

**TECHNICAL PAPER 15**

**Report of an inventory of selected proposed  
forest reserves in Muheza District, Tanga Region**

**Felix C.N. Munyuku**

**1995**

# **East Usambara Catchment Forest Project**

## **TECHNICAL REPORT 15**

### ***REPORT ON AN INVENTORY OF SELECTED PROPOSED FOREST RESERVES IN MUHEZA DISTRICT, TANGA REGION***

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## **Preface**

The present report is based on a inventory carried out in 1992. The purpose was to cover selected areas which had been excluded from the Amani Forest Inventory and Management Planning Project in 1986-1988. The finalisation of the report was delayed for various reasons. The present report follows the original report draft with only minor text and table editing, and by adding an executive summary.

Since the inventory, the gazettelement of Mlinga proposed forest reserve has been brought to the Attorney Generals office, and the process of gazetting the other proposed areas is well under way.

The preliminary editing of the final version was done by Pattni & Sons, and the finalisation was done by the Chief Technical Adviser of the East Usambara Catchment Forest Project. Proof reading of botanical names was done by Raymond Kilenga.

Stig Johansson  
Chief Technical Adviser

## Executive summary

During the Amani Forest Inventory and Management Project (AFIMP) some proposed forest reserves were not covered by the forest inventory. An inventory was carried out by the Survey and Inventory Section of the Forest and Beekeeping Division (FBD) between June and August 1992. The inventory covered Manga, Mlinga, Semdoe and Mlungui proposed forest reserves. The total forest area covered was 2,454 hectares.

The method was a systematic sampling design using line recording for area ratio calculations and clusters of four circular sample plots for volume calculations. The sampling intensity for volume calculation of trees with a diameter at breast height (dbh) of more than 19.5 cm was 2.5 % and for trees with dbh of 4.5—19.5 cm was 1.25 %.

The total bole volume for the 1,990 ha covered was 276,000 m<sup>3</sup>; 54,400 m<sup>3</sup> of commercial species, and 222,150 m<sup>3</sup> of non-commercial species. The average volume per hectare was estimated to be 139 m<sup>3</sup> ha<sup>-1</sup>; of which 27.3 m<sup>3</sup> ha<sup>-1</sup> of commercial species, and 111.6 m<sup>3</sup> ha<sup>-1</sup> of non-commercial species. Diameter distribution of major species by reserve are presented. Observations on regeneration showed that all commercial species in the four proposed forest reserves had seedlings underneath. With regard to the inventoried forests, crown cover varied between 10—60 %. The reasons for low crown cover were site conditions or heavy exploitation. Observations on phenology were also made.

All the four forests were heavily exploited except in inaccessible areas. Apart from timber, poles and fuelwood, many other products are taken from the forest for local use. Cultivation was taking place within Semdoe and Mlinga forests. There were settlements and temporary houses within Mlinga proposed forest reserve.

It is recommended that due to their importance in soil and water conservation these forests should be reserved and managed as catchment forests. At the same time they could serve conservation purposes. Human activities within the forests should be controlled. An extension of Mlinga forest is proposed to include the northwestern part of the present proposed forest reserve covering an area of 235.8 ha. After gazettelement, these forests should be incorporated under the management of the East Usambara Catchment Forest Project.

Forest maps were produced at a scale of 1:10,000 using topographic maps at a scale of 1:50,000.

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## INTRODUCTION

### Background

The East Usambara mountains are located in northeastern Tanzania. Administratively they are in Muheza and Korogwe Districts in Tanga Region. The East Usambara Catchment Forest Project (EUCFP) is project based on proposals which came about after during the Amani Forest Inventory and Management Project (AFIMP) which was carried out in the East Usambara forests in 1986-87 by Finmap - Silvestria and the Forest and Beekeeping Division of Tanzania. During the AFIMP some proposed forest reserves were not covered by the inventory. It was therefore decided that these forests should be surveyed, an inventory conducted, and that they should be gazetted and incorporated into the EUCFP. For that reason an inventory was carried out by the Survey and Inventory Section of the Forest and Beekeeping Division (FBD) between June and August 1992. The inventory covered Manga, Mlinga, Semdoe and Mlungui proposed forest reserves. The Manga, Mlinga and Semdoe forest inventories were financed by the EUCFP and the Mlungui forest inventory by the East Usambara Conservation and Agricultural Development Project (EUCADP).

### Forest area

These proposed forest reserves together cover an area of 2,454 hectares divided as follows:

**Table 1.** Total, encroached and area inventoried in the selected forests.

Forest	Total area (ha)	Encroachment (ha)	Inventoried area (ha)
Manga	753.0	-	753.0
Semdoe	901.0	175.5	725.3
Mlinga	623.0	287.6	335.4
Mlungui	176.0	-	176.0
<b>Total</b>	<b>2,453.0</b>	<b>463.3</b>	<b>1,989.7</b>

The main vegetation types are lowland forest and sub-montane forest. Due to human activities around and within the forests only patches of forest remain together with woodlands, shrubs and grasslands.

## INVENTORY METHOD

### Inventory design

The same design which was used in the previous 1986-87 AFIMP inventory was applied. The method was a systematic sampling design using line recording for area ratio calculations and clusters of four circular sample plots for volume calculations. The sampling intensity for volume calculation of trees with a diameter at breast height (dbh) of more than 19.5 cm was 2.5 % and for trees with dbh of 4.5—19.5 cm was 1.25 %.

### **Field instructions**

Field instructions and field forms were prepared before the inventory field work. In these manuals the inventory design was outlined and the methods explained. These were given to crew leaders for use during the field work.

### **Field survey**

The inventory of these forests was conducted between June and August 1992 by the Survey and Inventory Section of the Forest and Beekeeping Division. It was carried out by three crews having two members from FBD and two local people. The average daily achievement was four clusters. The field work was led by Mr. Felix Munyuku.

### **Species identification**

Local crew members were chosen among the villagers who best know the tree species. They gave the vernacular name of a tree, which was transferred into inventory codes according to a species list. The list was compiled during the 1986-87 inventory and amended during the field work. The new species which were not on the list were sent to the Tanzania Forestry Research Institute (TAFORI) Lushoto Silvicultural Research Station for identification.

### **Data processing**

Data processing was carried out manually by the Data Processing Unit of the Survey and Inventory Section in September—October, 1992. Volume tables and functions which had been developed during the previous AFIMP inventory were used.

