Melliferous Status and Activities Endangering Tree Species Composition and Diversity Survey of Mlele Bee Keeping Zone [Mbkz], in Mlele District, Katavi Region-Tanzania.

Report to the Association for Development of Protected Areas [ADAP], Inyonga-Mpanda, Rukwa Region-Tanzania.

Consultancy carried out by the Forestry Training Institute-Olmotonyi, Arusha-Tanzania.

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ABSTRACT

The survey was conducted at Mlele Beekeeping Zone [MBKZ] to examine the tree species composition, diversity, melliferous status and activities endangering tree species. Purposive sampling was employed based on the prioritized sites by the ADAP project and the revealed vegetation strata by the researcher At least two 20m x 20m plots were set in each site [cluster] at an interval of 250m. GPS was used to record the coordinates, long tape measure for measuring the plot size. Plant specimen was collected for further justification of the scientific names at the herbarium in Arusha. Tree species were determined for their scientific names and counted for their frequency. The observed human activities were recorded. Shannon Wiener of diversity index [H^I] was applied to assess index of diversity. Simpson index [C] formula was used to determine the index of dominance. Family percentage based on the number of species per family was considered. 38 families including 96 general and 124 tree species were identified from the 1058 counted stems in the 42 sample plots at Mlele Beekeeping Zone (MBKZ) in Inyonga district. The diversity index was 6.89, an implication that the area consisted high diversity of tree species. Further more the index of 6.89 indicated the presence of relatively moderate disturbance that could have opened up a room for several tree species to regenerate. The most dominant tree species based on species diversity and dominance indices a diversity index of 0.05082 to 0.132. Those involved *Brachystegia spiciformis, Julbernardia globiflora, Diplorynchus condylocarpon, Terminalia kaiserana, Pseudolachnosylis maprouneifolia, Margaritaria discoidea annona senegalensis, Brachystegia boehmiii, Uapaca kirkiana, Brachystegia microphylla, Hymenocardia acida and Grewia ?bicolor* . The rest of them fell under medium and the least. Fabaceae, Euphorbiaceae, Rubiaceae, Combretaceae and Anacardiaceae were the most dominant based on number of species. Celasteraceae, Annonaceae, Arecaceae, Loganiaceae, Proteaceae and Sapotace were medium, while the rest were the least. Of the 124 identified tree species, 90% were known to be foraged by bees while the rest 10% were not known. The activities endangering tree species were wildfire, logging, cutting for poles and rods, beekeeping, camp huts, wildlife trapping debarking and grazing. The estimated canopy cover was revealed to be <30% and 30-60%. MBKZ is such a unique locality in terms of biological diversity. Further study is recommended to capture all plant growth forms and fauna of the area, flowering period calendar should be produced based on the time to time survey all year round. Permanent plots should be set and visited regularly to monitor and evaluate the changes in composition and diversity. Systematic collection of plant specimens should be conducted and distributed to other herbaria for taxonomic justification to whether the species are new records and or new species.

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LIST OF ACRONYMS

*	=	Multiplication sign
<	=	Less than
>	=	Greater than
a.s.l	=	above sea level
ADAP	=	Association for Development of Protected Areas
C	=	Simpson Index of Dominance
FRQ	=	Frequency
ha	=	Hectare[s]
m	=	meter[s]
MBKZ	=	Mlele Beekeeping Zone
No.	=	Number
RC	=	Relative Dominance
RD	=	Relative density
sp.	=	Species[singular]
spp	=	species [plural]
UTM	=	Universal Transverse Mercator

1.0 INTRODUCTION

1.0 Background Information

Tanzania with an area of 945,000square kilometers has the greatest diversity of plant species of all African countries with exception of the Democratic Republic of Congo and South Africa. There are over 9,000 species of higher plants in Tanzania, many of which are endemic, in a sense that they are only found in Tanzania (Ruffo *et* al, 2002). Forests provide a wide range of ecosystem services such as protecting soil from erosion, regulation of the water regime and provision of freshwater, capturing and storing carbon, producing oxygen and maintaining habitats for the biodiversity. Production of wood-based products, fiber and various non-wood products is critical for satisfying the needs for shelter, communication, packaging, food and many other uses of the global population (Simula and Mansur, 2011). The global countries seek for information on the state of forest, including forest degradation. A measure of forest degradation may be in terms of loss of biodiversity, forest health, productive potential or aesthetic value.

In many centuries, humans have relied on plants for survival and pleasure. Many citizens of several countries of the world were based on plants as source of food such as rice, wheat, barley and corn. The dependence on plants persists almost everything we do is influenced directly and indirectly by plants(Moore *et al.*, 1995).. Today we use plants to make clothes, string, rope, resin, lumber, musical instruments, sports equipment, furniture, fabrics, cardboard and explosives. Plants also, generate oxygen and sugars that sustain life, plants supply food and many of our drinks, extracts of plants and plant like

organisms to make paint, plastics, spices, soap, oils, adhesives, natural rubber, waxes, dyes and drugs like aspirin (Moore *et al.*, 1995).

Our natural vegetations including woodlands and forests are important as sources of wild fruits and vegetables as well as habitats for wildlife (Moore *et al.*, 1995). Forest degradation involves a change process that negatively affects the characteristics of a forest, reducing the value and production of its goods and services. This process is caused by disturbances, although not all of them cause degradation. The disturbances vary in origin, extent, severity, quality and frequency. Disturbances may be natural such as fire, storm or drought. Human induced disturbances including harvesting, road construction, shifting cultivation, hunting and grazing or combination of hunting and grazing. Human induced disturbances are internal (direct) such as those caused by logging and grazing or it may be indirect [unintentional] such as spread of invasive alien species (FAO, 2009).

Biological research is vital when the presence of the taxa in a given location is not certainly known. Systematic biological study results to the publication of many floristic and fauna accounts much more in the tropics where very little has been known. The published information is important for production of meaningful world ecological situation including biodiversity checklists. Taxonomic research provides new insights that result to determining the names of taxa existing in our ecosystems (Govaerts and Dransfield, 2005). The exchange of biological information is particularly important as a basic framework for exchange of information in economically important and providing a framework for addressing conservation status and needs (Govaerts and Dransfield, 2005).

One way of botanical survey is to involve identification of plants, a process which involves looking at leaves to see if they resemble any of those illustrated and described in the botanical keys which are series of questions and answers which will make the researcher look at important details of structure in the plant (Agnew, 1994), and this is performed easily when field surveys are conducted involving description, determination and collection of plant specimens for further justification at the herbarium.

1.2 Problem Statement and Justification

Plants including forest trees form an attractive and valuable part of our natural heritage. Landscape with trees makes an impressive environment for human beings: improve the beauty for many of our wildlife including animals and insects (Fitschen, 2013). Our environment accommodates a variety of tree species meant to support to fauna and human being, though only a few statistics are known (Kperkouma, *et al.,* 2006). The existing quality and quantity needs to be understood through systematic methods (Katende *et al.,* 1999). The type of forest tree species and other related data rely on organized data collection, and that the sustainable uses and management of forests are possible when the present plant varieties are determined (Munishi *et al*., 2009).

Melele Beekeeping Zone in Mlele district comprises of enormous plant species diversity, whereby trees are the prominent growth forms, but not studied for their composition, diversity and dominance yet. Also, the area faces severe human activities endangering plant species such as logging for timber and local hives, but very little is known. Ruffor *et al* (2002), highlighted that with increasing deforestation on exploitation and changes in

land use, the diversity of natural vegetation in Tanzania is declining and many of the wild potentials including wild foods and fruits are no longer readily available. According to Smith (2013), in terms of natural resources, Katavi, just like in Rukwa region enjoys a diversity of natural resources among others including wildlife, forests most of which are yet to be yet to be exploited. The aim of this study was to assess the tree species composition, diversity, dominance and activities endangering tree species composition and diversity at Mlele Beekeeping Zone.

1.3 Objective

1.3.1 General objective

The general objective was to examine melliferous status and activities endangering tree species composition and diversity of Mlele Bee Keeping Zone [Mbkz], in Mlele District, Katavi Region-Tanzania

1.3.1.1 Specific objectives

The specific objectives were:-

- To examine tree species diversity at Mlele Beekeeping Zone
- To assess tree species dominance of Mlele Beekeeping Zone
- To indicate the melliferous status of the tree species of Mlele Beekeeping Zone
- To identify human activities endangering tree species composition and diversity

1.0 METHODOLOGY

2.1 Description of Study Area

2.1.1 Location

The study was conducted at Mlele Beekeeping Zone[MBKZ] which lies at 36UTM 351963 and 9248114 in the southern side of the beekeeping reserve and 36UTM 353524 and 9284884 northern side, with an altitude range of 1200 to 1600m *a.s.l.*(Garmin GPS). It is located North West of Inyonga Township, along main road to Mpanda and road to Rukwa Game Resrve headquaters. The accessibility is from Inyonga towards Mpanda, or from Mpanda towards Inyonga Township, reached via road. Also, MBKZ can be accessed via air plane landing at the air strip near Katavi Game Reserve Head Quartos, and then driven to Inyonga Beekeeping Reserve. The MBKZ is situated about 12km from Inyanga townsiship via Mgombe village towards Mpand town, and 16km from Inyonga Township via Kanoge village.

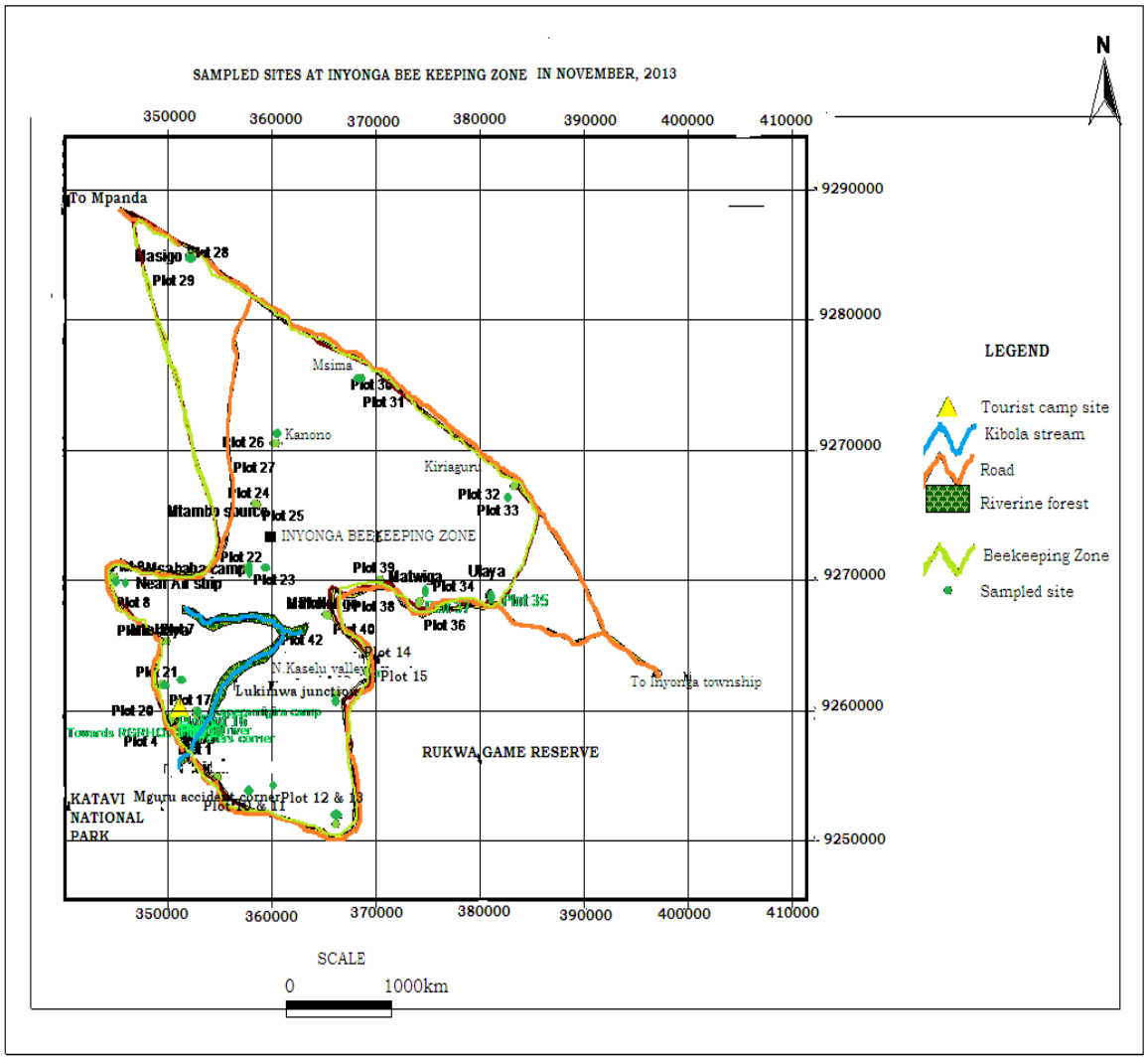

Figure 1: Map of Inyonga Beekeeping Reserve showing the sampled sites

2.1.2 Vegetation

In general MBKZ can be termed as miombo woodland, however, it comprises of a variety of micro-habitats as will be highlighted in this work.

