, it is bound to disappear one day because of the unsustainable manner in which it is exploited.

V-3 TIMBER SPECIES

The Tikar Plain has not escaped timber exploitation. Though the southern part of the plain is an enclave, this does not prevent exploitation companies like the HASIM which presently is still exploiting in sectors around Ngambe-Tikar. This zone is noted for it high quality timber such as *Entandrophragma cylindrica* (Sapeli) and the *Diospyros* sp. (ebene) which are becoming scarce in other parts of the country. This exploitation, though under license, is not carried out in a sustainable manner. The proof is that in other parts of the Plain like Bankim and Manda'ah where exploitation had taken place long ago, the forest is almost disappearing. The formation of logging parts in the forest has much effect on the existence and sustainability of NTFPs. Many timber species were encountered in this area and almost all of them are currently being exploited. Table 10 presents those species which are currently being exploited both for exportation and local use.

Table 10. Commonly exploited timber species

Gazetteer	Species	Trade name	Total no. of stems	No. of stems/ha	Notes
Ngambe Tikar	*Milecia excelsa*	Iroko	4	0.8	50% of stems encountered were exploitable
	Pycnanthus angolensis	Ilomba	44	8.8	Species present but not highly demanded
	Terminalia superba	Frake	10	2	Very few large trees are remaining
	Sterculia sp.	Kponzom	85	17	High proportion of harvestable size
	Lovoa trichilioides	Bibolo	8	1.6	Very few large trees are remaining
	Entandrophragma cylindricum	Sapeli	3	0.6	Few large trees are remaining
	Alstonia boonei	Emien	3	0.6	All stems have their DBH>50cm
	Pterocarpus sp.	Padouk	3	0.6	Medium size trees
	Gambeya africana		18	3.6	Medium size trees
	Diospyros sp.	Ebene	4	0.8	Few large trees are remainning
	Afzelia pachyloba	Doussie	1	0.2	Tree of exploitable size
	Coelocarion preussii	Ekoume	8	1.6	Many of exploitable size
	Celtis sp.		92	18.4	Many large trees present
	Mammea africana		2	0.4	Trees of exploitable size
	Parkia bicolor		4	0.8	Small size timber
Manda'ah	*Milecia excelsa*	Iroko	9	1.8	Few individuals of exploitable size
	Pycnanthus angolensis	Ilomba	27	5.4	Few large trees
	Terminalia superba	Frake	11	2.2	Large number of small trees
	Sterculia sp.	Kponzom	55	11	Many trees of harvestable size
	Lovoa	Bibolo	1	0.2	Medium size tree

	trichilioides				
	Lophira alata	Azobe	3	0.6	Medium size timber
	Alstonia boonei	Emien	1	0.2	Tree encountered has DBH>50
	Pterocarpus sp.	Padouk	1	0.2	Medium size tree
	Gambeya africana		17	3.4	Low proportion of harvestable size trees
	Diospyros sp.	Ebene	1	0.2	Harvestable
	Pterigota sp.		14	2.8	Many large trees existed
	Celtis sp.		47	9.4	Large trees present
	Mammea africana		1	0.2	Large tree of exploitable size
	Parkia bicolor		1	0.2	Medium size timber
Bankim	*Milecia excelsa*	Iroko	7	1.4	Few trees found were of exploitable size
	Pycnanthus angolensis	Ilomba	13	2.6	Half of trees encountered were of exploitable size
	Terminalia superba	Frake	3	0.6	Medium size trees
	Sterculia sp.	Kponzom	8	1.6	Large trees present
	Lovoa trichilioides	Bibolo	3	0.6	Medium size trees
	Alstonia boonei	Emien	1	0.2	Tree of exploitable size
	Celtis sp.		5	1	Many medium size trees
	Parkia bicolor		2	0.4	Harvestable size
	Pterigota sp.		3	0.6	Small size trees
	Pterocarpus sp.	Padouck	1	0.2	Harvestable

Milicia excelsa:

This tree is widespread in the plain and is highly exploited. Individuals with exploitable sizes were almost absent in Ngambe-Tikar. In the course of this inventory,

many individuals with smaller size-classes were encountered. Since small size-class individuals exist we can say the regeneration status of this species is satsfactory.