The field forms are stored in the Forest and Beekeeping Division (FBD), Inventory section at Ivory room. The data and the report are in diskettes and these are with the EUCFP and the Tanga Region Catchment Forestry Office.

### **Mapping**

Forest maps were produced at a scale of 1:10,000 using topographic maps at a scale of 1:50,000.

## **RESULTS**

### **Volume**

The inventory results are summarised in Appendix 1, Tables 1—5. It is estimated that the total bole volume for the 1,990 ha covered was 276,000 m<sup>3</sup>. This is further sub-divided as follows:

**Table 2.** Total volume of commercial and non-commercial species in the selected forests.

Forest	Volume of commercial species (m <sup>3</sup> )	Volume of non-commercial species (m <sup>3</sup> )	Total volume (m <sup>3</sup> )
Manga	15,360	104,239	119,599
Semdoe	5,537	30,828	36,365
Mlinga	30,349	71,286	101,635
Mlungui	3,154	15,797	18,951
<b>Total</b>	<b>54,400</b>	<b>222,150</b>	<b>276,550</b>

Of the 276,000 m<sup>3</sup>, 54,000 m<sup>3</sup> are of commercial species and the remaining, i.e. 222,000 m<sup>3</sup> are non-commercial. The average volume per hectare was estimated to be as follows:

**Table 3.** Volume per ha of commercial and non-commercial species in the selected forests.

Forest	Volume of commercial species (m <sup>3</sup> ha <sup>-1</sup> )	Volume of non-commercial species (m <sup>3</sup> ha <sup>-1</sup> )	All species (m <sup>3</sup> ha <sup>-1</sup> )
Manga	20.0	138.0	158.0
Semdoe	16.5	92.0	108.5
Mlinga	42.0	98.0	140.0
Mlungui	17.9	89.7	107.3
<b>Average</b>	<b>27.3</b>	<b>111.6</b>	<b>139.0</b>

## Other observations

### *Regeneration*

The presence of seedlings in the forest is an indicator of the forest to perpetuate itself. Observations showed that all commercial species in the four proposed forest reserves had seedlings underneath. However, more seedlings were observed in Manga forest than in others.

### *Crown cover*

Crown cover gives an idea of the type of forest, maturity and the extent of exploitation. With regard to the inventoried forests, crown cover varied between 10—60 %. Semdoe and Manga had more crown cover than Mlinga and Mlungui. Most of Mlinga forest is rocky with stunted and scattered vegetation especially on higher slopes. Another reason for low crown cover is the absence of big trees due to heavy exploitation which has removed most of the big commercial trees that are in most cases the dominant species.



### ***Phenology***

This is the presence of leaves, flowers and fruits or the regeneration capability of the tree species. Observations during the inventory revealed the following:

#### Mlinga

All tree species had leaves only except for the following:

**Table 5.** Phenological stage of trees with other than leaves in proposed Mlinga forest reserve.

<b>Botanical name</b>	<b>Vernacular name</b>	<b>Phenological stage</b>
<i>Craibia zimmermannii</i>	Mhamde	Leaves and flowers
<i>Pachystela</i> sp	Msambia	Leaves and fruits
<i>Rhodognaphalon schumannianum</i>	Mwale	Leaves and fruits

#### Semdoe

All trees species had leaves only except for *Albizia adianthifolia* [Mshai] which had leaves and flowers.

#### Mlungui

All trees had leaves but flowers and fruits were absent.

#### Manga

During the inventory of Manga forest all trees had leaves while the following tree species had flowers and/or fruits.

**Table 6.** Phenological stage of trees with other than leaves in proposed Mlungui forest reserve.

<b>Botanical name</b>	<b>Vernacular name</b>	<b>Phenological stage</b>
<i>Albizia gummifera</i>	Mkenge	leaves, flowers and fruits
<i>Albizia versicolor</i>	Mkingu	leaves and fruits
<i>Annona senegalensis</i>	Mtokwe/Mtomoko	leaves and fruits
<i>Antiaris</i> sp	Mtee	leaves and fruits
<i>Antiaris toxicaria</i>	Mkuzu	leaves and fruits
<i>Citrus aurantium</i>	Mshuza	leaves and fruits
<i>Combretum schumanii</i>	Muankaa	leaves and flowers
<i>Craterogyne kameruniana</i>	Mtayaya	leaves and fruits
<i>Deinbolia kilimandscharica</i>	Mtambaa kuzimu	leaves and fruits
<i>Diospyros mespiliformis</i>	Mkea-kilindi	leaves and flowers
<i>Diospyros squarrosa</i>	Mpweke	leaves and fruits
<i>Drypetes gerardii</i>	Mnofi	leaves and flowers
<i>Drypetes usambarica</i>	Kihambie	leaves, flowers and fruits
<i>Erythrina abyssinica</i>	Muungu magoma	leavers, fruits and flowers

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*Erythrophleum suaveolens*

Mwavi/muhavi

leaves and flowers

**Table 6.** (Continued).

Fernandoa magnifica	Muauwa	leaves, flowers and fruits
Grewia goetzeana	Mkole	leaves fruits
Hevea brasiliensis	Mpira	leaves and fruits
Margaritaria discoidea	Mshembeshembe	leaves and fruits
Manilkara sulcata	Mshezi	leaves and flowers
Sorindeia madagascariensis	Mkwingwina	leaves and flowers
Vangueria tomentosa	Mviu	leaves and fruits
Xylophia sp	Mwawia/Mvawia	leaves and flowers
	Mkoti	leaves and flowers

### ***Exploitation***

All the four forests were heavily exploited except in inaccessible areas. Exploitation, primarily pitsawing, was continuing at the time of the inventory despite the fact that exploitation had been banned in the area. Old logging roads in Semdoe forest and information from neighbouring villages revealed that there used to be mechanized logging in the past.

Apart from timber, poles and fuelwood, many other products are taken from the forest for local use. These include ropes and twine, wood for making toolhandles, spoons, cups, pestles and mortars, edible fruits, dyes and medicines. Animal traps were also found in the forests.

### ***Encroachment***

There was cultivation taking place within Semdoe and Mlinga forests. It was estimated that 287 ha was cultivated in Mlinga and 175 ha in Semdoe forests. These areas are mostly planted with food crops. These are also settlements and temporary houses within Mlinga proposed forest reserve.

