

**MINISTRY OF ENVIRONMENT AND TOURISM  
Directorate of Forestry**



**Inventory Report on the Woody Resources in  
Sikanjabuka Community Forest**

**Namibia-Finland Forestry Programme**

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## 1. INTRODUCTION

The Directorate of Forestry (DoF) under the Ministry of Environment and Tourism in Namibia has a mission to carry out forest resource assessments in Namibia. In this task the Government of Finland has supported it since 1995. Initially the aim of the support was to build up the capacity of the Directorate to carry out regional forest inventories of large areas (National Forest Inventory component, NFI). During the years, an increasing number of local level inventories have also been carried out to fulfill specific requests by projects and forest managers. The support from the Government of Finland today through Namibia-Finland Forestry Programme Phase II aims now more at strengthening the capacity of DoF to serve the needs for local level forest management planning.

The inventory in Sikanjabuka was carried out by the National Forest Inventory team (NFI) between the 18<sup>th</sup> and 30<sup>th</sup> of April 2002. The forest inventory area covers the Sikanjabuka Community Forest that is an area of 4,927 hectares, in Katima Mulilo district, Caprivi Region. It is located about 7 kilometers south of Bukalo Forest Station.

Another component of NFFP, which is the Participatory Integrated Forest Management (PIFM), is directly working with the community of Sikanjabuka. They deemed it necessary to find out the amount of resources available in the area in order to compile a sound management plan. With regard to community forestry, the component is encouraging community participation in the management of their forest and forest products. More income generating activities for sustainable development are thought of in the near future, as the community will be synthesized to the concept of community forestry.

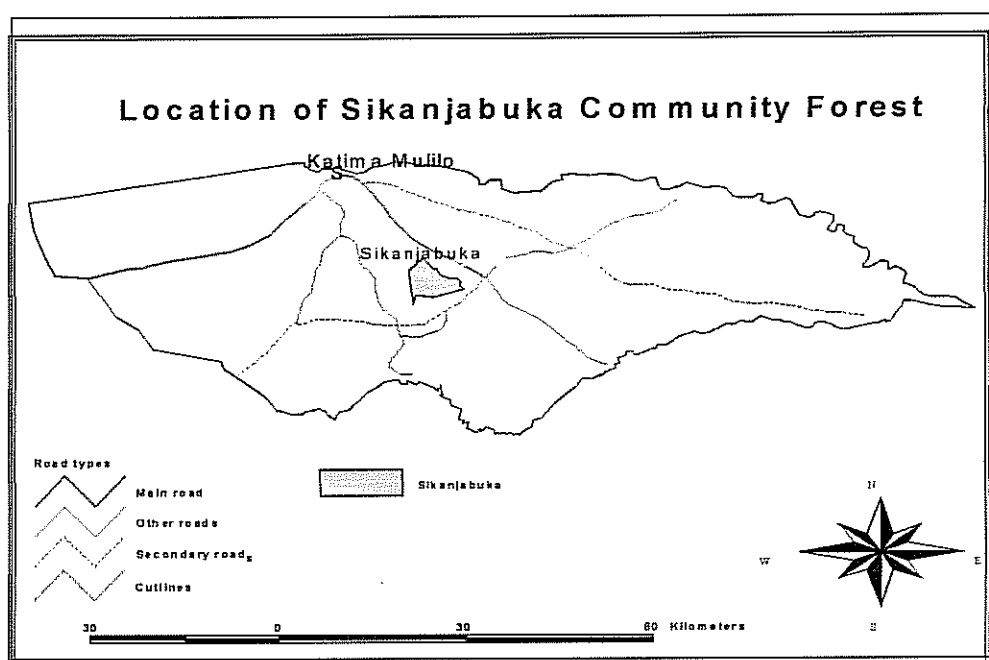
A participatory study of the indigenous land units (see The Description of Indigenous Land Units in Sikanjabuka area report) was undertaken in Sikanjabuka area between December 2001 and March 2002. The National Remote Sensing Center (NRSC) staff with the active involvement of the communities from various villages carried out the survey and mapping. The idea was to involve more people who are direct beneficiaries in the utilization and management of the natural resources in the area. It was also seen that the use of the indigenous environmental knowledge of the resources might contribute to the acceptance and successful management of the available resources. Another idea was to try to link the indigenous use and naming of the diverse resources to the scientific concepts and usages. Appendix 3 shows the land units observed in Sikanjabuka.

In this report, only some basic results have been presented for the different indigenous land units.

## 2. GENERAL DESCRIPTION OF THE AREA

The area belongs to the Mopane Savanna vegetation zone in the classification of Giess (National Atlas of South West Africa). The average rainfall is 700 mm per year. The average elevation is about 930 m above sea level.

The highest temperatures are felt in September, October and November when there is often little cloud cover. The sun's radiation is then high and average daily maximums are between 32°C and 35°C. Frost is unusual but to a lesser extent, they occur in Sikanjabuka. The rate at which water evaporates into the atmosphere varies during the year, from the highest rates in September and October when it is hot and dry and clouds are sparse, to the lowest rates in the coldest mid-winter months.



Map 1. Location of Sikanjabuka inventory area

### 3. INDIGENOUS LAND UNITS

The indigenous land units can be referred to as a collection of natural landscapes or landforms (see Appendix 3). It is a land surface, which one can comprehend and detect with the eyes. Many landforms are familiar, such as plains, mountains, hills, valleys, lakes, rivers etc. Below are brief descriptions of the land units in Sikanjabuka.

#### a. **Mulapo/ Mulonga**

Mulapo/ Mulonga is a floodplain that is used to direct water from the main stream to the other end, especially during the rain season.

#### b. **Chilundu/ Mutunda**

This land unit is very general. It can be for example, found around a pan or any other depression type of land units. It is an upper land area where people settle to avoid flood.

#### c. **Sikela/ Chigalala**

Chigalala has a soft and loose soil on the top layer but once dug a bit; it is very hard within few centimeters. This suggests the presence of a shallow hard pan.

#### d. **Museke**

Museke is an open sandy forest area mainly dominated by high *Terminalia sericea* (Muhonono), few *Acacia erioloba* and *Colophospermum mopane*.