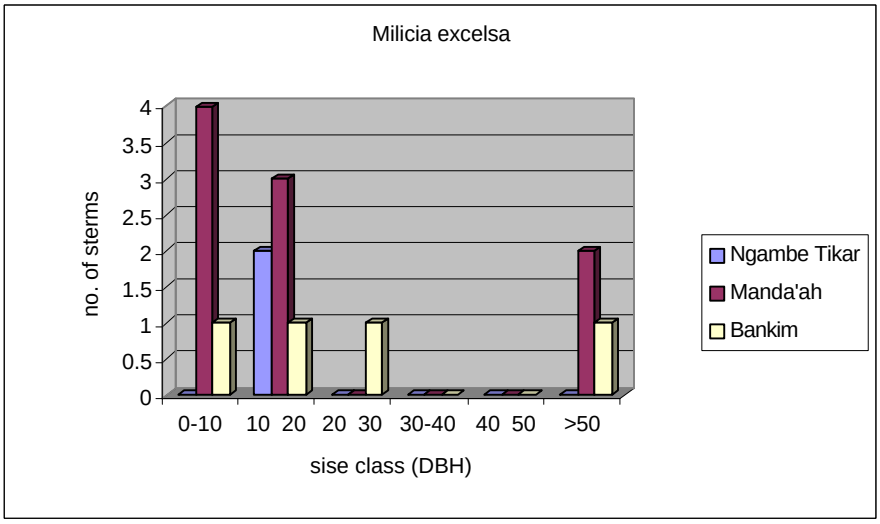
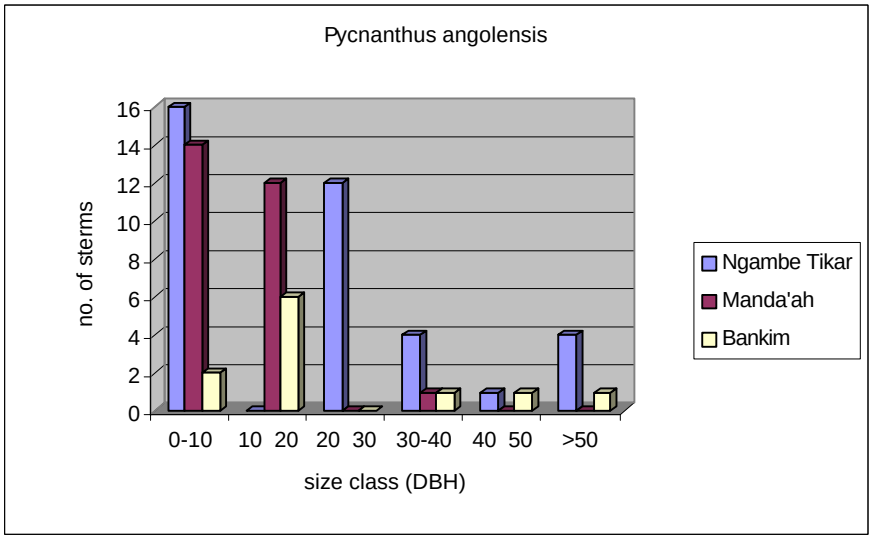


Figure 13. Size-class distribution for *Milecia excelsa*

Pycnanthus angolensis:

This plant is almost omnipresent in all late secondary and primary forest of the Plain presents many individuals of the smaller size-classes. The reason being that since its used locally for planks, doors and windows, individuals of the large size-class are cut down even illegally. In sectors where exploitation had taken place (Bankim) this species in less present and shows how unsustainable the process of exploitation has been. The presence of small individual ensures good regeneration rates.

Figure 14. Size-class distribution for *Pycnanthus angolensis*



Terminalia superba

Being another currently exploited timber, individuals of large size-class become scarce in forests where exploitation has taken place. Individuals of this species were encountered in all the gazetteers but it most be noted that those with larger size-classes were very few in number.