## **CONCLUSIONS AND RECOMMENDATIONS**

During the inventory it was observed that there are many activities taking place within the proposed forest reserves. These include cultivation, pitsawing, collection of fuelwood, poles, ropes, withies, hunting and trapping and honey collection.

These forests are the source of many streams and rivers which provide water to neighbouring villages and further beyond. They are also rich in flora and fauna and vegetation cover is ideal for soil conservation.

Due to their importance in soil and water conservation these forests should be reserved and managed as catchment forests. At the same time they could serve as gene pool reserves.

In order to achieve these objectives it is suggested that human activities within the forests should be controlled. Gazettement procedures should be initiated and implemented urgently.

In the gazettelement of Mlinga forest an extension is proposed to include the northwestern part of the present proposed forest reserve. In this area there is a good, almost undisturbed forest (except for pitsawing) covering an area of 235.8 ha.

After gazettelement, these forests should be incorporated under the management of the East Usambara Catchment Forest Project.



## APPENDIX 1

**Table 1.** List of tree species found in Manga, Mlinga, Semdoe and Mlungui forests.

Code	Botanical Name	Local Name
456	<i>Acacia senegal</i>	Mombe/mgunga
326	<i>Afrosersalisia cerasifera</i>	Mohoyo
159	<i>Azelia quanzesis</i>	Mkomba/mbambakofi
166	<i>Albizia adianthifolia</i>	Mshai
502	<i>Albizia anthelmutica</i>	Mfuleta
168	<i>Albizia gummifera</i>	Mkenge
167	<i>Albizia schimperana</i>	Mchaa
157	<i>Albizia versicolor</i>	Mkingu
366	<i>Alchornea hirtella</i>	Zasa
309	<i>Allophylus calophyllus</i>	Mbangwe
250	<i>Annona senegalensis</i>	Mtomoko/Mtokwe
508	<i>Antiaris sp</i>	Mtee
104	<i>Antiaris toxicaria</i>	Mkuzu
481	<i>Anyglocalyx braunii</i>	Mkomboa
481	<i>Anyglocalyx braunii</i>	Mkomboa
367	<i>Aulacocalyx diervilleoides</i>	Msiwa/Msia
413	<i>Barringtonia racemosa</i>	Mkuvukuvu
415	<i>Bequaertiodendron natalense</i>	Mduyuyu/Mmeemee
307	<i>Bersama abyssinica</i>	Mbamba
347	<i>Blighia unijugata</i>	Mzindanguuwe
47	<i>Brachylaena hulchinsii</i>	Mkalambati/Mhugwe
526	<i>Balanites sp</i>	Mkonga
511	<i>Bridelia micrantha</i>	Mwitza/Mg'wiza
499	<i>Buddleja pulchella</i>	Mkungo ungo
514	<i>Canthium sp</i>	Msakasaka
442	<i>Cassia singuena</i>	Muhumba/Mhumba
419	<i>Ceiba pentandra</i>	Msufi
510	<i>Celtis mildbraedii</i>	Ngomoka
435	<i>Celtis wightii</i>	Mjambegha
518	<i>Citrus aurantium</i>	Mshuza
494	<i>Coffea mongensis</i>	Mbuni mwitu
529	<i>Cola clavata</i>	Mkavi
364	<i>Cola sp</i>	Muungu
524	<i>Combretum collinum</i>	Mnama
213	<i>Combretum molle</i>	Mnama
320	<i>Combretum schumannii</i>	Muankaa/Mpera mwitu
308	<i>Commiphora zimmermannii</i>	Mbambaa/Mnyakwa
360	<i>Craibia zimmermannii</i>	Mhande
468	<i>Craterogyne kameruniana</i>	Kitayaya/Mtayaya
504	<i>Cremaspora triflora</i>	Muovu
215	<i>Cremaspora triflora</i>	Msiwa
520	<i>Croton sylvaticus</i>	Mkomantee

433 | *Cussonia arborea*

| Mtindi

Table 1. (Continued).

Code	Botanical Name	Local Name
325	<i>Cussonia spicata</i>	Mntindi
339	<i>Cylicomorpha parviflora</i>	Mtonto
211	<i>Cynometra engleri</i>	Mkwe
355	<i>Cynometra sp</i>	Kimungwe
495	<i>Deinbollia kilimandscharica</i>	Mtambaa/Kuzimu
440	<i>Dialium holtzii</i>	Mhetee
473	<i>Dictyandra arborescens</i>	Mtuavuha
497	<i>Diospyros mespiliformis</i>	Mkea-Kilindi
486	<i>Diospyros squarrosa</i>	Mpweke/Mtambaa-mshwa
212	<i>Dombeya shupangae</i>	Mwati/Mluati/Mkilika
513	<i>Dombeya sp</i>	Moza
496	<i>Dovyalis sp</i>	Mgoa
491	<i>Drypetes gerardii</i>	Mnofi
394	<i>Drypetes usambarica</i>	Kihambie
111	<i>Entandrophragma excelsum</i>	Mbokoboko
509	<i>Erythococca atrovirens</i>	Mshia - shia
217	<i>Erythrina abyssinica</i>	Muungu magoma
361	<i>Erythrophleum suaveolens</i>	Mwavi/Muhavi
441	<i>Faurea saligna</i>	Msise msizize
480	<i>Fernandoa magnifica</i>	Muauwa/Muwowo
371	<i>Ficus capensis</i>	Mkuyu
330	<i>Ficus exasperata</i>	Msasa
399	<i>Ficus kirkii</i>	Kinyandege/ Mliandege
379	<i>Ficus subcalcarata</i>	Mvumo
304	<i>Funtumia africana</i>	Kiimboti
493	<i>Grandidiera boivinii</i>	Mtambaa mkoa
478	<i>Grewia bicolor</i>	Mkoe
476	<i>Grewia goetzeana</i>	Mkoe ngombe
414	<i>Grewia goetzeana</i>	Mkole
427	<i>Hevea brasiliensis</i>	Mpia/mpira
108	<i>Isoberlinia scheffleri</i>	Mbarika
112	<i>Khaya niasica</i>	Mkangazi/Ntondoo
512	<i>Kigelia aethiopica</i>	Mvungunya
439	<i>Lannea schweinfurthii</i>	Mumbu/Muunbu
421	<i>Lecaniodiscus fraxinifolius</i>	Mbwewe/Mfumbu
515	<i>Leptonychia usambarensis</i>	Mtengu
531	<i>Lonchocarpus bussei</i>	Mfumbi
163	<i>Macaranga capensis</i>	Mkumba
350	<i>Malacantha alnifolia</i>	Msambia-longwe
396	<i>Manilkara sp</i>	Mghambo
498	<i>Manilkara sulcata</i>	Mshezi/Msezi
151	<i>Maranthes goetzeniana</i>	Fuzu, ng'anga
448	<i>Margaritaria discoidea</i>	Mshembeshembe
170	<i>Markhamia hildebrandtii</i>	Mtalawanda



503 | *Maytenus senegalensis*

| Moomasozi

Table 1. (Continued).