#### e. **Chikera**

This is more or less a flood plain where rain water stays for sometimes after the rain. It is another vernacular name for Oshana. This type of land unit was not found inside the sikanjabuka inventory area.

#### f. **Lun'amba**

It is a relatively high lying area which is a small magnification of Chilundu. It is found usually just after the river banks or Mulonga.

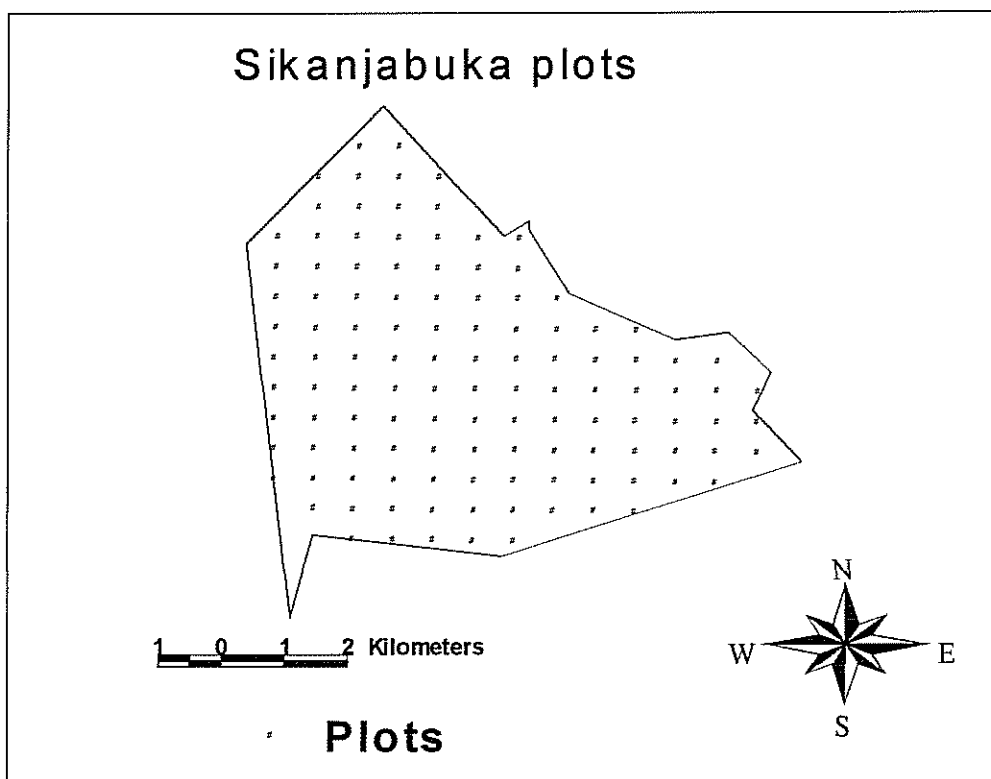
#### g. **Lukunduseke**

This is more or less the same like Museke. It occurs everywhere where sandy soil is noticed.

## 4. INVENTORY DESIGN

### 4.1 Sampling method

The woody resources were estimated using a systematic sampling of field plots (see map 2). A total of 119 sample plots were measured in Sikanjabuka. This was much dictated by the given number of working days available for the inventory. Also experience showed that satisfactory inventory accuracy should be possible to achieve with that number of plots.



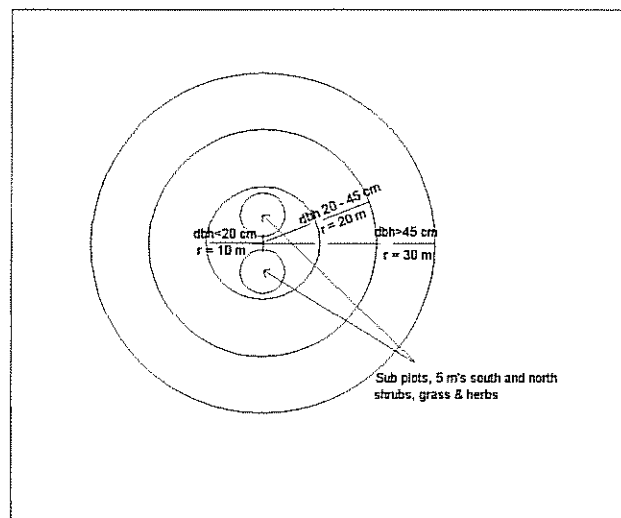
**Map 2. Location of sample plots**

All trees, with at least 5 cm DBH, inside the circular plot were measured. The plot consisted of three concentric circles. The size of the plot depended on the size of the tree so that the radius of the plot is 30 m for trees with a breast height

diameter (DBH) more than or equal to 45 cm; 20 m for trees with  $20 \leq \text{DBH} < 45$  cm; and 10 m for trees with  $5 \leq \text{DBH} < 20$  cm. Diameter, location, species, crown class, quality, length and quality of possible saw log were measured. Height, canopy diameter, crown height, damages and phenology were recorded for each tree in the plot.

In addition, shrubs and regeneration were measured using two circular sub plots of 3.99 m radius. Woody plants with a diameter at breast height less than 5 cm were recorded on the shrub and regeneration field form.

Several variables describing the site, soil and tree cover were observed for each plot. All measurements are described in more detail in the field instructions (see Field instructions for the NFI, 2001)



**Figure 1: Plot design**

The inventory did not collect information specifically on the NTFPs in the sense that it did not for example try to estimate the availability of fruits from different species or collect information on roots tubers etc. However, a considerable part of the NTFPs used in the region are related to trees. Therefore, the information on trees can be used to indicate the abundance or scarcity of some of the NTFPs.



## 5. INVENTORY RESULTS

### 5.1 Measured data

A total of 119 plots were measured on an area of 4,927 hectares. Each plot represents an area of 41.4 ha. A total of 2,593 trees with a diameter of at least 5 cm were measured on the plots. Table 1 shows the total number of measured trees by species.