- **Miombo woodland**: This was the dominant type of vegetation dominated by *Brachystegia spiciformis, B. longifolia, B. boehmii, B.utilis, Albizia antunesiana,*

Burkea africana, Pericopsis angolensis, Pterocarpus angolensis,P.tinctorius, Isoberlinia angolensis, Julbernardia globiflora, Piliostigma thonningii, Lonchocarpus capassa, Annona senegalensis, Parinari curaterifolia, Pseudolachnostylis maprouneifolia mixed with: *Syzygium guineense*, *Craterispermum schweinfurthii*, *Maytenus senegalensis*, *Terminalia* sp., *Combretum* sp. and *Senna abbreviata.*

(i) **Terminali-Combretum woodland:** This was a type of woodland patches within the typical miombo woodland, dominated by *Terminali* spp. and *Combretum* spp.

(ii) **Seasonal water lodging wooded grassland plain:** An area where water lodging was revealed to be prominent, especially during rainy season. The dominant woody plants were *Acacia derepanolobium* and *Combretum* spp[MLUZYA MINZE/water loving tree species]. However, grass remain the dominant growth form.

(iii) ***Acacia-Terminalia-Combretum*** woodland: This was a type of woodland that was dominated by *Acacia* sp., *Terminalia* spp. aAnd *Combretum* spp. Mixed with *Antidesma membranacea*.

(iv) **Evergreen forest patch:** This was a type of vegetation observed within the miombo woodland, especially at the northern-western side of the Mlele Bee Reserve, at Masigo. The dominant trees were: *Garcinia buchananii, Rawsonia lucida, Mystroxylon aethiopicum, Berquaertiodendron natalense* and *Euphorbia candelabrum.*

(v) **Riverine vegetation:** This was a vegetation fringe along the river side such as Kibola stream. The dominant trees were:- *Raphia farinifera, Syzygium cordatum, Kotschya africana, Hymenodictyon floribunda, Ficus sur, Faurea saligna, Bridealia micrantha, Rothmania longiflora, Dracaena* sp., *Rhus* sp.and *Milletia oblata*.

Plate 1: Riverine forest, with disturbed grassland by wildlife [buffaloes dung seen] at Mtalazya.

(vi) **Wooded grassland:** The vegetation consisted of woody plants and grass, of which grass was the dominant growth form. Trees including *Terminalia* sp. *Albizia antun esiana*. The abundant grass was *Hyperhenia* spp. mixed with other species of grass.

(vii) **Grassland:** An area dominated with grasses within the miombo woodland. This was dominant in somewahat seasonanal water lodging area. These were

revealed to be browsing points for the wildlife including buffaloes, and Sebo antelopes.

Palate 2: Grassland patch with miombo woodland behind.

2.1.3 Soil type

The soil types noted were black cotton, sand loamy, red-rocky soil, and clay-sand-loamy in some areas.

2.1.4 Zoological importance

The wild animals included Sebo antelopes, Grand gazelle [Tandala], Ground squirrels, Giraffes, Blue monkeys, Baboons and birds such as Ground hornbills, Flying pigeons and Guinea fowl. The unique reptile was the monitor lizard found near the Mlele Beekeeping Reserve Tourists camp site, at small water fall [352058/9248224].

2.1.5 Water catchment value

The MBKZ is potential in terms of water protection, through which Kibola stream passes through, and several stream sources are imbedded in the site. The Kibola stream supports the population at Katavi Game Reserve Head Quarters, whereby water is trapped and used for various purposes. Also, the available water sustains the wildlife including reptiles, mammals, birds and bees which are important producers of honey in the site.

2.1.6 Melliferous potentials

The MBKZ accommodates high plant species diversity potential as bee fodder including lower and higher growing ones. The famous bee fodder lower growing plants include:- *Dolichos kilimandscharica, Crotalaria axillaris, Fadogia* sp., *Sphonochillus aethiopicum, Hygrophylla auriculifolia, Discorea* sp., *Cyphostemma* sp., *Ludwigia* sp., and *Afromomum angustifolia.* The higher growing bee fodder plants [trees] include *Brachystegia* spp., *Pericopasis angolensis, Albizia* spp., *Acacia* spp., *Markhamia obtusifolia, Parinari curatellifolia, Disospyros* spp., *Anisophylla pomifera, Raphia farinifera, Vitex doniana, Terminalia* spp., *and Combretum* spp.

Plate 3: Among famous bee fodder tree species [*Pterocarpus angolensis*]

2.2 Materials

- **Global Positioning System [GPS]:-** For recording latitude and longitude for the study area, marking the plot area, aligning the transect and for recording coordinates to be used for producing a map for the study area.
- **Map of the study area:** for justification of boundaries and planning the field survey in the study areas
- **Recording materials:** including pens, marker pens, pencils and notebooks
- **Taxonomic literatures**: included botanical books with identification keys and illustrations for justification of the scientific names.
- **Box file**: for collecting plant specimens to be identified at the herbarium
- **Long tape measure**: for aligning and measuring the plot size.
- **Camera**: for taking photographs of the necessary features in the study area.

2.3 Methods

2.3.1 Sampling technique and sample size

2.3.1.1 Sampling frame

The sampling frame was 850 square kilometers [m^2]

2.3.1.1.1 Sample size

The sample size was calculated from the following formula:-

$$n = \frac{(TA * Si)}{(Ps * 100)}$$

n = number of sample plots; TA = total area of the forest; Si = sampling intensity [determined by researcher]; which was 1% (0.01). Synnott, (1979) recommended the

sampling intensity to be within a range of 5% [0.05] to 7% [0.07] for tropical natural forest inventories. However, according to Malimbwi and Mugasha, (2002) and Malimbwi *et al.,* (2005), highlighted that financial and time constraints and purpose of the forest inventory may dictate the sampling intensity to be as low as 1% [0.01]; and *PS* = Plot Size [size of sample plot (ha)].

Given

- Sampling intensity = (2%) = 0.02
- Size of sample plot = 0.04 ha i.e. [20 x 20]/10,000

For a forest of 850km^2

The total area of sample = 850km^2 x 1000m^2 = 850,000m^2/10,000m^2/ha = 85ha

$$\frac{(85*2)}{(0.04*100)} = 42.5 = 42$$

Therefore, the number of sample plots was 42.

2.3.1.1.2 Sampling unit

The sampling unit was a plot of 20 x 20m = 400m^2

2.3.1.1.3 Sampling procedure

Purposive sampling was employed focusing on the prioritized locations including Kariaguru, Mtalazya, Msima, Kanono, Masigo, Mtambo water source, Near air strip, Peter Mruru's accident corner, Lukimwa junction, Before Kaselu valley, Matwiga plain,

Ulaya, Msabaha camp and Kipiramigira camp as prioritized by the ADAP project and the notable vegetation strata [zones] in a cluster form. 20m x 20m plot was set at an interval of 250m within a cluster, of which each cluster consisted of at least two plots. The observed tree species were identified for their scientific names and counted for their frequency. The melliferous status was indicated based of the researchers' knowledge, experience and the local guide experience. The revealed activities endangering tree species diversity were recorded.

2.4 Data Collection

2.4.1 Data type and sources

2.4.1.1 Primary data

Primary data involved those data that were collected in the field based on observation of the real situation and determination of plants in the field.

2.4.1.2 Secondary data

A variety of books, reports, scientific journals and World Wide Webs [www] were consulted during this study.

2.5 Data Processing, Analysis and Presentation

2.5.1 Data processing

The collected field data were edited in order to make any necessary corrections of errors that could have occurred during recording. The computer packages such as micro-soft excel and Arc View GIS were used for data recording and initial data analysis.

2.5.2 Data analysis

(i) Shannon Wiener [H^1]

Tree species diversity index was calculated by using Shannon Wiener Index. Shannon Wiener Diversity Index Formula was $H^1 = \sum(pilnpi)$; where $\sum$ = summation symbol from 1^{st} to i^{th} species, pi = proportional of importance value for a species in the sample, ln = natural logarithm. The Shannon Index of Diversity Index is the best option due to the reason that it combines both species richness and evenness and less affected by sample size compared to other indices (Giliba *et al.,* 2011; Kent and Coker, 1994).

(ii) Simpson Index Formula [C]

Tree species dominance was calculated by using the Simpson Index. Simpson Index Formula $C = \sum (pi)^2$**,** was considered to find out the tree species dominance in the sample area. Kent and Coker (1994) clarified that C=Simpson Index, pi = proportional of each i^{th} species importance value index compared to total of all other species occurrence (n^{th}-species) to indicate the species dominance $(n/N)^2$; where "n" = total count of individual tree species , "N" = total count of individual of all tree species identified in the sample.

(iii) Family percentage [P]

The family percentage was calculated based on the total number of tree species per family, using the formula:-

$$P = \frac{n}{\sum[n]} x\ 100\%$$

Where:-

P = family percentage; n = total number of tree species per family and $\sum$ = summation

2.5.3 Data presentation

Tables, figures and plates with the associated text translation have been used to present the analyzed data.

2.0 RESULTS AND DISCUSSION

3.1 Introduction

This chapter outlines the tree species diversity index, dominance and the observed activities endangering the tree species composition at Mlele Beekeeping Zone in Mlele district, Katavi region.

3.2 Tree Species Composition and Diversity

A total of 38 families including 96 general and 124 tree species were identified from the 1058 counted stems in the 42 sample plots at Mlele Beekeeping Zone (MBKZ) in Inyonga district (Table 1). The diversity index was 6.89, an implication that the area consisted enormous diversity of tree species. Further more, the result indicated the presence of relatively moderate disturbance that could have opened up a room for several tree species to regenerate. Moderate disturbance of natural forest is made efficient when systematic inventory is conducted regularly to find out the most dominant tree species, even though it must be controlled and even stopped at some stage to balance the biodiversity in the ecosystem (Sapkota *et al.,* 2010).

Table 1: Number of stems, families, genera, species and diversity index for tree species

VARIABLE	No. of stems	Families	No. of genera	No. of Species	H^I
VALUE	1058	38	96	124	6.89

The diversity index (H^I) of 6.89 indicated very tree species diversity in the study area. According to Kent and Coker (1992), the value of diversity index usually lies between 1.5 to 3.5, although in exceptional cases the value can go beyond 3.5 or 4.5. According to Giliba *et al*. (2010), the very high diversity index is associated with disturbance that could have opened a room for regenerating plants

3.2.1 Diversity index

Those tree species with a diversity index of 0.1320 to 0.5081 were considered as the highest according to this study. Those involved *Brachystegia spiciformis, Julbernardia globiflora, Diplorynchus condylocarpon, Terminalia kaiserana, Pseudolachnosylis maprouneifolia, Margaritaria discoidea annona senegalensis, Brachystegia boehmiii, Uapaca kirkiana, Brachystegia microphylla, Hymenocardia acida and Grewia ?bicolor* (Table 2 and Appendix 1)

Table 2: Scientific name, frequency, diversity, dominance, density, relative density and dominance.