Code	Botanical Name	Local Name
322	<i>Mesogyne insignis</i>	Mkuhe
132	<i>Milicia excelsa</i>	Mvule
312	<i>Millettia dura</i>	Mhafa
465	<i>Mimusops sp</i>	Mtobwe
321	<i>Monodora grandidieri</i>	Kuakua/ Mkuakua
224	<i>Morinda asteroscepa</i>	Mromberombe
244	<i>Myrianthus holstii</i>	Mkonde
428	<i>Newtonia paucijuga</i>	Mnyovu
110	<i>Odyndea zimmermannii</i>	Banko
248	<i>Pachystela brevipes</i>	Msambia
247	<i>Pachystela msolo</i>	Msambia
443	<i>Parkia filicoidea</i>	Mnyese
214	<i>Pauridiantha hostii</i>	Mnavilavi/Mvaviavi
373	<i>Pauridiantha hostii</i>	Mnavilavi
530	<i>Piliostigma thonningii</i>	Msegesi,mshegese
517	<i>Porterandia penduliflora</i>	Mkutu
417	<i>Premna chrysoclada</i>	Mhaha/Mhaasha-nyoya
158	<i>Prunus africana</i>	Mkomahoya
452	<i>Psidium guajava</i>	Mpera, mpea
453	<i>Pteleopsis myrtifolia</i>	Mngoje
153	<i>Pterocarpus mildbraedii</i>	Mkula/Mngoje
160	<i>Pterocarpus tinctorius</i>	Mkula
122	<i>Rhodognaphalon schumonnianum</i>	Mwale/Msufimwitu
359	<i>Ricinodendron heudelottii</i>	Tondoo
372	<i>Rinorea ferruginea</i>	Kibandu
376	<i>Rinorea ferruginea</i>	Kibandu
216	<i>Rytigynia schumannii</i>	Ntuavuha
264	<i>Sapium ellipticum</i>	Mkongoo
245	<i>Sorindeia madagascariensis</i>	Mkwingwina
123	<i>Sterculia appendiculata</i>	Mgude
131	<i>Strombosia scheffleri</i>	Sangana
363	<i>Strychnos mitis</i>	Mtonga
505	<i>Syzigium sp</i>	Mjamee
249	<i>Syzigium sp</i>	Mshihwi/mshiwa
521	<i>Tamarindus indica</i>	Mkwaju
328	<i>Tarennia nigrescens</i>	Mshagasha-chole
389	<i>Tarennia pavettoides</i>	Mshagasha-chole
522	<i>Teclea nobilis</i>	Mdimu mwitu
161	<i>Terminalia sambesiaca</i>	Mkuungo
528	<i>Thespesia danis</i>	Mkoko
501	<i>Tinnea aethiopice</i>	Mgimbu
242	<i>Trichilia emetica</i>	Mgoimazi
348	<i>Trilepsium madagascariense</i>	Mzughu/ Mzugu
388	<i>Uvariadendron sp</i>	Msofu

432 | *Vangueria tomentosa*

| Mviu

Table 1. (Continued).

Code	Botanical Name	Local Name
446	<i>Vitellariopsis kirkii</i>	Mghambo
397	<i>Xylopiia sp</i>	Mwawia/Mvawia
201	<i>Xymalos monospora</i>	Mvungawiza, Kidimdim
261	<i>Zanha golungensis</i>	Mkwanga
523	<i>Zanthoxylum gillettii</i>	Mhombbo/Mlungulungu
516	<i>Zenkerella grotei</i>	Mfunda
507	unknown	Kazitu/Kishuzamzitu
532	"	Kibaranga
540	"	Mfela
525	"	Mgombamgomba
539	"	Mhagata
534	"	Mhotoa
541	"	Mkoti
538	"	Mnkinda
533	"	Mnyongapembe
542	"	Mpambamwitu
536	"	Mshafusha
535	"	Mshewezi/Msowezi
543	"	Msozwe
490	"	Mviza/Mweziuzi
537	"	Ulamba
532	"	Yoyo kinuke

Table 2. List of commercial species in the inventoried proposed forest reserves.

Botanical name	Local name	Manga	Mlinga	Mlungui	Semdoe
<i>Azelia quanzensis</i>	Mbambakofi/Mkomba	X	X	X	X
<i>Albizia gummifera</i>	Mkenge		X	X	X
<i>Antiaris toxicaria</i>	Mkuzu	X	X		X
<i>Milicia excelsa</i>	Mvule	X	X	X	X
<i>Isobertinia scheffleri</i>	Mbarika				X
<i>Khaya nyasica</i>	Tondoo	X			X
<i>Odyndea zimmermannii</i>	Banko				X
<i>Pterocarpus sp.</i>	Mkula/mngoje			X	X
<i>Rhodognaphalon schumannianum</i>	Mwale/Msufipori/ Msufimwitu	X	X	X	X
<i>Ricinodendron heudelottii</i>	Tondoo		X	X	
<i>Sterculia appendiculata</i>	Mgude	X		X	X
<i>Strombosia scheffleri</i>	Sangana	X			X
<i>Syzigium sp</i>	Mshihwi/mshiwa				X