Species	Total No. of measured trees	% of measured trees
<i>Acacia erioloba</i>	5	0.2
<i>Acacia nebrownii</i>	24	0.9
<i>Acacia tortillis</i>	1	0.0
<i>Boscia albitrunca</i>	1	0.0
<i>Burkea africana</i>	31	1.2
<i>Colophospermum mopane</i>	1,938	74.7
<i>Combretum apiculatum (apiculatum)</i>	5	0.2
<i>Combretum collinum</i>	38	1.5
<i>Combretum imberbe</i>	46	1.8
<i>Combretum molle</i>	4	0.2
<i>Commiphora angolensis</i>	2	0.1
<i>Dialium engleranum</i>	5	0.2
<i>Diospyros mespiliformis</i>	8	0.3
<i>Erythrophleum africanum</i>	18	0.7
<i>Fiadherbia albida</i>	4	0.2
<i>Lonchocarpus capassa</i>	58	2.2
<i>Lonchocarpus nelsii</i>	3	0.1
<i>Manilkara mochicia</i>	10	0.4
<i>Ochna pulchra</i>	1	0.0
<i>Peltophorum africanum</i>	20	0.8
<i>Piliostigma thonningii</i>	1	0.0
<i>Sclerocarya birrea</i>	7	0.3
<i>Terminalia sericea</i>	332	12.8
<i>Ximenia americana var americana</i>	30	1.2
Unknown	1	0.0
<b>Total</b>	<b>2,593</b>	<b>100.0</b>

**Table 1. Number of measured trees by species**

The two most frequent tree species in the data set were *Colophospermum mopane* (74.7 %) and *Terminalia sericea* (12.8 %). There was 1 observation of an unknown tree species.

## 5.2 Average and maximum height by species

Species	Average height, (m)	Maximum height, (m)
<i>Acacia erioloba</i>	7.0	16.3
<i>Acacia nebrownii</i>	10.1	20
<i>Acacia tortillis</i>	11.0	11
<i>Boscia albitrunca</i>	11.4	11.4
<i>Burkea africana</i>	10.3	21
<i>Colophospermum mopane</i>	6.4	22.5
<i>Combretum apiculatum (apiculatum)</i>	5.1	10.4
<i>Combretum collinum</i>	6.3	16.7
<i>Combretum imberbe</i>	5.5	12.8
<i>Combretum molle</i>	5.2	8.4
<i>Commiphora angolensis</i>	6.0	6.1
<i>Dialium engleranum</i>	1.2	5.9
<i>Diospyros mespiliformis</i>	12.3	23
<i>Erythrophleum africanum</i>	9.6	15.4
<i>Fiadherbia albida</i>	7.2	10.1
<i>Lonchocarpus capassa</i>	9.0	24.4
<i>Lonchocarpus nelsii</i>	8.2	8.9
<i>Manilkara mochicia</i>	7.6	23
<i>Ochna pulchra</i>	8.1	8.1
<i>Peltoporum africanum</i>	6.2	17.4
<i>Piliostigma thonningii</i>	13.6	13.6
<i>Sclerocarya birrea</i>	12.3	18.9
<i>Terminalia sericea</i>	7.7	21.8
<i>Ximenia americana var americana</i>	3.7	10.3
Unknown	6.7	6.7

**Table 2. Average and maximum height by species found**

The highest tree that was measured was *Lonchocarpus capassa*, a tree with 24.4 m. The second highest tree species is *Colophospermum mopane* with a height of 22.5 m.

### 5.3 Species diversity

A simple measure of species diversity is to express the number of species found in the area and the number of plots where each species was found. Table 3 shows the number of plots where each species was found for both trees ( $\geq 5\text{cm}$ ) and shrubs ( $< 5\text{cm}$ ).

Species	No. of plots dbh < 5 cm	No. of plots dbh $\geq 5$ cm
<i>Acacia erioloba</i>	1	2
<i>Acacia nebrownii</i>	2	12
<i>Acacia tortilis</i>		1
<i>Baissea wulfhorstii</i>	3	
<i>Baphia massaiensis</i>	2	
<i>Burkea africana</i>	11	12
<i>Boscia albitrunca</i>		1
<i>Colophospermum mopane</i>	94	99
<i>Combretum apiculatum (apiculatum)</i>	1	2
<i>Combretum collinum</i>	4	11
<i>Combretum imberbe</i>	5	23
<i>Combretum zeyheri</i>	2	
<i>Combretum molle</i>		2
<i>Commiphora angolensis</i>		2
<i>Croton gratissimus</i>	1	
<i>Dichrostachys cinerea (Setulosa)</i>	6	
<i>Diospyros mespiliformis</i>	3	4
<i>Dialium engleranum</i>		1
<i>Erythrophleum africanum</i>	3	8
<i>Fiadherbia albida</i>		2
<i>Grewia bicolor</i>	5	
<i>Grewia retinervis</i>	10	
<i>Guibourtia coleosperma</i>	1	
<i>Lonchocarpus nelsii</i>	1	2
<i>Lonchocarpus capassa</i>		27
<i>Manilkara mochicia</i>	2	4
<i>Markhamia acuminata</i>	7	
<i>Ochna pulchra</i>	3	1
<i>Ozoroa paniculosa</i>	1	
<i>Peltophorum africanum</i>	6	9
<i>Piliostigma thonningii</i>		1
<i>Rhus tenuinervis</i>	2	
<i>Salacia luebbertii</i>	1	
<i>Sclerocarya birrea</i>		5
<i>Terminalia sericea</i>	33	50
<i>Vangueria infausta</i>	1	
<i>Ximenia americana var americana</i>	8	6
<i>Ximenia caffra var microphylla</i>	1	
<i>Ziziphus mucronata</i>	1	
Unknown		1
<b>Total</b>	<b>221</b>	<b>288</b>

**Table 3. Species diversity expressed by the number of plots where each species was found**

A total of 41 woody species were recorded in Sikanjabuka. 26 species are occurring as trees while 30 species are found in the shrub layer. 15 species occurred both as trees and in the shrub layer.

*Colophospermum mopane* trees were found on 83 % (99 plots) of the measured plots, while shrubs from the same species were found on 79 % (94 plots) of the measured plots.