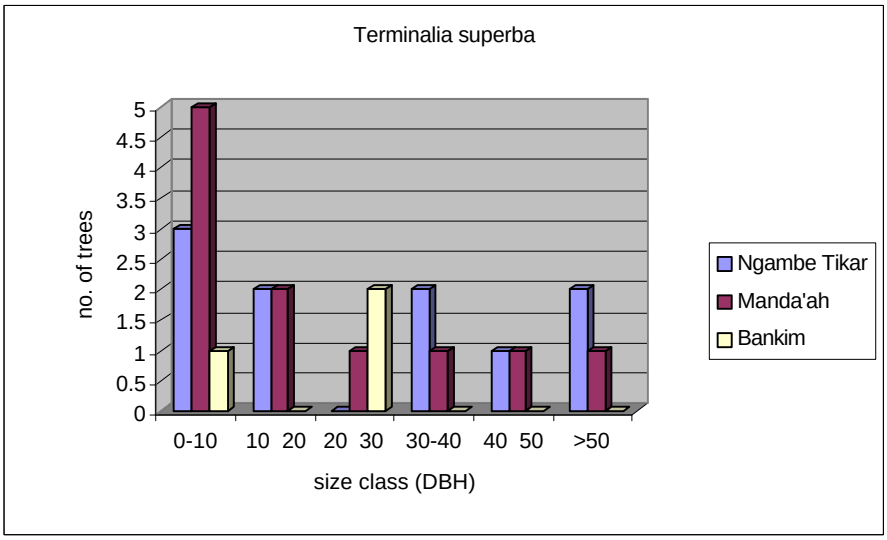


Figure15. Size-class distribution for *Terminalia superba*

Alstonia boonei:

In the course of this inventory few individuals of this species were encountered. What is strange here is that only larger size-class individuals existed although this species is exploited. The absence of smaller trees indicate a very low regeneration rate of this species hence there is a need for the sustainable logging of this timber.

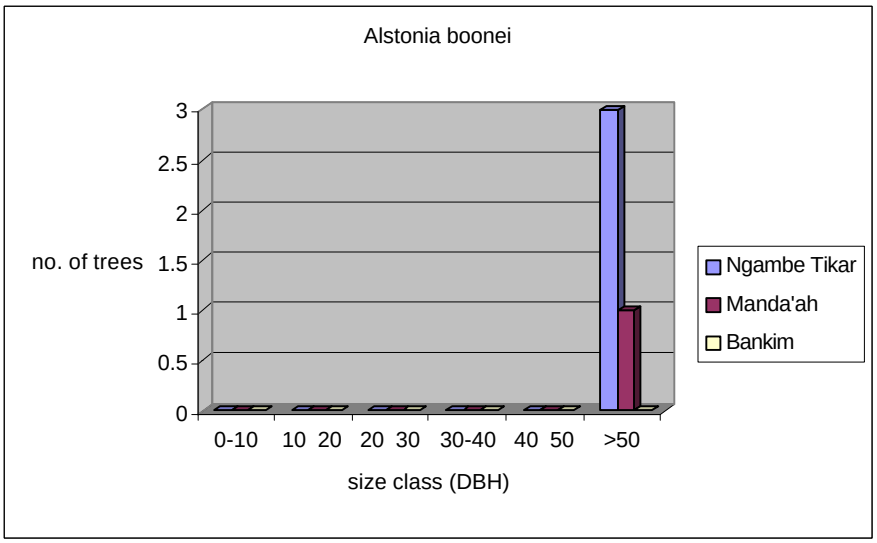


Figure 16. Size-class distribution for *Alstonia boonei*

Entandrophragma cylindricum:

This is one of the most valuable and important timber species of the plain. The great search for this product makes it relatively scarce in the forest. Few individuals were encountered during this fieldwork and most of them were of the smaller size-classes. However it should be acknowledge that the high level of exploitation has a negative effect on the regeneration status of this species.

VI DISCUSSION

VI-1 NTFPs

In the Tikar plain there exists a degree of imbalance in resource distribution for both timber and non-timber forest products. There also exists trends in resources use or exploitation with most exploitation taking place in the secondary forest and farm fallow. Exploitation levels are greater in farm fallow followed by secondary forests and lastly in the primary forests for resources which are extremely scarce in the fallow and secondary forest like *Garcinia kola* and *Irvingia gabonensis.* It is also noted that the further away you move from the villages the level of exploitation of NTFPs like *Ricinodendron heudelotii* reduces such that in the high canopy forest far off from the villages, this most important NTFP is not even picked.

In term of distribution you will find that the secondary forest harbors more potential important NTFPs followed by the primary forest for the scarce ones and lastly the farm fallows.

As regards regeneration status we noted a greater regeneration in intact secondary forest. However it must be raised that areas where timber exploitation had taken place show no such trends.

The figures obtained on species composition and stocking could enable us after extrapolation to develop rough estimates of harvestable populations; the sustainability of which will be determined through permanent sampling and long term ecological monitoring.

For the species being over-exploited, continued harvesting at the current rate will undoubtedly lead to local scarcity (*Dacryodes edulis, canarium schweinfurthii*). In general, exploitation of resources ranges from the relatively high and unsustainable (*Dioscorea* spp., *Piper guineensis*) to relatively benign, but unsustainable in the long term (*Garcinia kolai, Irvingia gabonensis*) to low impact and sustainable (*Elaeis guineensis*). The population, being conscious of the potentials of the *Ricinodendron heudelotii,* is attempting to exploit this particular resource in a sustainable manner (no cutting down of stems of *Ricinodendron heudelotii)*.