S/N	SCIENTIFIC NAME	FRQ	pi	H^I=pilnpi	C=(pi)^2	D=n/ha	RD	RC
1.	*Brachystegia spiciformis*	**77**	0.0730	0.5081	0.0053269	1925	7.299	0.5327
2.	*Julbernardia globiflora*	**61**	0.0578	0.4025	0.0033431	1525	5.782	0.3343
3.	*Diplorynchus condylocarpon*	56	0.0531	0.3695	0.0028175	1400	5.308	0.2818
4.	*Terminalia kaiserana*	**51**	0.0483	0.3365	0.0023369	1275	4.834	0.2337
5.	*Pseudolachnostylis maprouneifolia*	**50**	0.0474	0.3299	0.0022461	1250	4.739	0.2246
6.	*Margaritaria discoidea*	**32**	0.0303	0.2111	0.0009200	800	3.033	0.0920
7.	*Pterocarpus angolensis*	30	0.0284	0.1980	0.0008086	750	2.844	0.0809
8.	*Annona senegalensis*	**23**	0.0218	0.1518	0.0004753	575	2.180	0.0475

9.	*Brachystegia boehmii*	**23**	0.0218	0.1518	0.0004753	575	2.180	0.0475
10.	*Uapaca kirkiana*	22	0.0209	0.1452	0.0004349	550	2.085	0.0435
11.	*Brachystegia microphylla*	**21**	0.0199	0.1386	0.0003962	525	1.991	0.0396
12.	*Hymenocardia acida*	**21**	0.0199	0.1386	0.0003962	525	1.991	0.0396
13.	*Pericopsis angolensis*	21	0.0199	0.1386	0.0003962	525	1.991	0.0396
14.	*Grewia ?bicolor*	**20**	0.0190	0.1320	0.0003594	500	1.896	0.0359

Those tree species with the diversity index of 0.0792 to 0.1254 were ranked the medium. Those involved:- *Albizia antunesiana, Dalbergia nitidula, Combretum sp., Brachystegia utilis, Flacourtia indica, Ximenia americana, Monotes africanus*

Rothmania longiflora, Oldfieldia somalensis, Parinari curatellifolia, Syzygium guineense and *Uapaca nitida* (Appendix 1). The rest identified tree species, with diversity index less than 0.0792 were judged as the least (Table 1 and Appendix 1).

3.2.2 Tree Species dominance

The tree species with high diversity index were also, the dominant as both of them were reflected on the frequency of each individual tree. The higher the frequency, the higher the dominance index and the vice versa is true (Appendix 1

3.2.2.1 Family percentage diversity and dominance in terms of total number of species

Those families with the percentage of 4.8 to 22.6 were ranked as the most dominant in terms of number of species, and those were Fabaceae (22.6%), Euphorbiaceae (9.7%), Rubiaceae (9.7%), Combretaceae (5.6%) and Anacardiaceae (4.8%]. The medium dominant were from 2.4 % to 4%, and those included:- Celasteraceae (4%). Annonaceae

(3.2%), Arecaceae, Aracaceae, Loganiaceae, Proteaceae and Sapotace which got a score of 2.4% each.(Figure 4 and Appendix 3). The rest of the identified families of trees which got less than 2.4% were ranked the least according to this study (Appendix 3)

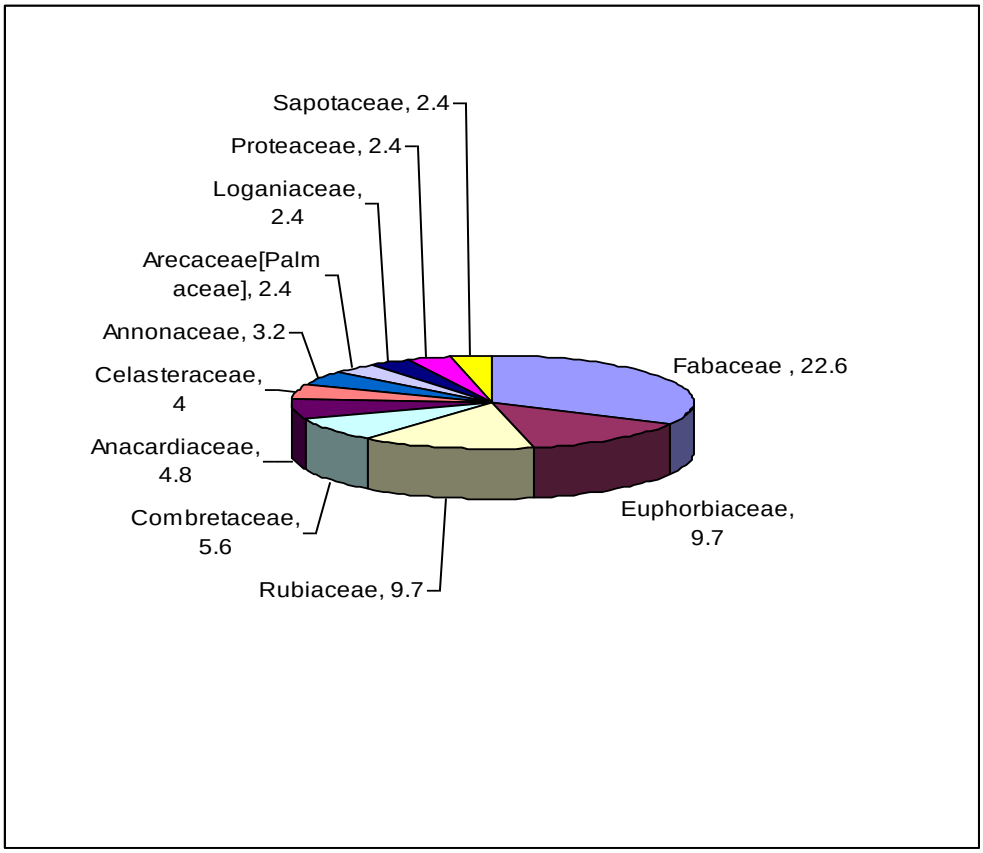

Figure 2: Percentage based of total number of species per family

3.2.3 Melliferous status of tree species identified at Mlele Beekeeping Zone.

Plant species, including trees support bees in many ways, among those being provision of pollen and nectar. The MBKZ was revealed to contain high tree species diversity, out of the 124 identified trees, 111[90%], were bee fodder, while only 13 [10%] were not known to be bee fodder (Figure 5 and Appendix 4). Most of the foraged tree species were relatively abundant (frequent) (Appendix 4). The not known to bee foraged by bees 13

tree species included:- *Antidesma membranacea, Bridelia scleroneura, Commiphora Africana, Elaeodendron schweinfurthii, Euphorbia candelabrum, Ficus sur, Ficus thonningii, Hymenocardia acida, Oldfieldia somalensis, Olea capensis, Pseudolachnostylis maprouneifolia, Sapium ellipticum, Senna abbreviate* (Figure 4).

This situation implied that the site is potential for beekeeping activities and any othe non woody income generating activities including ecotourism**.**

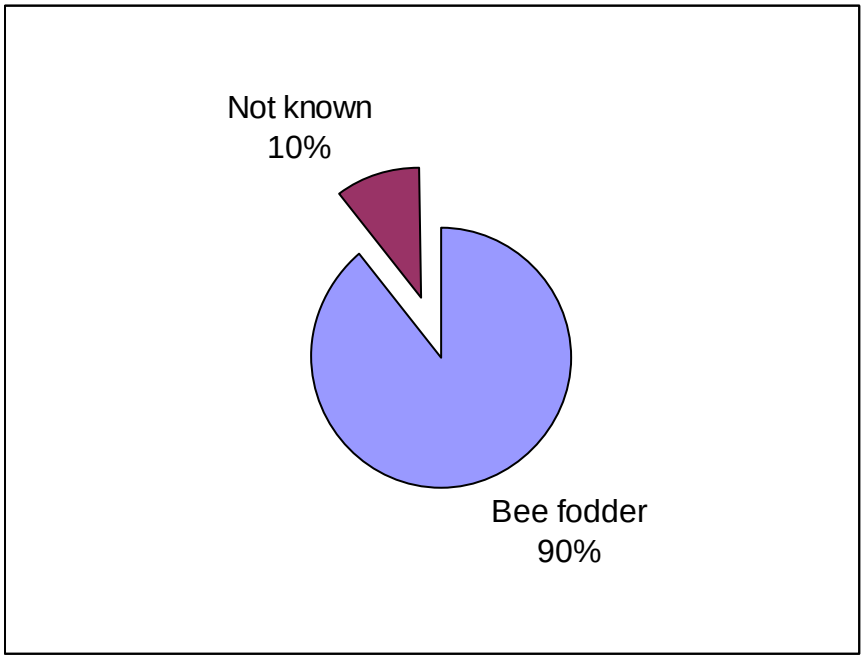

Figure 3: Tree species foraged by bees and those not known to be fodder.

3.2.4 Observed Activities Endangering Tree Species in the Catchment Forest

Human activities taking place in our environment are necessary for the development and or improvement of their livelihood. However, they have negative effect to other organisms, if not controlled. A total of nine activities were identified in the study area, of

which fire was the most dominant (44.2%), followed by Beekeeping (16%), cutting (11.6%) debarking (11.6%), camp huts (7%), grazing (2.3%), Logging (2.3%) and timbering (2.3%) (Table 2).

Table 2: Activities identified at Mlele Beekeeping Zone sample plots

ACTIVITY	OCCURRENCE	PERCENTAGE[%]
1. Animal trapping	2	4.7
2. Beekeeping	6	16
3. Camp hut	3	7
4. Cutting	5	11.6
5. Debarking	5	11.6
6. Grazing	1	2.3
7. Logging	1	2.3
8. Timbering	1	2.3
9. Wild fire	19	44.2
TOTAL	**43**	**100%**

(i) Beekeeping

This involved modern (plate 3) and local hives (plate 4). Most of the modern hives may involve a certain level of cutting trees and rope making to support or suspend the hives. Also, camps are initiated, whereby poles are cutt for huts construction purposes. During honey harvesting, fire is used to smoke the bees and then left to burn the vegetation.

Furthermore, the beekeepers may use the beekeeping opportunity to poach for trees and wild animals.

Plate 3: The few modern hives observed at Mlele Beekeeping Zone

The local hives were made from large trees barks. The revealed famous debarked tree species was *Julbernardia globiflora*. Debarking affect the food system transportation as it affects the phloem tissue responsible for transportation of food from leaves down to the other parts of the tries, and thus death of the trees.

Plate 4: Local bee hives made from bark (debarked material).

(ii) Logging

Logging considered the cutting of tree with large stems (trunks). According to Pearsall (2002), logging is the cutting of a part of the trunk or a large branch of tree that has fallen or been cut off. Near air strip was among areas where large stumps were revealed, but of at least 5 to 6 years old. The most logged tree species was *Pterocarpus angolensis*, a famous hard wood timber. The area consists of more good quality timber trees apart from *P. angolensis* which are *Afzelia quanzensis*, *Pterocarpus tinctorius* which are also, the best quality bee fodder. The damage of those trees have a negative impact to the bees.

Plate 5: Logged tree stumps near air strip..

(iii) Cutting

This aspect considere the small size of trees such as pole size and rods. This was noticed to be common wherever, camp huts were cosntructed. The construction of bee keeper's huts [camps] requires poles and rods from Mlele Beekeeping Zone. This process discourages the tree species composition and diversity, as well as affecting habitats for the wildlife (Plate 6). The cutting of grass can involve damaging the tree seedlings.

Plate 6: Beekeepers hut constructed with poles, thatched with grass.

(iv) Wildfire

Fire has been used in many places as a management tool. Miombo vegetation requires a certain level of fire for management, but usually done befor the area gets completely dry [early burning] by the forest management. The study revealed fire in all areas except Kibola riverine area, where fire could not get in due to wetness. It may be assumed that fire is set purposely to keep the camp sites clean and probably free from wildlife including snake, also, to ensure visibility. Sometimes happens during honey harvesting, whereby fire is set to burn the combs (Plate 7). Fire leads to deaths of lower growing plants including grass, herbs and sedges. Also, fire leads to dwindled growth of some trees such as *Annona senegalensis* which is usually a tee (Plate 7), but at Mlelet, most of the *A. senegalensis* individuals were revealed to be geoxylic sufrutexy with fruits arising from a woody root stock, instead of branches. It was mostly 0.5 to 1.5m tall, due to fire incidences occurring regularly. It may be not very easy to kill most of the trees immediately, but dwindled growth for most of the samplings will be common.