#### 4.4 Tree volumes and number of stems

The tree volumes were divided into dead and live tree volumes.

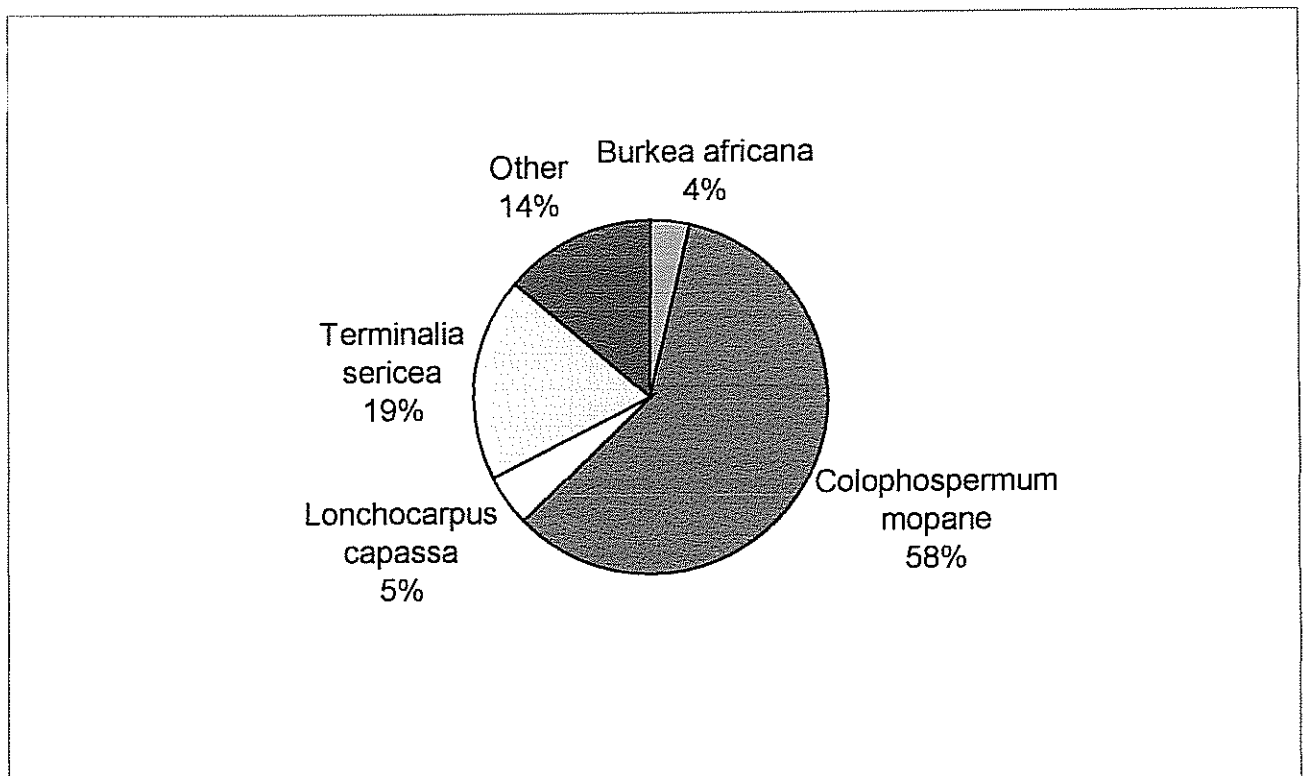
##### Live trees

Species	Total number of stems	Stems per ha	Total tree volume, m <sup>3</sup>	Mean volume m <sup>3</sup> /ha
<i>Acacia erioloba</i>	4,430	0.9	581	0.1
<i>Acacia nebrownii</i>	8,202	1.7	2,154	0.4
<i>Acacia tortillis</i>	330	0.1	175	0.0
<i>Boscia albitrunca</i>	330	0.1	92	0.0
<i>Burkea africana</i>	14,866	3.0	7,668	1.6
<i>Colophospermum mopane</i>	1,783,953	362.0	169,752	34.4
<i>Combretum apiculatum</i> (apiculatum)	4,614	0.9	451	0.1
<i>Commiphora angolensis</i>	1,648	0.3	333	0.1
<i>Combretum collinum</i>	28,341	5.8	4,805	1.0
<i>Combretum imberbe</i>	32,295	6.6	2,945	0.6
<i>Combretum molle</i>	4,284	0.9	217	0.0
<i>Dialium engleranum</i>	6,591	1.3	187	0.0
<i>Diospyros mespiliformis</i>	1,574	0.3	2,692	0.5
<i>Erythrophleum africanum</i>	5,419	1.1	3,748	0.8
<i>Fiadherbia albida</i>	4,284	0.9	329	0.1
<i>Lonchocarpus capassa</i>	24,825	5.0	10,161	2.1
<i>Lonchocarpus nelsii</i>	989	0.2	494	0.1
<i>Manilkara mochicia</i>	6,884	1.4	3,476	0.7
<i>Ochna pulchra</i>	330	0.1	91	0.0
<i>Peltoporum africanum</i>	1,7612	3.6	2,052	0.4
<i>Ptilostigma thonningii</i>	146	0.0	394	0.1
<i>Sclerocarya birrea</i>	4,723	1.0	2,193	0.4
<i>Terminalia sericea</i>	192,782	39.1	39,289	8.0
<i>Ximenia americana var americana</i>	32,295	6.6	1,840	0.4
Unknown	1,318	0.3	192	0.0
<b>Total</b>	<b>2,183,064</b>	<b>443.0</b>	<b>256,309</b>	<b>52.0</b>

Table 4. Volumes and number of stems for live trees

Table 4 above shows that there are 2,183,064 stems, which is 443 stems per hectare. The biggest share of stems are of *Colophospermum mopane* and *Terminalia sericea*.

The mean volume of all species is 52.0 m<sup>3</sup>/ha. The 4 most common species represent 86 % of the total volume .