**Table 3.** Number of stems and volume (m3) of commercial species in the inventoried forests.

Botanical name	Manga		Mlinga		Mlungui		Semdoe	
	Stems	Volume	Stems	Volume	Stems	Volume	Stems	Volume
<i>Azelia quanzensis</i>	1,730	859	2,542	1,689	76	262	557	732
<i>Albizia gummifera</i>			930	1,010	228	188	4,269	3,434
<i>Antiaris toxicaria</i>	11,793	4,604	682	461			13,016	17,940
<i>Milicia excelsa</i>	8,385	3,365	248	211	229	105	2,134	1,629
<i>Isobertia scheffleri</i>							43	118
<i>Khaya nyasica</i>	879	2,257					1,841	1,770
<i>Odydea zimmermannii</i>							513	22
<i>Pterocarpus sp.</i>					114	61	2,011	1,941
<i>Rhodognaphalon schumannianum</i>			1,302	1,877	382	149	1,667	2,230
<i>Ricinodendron heudelottii</i>			124	289	753	2,225		
<i>Sterculia appendiculata</i>	989	937			76	164	86	138
<i>Strombosia scheffleri</i>	215	6					854	222
<i>Syzigium sp</i>								173
<b>Total</b>	<b>24,591</b>	<b>15,360</b>	<b>5,828</b>	<b>5,537</b>	<b>1,858</b>	<b>3,154</b>	<b>29,895</b>	<b>30,349</b>

**Table 4.** Number of stems and volume (m3) of commercial species (dbh > 55 cm) in the inventoried proposed forest reserves.

Botanical name	Manga		Mlinga		Mlungui		Semdoe	
	Stems	Volume	Stems	Volume	Stems	Volume	Stems	Volume
<i>Azelia quanzensis</i>	55	139	186	464	38	181	129	449
<i>Albizia gummifera</i>			-	-	-	-	342	1,480
<i>Antiaris toxicaria</i>	165	684	62	187			1,966	10,596
<i>Milicia excelsa</i>	55	210	62	151	-	-	86	291
<i>Isobertia scheffleri</i>							43	118
<i>Khaya nyasica</i>	275	1,397					129	531
<i>Odydea zimmermannii</i>							-	-
<i>Pterocarpus sp.</i>					-	-	129	789
<i>Rhodognaphalon schumannianum</i>	165	691	62	696	-	-	129	1,360
<i>Ricinodendron heudelottii</i>			-	-	276	1,426		
<i>Sterculia appendiculata</i>	330	2,451			38	106	-	-
<i>Strombosia scheffleri</i>	-	-					-	-
<i>Syzigium sp</i>							-	-
<b>Total</b>	<b>1,045</b>	<b>5,572</b>	<b>372</b>	<b>1,498</b>	<b>352</b>	<b>1,713</b>	<b>2,953</b>	<b>15,614</b>

**Table 5.** Volume (m<sup>3</sup>) of non-commercial species in the inventoried proposed forest reserves.

<b>Botanical name</b>	<b>Manga</b>	<b>Mlinga</b>	<b>Mlungui</b>	<b>Semdoe</b>
<i>Afrosersalisia cerasifera</i>		63		
<i>Albizia adianthifolia</i>	1,130	80		
<i>Albizia gummifera</i>	9,335			
<i>Albizia schimperana</i>	24,848	873	818	
<i>Albizia sp.</i>		50		
<i>Bequaertiodendron natalensis</i>			553	
<i>Brachylaena hutchinsii</i>		865		
<i>Balanites sp.</i>	1,335			
<i>Coffea mongeninsis</i>				4,583
<i>Cola clavata</i>				1,234
<i>Combretum schumannii</i>	3,845			
<i>Craibia zimmermannii</i>	4,784	4,839	2,136	2,110
<i>Cussonia spicata</i>	1,083			
<i>Cynometra engleri</i>		578	926	
<i>Cynometra sp.</i>	2,026	1,218		4,828
<i>Dialium holtzii</i>	2,112			
<i>Dictyandra arborescens</i>		3,962		
<i>Diospyros mespiliformis</i>	2,277	516	937	12,588
<i>Diospyros squarrosa</i>	2,403			
<i>Drypetes gerardii</i>	3,180	761		2,909
<i>Drypetes usambarica</i>	1,028			
<i>Erythrophleum suaveolens</i>		1,368		
<i>Fernandoa magnifica</i>		43	562	7,785
<i>Grewia goetzeniana</i>	6,325			3,621
<i>Hevea brasiliensis</i>	2,051			
<i>Lannea schweinfurthii</i>	1,045	479		
<i>Lecaniodiscus fraxinifolius</i>	7,991	1,650	2,622	9,331
<i>Lonchocarpus bussei</i>		79		
<i>Manilkara sp.</i>			752	
<i>Manilkara sulcata</i>	2,250	63	652	
<i>Maranthes goetzeneana</i>				1,706
<i>Markhamia sp.</i>				2,558
<i>Markhamia hildebrandtii</i>	3765			
<i>Millettia dura</i>			558	1,104
<i>Pachystela sp.</i>		376		3,984
<i>Pterocarpus mildbraedii</i>	2,020			
<i>Pterocarpus sp.</i>		889		
<i>Rinorea ferruginea</i>		3,663		
<i>Rytigynia schumannii</i>	1,036			
<i>Sorindeia madagascariensis</i>				1,222
<i>Terminalia sambesiaca</i>		1,218	575	
<i>Xylopiya sp.</i>	1,230		1,026	
<i>Xymalos monospora</i>	1,394			
<i>Zenkerella grotei</i>				1,413
Others	15,746	3,77	3,680	10,310
<b>Total</b>	<b>104,239</b>	<b>30,823</b>	<b>15,797</b>	<b>71,286</b>