(a) **(b)**

Plate 7: Comb left burning by the honey harvesters at Kaperamigira(a) and the dwindled growth of *A. senegalensis* (b) in most sampled sites.

(v) Debarking

Debaking is the process of removing the bark from the tree trunk (stem) (Pearsall, 2002). The debarked materials or barks were found to be used for beehives (Plate 8(a) and laerge amount of the observed local bee hives were made from barks. Also, during suspending the local and modern hives, barks are removed from trees for ropes (Plate 8(b). The barked trees belong to the Fabacea family including the *Julbernardia globiflora* and *Brachystegia* spp.

(a) **(b)**

Plate 8: Debarking for local bee hives and ropes

(vi) Grazing

This was noticed at Ulaya miombo woodland in the south eastern side of the MBKZ, an area which was somewhat close to the human settlement. The cattle always browse lower and higher growing plants, and thus affecting the tree seedlings, herbaceous plants, also discouraging the natural interaction of wildlife in their natural environment. Sometime, grazing is associated with other activities including poaching for wild animals, timber, and poles.

(vii) Timbering

This activity involves the sawing of timber. Msabaha camp was the site with timber sawing area near the camp, while no bee hives were seen nearby the camp. According to Pearsall (2002), timbering is the process of preparing wood for use in building and carpentry.

(viii) Wild animals traping

Animal trapping is the situation of catching an animal. It is an unpleasant situation from which it is hard to escape (Pearsall, 2002). Msabaha camp was among sites where local traps were observed near the camp hut. There were several wild animals foot tracks on which the traps were found set.

(ix) Hut building

Nearly all beekeeping camps heard huts built using poles, rods, ropes and grass thatched on. None of the huts could not demand damage of plant resources. Wherever there was camp huts, trees were cut (Plate 6).

3.2.4.1 Total categories of activities per sampled site.

Each sample site had a certain level of activities being conducted by the people. This study ranked them based on the total number of types of activities which occurred in the sites, and was ranked as the most, medium and the least. Kaperamigira (6), Msabaha (6) and Mtalazya (4) were ranked as the most affected based on the types of activities conducted. Masigo (3), Kariaguru (3), Peters' corner (2), Near Mlele Tourist camp site (2), Lukimwa road junction (2), Near Mlele camp towards KGRHQ (2), Msima (2), Ulaya (2) and Matwiga (2), were medium (Figure 6). The rest sites were the least based on the number of types of activities conducted in the sample sites (Appendix 6)**.**

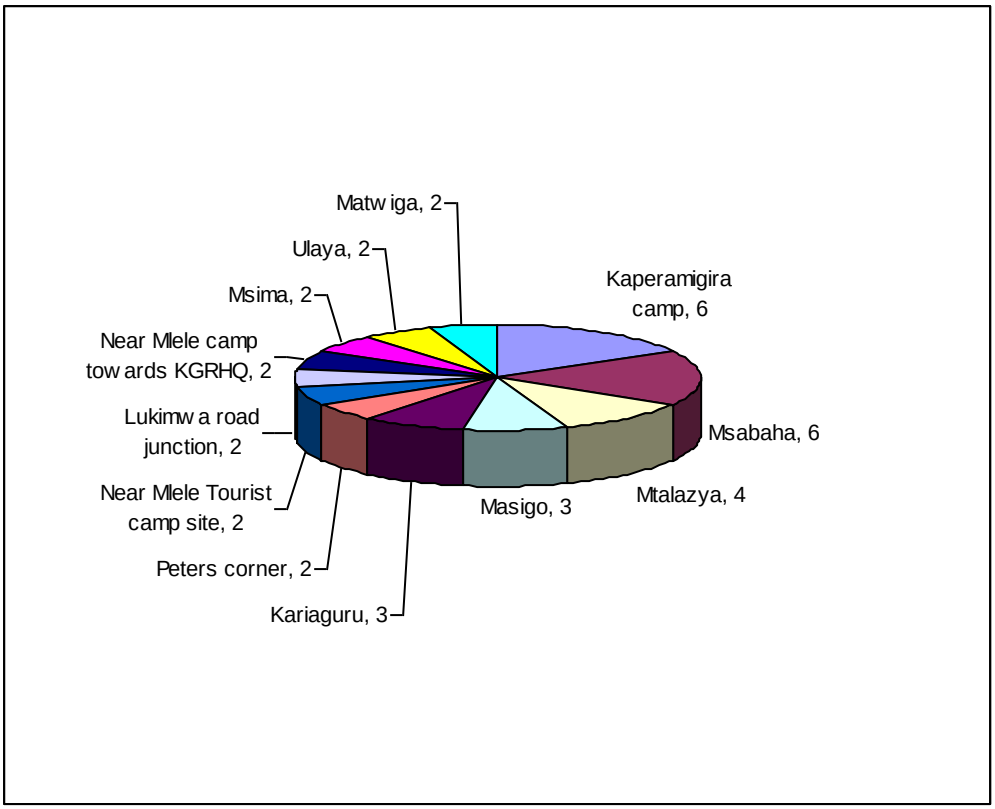

Figure 4: Total categories of activities identified at Mlele Beekeeping Zone

3.2.5 Canopy cover ranking

Canopy cover refers to as leaves of trees which act as an umbrella over the ground beneath. It is a percentage of the surface which is covered by the leaves of trees (Collin, 2001). According to Hornby (1995), canopy is a hanging cover forming a shelter above something. Is a covering that hangs over something such as in a forest.

This study estimated the canopy cover in form of percentage and number ranking as <30 [1], 30-60% [2] and >60 [3]. This referred to as <30% was the lowest canopy cover; 30-60% as medium and >60% was the highest in canopy cover. Therefore rank of one [1] was the lowest; two [2] was medium and three [3] was the highest in canopy cover. Of all those ranking, none of the sampled sites scored the highest canopy cover (Table 1). .

Table 4: Canopy cover

Name of sampled site	**Percentage score and rank**		
	[1]	**[2]**	**[3]**
Near campsite to Peters' corner		30-60%	
Iloba Miombo woodland		30-60%	
Near camp site-towards Rukwa Game HQS		30-60%	
Mtalazya	<30%		
Near air strip		30-60%	
Peter Mguru accident corner	<30%		
Lukimwa junction	<30%		
Before Kaselu valley	<30%		
Kaperamigira camp		30-60%	
Kanono	<30%		
Masigo	<30%		
Msima		30-60%	
Kariaguru	<30%		
Ulaya	<30%		
Matwiga		30-60%	
Matwiga seasonal water logging plain	<30%		
Makolongo		30-60%	
TOTAL	**9**	**8**	**0**

Canopy cover of less than 30% in most of the study areas could have influenced by dry season when most of the leaves were shaded. If it was rain season, probably canopy cover could range from 30-60% and above 60%.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

Plant species including trees which are the prominent growth form play a great role to human development and ecological sustainability in general. The Mlele Beekeeping Zone comprises of very high tree species diversity, with a diversity index of 6.98 with 850 square kilometers. Some of the tree species had higher frequency while others got less, but all of them had contribution in terms of the diversity, while diversity and dominance indices depended on the total counts per tree species. Most of the identified tree species were revealed to be foraged by stinging honey bees (melliferous), while very little were not known to be foraged by bees. The most alarming activity endangering tree species composition and diversity was wildfire which occurred nearly in all sampled sites except Kibola stream. The other common activities were cutting, debarking and hut construction that had negative effect to the plants in the study area.

4.2 Recommendations

Mlele Beekeeping Zone is such a unique locality with high floristic and fauna species, simultaneously important for the local community's sustainable development. It provides fodder to honey bees, protects water catchment areas, it regulates the amount of rainfall and temperature, habitat for wild animal sell as maintaining the natural scenery, to mention a few potentials. This study sets the following recommendations:-

(i) Botanical and zoological inventory should be conducted to determine the all existing plants and animals and collections of plants of all growth forms

distributed to various herbaria for knowledge sharing and recognition of whether there are any endemic plants or new records.

(ii) There should be enough time of collection of specimens for the ADAP to enrich the herbarium, especially those known to be foraged by honey bees

(iii) Phonological study should be done all year round in order to come up with flowering periods calendar, as this cannot be accomplished at only one trip of botanical survey[can be completed at least in six visits after every two months throughout the year.

(iv) Further study should be initiated focusing on transects set across the site to reveal more threats of the trees and other living organisms.

(v) Permanent plots should be established, marked and monitored or revisited every year or after at least two years, as most of the visited sites did not reveal any sign for the previous set plots at all.

5.0 REFERENCES

Beentje, H. J. (1994). Kenya trees, shrubs and lianas. National Museum of Kenya, Nairobi-Kenya.

Collin, P.H. (2001). Dictionary of ecology and environment. Fourth edition. Peter publishing Limited-London.

FAO. (2009*). Global mapping and monitoring the extent of forest alteration: the intact Forest landscapes method*, by P. Potapov, L. Laestadius, A. Yaroshenko and S. Turubanova. Forest Resources Assessment Working Paper. No. 166. Rome (*www.fao.org/docrep/012/k7611e/k761e00.pdf*: Cited on 17th November, 2013]

FAO. (2011). *A global challenge needing local response. A common approach to Defining and measuring forest degradatiom can lead to unique solution for addressing it,* by M. Simula and E. Mansur. Food and Agriculture of the United Nations. An International Journal of forestry and forest industries. Vol. 62.

Fitschen, T. (2013). Forests: the Roots of Sustainability Conference on the occasion of the first International Day of Forests Geneva, Palais des Nations *[http://www.unece.org/fileadmin/DAM/timber/publications/UNited_Forests Newsletter/Ambassador_Fitschen.pdf:* Cited on 10th November, 2013].

Giliba, R.A. Boon, E.K., Kayombo, C.J., Musamba, E.B. Kashinde, A.M. & Shayo, P.F. (2011): Species Composition, Richness and Diversity in Miombo Woodland of Bereku Forest Reserve, Tanzania. Forestry Training Institute, Olmotonyi, Tanzania. Vrije Universiteit Brussel, Belgium, 3Ministry of Natural Resources and Tourism, Tanzania.

Govaerts, R. and Dransfield, J. (2005). World checklist of Palms. Plants people possibilities. Royal Botanic Gardens Kew. Richmond, Surrey. United Kingdom.

Hornby, A.S. (1995). Oxford advanced learner's dictionary of current English. Oxford Uiniversity Press. Printed in China.

Katende, A.B., Ssegawa, P. & Birnie, A. (1999). Wild food plants and mushrooms of Uganda. Technical handbook No. 9.

Kperkouma, W., Brice, S., Hahn-handjali, K. & Akapagana, K. (2006). Tree species Diversity in relation to topography and human activities in the Atakora Mountains in Benini. Taxonomy and ecology of African plants, their conservation and sustainable use. Proceedings of the 17th AETFAT Congress. Addis Ababa, Ethiopia**.** Limited. United States of America.

Malimbwi, R. E and Mugasha, A. G. & Monela, G.C. (2005). Reconnaissance Timber Inventory Report for Handeni Hill Forest Reserve in Handeni District, Tanzania. FOCONSULT, Faculty of Forestry and Nature Conservation, Sokoine University of Agriculture, Morogoro, Tanzania. 34 pp.

Moore, R. Clark, W.D., Stern, K.R. and Vodapich, D. (1995). Botany complimentary copy. United States of America.

Munishi, P.K.T., Shirima, D. & Edward, E. (2009). Proceedings of the First Participatory Forestry Management (PFM) Research workshop: Participatory Forest Management for Improved Qaulity, Livelihood and Governance. Morogoro-Tanzania.

Pearsall, J. (2002). The concise Oxford Dictionary. Oxford University Press. Tenth Edition. UK.

Ruffo, C.K, Birnie, A. and Tengnas, B. (2002). Edible wild plants of Tanzania technical handbook no. 27. Regional land management unit (RELMA), Nairobi-Kenya.