**Figure 2: The volumes of the most common live species expressed in % of the total volume of all species (256,309 m<sup>3</sup>).**

The total volume of all live trees is 256,309 m<sup>3</sup>. The total volume of *Colophospermum mopane* is 169,752 m<sup>3</sup> and the total volume for *Terminalia sericea* is 39,289 m<sup>3</sup>.

### Dead trees

The majority of dead trees in Sikanjabuka are *Colophospermum mopane* and *Terminalia sericea* trees. The total volume for *Colophospermum mopane* is the highest (see table 5). The 4 most common species represent 54 % of the total volume as indicated in figure 3.

Species	Total number of stems	Stems per ha	Total tree volume, m <sup>3</sup> /ha	Mean volume, m <sup>3</sup> /ha
<i>Acacia nebrownii</i>	5,273	1.1	1,321	0.3
<i>Burkea africana</i>	1,465	0.3	757	0.2
<i>Colophospermum mopane</i>	37,128	7.5	6,029	1.2
<i>Combretum collinum</i>	2,966	0.6	320	0.1
<i>Combretum imberbe</i>	11,973	2.4	3,998	0.8
<i>Diospyros mespiliformis</i>	146	0.0	598	0.1
<i>Erythrophleum africanum</i>	2,307	0.5	2,043	0.4
<i>Lonchocarpus capassa</i>	4,614	0.9	2,357	0.5
<i>Peltoporum africanum</i>	2,636	0.5	132	0.0
<i>Terminalia sericea</i>	17,466	3.5	1,649	0.3
<i>Ximenia americana var americana</i>	2,307	0.5	719	0.1
<b>Total</b>	<b>88,280</b>	<b>17.9</b>	<b>19,924</b>	<b>4.0</b>

Table 5. Volumes and total number of stems for dead trees

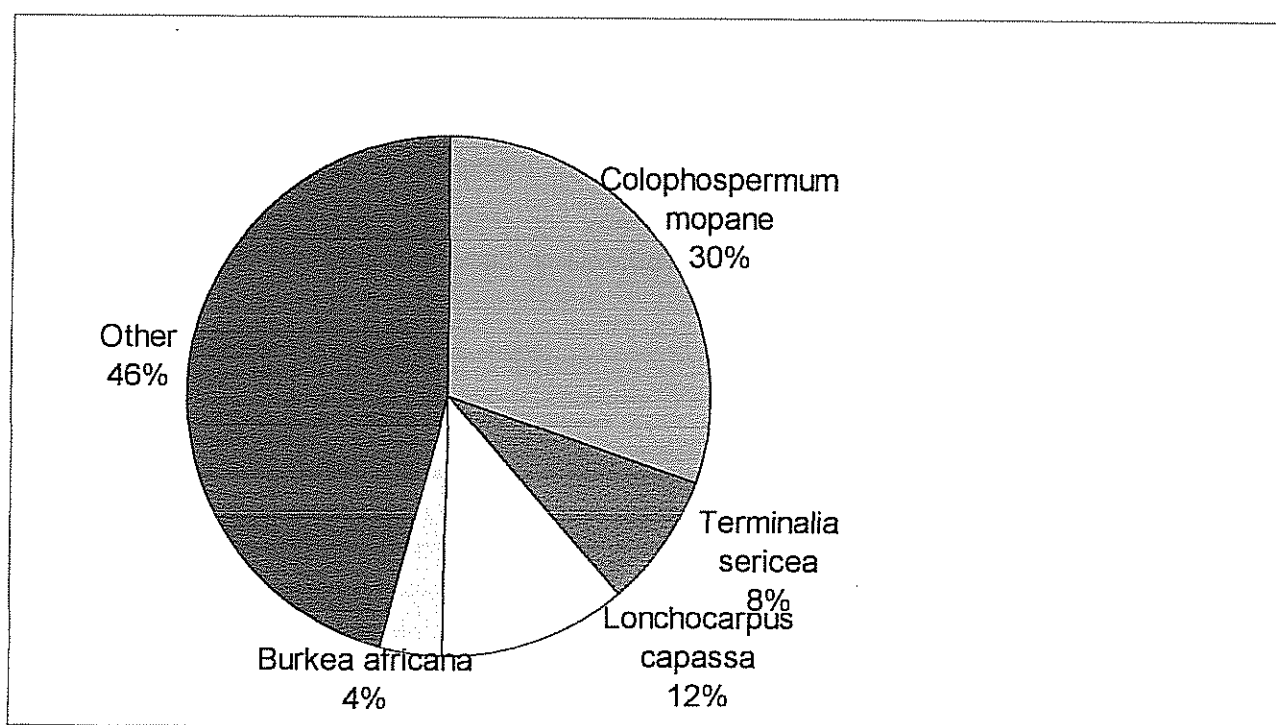


Figure 3. The volumes of the most common dead species expressed in % of the total volume of all species (19,924 m<sup>3</sup>).

## 5.5 Diameter distribution

### Live trees

Appendix 1 shows the diameter distribution of live trees. The bulk of the trees in Sikanjabuka are in the small and medium sized diameter classes. The distribution also gives indications on which tree species have a potential to grow into big size trees in the area. The biggest live trees in Sikanjabuka are *Colophospermum mopane*, *Sclerocarya birrea* and *Terminalia sericea*-trees. Their diameter distribution is also good in the sense that the majority of the stems are in lower diameter classes. These trees, if managed properly, will grow into bigger trees and provide poles also in the future. The diameter distribution of *Colophospermum mopane* is illustrated in figure 4.