## APPENDIX 2

**Table 1.** Diameter class distribution in Manga proposed forest reserve.

Species	Stems per diameter class (cm)				
	5-15	16-30	31-45	46-60	over 60
<i>Afrosersalisia cerasifera</i>	645	216	-	55	-
<i>Acacia senegal</i>	215	-	-	-	-
<i>Afzelia quanzensis</i>	430	860	-	-	-
<i>Albizia adianthifolia</i>	645	110	275	218	55
<i>Albizia anthelmintica</i>	1,505	109	-	-	-
<i>Albizia gummifera</i>	3,226	704	548	-	-
<i>Albizia schimperana</i>	3,440	2,328	1,040	275	-
<i>Albizia versicolor</i>	215	-	-	-	-
<i>Allophylus calophyllus</i>	2,795	325	-	55	-
<i>Antiaris sp</i>	1,505	1,031	165	55	-
<i>Antiaris toxicaria</i>	5,593	4,290	1,562	548	55
<i>Anyglocalyx braunii</i>	215	-	-	-	-
<i>Balanites sp.</i>	2,795	164	-	-	-
<i>Blighia unijugata</i>	2,150	485	110	-	-
<i>Buddleja pulchella</i>	645	430	-	-	-
<i>Canthium sp.</i>	860	490	164	55	55
<i>Ceiba pentandra</i>	5,163	1,187	-	110	55
<i>Celtis mildbraedii</i>	2,365	-	-	-	-
<i>Celtis wightii</i>	860	-	-	-	-
<i>Citrus aurantium</i>	-	55	110	-	-
<i>Coffea mongensis</i>	860	595	55	-	-
<i>Cola sp.</i>	215	165	55	-	-
<i>Combretum collinum</i>	860	-	-	-	-
<i>Combretum schumannii</i>	4,087	2,931	1,420	165	55
<i>Craibia zimmermannii</i>	15,468	4,774	711	439	-
<i>Craterogyne kameruniana</i>	13,984	1,025	55	-	-
<i>Cremaspora triflora</i>	645	-	-	-	55
<i>Cussonia spicata</i>	10,329	6,326	2,129	55	110
<i>Cylicomorpha parviflora</i>	645	-	-	-	-
<i>Cynometra engleri</i>	430	649	164	165	55
<i>Cynometra sp.</i>	5,378	819	55	55	-
<i>Deinbollia kilimandscharica</i>	7,960	3,067	-	-	-
<i>Dialium holtzii</i>	1,075	110	165	328	55
<i>Dictyandra arborescens</i>	1,075	-	-	-	-
<i>Diospyros mespiliformis</i>	12,909	1,560	-	-	-
<i>Diospyros mespiliformis</i>	645	55	110	55	55
<i>Diospyros squarrosa</i>	20,009	4,258	-	-	-
<i>Dombeya shupangae</i>	13,770	4,370	274	-	-



Table 1. (Cont.)

Species	Stems per diameter class (cm)				
	5-15	16-30	31-45	46-60	over 60
<i>Dovyalis sp.</i>	-	-	55	-	-
<i>Drypetes gerardii</i>	6,236	1,791	275	328	55
<i>Drypetes usambarica</i>	6,239	270	-	-	-
<i>Erythococca atrovirens</i>	-	55	55	-	110
<i>Erythrina abyssinica</i>	4,515	-	-	-	55
<i>Erythrophleum suaveolens</i>	430	-	-	-	-
<i>Faurea saligna</i>	430	215	110	-	55
<i>Fernandoa magnifica</i>	-	-	-	-	55
<i>Ficus kirkii</i>	215	-	-	-	-
<i>Grandidiera boivinii</i>	1,935	919	164	-	-
<i>Grewia bicolor</i>	-	55	165	55	-
<i>Grewia goetzeana</i>	6,240	3,300	657	383	110
<i>Grewia goetzeana</i>	5,162	485	55	55	-
<i>Hevea brasiliensis</i>	1,935	-	-	-	-
<i>Lannea schweinfurthii</i>	44,320	12,079	1,092	165	110
<i>Lecaniodiscus fraxinifolius</i>	25,171	12,275	984	110	55
<i>Leptonychia usambarensis</i>	215	-	-	-	55
<i>Lonchocarpus bussei</i>	215	55	-	-	-
<i>Malacantha alnifolia</i>	-	430	-	-	-
<i>Manilkara sulcata</i>	8,820	5,289	-	-	-
<i>Maranthes goetzeniana</i>	-	55	-	-	-
<i>Margaritaria discoidea</i>	44,105	4,423	-	55	-
<i>Markhamia hildebrandtii</i>	3,010	-	-	-	-
<i>Milicia excelsa</i>	4,301	1,515	549	110	110
<i>Milletia dura</i>	-	-	-	55	-
<i>Mimusops sp.</i>	645	-	110	55	-
<i>Monodora grandidieri</i>	430	325	55	-	-
<i>Myrianthus holstii</i>	430	700	219	-	-
<i>Newtonia paucijuga</i>	6,022	2,594	1,505	-	-
<i>Pauridiantha holstii</i>	215	-	-	-	-
<i>Piliostigma thonningii</i>	430	-	-	-	-
<i>Prunus africana</i>	-	215	-	-	-
<i>Psidium guajava</i>	215	-	-	-	-
<i>Pterocarpus mildbraedii</i>	-	165	384	220	220
<i>Pterocarpus tinctorius</i>	215	219	275	274	220
<i>Rhodognaphalon schumannianum</i>	1,505	540	328	-	110
<i>Ricinodendron heudelottii</i>	215	55	165	-	165
<i>Rinorea ferruginea</i>	13,122	1,991	-	-	55
<i>Rytigynia schumannii</i>	6,088	599	55	-	-
<i>Sapium ellipticum</i>	4,732	1,290	-	-	-
<i>Sorindeia madagascariensis</i>	3,656	434	165	-	-

Table 1. (Cont.)

Species	Stems per diameter class (cm)				
	5-15	16-30	31-45	46-60	over 60
<i>Sterculia appendiculata</i>	3,655	325	329	-	110
<i>Strombosia scheffleri</i>	-	-	55	-	-
<i>Strychnos mitis</i>	-	55	-	-	-
<i>Syzigium sp.</i>	215	-	-	-	-
<i>Tamarindus indica</i>	215	-	-	-	-
<i>Tarennia pavettoides</i>	430	-	-	55	-
<i>Teclea nobilis</i>	-	55	-	-	-
<i>Thespesia danis</i>	6,022	1,565	-	-	-
<i>Tinnea aethiopice</i>	1,290	-	-	-	-
<i>Trichilia roka</i>	-	110	-	-	-
<i>Trilepsium madagascariense</i>	-	55	-	-	-
<i>Vangueria tomentosa</i>	860	594	-	55	-
<i>Xylopiya sp.</i>	-	110	274	220	275
<i>Xymalos manospora</i>	6,237	2,592	220	-	-
<i>Zanthoxylum gillettii</i>	1,290	-	-	-	-
<i>Zenkerella grotei</i>	1,075	325	220	110	-