Smith, D. (2013). Tanzania: Rukwa Region Throws Doors Wide Open for Potential Investors. AfricanCR Ltd. Mining and Exploration in Africa. [*http://www.africancr.com/news/tanzania-rukwa-region-throws-doors-wide-open-for-potential-investors: cited on 17th November, 2013*]

Synnott, T.J.(1979). Manual for plot procedures for tropical rain forests. Department of forestry common wealth forestry institute of Tropical Silviculture Commonwealth Forestry Institute University of Oxford

6.0 APPENDICES

Appendix 1: Tree species diversity and dominance indices, relative density and Dominance

S/N	SCIENTIFIC NAME	FRQ	pi	H^I=pilnpi	C=(pi)^2	D=n/ha	RD	RC
15.	*Acacia abyssinica*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
16.	*Acacia amythethophylla*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
17.	*Acacia drepanolobium*	6	0.0057	0.0396	0.0000323	150	0.569	0.0032
18.	*Acacia tortilis*	**3**	0.0028	0.0198	0.0000081	75	0.284	0.0008
19.	*Afzelia quanzensis*	**2**	0.0019	0.0132	0.0000036	50	0.190	0.0004
20.	*Albizia antunesiana*	**19**	0.0180	0.1254	0.0003243	475	1.801	0.0324
21.	*Albizia versicolor*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
22.	*Allophyllus sp.*	**6**	0.0057	0.0396	0.0000323	150	0.569	0.0032
23.	*Anisophyllea pomifera*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
24.	*Annona senegalensis*	**23**	0.0218	0.1518	0.0004753	575	2.180	0.0475
25.	*Antidesma membranacea*	**9**	0.0085	0.0594	0.0000728	225	0.853	0.0073
26.	*Bequartiodendron magalisamontanum*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
27.	*Borassus aethiopum*	**6**	0.0057	0.0396	0.0000323	150	0.569	0.0032
28.	*Boscia salicifolia*	**2**	0.0019	0.0132	0.0000036	50	0.190	0.0004
29.	*Brachystegia boehmii*	**23**	0.0218	0.1518	0.0004753	575	2.180	0.0475
30.	*Brachystegia glaucescens*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
31.	*Brachystegia longifolia*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
32.	*Brachystegia microphylla*	**21**	0.0199	0.1386	0.0003962	525	1.991	0.0396
33.	*Brachystegia spiciformis*	**77**	0.0730	0.5081	0.0053269	1925	7.299	0.5327
34.	*Brachystegia utilis*	**17**	0.0161	0.1122	0.0002597	425	1.611	0.0260
35.	*Bridelia micrantha*	**5**	0.0047	0.0330	0.0000225	125	0.474	0.0022

36.	*Bridelia scleroneura*	**3**	0.0028	0.0198	0.0000081	75	0.284	0.0008
37.	*Burkea Africana*	**10**	0.0095	0.0660	0.0000898	250	0.948	0.0090
38.	*Cassipourea mollis*	**4**	0.0038	0.0264	0.0000144	100	0.379	0.0014
39.	*Catunaregam spinosa*	**4**	0.0038	0.0264	0.0000144	100	0.379	0.0014
40.	*Combretum ?fragans*	**6**	0.0057	0.0396	0.0000323	150	0.569	0.0032
41.	*Combretum ?psidioides*	**4**	0.0038	0.0264	0.0000144	100	0.379	0.0014
42.	*Combretum ?zeyheri*	**2**	0.0019	0.0132	0.0000036	50	0.190	0.0004
43.	*Combretum molle*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
44.	*Combretum* sp.	**18**	0.0171	0.1188	0.0002911	450	1.706	0.0291
45.	*Commiphora Africana*	**2**	0.0019	0.0132	0.0000036	50	0.190	0.0004
46.	*Craterispermum schweinfurthii*	**3**	0.0028	0.0198	0.0000081	75	0.284	0.0008
47.	*Crossopteryx febrifuga*	**4**	0.0038	0.0264	0.0000144	100	0.379	0.0014
48.	*Cussonia kirkii[C. arborea]*	**2**	0.0019	0.0132	0.0000036	50	0.190	0.0004
49.	*Dalbergia nitidula*	**19**	0.0180	0.1254	0.0003243	475	1.801	0.0324
50.	*Dichrostachys cinerea*	**4**	0.0038	0.0264	0.0000144	100	0.379	0.0014
51.	*Diospyros ?abyssinica*	**7**	0.0066	0.0462	0.0000440	175	0.664	0.0044
52.	*Diospyros* sp.	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
53.	*Diplorynchus condylocarpon*	56	0.0531	0.3695	0.0028175	1400	5.308	0.2818
54.	*Dombeya rotundifolia*	**4**	0.0038	0.0264	0.0000144	100	0.379	0.0014
55.	*Ehretia amoena*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
56.	*Ekebergia benguelensis*	**3**	0.0028	0.0198	0.0000081	75	0.284	0.0008
57.	*Elaeodendron schweinfurthii*	**2**	0.0019	0.0132	0.0000036	50	0.190	0.0004
58.	*Elaeodendron schweinfurthii*	**2**	0.0019	0.0132	0.0000036	50	0.190	0.0004
59.	*Entada abyssinica*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
60.	*Erythrina abyssinica*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
61.	*Euphorbia candelabrum*	**3**	0.0028	0.0198	0.0000081	75	0.284	0.0008
62.	*Faurea rochetiana*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001

63.	*Faurea saligna*	**3**	0.0028	0.0198	0.0000081	75	0.284	0.0008
64.	*Ficus sur*	**4**	0.0038	0.0264	0.0000144	100	0.379	0.0014
65.	*Ficus thonningii*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
66.	*Flacourtia indica*	**17**	0.0161	0.1122	0.0002597	425	1.611	0.0260
67.	*Friesodielsia obovata*	**2**	0.0019	0.0132	0.0000036	50	0.190	0.0004
68.	*Garcinia buchananii*	**9**	0.0085	0.0594	0.0000728	225	0.853	0.0073
69.	*Gardenia ternifolia*	**2**	0.0019	0.0132	0.0000036	50	0.190	0.0004
70.	*Grewia ?bicolor*	**20**	0.0190	0.1320	0.0003594	500	1.896	0.0359
71.	*Hymenocardia acida*	**21**	0.0199	0.1386	0.0003962	525	1.991	0.0396
72.	*Hymenodictyon floribunda*	**7**	0.0066	0.0462	0.0000440	175	0.664	0.0044
73.	*Isoberlinia angolensis*	**5**	0.0047	0.0330	0.0000225	125	0.474	0.0022
74.	*Julbernardia globiflora*	**61**	0.0578	0.4025	0.0033431	1525	5.782	0.3343
75.	*Kigelia Africana*	**4**	0.0038	0.0264	0.0000144	100	0.379	0.0014
76.	*Lannea humilis*	1	0.0009	0.0066	0.0000009	25	0.095	0.0001
77.	*Lannea schimperi*	**11**	0.0104	0.0726	0.0001087	275	1.043	0.0109
78.	*Lonchocarpus capassa*	6	0.0057	0.0396	0.0000323	150	0.569	0.0032
79.	*Manilkara mochsia*	**11**	0.0104	0.0726	0.0001087	275	1.043	0.0109
80.	*Maprounea Africana*	**6**	0.0057	0.0396	0.0000323	150	0.569	0.0032
81.	*Margaritaria discoidea*	**32**	0.0303	0.2111	0.0009200	800	3.033	0.0920
82.	*Markhamia obtusifolia*	**2**	0.0019	0.0132	0.0000036	50	0.190	0.0004
83.	*Maytenus senegalensis*	**2**	0.0019	0.0132	0.0000036	50	0.190	0.0004
84.	*Maytenus undata*	**4**	0.0038	0.0264	0.0000144	100	0.379	0.0014
85.	*Milletia oblate*	**4**	0.0038	0.0264	0.0000144	100	0.379	0.0014
86.	*Monotes tomentellus*	**13**	0.0123	0.0858	0.0001518	325	1.232	0.0152
87.	*Multidentia crassa*	**4**	0.0038	0.0264	0.0000144	100	0.379	0.0014
88.	*Mystroxylon aethiopicum*	**5**	0.0047	0.0330	0.0000225	125	0.474	0.0022
89.	*Ochna ovata*	**8**	0.0076	0.0528	0.0000575	200	0.758	0.0058

90.	*Oldfieldia somalensis*	**12**	0.0114	0.0792	0.0001294	300	1.137	0.0129
91.	*Olea capensis*	**2**	0.0019	0.0132	0.0000036	50	0.190	0.0004
92.	*Ozoroa insigns*	**3**	0.0028	0.0198	0.0000081	75	0.284	0.0008
93.	*Parinari curatellifolia*	**12**	0.0114	0.0792	0.0001294	300	1.137	0.0129
94.	*Pericopsis angolensis*	21	0.0199	0.1386	0.0003962	525	1.991	0.0396
95.	*Phoenix reclinata*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
96.	*Phyllanthus engleri*	**10**	0.0095	0.0660	0.0000898	250	0.948	0.0090
97.	*Piliostigma thonningii*	**3**	0.0028	0.0198	0.0000081	75	0.284	0.0008
98.	*Protea madiensis*	2	0.0019	0.0132	0.0000036	50	0.190	0.0004
99.	*Pseudolachnostylis maprouneifolia*	**50**	0.0474	0.3299	0.0022461	1250	4.739	0.2246
100.	*Psorospermum febrifuga*	**6**	0.0057	0.0396	0.0000323	150	0.569	0.0032
101.	*Psychotria ripari*	**6**	0.0057	0.0396	0.0000323	150	0.569	0.0032
102.	*Psychotria schummaniana*	**2**	0.0019	0.0132	0.0000036	50	0.190	0.0004
103.	*Pterocarpus angolensis*	30	0.0284	0.1980	0.0008086	750	2.844	0.0809
104.	*Pterocarpus tinctorius*	**4**	0.0038	0.0264	0.0000144	100	0.379	0.0014
105.	*Raphia farinifera*	**4**	0.0038	0.0264	0.0000144	100	0.379	0.0014
106.	*Rawsonia lucida*	**3**	0.0028	0.0198	0.0000081	75	0.284	0.0008
107.	*Rhus longipes*	**7**	0.0066	0.0462	0.0000440	175	0.664	0.0044
108.	*Rothmani engleriana*	**3**	0.0028	0.0198	0.0000081	75	0.284	0.0008
109.	*Rothmania ?longiflora*	**13**	0.0123	0.0858	0.0001518	325	1.232	0.0152
110.	*Rytignia uhilgii*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
111.	*Sapium ellipticum*	3	0.0028	0.0198	0.0000081	75	0.284	0.0008
112.	*Schrebera trichoclada*	**4**	0.0038	0.0264	0.0000144	100	0.379	0.0014
113.	*Sclerocarrya birrea* sbsp *birrea*	**3**	0.0028	0.0198	0.0000081	75	0.284	0.0008
114.	*Sclerocarrya birrea* sbsp c*affra*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
115.	*Securidaca longipedunculata*	**3**	0.0028	0.0198	0.0000081	75	0.284	0.0008
116.	*Senna abbreviate*	**7**	0.0066	0.0462	0.0000440	175	0.664	0.0044

117.	*Sideroxylon inerme*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
118.	*Steganotaenia araliacea*	**3**	0.0028	0.0198	0.0000081	75	0.284	0.0008
119.	*Sterculia quinqueloba*	**2**	0.0019	0.0132	0.0000036	50	0.190	0.0004
120.	*Strophanthus eminii*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
121.	*Strychnos cocculoides*	**3**	0.0028	0.0198	0.0000081	75	0.284	0.0008
122.	*Strychnos innocua*	**11**	0.0104	0.0726	0.0001087	275	1.043	0.0109
123.	*Strychnos* sp.	**3**	0.0028	0.0198	0.0000081	75	0.284	0.0008
124.	*Syzygium cordatum*	**7**	0.0066	0.0462	0.0000440	175	0.664	0.0044
125.	*Syzygium guineense*	**12**	0.0114	0.0792	0.0001294	300	1.137	0.0129
126.	*Tamarindus indica*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
127.	*Terminali mollis*	**11**	0.0104	0.0726	0.0001087	275	1.043	0.0109
128.	*Terminalia kaiserana*	**51**	0.0483	0.3365	0.0023369	1275	4.834	0.2337
129.	*Tricalysia ?coriacea*	**3**	0.0028	0.0198	0.0000081	75	0.284	0.0008
130.	*Uapaca kirkiana*	22	0.0209	0.1452	0.0004349	550	2.085	0.0435
131.	*Uapaca nitida*	**12**	0.0114	0.0792	0.0001294	300	1.137	0.0129
132.	*Vites doniana*	**6**	0.0057	0.0396	0.0000323	150	0.569	0.0032
133.	*Vitex mombassae*	**7**	0.0066	0.0462	0.0000440	175	0.664	0.0044
134.	*Ximenia Americana*	**14**	0.0133	0.0924	0.0001761	350	1.327	0.0176
135.	*Xylopia odoratissima.*	**8**	0.0076	0.0528	0.0000575	200	0.758	0.0058
136.	*Xylopia parviflora*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
137.	*Zanha Africana*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
138.	*Zanthoxyllum chalybeum*	**1**	0.0009	0.0066	0.0000009	25	0.095	0.0001
139.	*Ziziphus mauritiana*	**2**	0.0019	0.0132	0.0000036	50	0.190	0.0004
TOTAL		**1058**	**1**	6.9811	**1**	**26450**	**100**	**100**