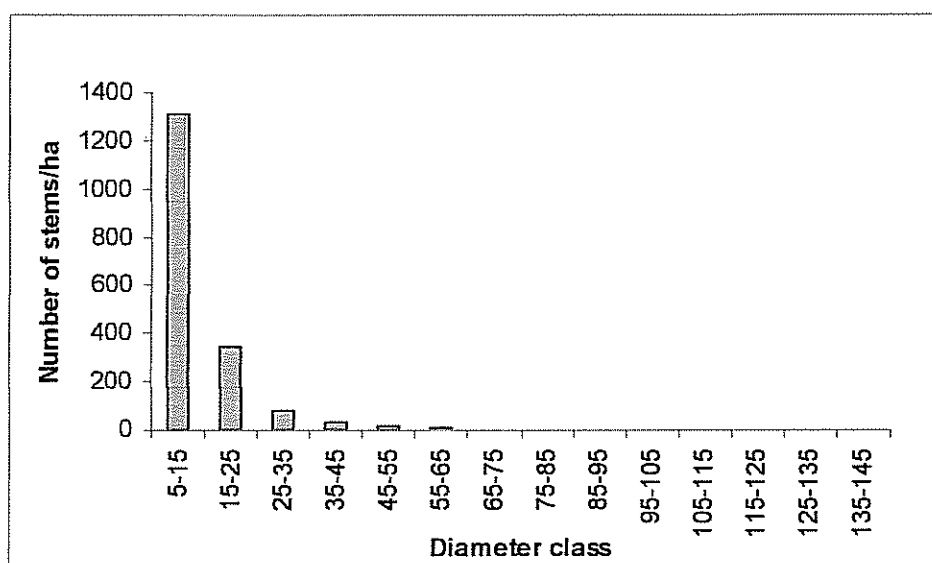


Figure 4. Live wood diameter distribution for *Colophospermum mopane*

The number of small size *Colophospermum mopane* stems is very high, 1,300 stems with dbh between 5 and 15 cm.

The diameter distribution of the three other most common tree species is illustrated in figure 5. *Terminalia sericea* has got a lot of small diameter stems. *Burkea* and *Lonchocarpus* are much less frequent, also in the small diameter classes.

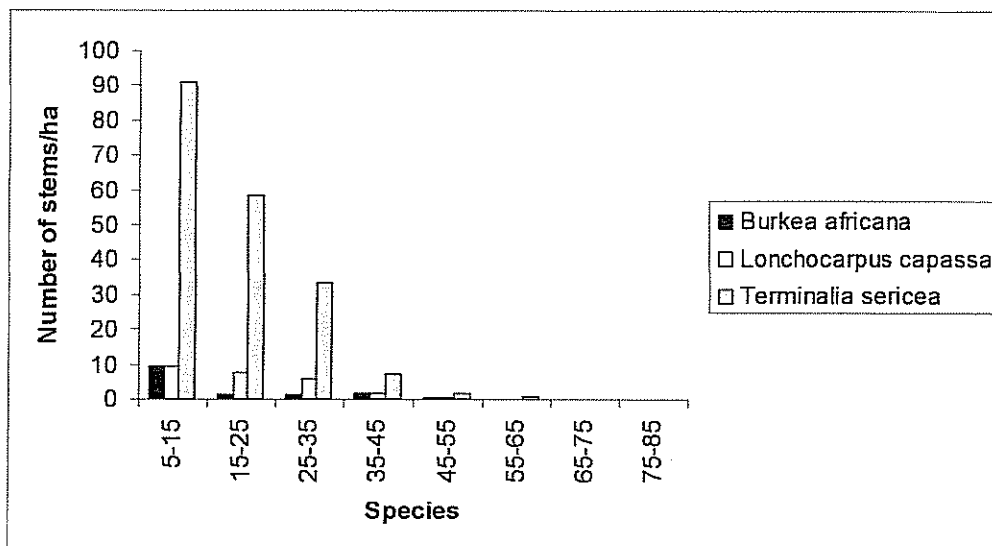


Figure 5. Live wood diameter distribution for the other main species

Poles are used for homestead construction and fencing. The most preferred species for poles is *Colophospermum mopane*. No significant damages on the trees were found in the inventory.

Dead trees

Figure 6 and Appendix 2 show that most of dead stems are of *Colophospermum mopane* and *Terminalia sericea*. They are mainly small size trees, less than 25 cm at breast height.

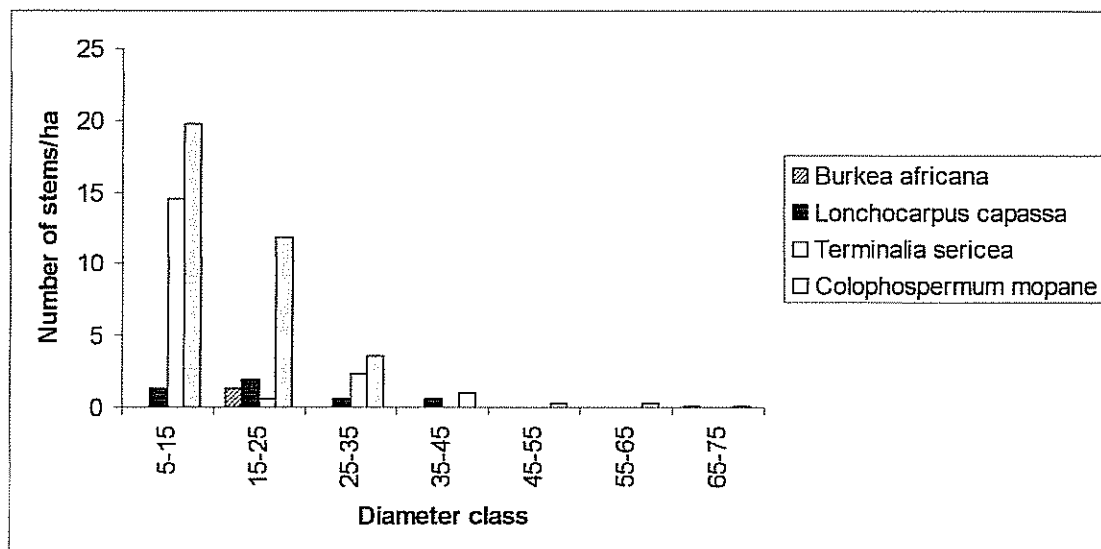


Figure 6. Dead wood diameter distribution for the most frequent species



### 5.5.1 Regeneration and shrubs

The regeneration potential of *Colophospermum mopane* is very good. *Terminalia sericea* has a good regeneration as well, however much less than mopane. The number of saplings per hectare of tree species is expressed in the table below.