**Table 2.** Diameter class distribution in Mlinga proposed forest reserve.

Species	Stems per diameter class (cm)				
	5-15	16-30	31-45	46-60	Over 60
<i>Afrosersalisia ceracifirera</i>	-	-	62	186	62
<i>Afzokia quanzensis</i>	596	1,302	372	372	-
<i>Albizia adianthifolia</i>	-	-	382	-	62
<i>Albizia gummifera</i>	596	124	134	134	62
<i>Albizia schimperana</i>	744	658	382	186	-
<i>Albizia schimperana</i>	-	134	248	-	62
<i>Albizia versicolor</i>	-	62	-	-	-
<i>Allophylus calophylus</i>	248	-	-	-	-
<i>Antiaris toxicaria</i>	248	186	186	-	62
<i>Anyglocalyx braunii</i>	248	-	-	-	-
<i>Balanites sp.</i>	-	62	-	-	-
<i>Beguerti dendron natalense</i>	1,739	-	-	-	-
<i>Brachylaena hutchinsii</i>	-	186	496	-	62
<i>Combretum schumannii</i>	744	434	62	-	-
<i>Commiphora zimmermannii</i>	248	62	134	62	-
<i>Craibia Zimmermannii</i>	4,090	4,968	1,613	372	186
<i>Craterogyne kameruniana</i>	2,847	-	-	-	62
<i>Croton sylvaticus</i>	-	62	-	-	-
<i>Cussonia sp.</i>	-	134	186	-	-
<i>Cylicomorpha parviflora</i>	-	62	62	-	-
<i>Cynometra engleri</i>	1,241	434	-	186	-
<i>Cynometra sp.</i>	1,241	496	258	134	134
<i>Dialium holtzii</i>	-	-	62	62	-
<i>Dictyandra arborescens</i>	121,155	1,862	1,302	682	186
<i>Diospyros mespiliformis</i>	1,240	682	186	-	-
<i>Dombeya sp.</i>	248	1,118	-	-	-
<i>Drypetes gerardii</i>	-	310	62	62	62
<i>Drypetes usambarica</i>	596	496	-	-	-
<i>Erythrina abyssinica</i>	-	134	-	-	-
<i>Erythrophleum suaveolens</i>	-	186	134	62	186
<i>Faurea saligna</i>	744	62	62	-	-
<i>Fernandoa magnifica</i>	248	134	-	-	-
<i>Ficus capensis</i>	248	62	-	-	-
<i>Ficus subclarata</i>	-	-	62	-	62
<i>Funtumia africana</i>	-	62	-	-	-
<i>Grandidiera boivinii</i>	248	-	-	-	-
<i>Grewia goetzeana</i>	744	372	62	-	-
<i>Lannea schweinfurthii</i>	248	248	186	62	-

Table 2. (Cont.)

Species	Stems per diameter class (cm)				
	5-15	16-30	31-45	46-60	Over 60
<i>Lecaniodiscus fraxinifolius</i>	1,489	1,722	692	134	-
<i>Lonchocarpus bussei</i>	-	-	62	-	62
<i>Manilkara sulcata</i>	3,229	931	134	-	-
<i>Markhamia hildebrandtii</i>	744	310	-	-	-
<i>Milicia excelsa</i>	-	186	-	62	-
<i>Millettia dura</i>	1,489	62	-	-	-
<i>Newtonia paucijuga</i>	-	-	-	62	-
<i>Pachystela sp.</i>	-	-	-	-	62
<i>Parkia filicoidea</i>	-	-	134	-	-
<i>Prunus africana</i>	596	62	-	-	-
<i>Pteleopsis myrtifolia</i>	-	62	-	62	-
<i>Pterocarpus tinctorius</i>	248	434	186	62	134
<i>Rhodognaphalon schumannianum</i>	248	245	496	186	62
<i>Ricinodendron heudelottii</i>	-	-	62	62	-
<i>Rinorea ferruginea</i>	3,593	2,110	930	248	310
<i>Sapium ellipticum</i>	-	-	-	-	62
<i>Tamarindus indica</i>	-	-	-	-	62
<i>Tarrena sp.</i>	248	-	-	-	-
<i>Terminalia sambesiaca</i>	-	248	134	134	186
<i>Trichilia roka</i>	-	134	62	-	-
<i>Trilepsium madagascariense</i>	-	62	62	-	-
<i>Xylopia sp.</i>	-	62	186	-	-
<i>Zanthoxylum gillettii</i>	248	-	-	-	-
<i>Zenkerella grotei</i>	-	62	-	-	-
Mnkinda	-	-	62	-	-
Ulamba	-	134	62	-	-

**Table 3.** Diameter class distribution in Mlungui proposed forest reserve.

Species	Stems per diameter class (cm)				
	5-15	16-30	31-35	46-60	over 60
<i>Acacia polyacantha</i>	-	76	76	-	-
<i>Azelia quanzensis</i>	-	-	-	38	38
<i>Albizia adianthifolia</i>	153	76	-	-	-
<i>Albizia anthelmatica</i>	-	114	-	-	-
<i>Albizia gummifera</i>	-	114	114	-	-
<i>Albizia schimperana</i>	765	76	190	266	76
<i>Aulacocalyx diervilleoides</i>	-	-	38	-	-
<i>Beguertiodendron natalense</i>	9,333	955	38	-	-
<i>Blighia Unijugata</i>	153	38	-	-	-
<i>Brachylaena hutchinsii</i>	-	38	76	-	38
<i>Bridelia micrantha</i>	-	38	-	-	-
<i>Combretum schumanii</i>	1,524	617	76	-	-
<i>Craibia zimmermannii</i>	2,142	2,218	1,030	152	-
<i>Cussonia arborea</i>	459	191	38	76	-
<i>Cylicomorpha parviflora</i>	-	38	-	-	-
<i>Cynometra engleri</i>	153	764	76	114	38
<i>Cynometra sp.</i>	918	382	114	38	-
<i>Dictyandra arborescens</i>	-	38	-	-	-
<i>Diospyros amaniensis</i>	918	76	38	-	38
<i>Diospyros mespiliformis</i>	5,967	1,375	114	76	-
<i>Dombeya shupangae</i>	2,295	153	-	-	-
<i>Drypetes gerardii</i>	459	343	152	114	-
<i>Erythococca atrovirens</i>	-	38	-	-	-
<i>Fernandoa magnifica</i>	459	610	114	76	-
<i>Grewia goetzeana</i>	2,295	305	-	-	-
<i>Lecaniodiscus fraxinifolius</i>	2,448	2,408	763	495	-
<i>Manilkara sp</i>	459	1,375	228	38	38
<i>Manilkara sulcata</i>	-	534	343	38	38
<i>Markhamia hildebrandtii</i>	1,071	-	38	-	-
<i>Miletia dura</i>	612	956	-	-	-
<i>Milicia excelsa</i>	-	153	38	38	-
<i>Monodora grandidieri</i>	918	-	-	-	-
<i>Pterocarpus mildbraedii</i>	-	76	38	-	-
<i>Ricinodendron heudelottii</i>	-	152	228	152	228
<i>Rodognaphalon schumannianum</i>	306	-	38	38	-
<i>Sprudia appendiculata</i>	-	-	38	38	-
<i>Teclea nobilis</i>	918	-	-	-	-

Table 3. (Cont.)