Appendix 2. Total number of species and percentage per family

S/N	FAMILY NAME	S/N	SCIENTIFIC NAME	**TOTAL TREE SPECIES PER FAMILY**
1	Anacardiaceae	1.	*Lannea humilis*	**6**
		2.	*Lannea schimperi*	
		3.	*Ozoroa insigns*	
		4.	*Rhus longipes*	
		5.	*Sclerocarrya birrea* sbsp *birrea*	
		6.	*Sclerocarrya birrea* sbsp c*affra*	
2	Annonaceae	7.	*Annona senegalensis*	**4**
		8.	*Friesodielsia obovata*	
		9.	*Xylopia odoratissima.*	
		10.	*Xylopia parviflora*	
3	Apiaceae[Umbelliferae]	11.	*Steganotaenia araliacea*	**1**
4	Apocynaceae	12.	*Diplorynchus condylocarpon*	**1**
5	Araliaceae	13.	*Cussonia kirkii[C. arborea]*	**1**
6	Arecaceae[Palmaceae]	14.	*Borassus aethiopum*	**3**
		15.	*Phoenix reclinata*	
		16.	*Raphia farinifera*	
7	Asclepiadaceae	17.	*Strophanthus eminii*	**1**
8	Bignoniaceae	18.	*Kigelia Africana*	**2**
		19.	*Markhamia obtusifolia*	
9	Boraginaceae	20.	*Ehretia amoena*	**1**

10	Bursearcae	21.	*Commiphora africana*	**1**
11	Capparaceae	22.	*Boscia salicifolia*	**1**
12	Celasteraceae	23.	*Elaeodendron schweinfurthii*	**5**
		24.	*Maytenus senegalensis*	
		25.	*Maytenus undata*	
		26.	*Mystroxylon aethiopicum*	
		27.	*Rawsonia lucida*	
13	Clusiaceae	28.	*Garcinia buchananii*	**2**
		29.	*Psorospermum febrifuga*	
14	Combretaceae	30.	*Combretum ?fragans*	**7**
		31.	*Combretum ?psidioides*	
		32.	*Combretum ?zeyheri*	
		33.	*Combretum molle*	
		34.	*Combretum* sp.	
		35.	*Terminali mollis*	
		36.	*Terminalia kaiserana*	
15	Dipterocarpaceae	37.	*Monotes africanus*	**1**
16	Ebanaceae	38.	*Diospyros ?abyssinica*	**2**
		39.	*Diospyros* sp.	
17	Euphorbiaceae	40.	*Antidesma membranacea*	**12**
		41.	*Bridelia micrantha*	
		42.	*Bridelia scleroneura*	
		43.	*Euphorbia candelabrum*	
		44.	*Maprounea Africana*	
		45.	*Margaritaria discoidea*	

		46.	*Oldfieldia somalensis*	
		47.	*Phyllanthus engleri*	
		48.	*Pseudolachnostylis maprouneifolia*	
		49.	*Sapium ellipticum*	
		50.	*Uapaca kirkiana*	
		51.	*Uapaca nitida*	
18	Fabaceae [Caesalpiniaceae]	52.	*Afzelia quanzensis*	**13**
		53.	*Julbernardia globiflora*	
		54.	*Erythrina abyssinica*	
		55.	*Brachystegia boehmii*	
		56.	*Brachystegia glaucescens*	
		57.	*Brachystegia longifolia*	
		58.	*Brachystegia microphylla*	
		59.	*Brachystegia spiciformis*	
		60.	*Brachystegia utilis*	
		61.	*Burkea Africana*	
		62.	*Isoberlinia angolensis*	
		63.	*Piliostigma thonningii*	
		64.	*Senna abbreviate*	
	Fabaceae[Mimosaceae]	65.	*Acacia abyssinica*	**9**
		66.	*Acacia amythethophylla*	
		67.	*Acacia drepanolobium*	
		68.	*Acacia tortilis*	
		69.	*Albizia antunesiana*	

		70.	*Albizia versicolor*	
		71.	*Dichrostachys cinerea*	
		72.	*Entada abyssinica*	
		73.	*Tamarindus indica*	
	Fabaceae[Papilionaceae]	74.	*Dalbergia nitidula*	**6**
		75.	*Lonchocarpus capassa*	
		76.	*Milletia oblate*	
		77.	*Pericopsis angolensis*	
		78.	*Pterocarpus angolensis*	
		79.	*Pterocarpus tinctorius*	
19	Flacourtiaceae	80.	*Flacourtia indica*	**1**
20	Hymenocardiaceae	81.	*Hymenocardia acida*	**1**
21	Loganiaceae	82.	*Strychnos cocculoides*	**3**
		83.	*Strychnos innocua*	
		84.	*Strychnos* sp.	
22	Meliaceae	85.	*Ekebergia benguelensis*	**1**
23	Moraceae	86.	*Ficus sur*	**2**
		87.	*Ficus thonningii*	
24	Myrtaceae	88.	*Syzygium cordatum*	**2**
		89.	*Syzygium guineense*	
25	Ochnaceae	90.	*Ochna ovata*	**1**
	Oleaceae	91.	*Olea capensis*	**2**
		92.	*Schrebera trichoclada*	
26	Olacaceae	93.	*Ximenia Americana*	**1**
27	Proteaceae	94.	*Faurea rochetiana*	**3**

		95.	*Faurea saligna*	
		96.	*Protea madiensis*	
28	Rhamnaceae	97.	*Ziziphus mauritiana*	**1**
29	Rhizophoraceae	98.	*Anisophyllea pomifera*	**2**
		99.	*Cassipourea mollis*	
30	Rosaceae	100.	*Parinari curatellifolia*	**1**
31	Rubiaceae	101.	*Catunaregam spinosa*	**12**
		102.	*Craterispermum schweinfurthii*	
		103.	*Crossopteryx febrifuga*	
		104.	*Gardenia ternifolia*	
		105.	*Hymenodictyon floribunda*	
		106.	*Multidentia crassa*	
		107.	*Psychotria ripari*	
		108.	*Psychotria schummaniana*	
		109.	*Rothmani engleriana*	
		110.	*Rothmania longiflora*	
		111.	*Rytignia uhilgii*	
		112.	*Tricalysia ?coriacea*	
32	Rutaceae	113.	*Zanthoxyllum chalybeum*	**1**
33	Sapindaceae	114.	*Allophyllus sp.*	**2**
		115.	*Zanha Africana*	
34	Sapotaceae	116.	*Bequartiodendron magalisamontanum*	**3**
		117.	*Manilkara mochsia*	
		118.	*Sideroxylon inerme*	

35	Polygalaceae	119.	*Securidaca longipedunculata*	**1**
36	Sterculiaceae	120.	*Dombeya rotundifolia*	**2**
		121.	*Sterculia quinqueloba*	
37	Tiliaceae	122.	*Grewia ?bicolor*	**1**
38	Verbenaceae	123.	*Vitex doniana*	**2**
		124.	*Vitex mombassae*	
TOTAL				**124**

Appendix 3: Percentage based on the total number of species per family

S/N	FAMILY NAME	TOTAL TREE SPECIES PER FAMILY	%
1	Fabaceae	**28**	22.6
2	Euphorbiaceae	**12**	9.7
3	Rubiaceae	**12**	9.7
4	Combretaceae	**7**	5.6
5	Anacardiaceae	**6**	4.8
6	Celasteraceae	**5**	4.0
7	Annonaceae	**4**	3.2
8	Arecaceae[Palmaceae]	**3**	2.4
9	Loganiaceae	**3**	2.4
10	Proteaceae	**3**	2.4
11	Sapotaceae	**3**	2.4
12	Bignoniaceae	**2**	1.6
13	Clusiaceae	**2**	1.6
14	Ebanaceae	**2**	1.6
15	Moraceae	**2**	1.6
16	Myrtaceae	**2**	1.6
17	Rhizophoraceae	**2**	1.6
18	Sapindaceae	**2**	1.6
19	Sterculiaceae	**2**	1.6
20	Verbenaceae	**2**	1.6

21	Apiaceae[Umbelliferae]	**1**	0.8
22	Apocynaceae	**1**	0.8
23	Araliaceae	**1**	0.8
24	Asclepiadaceae	**1**	0.8
25	Boraginaceae	**1**	0.8
26	Bursearcae	**1**	0.8
27	Capparaceae	**1**	0.8
28	Dipterocarpaceae	**1**	0.8
29	Flacourtiaceae	**1**	0.8
30	Hymenocardiaceae	**1**	0.8
31	Meliaceae	**1**	0.8
32	Ochnaceae	**1**	0.8
33	Olacaceae	**1**	0.8
34	Rhamnaceae	**1**	0.8
35	Rosaceae	**1**	0.8
36	Rutaceae	**1**	0.8
37	Polygalaceae	**1**	0.8
38	Tiliaceae	**1**	0.8
TOTAL		**124**	**100**

Appendix 4: Tree species abundance ranking and melloferous status and

S/N	SCIENTIFIC NAME	FRQ	MELLIFEROUS STATUS	
			Bee fodder	Not known
1.	*Brachystegia spiciformis*	**77**	V	
2.	*Julbernardia globiflora*	**61**	V	
3.	*Diplorynchus condylocarpon*	56	V	
4.	*Terminalia kaiserana*	**51**	V	
5.	*Pseudolachnostylis maprouneifolia*	**50**		V
6.	*Margaritaria discoidea*	**32**	V	
7.	*Pterocarpus angolensis*	30	V	
8.	*Annona senegalensis*	**23**	V	
9.	*Brachystegia boehmii*	**23**	V	
10.	*Uapaca kirkiana*	22	V	
11.	*Brachystegia microphylla*	**21**	V	
12.	*Hymenocardia acida*	**21**		V
13.	*Pericopsis angolensis*	21	V	
14.	*Grewia ?bicolor*	**20**	V	
15.	*Albizia antunesiana*	**19**	V	
16.	*Dalbergia nitidula*	**19**	V	
17.	*Combretum* sp.	**18**	V	
18.	*Brachystegia utilis*	**17**	V	
19.	*Flacourtia indica*	**17**	V	

20.	*Ximenia Americana*	**14**	V	
21.	*Monotes africanus*	**13**	V	
22.	*Rothmania longiflora*	**13**	V	
23.	*Oldfieldia somalensis*	**12**		V
24.	*Parinari curatellifolia*	**12**	V	
25.	*Syzygium guineense*	**12**	V	
26.	*Uapaca nitida*	**12**	V	
27.	*Lannea schimperi*	**11**	V	
28.	*Manilkara ?mochsia*.	**11**	V	
29.	*Strychnos innocua*	**11**	V	
30.	*Terminalia mollis*	**11**	V	
31.	*Burkea Africana*	**10**	V	
32.	*Phyllanthus engleri*	**10**	V	
33.	*Antidesma membranacea*	**9**		V
34.	*Garcinia buchananii*	**9**	V	
35.	*Ochna ovata*	**8**	V	
36.	*Xylopia odoratissima*.	**8**	V	
37.	*Diospyros abyssinica*	**7**	V	
38.	*Hymenodictylon floribunda*	**7**	V	
39.	*Rhus longipes*	**7**	V	
40.	*Senna abbreviate*	**7**		V
41.	*Syzygium cordatum*	**7**	V	
42.	*Vitex mombassae*	**7**	V	
43.	*Acacia drepanolobium*	6	V	
44.	*Allophyllus sp.*	**6**	V	