Species	Height cl., cm							Total	
	0-25	26-50	51-100	101-150	151-200	201-250	251-300		300+
<i>Acacia erioloba</i>			1						1
<i>Burkea africana</i>	20	35	1	3	4			2	65
<i>Colophospermum mopane</i>	4174	535	333	78	87	50	37	21	5316
<i>Combretum collinum</i>		2	8	2	1				12
<i>Combretum zeyheri</i>			3	1					3
<i>Croton gratissimus</i>		3							3
<i>Dichrostachys cinerea</i>	18	1	8	18	29	3		2	76
<i>Erythrophleum africanum</i>	1	1			3			1	5
<i>Guibourtia coleosperma</i>			1						1
<i>Lonchocarpus nelsii</i>				1					1
<i>Ochna pulchra</i>		3	1		1				4
<i>Ozoroa paniculosa</i>		1	2						3
<i>Peltoporum africanum</i>		1	2		3		2		8
<i>Terminalia sericea</i>	39	37	32	18	17	13	6	13	176
All species	4251	618	389	120	144	66	45	39	5672

The number of shrub species per hectare is expressed in the table below. 50 % of the shrubs are of *Markhamia acuminata*-species.

Species	Nr per ha
<i>Baijsea wulfhorstii</i>	14
<i>Baphia massaiensis</i>	3
<i>Combretum apiculatum</i>	8
<i>Grewia bicolor</i>	8
<i>Grewia retinervis</i>	26
<i>Markhamia acuminata</i>	67
<i>Rhus tenuinervis</i>	3
<i>Vangueria infausta</i>	3
All species	134

## 5.6. Results for the indigenous land units

In this chapter, only the area of each indigenous land unit (Table 6) and the number of stems by species for each unit (Table 7) is presented. The results for a certain land unit have been calculated using the data of the plots that fell in the specific land unit. More detailed results can be easily derived from the inventory database.

Indigenous land unit	Area, hectares	Area, % of total	Nr of inventory plots
Chilundu	2439	49	59
Chingalala	816	17	17
Museke	560	11	14
Mulonga	559	11	13
Lukunduseke	361	7	10
Lun'amba	193	4	6
Total	4927	100	119

**Table 6. Indigenous land units within the Sikanjabuka inventory area.**

Chilundu is the dominant indigenous land unit with almost half of the hectares in the inventory area. Chingalala covers 1/5 of the area. Lun'amba has got only a minor share, 4 % of the area.

The most "wooded" land unit seems to Lun'amba with 688 stems per hectare (see Table 7). However, only 4 plots fell in Lun'amba and the result is not reliable. Chilundu and Mulonga both have about 470 stems per hectare. Chilundu is the most species rich land unit. 22 out of the 25 species found in the whole inventory were found in Chilundu too. In other land units, the diversity is much less. Lukunduseke is the second diverse land unit with 12 species. The least diverse is Lun'amba with only 5 species. *Colophospermum mopane* dominates in all land units.

The biggest *Colophospermum mopane* trees could be found in Chilundu and Lukunduseke, trees even up to dbh of 1 meter and more were found. Trees on the other land units don't seem to reach that big dimensions.

Species/ land unit	Chilundu	Chingalala	Lukunduseke	Lun'amba	Mulonga	Museke
<i>Acacia erioloba</i>	1.8					
<i>Acacia nebrownii</i>	2.9	0.2	1.8	1.7		
<i>Acacia tortillas</i>	0.1					
<i>Boscia albitrunca</i>	0.1					
<i>Burkea Africana</i>	4.3	0.4	9.5			1.2
<i>Colophospermum mopane</i>	382.5	192.7	181.3	657.9	401.2	495.0
<i>Combretum apiculatum</i>	1.9					
<i>Commiphora angolensis</i>	0.7					
<i>Combretum collinum</i>	4.6	10.5	23.7			
<i>Combretum imberbe</i>	7.4	4.4		20.5	4.7	7.1
<i>Combretum molle</i>	1.8					
<i>Dialium engleranum</i>	2.7					
<i>Diospyros mespiliformis</i>	0.6				0.3	
<i>Erythrophleum africanum</i>	2.1		0.9			
<i>Fiadherbia albida</i>	0.7				4.7	
<i>Lonchocarpus capassa</i>	3.4	14.1	1.8	1.7	2.9	4.4
<i>Lonchocarpus nelsii</i>	0.3		0.9			
<i>Manilkara mochicia</i>	0.3		17.3			
<i>Ochna pulchra</i>			0.9			
<i>Peltoporum africanum</i>	5.6		7.3	6.8		
<i>Piliostigma thonningii</i>		0.2				
<i>Sclerocarya birrea</i>	1.8					0.6
<i>Terminalia sericea</i>	34.8	33.5	96.6		54.2	27.3
<i>Ximania Americana</i>	5.1					35.3
Unknown			3.7			
Total	465.4	256.0	345.9	688.7	468.1	570.9

**Table 7. Number of stems per hectare by species in the indigenous land units.**

## 5.7 Reliability of the results

The following error sources are always present in sampling based forest inventories: Sampling error, measurement error including coding error, errors in data processing and errors in models for volume estimation. In this work, specific attention was paid to guarantee good quality of the field data. Several cross checkings were done to find out possible errors and inconsistencies in the data.

The applied volume functions are probably the main source of errors. The size of the material collected for constructing the functions was moderate. A total of 252 trees were felled in West Tsumkwe, Caprivi, Omusati and Oshikoto regions and these were used for modeling.

The sampling error was estimated using the formula for random sampling. The standard error for the mean volume (52 m<sup>3</sup>/ha) was 2.8 m<sup>3</sup>/ha which is 5.3 % of the mean volume. The true volume with 95 % probability is between 46.4 m<sup>3</sup>/ha and 57.6 m<sup>3</sup>/ha.