Resource ownership here has no major effects on the potential sustainability of certain products. Apart from the resources found in home gardens and around compounds, exploitation or harvesting of NTFPs is done on a “first come first serve” basis. Since no one closely controls the forest, whether gathering is on the part of natives or foreigners the effects are the same - over exploitation. In this region what reigns is survival of the fittest. The under-exploitation of some important NTFPs present in the Plain can be accounted for by the fact that a greater part of the Plain is enclave hence less foreigners explore this zone.

VI-2 TIMBER SPECIES

The trend of exploitation here is obvious. Secondary forest zones close to transport routes are most exploited hence the secondary forests are most exploited. Since many sawyers exist in this area it is noticed that sometimes they move a long way into

the primary forest where trees are felled, split and head ported to the villages or the saw mills. The rate of timber exploitation in the Tikar Plain is high.

Field observations indicate that there are four major ecological and sustainability issues regarding current timber exploitation:

- The maximum size-class of 60 cm DBH is neglected, hence good quality smaller trees are removed by both the exploitation companies and local (illegal) exploiters. This aspect is detrimental to future regeneration;
- The establishment of routes through which the logs are dragged by tractors is an important source of forest clearance and destruction;
- Concentration of timber exploitation activities for a long time in certain areas render them devoid of marketable species;
- The fact that exploitation in this zone is done by a licence company answerable only to the state makes the population to have no interest as to whether a species is exploited in a sustainable manner or not. The exploitation of species with overlapping uses such as *Canarium schweifurthii* which also has a NTFP use is also a cause of concern.

VI-3 LEVELS OF EXPLOITATION AND PROSPECTS FOR DOMESTICATON

The level of exploitation of many wood and non–wood forest products are considered as being moderate but the long term impact on many taxa (which of course difficult to quantify) is quite significant. From a visual observation of the Plain, we can see that the exploitation of the timber is highly unsustainable. This is demonstrated by the disappearance of high canopy forest where it used to exist, the existence of discontinuity in the forest canopy and the complete disappearance of quality exploitable timber.

The constant removal of propagules: fruits of *Irvingia gabonensis, Garcinia kola, Ricinodendron heudelotii, Dacryodes edulis* and other species has an undoubted impact on the population structure as can be seen from the preliminary data.

In addition, the unsustainable exploitation of vegetation part such as the removal of the bark of *Petersianthus macrocarpus* (picture 5) or harvesting the stems of rattans, harvesting *Piper guineensis* by cutting the stem and dragging, digging the entire tuber of *Dioscorea* spp. also has an immediate and long-term effect on their potential to reproduce

and replace the individuals lost. Since exploitation is greatest in the immediate vicinity of the population, local scarcity in these more accessible areas has lead to an increase collection range for many products, hence increasing pressure on the existence of products such as *Ricinodendron heudelotii, Garcinia kola* and *Irvingia gabonensis.*

Without the necessary management scheme these cited resources will become increasingly scarce and risk extinction. This indicates that interventions will be needed to mitigate or moderate the long-term effects of current harvesting practices including better management of wild resources and greater domestication. This aspect is already noted in parts of the Plain (Bankim) but must be encouraged.

Table 9. Summary of agrorestry status and domestication potential of selected NTFPs

Species	Current harvesting impact in the Tikar Plain	Prospects for domes-tication in the Plain	Current domestication status and potential	Notes
Ricinodendron heudelotii	Medium in enclaved area and high at Bankim	Good	Currently in cultivation at Bankim. Subject of current ICRAF research (Tchoundjeu in press)	However high value resource would benefit from better management rather than domestication
Irvingia gabonensis	High	Good	Widely cultivated in Nigeria with high yielding cultivars (Okafor in press) Subject of current ICRAF research (Tchoundjeu in press)	The cultivated resource is becoming more important with high yielding cultivars. High demand for planting stock in Cameroon
Garcinia kola	High	Low	Trials of cultivation is a subject of the current ICRAF research (Tchoundjeu in press)	Successful stems planted by local farmer take a very long time to fruit hence research cultivars will be readily welcome all over the country
Piper guineensis	Medium	Low	Sometimes cultivated in farms and farm-fallow. It is most collected in the wild	It grows readily from both seed and cuttings: a high value addition to any cultivation system
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Cola accuminata	High	Good, can be found planted around compounds	Widely cultivated with many improved cultivars (Opeke 1997)	Good planting material is often not available; strong demand
Dacryodes edulis	High	Good can be found	Widely cultivated with many improved	A common component of compound and home gardens easily grown from