45.	*Borassus aethiopum*	**6**	V	
46.	*Combretum ?fragans*	**6**	V	
47.	*Lonchocarpus capassa*	6	V	
48.	*Maprounea Africana*	**6**	V	
49.	*Psorospermum febrifuga*	**6**	V	
50.	*Psychotria ripari*	**6**	V	
51.	*Vites doniana*	**6**	V	
52.	*Bridelia micrantha*	**5**	V	
53.	*Isoberlinia angolensis*	**5**	V	
54.	*Mystroxylon aethiopicum*	**5**	V	
55.	*Cassipourea mollis*	**4**	V	
56.	*Catunaregam spinosa*	**4**	V	
57.	*Combretum ?psidioides*	**4**	V	
58.	*Crossopteryx febrifuga*	**4**	V	
59.	*Dichrostachys cinerea*	**4**	V	
60.	*Dombeya rotundifolia*	**4**	V	
61.	*Ficus sur*	**4**		V
62.	*Kigelia Africana*	**4**	V	
63.	*Maytenus undata*	**4**	V	
64.	*Milletia oblate*	**4**	V	
65.	*Multidentia crassa*	**4**	V	
66.	*Pterocarpus tinctorius*	**4**	V	
67.	*Raphia farinifera*	**4**	V	
68.	*Schrebera trichoclada*	**4**	V	
69.	*Acacia tortilis*	**3**	V	

70.	*Bridelia scleroneura*	**3**		V
71.	*Craterispermum schweinfurthii*	**3**	V	
72.	*Ekebergia benguelensis*	**3**	V	
73.	*Euphorbia candelabrum*	**3**		V
74.	*Faurea saligna*	**3**	V	
75.	*Ozoroa insigns*	**3**	V	
76.	*Piliostigma thonningii*	**3**	V	
77.	*Rawsonia lucida*	**3**	V	
78.	*Rothmani engleriana*	**3**	V	
79.	*Sapium ellipticum*	3		V
80.	*Sclerocarrya birrea* sbsp *birrea*	**3**	V	
81.	*Securidaca longipedunculata*	**3**	V	
82.	*Steganotaenia araliacea*	**3**	V	
83.	*Strychnos cocculoides*	**3**	V	
84.	*Strychnos* sp.	**3**	V	
85.	*Tricalysia ?coriacea*	**3**	V	
86.	*Afzelia quanzensis*	**2**	V	
87.	*Boscia salicifolia*	**2**	V	
88.	*Combretum ?zeyheri*	**2**	V	
89.	*Commiphora Africana*	**2**		V
90.	*Cussonia kirkii[C. arborea]*	**2**	V	
91.	*Elaeodendron schweinfurthii*	**2**		V
92.	*Friesodielsia obovata*	**2**	V	
93.	*Gardenia ternifolia*	**2**	V	
94.	*Markhamia obtusifolia*	**2**	V	

95.	*Maytenus senegalensis*	**2**	V	
96.	*Olea capensis*	**2**		V
97.	*Protea madiensis*	2	V	
98.	*Psychotria schummaniana*	**2**	V	
99.	*Sterculia quinqueloba*	**2**	V	
100.	*Ziziphus mauritiana*	**2**	V	
101.	*Acacia ?abyssinica*	**1**	V	
102.	*Acacia amythethophylla*	**1**	V	
103.	*Albizia versicolor*	**1**	V	
104.	*Anisophyllea pomifera*	**1**	V	
105.	*Bequartiodendron ?magalisamontanum*	**1**	V	
106.	*Brachystegia glaucescens*	**1**	V	
107.	*Brachystegia longifolia*	**1**	V	
108.	*Combretum molle*	**1**	V	
109.	*Diospyros* sp.	**1**	V	
110.	*Ehretia amoena*	**1**	V	
111.	*Entada abyssinica*	**1**	V	
112.	*Erythrina abyssinica*	**1**	V	
113.	*Faurea rochetiana*	**1**	V	
114.	*Ficus thonningii*	**1**		V
115.	*Lannea humilis*	1	V	
116.	*Phoenix reclinata*	**1**	V	
117.	*Rytignia uhilgii*	**1**	V	
118.	*Sclerocarrya birrea* sbsp c*affra*	**1**	V	
119.	*Strophanthus eminii*	**1**	V	

120.	*Suderoxylon inerme*	**1**	V	
121.	*Tamarindus indica*	**1**	V	
122.	*Xylopia parviflora*	**1**	V	
123.	*Zanha Africana*	**1**	V	
124.	*Zanthoxyllum chalybeum*	**1**	V	
TOTAL			**111**	**13**

Appendix 5: Activities observed at the sample sites in Mlele Beekeeping Zone

S/N	SITE	ACTIVITIES									
		Wildfire	Beekeeping	Cutting	Camp hut	Logging	Debarking	Animal trapping	Timbering	Grazing	**TOTAL**
1	Peters corner	**V**	**v**								**2**
2	Near Mlele Tourist camp site	**V**	**v**								**2**
3	Mtalazya	**V**	**v**	**V**	**v**						**4**
4	Near Air strip	**V**									**1**
5	Mguru accident corner	**V**									**1**
6	Lukimwa road junction	**V**				**v**					**2**
7	Kaselu valley	**V**									**1**
8	Kaperamigira camp	**V**	**v**	**V**	**v**		**V**	**v**			**6**
9	Kibola stream[river]	0	0	0	0	0	0	0			**0**
10	Near Mlele camp towards KGRHQ	**V**	v								**2**
11	Msabaha	**V**		V	v		V	v	v		**6**
12	Near Mtambo river source	**V**									**1**
13	Kanono	**V**									**1**
14	Masigo	**V**		V			V				**3**
15	Msima	**V**	v								**2**
16	Kariaguru	**V**		V			V				**3**

17	Ulaya	**V**								v	**2**
18	Matwiga	**V**					V				**2**
19	Matwiga plain	**V**									**1**
20	Makolongo	V									**1**
	TOTAL	**19**	**6**	**5**	**3**	**1**	**5**	**2**	**1**	**1**	

Appendix 6: Total number of types of activities revealed at each sampled site

Sampled site	Total activities
Kaperamigira camp	**6**
Msabaha	**6**
Mtalazya	**4**
Masigo	**3**
Kariaguru	**3**
Peters corner	**2**
Near Mlele Tourist camp site	**2**
Lukimwa road junction	**2**
Near Mlele camp towards KGRHQ	**2**
Msima	**2**
Ulaya	**2**
Matwiga	**2**
Near Air strip	**1**
Mguru accident corner	**1**
Kaselu valley	**1**
Near Mtambo river source	**1**
Kanono	**1**
Matwiga plain	**1**
Makolongo	**1**
Kibola stream[river]	**0**

Appendix 7: Tree species identified in at cluster 1-20[43-plots]

CLUSTER 1.

Plot no. 01**.**

Locality: Near Camp site; to Peters' corner**. Habitat: Miombo woodland. Coordinates**: 351963/9248114. **Altitude**: 1461m *a.s.l.*					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	• **Fire**
1	*Brachystegia spiciformis*	16	**V**		
2	*Diplorynchus condylocarpon*	1	**V**		
3	*Lonchocarpus capassa*	2	**V**		
4	*Oldifieldia somalensis*	1		**V**	
5	*Pericopsis angolensis*	6	**V**		
6	*Pterocarpus angolensis*	4	**V**		
7	*Terminalia [large leaf]*	6	**V**		
8	*Uapaca kirkiana*	2	**V**		
9	*Vitex payos*	1	**V**		
TOTAL			**8**	**1**	

Plot no. 02.

Locality: Near Camp site; to Peters' corner: **Habitat**: Miombo woodland. **Coordinates**: 352195/9248198 **Altitude**: 1455m *a.s.l.*					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	• Fire • Bee hives
1	*Brachystegia spiciformis*	**3**	**V**		
2	*Diplorynchus condylocarpon*	**1**	**V**		
3	*Julbernardia globiflora*	**2**	**V**		
4	*Oldifieldia somalensis*	**1**		**V**	
5	*Pseudolachnostylis maprouneifolia*	**2**		**V**	
6	*Terminalia [large leaf]*	**1**	**V**		
7	*Xylopia ?odoratissimum*	**1**		**V**	
8	*Ximenia americana*	**1**	**V**		
TOTAL			**5**	**8**	

Plot no. 3

Locality: Near Iloba River. **Coordinates**: 352195/9248198 **Altitude**: 1455m *a.s.l.*					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	**Not known**	• Wildfire • Local honey
1.	*Brachystegia spiciformis*	**9**	**V**		
2.	*Cassipourea mollis*	**1**	**V**		

3.	*Erythrina abyssinica*	**1**	**V**		harvesting • Beekeeping
4.	*Multidentia crassa*	**2**	**V**		
5.	*Parinari curatellifolia*	**1**	**V**		
6.	*Pseudolachnostylis maprouneifolia*	**1**		**V**	
7.	*Strychnos innocua*	**1**	**V**		
8.	*Uapaca nitidula*	**2**	**V**		
TOTAL			**7**	**1**	

CLUSTER NO. 02.

Plot no. 4.

Locality: Near campsite, towards Rukwa Game Reserve Head quarters. **Habitat**: Miombo woodland.

Coordinates: 351698/9248844. **Altitude**: 1482m *a.s.l.*

S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**Remarks**
			Bee fodder	Not known	• Wild fire • Bee hives
1	*Albizia antunesiana*	**3**	**V**		
2	*Brachystegia boehmii*	**5**	**V**		
3	*Brachystegia spiciformis*	**3**	**V**		
4	*Combretum ?fragans*	**1**	**V**		
5	*Diplorynchus condylocarpon*	**1**	**V**		
6	*Psorospermum febrifuga*	**2**	**V**		
7	*Pterocarpus angolensis*	**1**	**V**		
8	*Xylopia odoratissima*	**2**		**V**	
TOTAL			**7**	**1**	

Plot no. 5.

Locality: Near campsite, towards Rukwa Game Reserve Head Quarters. **Habitat**: Miombo woodland . **Coordinates**: 351954/9248882. **Altitude**: 1462m, *a.s.l.*					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	
1.	*Albizia antunesiana*	**1**	**V**		
2.	*Brachystegia boehmii*	**3**	**V**		
3.	*Brachystegia longifolia*	**1**	**V**		
4.	*Brachystegia spiciformis*	**4**	**V**		
5.	*Craterispermum schweinfurthii*	**1**	**V**		
6.	*Diplorynchus condylocarpon*	**4**	**V**		
7.	*Julbernardia globiflora*	**1**	**V**		
8.	*Parinari curatellifolia*	**1**	**V**		
9.	*Syzygium guineense*	**1**	**V**		
10.	*Vitex doniana*	**2**	**V**		
TOTAL			**10**	**0**	

CLUSTER NO. 03.

Plot no. 06.

Locality: Mtalazya. **Habitat**: Miombo woodland . **Coordinates**: 351115/9254692. **Altitude**: 1341m, *a.s.l.* **Canopy cover**: <30%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
		Bee fodder	Not known		• Wildfire

	Brachystegia spiciformis	**4**	**V**		• Cutting • Camp hut • Bee keeping
	Burkea Africana	**3**	**V**		
	Diplorynchus condylocarpon	**2**	**V**		
	Hymenocardia acida	**3**		**V**	
	Lonchocarpus capassa	**1**	**V**		
	Maprounea Africana	**5**		**V**	
	Pericopsis angolensis	**2**	**V**		
	Pseudolachnostylis maprouneifolia	**1**		**V**	
	Pterocarpus angolensis	**1**	**V**		
	Terminalia kaiserana	**1**	**V**		
TOTAL					

Plot no. 07.