## 6. INVENTORY COSTS

All inventories require financial inputs which are either direct or indirect costs. The design of the inventory determines the financial implications that will be incurred during the inventory activities on the ground. The inventory in Sikanjabuka was carried out by the National Forest Inventory team (NFI) between the 18<sup>th</sup> and 30<sup>th</sup> of April 2002. 1 field trip was undertaken for 16 days. 5 men did the actual fieldwork. In the calculation, a cost for a man-day includes the salary plus the daily subsistence costs. 2 cars (1300 km one way, from Windhoek to Bukalo) were used to reach the area from Windhoek. 3 ATVs were used for moving from one plot to another. The costs for fuel are more or less real, but the cost for vehicle maintenance is an estimate which has been derived from annual maintenance costs. This calculation only includes immediate costs of the inventory. It does not include fixed costs and overhead costs like office facilities, computers, supervision etc. The total cost of the inventory is about N\$ 85880 which is N\$ 17.4 per hectare.

Cost item	Units	Cost/unit, N\$	Total cost, N\$
Inventory planning	1 week	1000	1000
Inventory equipment			4000
Inventory field work	96 man-days	530	50880
Fuel	1667 litres	3.55	6000
Vehicle maintenance			15000
Data entry	1 week	1000	1000
Data analysis	2 weeks	1000	2000
Report writing	4 weeks	1000	4000
Report printing			2000
<b>Total</b>			<b>85880</b>

**Table 8. Inventory costs**

## **7. CONCLUSION**

This inventory provides quantitative estimates of the present state of the forest in Sikanjabuka and indicates that the resources are still remarkable in terms of volume and stems per hectare.

The majority of people depend on the forest resources for fuel wood and poles for house construction and grass for thatching. The area inventoried has very good potential for management by the local community.

The information presented in this report and the map of indigenous land units creates now a sound basis for forest management planning.

## **8. ACKNOWLEDGEMENTS**

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## Appendix 1

Diameter distribution of the total number of stems by species for live trees (1000)

Species	6-15	16-25	26-35	36-45	46-55	56-65	66-75	76-85	86-95	96-105	106-115	116-125	126-135	136-145	Total	% of total
<i>Acacia etiolocha</i>	2.64	1.32	0.33		0.15										4.43	0.2
<i>Acacia nebotownii</i>	3.95	1.65	1.32	0.99	0.29										8.20	0.4
<i>Acacia tortilis</i>			0.33												0.33	0.0
<i>Boscia albitrunca</i>		0.33													0.33	0.0
<i>Burkea africana</i>	8.23	1.32	1.32	1.98	0.59	0.15	0.15	0.15							14.87	0.7
<i>Coloposperrum mopane</i>	1310.28	342.39	76.78	32.30	12.38	4.69	1.61	0.73	1.61	0.59	0.15			0.15	1783.62	81.7
<i>Combretum apiculatum</i> (apiculatum)	2.64	1.65	0.33												4.61	0.2
<i>Combretum collinum</i>	18.45	5.27	3.95	0.66											28.34	1.3
<i>Combretum imberbe</i>	23.73	7.58	0.66	0.33											32.30	1.5
<i>Combretum molle</i>	3.95		0.33												4.28	0.2
<i>Commiphora angolensis</i>	1.32		0.33												1.65	0.1
<i>Dialium englerianum</i>	6.59														6.59	0.3
<i>Diospyros mespiliformis</i>				0.99	0.15	0.15	0.15					0.15			1.57	0.1
<i>Erythronium africanum</i>	2.64			0.66	1.98	0.15									5.42	0.2
<i>Flaccharba alba</i>	3.85	0.33													4.28	0.2
<i>Lonicocarpus capassa</i>	8.23	7.58	5.60	1.98	0.29	0.15									24.63	1.1
<i>Lonicocarpus nelsii</i>			0.99												0.99	0.0
<i>Manilkara mochlicia</i>	3.95	1.32	0.66	0.66		0.15						0.15			6.88	0.3
<i>Ocotea pulchra</i>		0.33													0.33	0.0
<i>Palaephorum africanum</i>	15.62	0.33	0.99	0.33	0.15										17.61	0.8
<i>Ptilostigma thomlinsonii</i>					0.15										0.15	0.0
<i>Scleroctenya birrea</i>	3.95		0.33			0.29	0.15								4.72	0.2
<i>Terminalia sericea</i>	80.95	58.66	39.61	6.92	1.61	0.88	0.15								192.76	8.8
Unknown		1.32													1.32	0.1
<i>Xyrenia americana</i> var <i>americana</i>	26.36	5.60	0.33												32.30	1.5
Total	1599.62	436.97	128.65	49.10	15.74	6.59	2.20	0.88	1.61	0.59	0.15	0.29			2182.73	
% of total	70.5	20.0	5.9	2.2	0.7	0.3	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0		100.0



## Appendix 2

## Diameter distribution of the total number of stems by species for dead trees (1000)

Species	5-15	15-25	25-35	35-45	45-55	55-65	65-75	75-85	85-95	95-105	105-115	115-125	Total	% of total
<i>Acacia nebrovii</i>	2.6	0.7	2.0										5.3	6.0
<i>Burkea africana</i>		1.3					0.1						1.5	1.7
<i>Colophospermum mopane</i>	19.8	11.9	3.6	1.0	0.3	0.3	0.1					0.1	37.1	42.1
<i>Combretum collinum</i>	2.6		0.3										3.0	3.4
<i>Combretum imberbe</i>	6.6	2.6	1.0	1.3	0.3	0.1							12.0	13.6
<i>Diospyros mespiliformis</i>						0.1							0.1	0.2
<i>Erythrophloeum africanum</i>		0.3	1.3	0.7									2.3	2.6
<i>Lorchocarpus capassa</i>	1.3	2.0	0.7	0.7									4.6	5.2
<i>Peltoporum africanum</i>	2.6												2.6	3.0
<i>Terminalia sericea</i>	14.5	0.7	2.3										17.5	19.8
<i>Ximenia americana var americana</i>		1.6	0.7										2.3	2.6
<b>Total</b>	<b>50.1</b>	<b>21.1</b>	<b>11.9</b>	<b>3.6</b>	<b>0.6</b>	<b>0.6</b>	<b>0.3</b>					<b>0.1</b>	<b>88.3</b>	
<b>% of total</b>	<b>56.7</b>	<b>23.9</b>	<b>13.4</b>	<b>4.1</b>	<b>0.7</b>	<b>0.7</b>	<b>0.3</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.2</b>		<b>100.0</b>

## Appendix 3