Species	Stems per diameter class (cm)				
	5-15	16-30	31-35	46-60	over 60
<i>Terminalia sambesiaca</i>	-	38	228	114	38
<i>Trichilia roka</i>	-	-	38	-	-
<i>Trilepsium madagascariense</i>	153	76	-	-	-
<i>Xylopiia sp</i>	306	802	266	76	76
<i>Zanha golungensis</i>	153	38	-	-	-

**Table 4.** Diameter class distribution in Semdoe proposed forest reserve.

Species	Stems per diameter class (cm)				
	5-15	16-30	31-45	46-60	Above 60
<i>Afzelia quanzensis</i>	171	-	257	43	86
<i>Albizia adianthifolia</i>	342	642	171	43	43
<i>Albizia gummifera</i>	684	2,006	1,024	341	214
<i>Albizia Schimperana</i>	-	-	-	-	86
<i>Antiaris toxicaria</i>	3,756	3,540	2,559	2,304	1,495
<i>Aulacocalyx diervilleoides</i>	342	129	43	-	-
<i>Barringtonia racemosa</i>	2,389	1,579	43	43	43
<i>Bequertiodendron natalense</i>	1,537	86	-	43	43
<i>Bersama abyssinica</i>	-	-	-	-	43
<i>Blighia unijugata</i>	171	-	-	-	-
<i>Branchylaena hutschinsii</i>	341	86	-	43	-
<i>Bridelia micrantha</i>	513	-	-	-	-
<i>Ceiba pentandra</i>	171	-	-	-	43
<i>Celtis wightii</i>	-	43	-	-	-
<i>Coffea mongensis</i>	171	-	-	-	-
<i>Cola clavata</i>	8,192	1,323	256	43	-
<i>Combretum schumannii</i>	2,390	1,494	684	214	172
<i>Craibia zimmermannii</i>	4,436	1,323	641	171	86
<i>Cynometra sp.</i>	3,584	3,199	1,706	514	258
<i>Dialium holtzii</i>	-	43	-	-	-
<i>Diospyros squarrosa</i>	1,707	341	86	-	-
<i>Diospyros mespiliformis</i>	84,306	24,149	1,025	300	-
<i>Dombeya shupangae</i>	341	-	-	-	-
<i>Drypetes gerardii</i>	2,901	2,604	684	257	385
<i>Drypetes usambarica</i>	2,220	1,877	128	-	171
<i>Entandrophragma excelsum</i>	-	-	43	-	-
<i>Erythrina abyssinica</i>	-	-	-	43	-
<i>Fernandoa magnifica</i>	1,366	85	300	43	-
<i>Ficus capensis</i>	171	-	-	-	-
<i>Ficus capensis</i>	342	43	43	43	-
<i>Ficus exasperata</i>	855	86	43	-	-
<i>Grewia goetzeana</i>	9,898	4,522	770	215	129
<i>Grewia goetzeana</i>	171	43	43	-	-
<i>Isobertinia scheffleri</i>	-	-	-	-	43
<i>Khaya nyasica</i>	513	514	471	214	129
<i>Lannea schweinfurthii</i>	171	214	-	-	-
<i>Lecaniodiscus fraxinifolius</i>	22,870	7,723	3,200	558	214

Table 4. (Cont.)

Species	Stems per diameter class (cm)				
	5-15	16-30	31-45	46-60	Above 60
<i>Macaranga capensis</i>	513	1,111	300	43	43
<i>Manilkara sulcata</i>	-	43	-	43	-
<i>Maranthes goetzeniana</i>	684	86	-	43	43
<i>Markhamia hildebrandtii</i>	39,081	1,538	-	-	-
<i>Mesogyne insignis</i>	3,756	86	-	-	-
<i>Milicia excelsa</i>	342	809	726	257	43
<i>Milletia dura</i>	5,804	1,666	43	-	-
<i>Mimusops sp.</i>	1,366	768	215	43	-
<i>Morinda asteroscepa</i>	-	43	43	-	-
<i>Newtonia paucijuga</i>	171	86	86	-	43
<i>Odynedeia zimmermannii</i>	513	-	-	-	-
<i>Pachystela sp.</i>	8,022	2,645	853	428	214
<i>Parkia filicoidea</i>	-	-	-	-	43
<i>Premna chrysoclada</i>	-	43	-	-	43
<i>Psidium guajava</i>	854	341	-	-	-
<i>Pterocarpus sp.</i>	854	257	513	215	129
<i>Rhodognaphalon schumannianum</i>	683	342	385	171	86
<i>Rytigynia schumannii</i>	5,120	683	-	-	-
<i>Sorindeia madagascariensis</i>	6,656	811	299	-	43
<i>Sterculia appendiculata</i>	-	-	86	-	-
<i>Strombosia scheffleri</i>	512	299	43	-	-
<i>Syzigium sp.</i>	2,391	513	-	-	-
<i>Tarrena sp.</i>	2,388	-	-	-	-
<i>Teclea nobilis</i>	171	-	-	-	-
<i>Terminalia sambesiaca</i>	-	171	129	-	-
<i>Thespesia danis</i>	-	43	-	-	-
<i>Trichilia roka</i>	171	257	-	-	-
<i>Trilepsium madagascariense</i>	3,585	428	129	-	-
<i>Uvari dendron sp.</i>	-	43	43	-	-
<i>Uvari dendron sp.</i>	-	286	86	43	-
<i>Xylopi a sp.</i>	6,086	4,267	2,731	940	258
<i>Zanha golungensis</i>	-	-	-	-	43
<i>Zanthoxylum gillettii</i>	-	86	43	-	-
<i>Zenkerella grotei</i>	-	129	514	215	128
Kishuza misitu/Kazitu	342	-	-	-	-
Mshafusha	1,537	427	43	-	-
Mshewezi/Msowezi	-	43	-	-	-