		planted around compounds	cultivars. Subject of current ICRAF and IPGRI research (Tchoundjeu et al. in press)	seeds and cuttings
Tetrapleura tetraptera	Low	No present need	Not currently in cultivation	High value resources will benefit from better management rather than domestication e.g. retaining individuals in farm land and forest
Garcinia mannii	Low	No present need	Not currently in cultivation	No prime importance to inhabitants of the plain. The market of this product is closed
Voacanga africana	Low	No present need	Formerly it was being cultivated	The fall in the market of this product has discourage inhabitants of the plain who don't care about it any longer
Dioscorea sp.	High	Low	Current trials of cultivation	It grows readily from cuttings of tubers
Rattans	Low	Low	No trials of domestication	The first rattans sylviculture trials has been established in the SW province (IBID)

VI-5 LAND CLEARANCE AND RESOURCE TENURE

In the course of land clearance for agriculture many potential valuable trees are usually felled and burned along side the rest of the vegetation. This happens mostly with NTFPs which are of no immediate and particular importance to inhabitants of this area. In some parts of the Plain such as Bankim, the local authority lay the blame on foreigners (non-native Tikars) mostly anglophones from the Northwest province for being responsible for forest disappearance. This indicates that little control over land and forest resources is exercised by the local authority.

Another cause of destruction of important NTFPs is the lack of resource tenure. Since the forest is commonly owned by the entire community and controlled by the local authority nobody will want to look after a tree on the farm or forest when some one else will harvest it.

However, key resources such as *Ricinodendron heudelotii, Garcinia kola* and *Irvingia gabonensis* are retained in the farms of almost all the farmers because of their value. Since no traditional management and control exist for these species, their fruits are picked on a "fist come first serve" basis. Taking care and maintaining these products on farmland is viewed by most farmers as a means of ensuring access to it before any other members of the community. It is also a means of monitoring it so as to be the first to

harvest. According to the farmers, cultivation of important NTFPs on farmland requires little labour input other than collecting the fallen fruits and this also reduces the time and discomfort of searching for and harvesting the product in the wild. However, for these farmers the problem with the cultivation of important NTFPs is the technique of cultivation and the time these trees will take to become harvestable. It is commonly believed that once planted most species take a very long time to grow, mature and become productive. This indicates the belief that no immediate benefit can be accrued from planting a *Garcinia kola* or *Ricinodendron heudelotii* tree when it has to take about 5-10 years to grow and fruit.

In some parts of the Plain, attempts are being made to cultivate important NTFPs such as *Ricinodendron heudelotii* and *Invingia gabonensis* but we must say that in most parts, ignorance on exactly how to cultivate most of these high values resources discourages farmers who would like to diversify their cultivated resources. This was one of the responses obtained when interviewed on why they could only plant coffee and cocoa. This aspect or response indicates that there is lack of transfer of technological know-how from research agencies (ICRAF) to the local population in forest zones. Since the population is becoming more and more interested in NTFPs local scarcity will increase and this condition can only be mitigated by the incorporation of these resources into agroforestry systems.

VII RECOMMENDATIONS

VII-1 RECOMMENDATIONS

- Controls on the exploitation of the most unsustainable exploited resources in the Tikar Plain should be implemented (*Garcinia kola* and *Irvingia gabonesis*).
- Local communities should receive guidance from forest department officers when clearing land for farming in order to avoid felling valuable NTFPs.
- Local communities and forest department officers should take part in controlling commercial timber exploitation so as to enable exploiters respect the exploitation norms.

- agencies and NGOs should be more effective in transferring technical know-how on how to cultivate certain high value NTFP resources. This can alleviate poverty and increase living standards of some families.

VII-2 CRITICISMS

Based on observations and findings of this report, the following criticisms can be advanced:

- Now that the refined methodology has been tested, aspects such as dynamic inventory could be added to this methodology. This could be done by the establishment of permanent sample plots (PSP). The objectives of the PSP program will be to monitor the dynamics of forest stands so as to estimate future growth, harvesting and regeneration rates of particular important NTFPs.
- Respecting the distance of 200m between parallel transects in zones where the forest is scattered implies that so many transects have to be establish before a cross-section of the forest could be inventoried. This will mean spending more time in the field and increasing the labor force.
- This methodology should officially include a rapid data survey of areas out of the sampled sectors. This will give an insight of all the available resources found in the region even those not found along the transects.
- Numerous sensitization campaigns should be carried out at the level of the local population before the arrival of the research team. This means that resource persons should be stationed in time at each project site.

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