Locality: Mtalazya. **Habitat**: Miombo woodland . **Coordinates**: 351355/9254754. **Altitude**: 1338m, *a.s.l.* **Canopy cover**: <30%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Unknown	
1	*Brachystegia boehmii*	**2**	**V**		• Wildfire • Cutting • Campsite • Beekeeping
2	*Brachystegia microphylla*	**3**	**V**		
3	*Brachystegia spiciformis*	**7**	**V**		
4	*Burkea Africana*	**1**	**V**		
5	*Diplorynchus condylocarpon*	**1**	**V**		
6	*Oldfieldia somalensis*	**2**		**V**	

7	*Pericopsis angolensis*	**1**	**V**		
8	*Pterocarpus angolensis*	**1**	**V**		
9	*Rothmania engleriana*	**1**	**V**		
10	*Schrebera trichoclada*	**1**	**V**		
11	*Ximenia americana*	**1**	**V**		
TOTAL			**10**	**1**	

CLUSTER NO. 04.

Plot no. 08.

Locality: Near Air strip. **Habitat**: Miombo woodland. **Coordinates**: 3446175/9259684. **Altitude**: 1311m, *a.s.l.* **Canopy covers**: 30-60%.

S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Unknown	
1	*Brachystegia spiciformis*	**5**	**V**		
2	*Catunaregam spinosa*	**1**	**V**		
3	*Combretum ?zeyheri*	**2**	**V**		
4	*Dalbergia nitidula*	**2**	**V**		
5	*Diplorynchus condylocarpon*	**2**	**V**		
6	*Margaritaria discoidea*	**5**		**V**	
7	*Markhamia obtusifolia*	**1**	**V**		
8	*Ochna ovata*	**2**	**V**		
9	*Oldifieldia somalensis*	**1**		**V**	
10	*Pterocarpus tinctorius*	**1**	**V**		

11	*Rothmania engleriana*	**2**	**V**		
12	*Terminalia kaiserana*	**1**	**V**		
13	*Ximenia americana*	**1**	**V**		
TOTAL			**11**	**2**	

Plot no. 09.

Locality: Near Air strip. **Habitat**: Miombo woodland . **Coordinates**: 46422/9259708. **Altitude**: 1316m, *a.s.l.* **Canopy cover**: <30%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	
1	*Albizia antunesiana*	**2**	**V**		• Wildfire • Old security route
2	*Brachystegia spiciformis*	**8**	**V**		
3	*Diplorynchus condylocarpon*	**4**	**V**		
4	*Lannea schimperi*	**1**	**V**		
5	*Maprounea africana*	**1**		**V**	
6	*Terminalia kaiserina*	**3**	**V**		
7	*Uapaca kirkiana*	**2**	**V**		
8	*Uapaca nitidula*	**2**	**V**		
9	*Xylopia odoratissima*	**1**	**V**		
10	*Vitex doniana*	**1**	**v**		
			9	**1**	

CLUSTER NO. 05

Plot no. 10.

Locality: Peter Mguru Accident's Corner. **Habitat**: Miombo woodland. **Coordinates**: 356133/9243958. **Altitude**: 1514m, *a.s.l.* **Canopy cover**: <30%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Unknown	• **Wildfire**
1	*Anisophyllea pomifera* [**MSINDWI]**	**1**	**V**		
2	*Brachystegia microphylla*	**10**	**V**		
3	*Brachystegia spiciformis*	**1**	**v**		
4	*Diplorynchus condylocarpon*	**4**	**V**		
TOTAL			**5**	**0**	

CLUSTER NO. 05

Plot no. 11 [C5P1**]**

Locality: Peter Mguru Accident's Corner. **Habitat**: Miombo woodland with grassland patches . **Coordinates**: 356162/9244234. **Altitude**: 11491m, *a.s.l.* **Canopy cover**: 30-60%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Unknown	• Fire
1	*Albizia antunesiana*	**1**	**V**		
2	*Brachystegia boehmii*	**1**	**V**		
3	*Brachystegia microphylla*	**2**	**V**		
4	*Brachystegia spiciformis*	**2**	**V**		

5	*Burkea africana*	**1**	**V**		
6	*Diplorynchus condylocarpon*	**1**	**V**		
7	*Multidentia crassa*	**1**	**V**		
8	*Parinari curateklifolia*	**1**	**V**		
9	*Steganotaenia araliacea*	**1**	**v**		
10	*Syzygium guineense*	**3**	**V**		
11	*Uapaca kirkiana*	**2**	**V**		
12	*Xylopia odoratissima*	**1**		**V**	
13	*Ximenia Americana*	**3**	**V**		
TOTAL			**12**	**1**	

CLUSTER NO. 06

Plot no. 12.

Locality: Lukimwa Junction. **Habitat**: Miombo woodland. **Coordinates**: 367338/9250456. **Altitude**: 1561m, *a.s.l.* **Canopy cover**: 30%.

S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	
1	*Albizia antunesiana*	**1**	**V**		• Wildfire
2	*Brachystegia spiciformis*	**2**	**V**		
3	*Catunaregam spinosa*	**1**	**V**		
4	*Combretum ?fragrans*	**2**	**V**		
5	*Lannea schimperi*	**2**	**V**		
6	*Xylopia odoratissima*	**1**	**V**		

7	*Monotes tomentellus*	**2**	**V**		
8	*Pericopsis angolensis*	**2**	**V**		
9	*Pterocarpus angolensis*	**8**	**V**		
10	*Strophanthus eminii*	**1**	**V**		
11	*Vitex payos*	**1**	**V**		
TOTAL			**11**	**0**	

Plot no. 13.

Locality: Lukimwa Junction. **Habitat**: Miombo woodland. **Coordinates**: 367423/9250694. **Altitude**: 1566m, *a.s.l.* **Canopy cover**: <30%.

S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	• Wildfire • Cutting[stump of *Pterocapus angolensis* seen]
1	*Brachystegia spiciformis*	**2**	**V**		
2	*Cassipourea mollis*	**1**	**V**		
3	*Diplorynchus condylocarpon*	**2**	**V**		
4	*Faurea saligna*	**1**	**V**		
5	*Julbernardia globiflora*	**5**	**V**		
6	*Lannea schimperi*	**1**	**V**		
7	*Monotes africanus*	**6**	**V**		
TOTAL			**7**	**0**	

CLUSTER NO. 07.

Plot no. 14.

Locality: Before Kaselu valley. **Habitat**: Miombo woodland. **Coordinates**: 370335/9252192. **Altitude**: 1460, *a.s.l.* **Canopy cover**: <30%					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	
1	*Annona senegalensis*	**1**	**V**		• Wildfire
2	*Combretum* sp.	**1**	**V**		
3	*Dalbergia nitidula*	**2**	**V**		
4	*Flacourtia indica*	**2**	**V**		
5	*Hymenocardia acida*	**3**		**V**	
6	*Oldifieldia somalensis*	**3**		**V**	
7	*Pseudolachnostylis maprouneifolia*	**2**		**V**	
8	*Senna abbreviate*	**3**		**V**	
9	*Terminalia kaiserana*	**3**	**V**		
10	*Vitex doniana*	**2**	**V**		
TOTAL			**6**	**4**	

Plot no. 15.

Locality: Before Kaselu valley. **Habitat**: Miombo woodland. **Coordinates**: 370229/9252424. **Altitude**: 1461, *a.s.l.* **Canopy cover**:: 30-60%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	• Wildfire
1	*Afzelia quanzensis*	**1**	**V**		
2	*Annona senegalensis*	**1**	**V**		
3	*Brachystegia spiciformis*	**8**	**V**		
4	*Burkea Africana*	**1**	**V**		
5	*Cussonia arborea*	**1**	**V**		
6	*Dalbergia nitidula*	**2**	**V**		
7	*Multidentia crassa*	**1**	**V**		
8	*Piliostigma thonningii*	**1**	**V**		
9	*Pseudolachnostylis maprouneifolia*	**2**		**V**	
10	*Senna abbreviate*	**1**		**V**	
11	*Uapaca kirkiana*	**13**	**V**		
12	*Uapaca nitida*	**5**	**V**		
TOTAL			**10**	**2**	

CLUSTER NO. 08

Plot no. 16

Locality: Kaperamigira camp. **Habitat**: Miombo woodland. **Coordinates**: 354123/9249030. **Altitude**: 1395m. *a.s.l.* **Canopy cover**:: 30-60%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	• Fire • Security route • Back hives • Cutting • Camp hut • Debarking
1	*Albizia antunesiana*	**1**	**V**		
2	*Brachystegia boehmii*	**4**	**V**		
3	*Brachystegia spiciformis*	**2**	**V**		
4	*Dalbergia nitidula*	**8**	**V**		
5	*Faurea rochetiana*	**1**	V		
6	*Pericopsis angolensis*	**4**	**V**		
7	*Pseudolachnostylis maprouneifolia*	**1**		**V**	
8	*Terminalia kaiserana*	**3**	**V**		
TOTAL			**7**	**1**	

Plot no. 17.

Locality: Kaperamigira camp. **Habitat**: Miombo woodland. **Coordinates**: 354162/9249274. **Altitude**: 11336m. *a.s.l.* **Canopy cover**: 30-60%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	
1	*Annona senegalensis*	**1**	V		• Fire
2	*Brachystegia boehmiii*	**1**	V		

3	*Brachystegia spiciformis*	**6**	V		• Wildlife poaching [trap found] • Cutting
4	*Burkea africana*	**1**	V		
5	*Hymenocardia acida*	**3**		V	
6	*Margaritaria discoidea*	**1**		V	
7	*Protea madiensis*	2	V		
8	*Pseudolachnostylis maprouneifolia*	1		V	
9	*Securidaca longipedunculata*	**1**	V		
10	*Strychnos ?cocculoides*	**2**	V		
11	*Syzygium cordatum*	**1**	V		
12	*Terminali mollis*	**1**	V		
13	*Terminalia kaiserana*	**2**	V		
14	*Ziziphus mauritiana*	1	V		
TOTAL			**11**	**3**	

CLUSTER NO. 09.

Plot no. 18.

Locality: Kibola stream/river near tourist campsite. **Habitat**: Riverine open forest. **Coordinates**: 351899/9248170. **Altitude**: 1461m. *a.s.l.* **Canopy cover**: <30%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	
1	*Hymenodictyon floribunda*	**5**	**V**		
2	*Kotschya africana*	**3**	**v**		
3	*Raphia farinifera*	**2**	**V**		

4	*Rothmania longiflora*	**8**	**V**		
5	*Sapium ellipticum*	**3**		V	
6	*Syzygium cordatum*	**3**	**V**		
TOTAL			**5**	**1**	

Plot no. 19.

Locality: Kibola stream, near tourists' campsite; at small water fall/monitor lizard station.

Habitat: Riverine open forest. **Coordinates**: 352058/9248224. **Altitude**: 1474m *a.s.l.* **Canopy cover**: <30%.

S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
1	*Bridelia micrantha*	**2**	**V**		
2	*Faurea saligna*	**1**	**V**		
3	*Ficus thonningii*	**1**		**V**	
4	*Hymenodictylon floribunda*	**2**	**V**		
5	*Milletia oblate*	**4**	**V**		
6	*Raphia farinifera*	**1**	**V**		
7	*Rhus longipes*	**7**	**V**		
8	*Rothmania longiflora*	**5**	**V**		
9	*Syzygium cordatum*	**3**	**V**		
10	*Tricalysia ?coriacea*	**1**	**v**		
TOTAL			**9**	**1**	

CLUSTER NO. 10.

Plot no. 20.

Locality: Near tourists' campsite; towards Katavi Game Reserve Head Quartors. **Habitat**: Miombo woodland. **Coordinates**: 350715/9251272. **Altitude**: 1400m *a.s.l.* **Canopy cover**: 30-60%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	• Bee keeping • Wildfire
1	*Annona senegalensis*	**18**	**V**		
2	*Antidesma membranacea*	**7**	**V**		
3	*Brachystegia spiciformis*	**3**	**V**		
4	*Bridelia micrantha*	**2**	**V**		
5	*Hymenocardia acida*	**4**		**V**	
6	*Isoberlinia angolensis*	**1**	**V**		
7	*Lannea schimperi*	**1**	**V**		
8	*Pericopsis angolensis*	**2**	**V**		
9	*Pseudolachnostylis maprouneifolia*	**5**		**V**	
10	*Pterocarpus angolensis*	**1**	**V**		
11	*Schrebera trichoclada*	**1**	**V**		
12	*Syzygium guineense*	**6**	**V**		
13	*Terminalia kaiserana*	**2**	**V**		
TOTAL					

Plot no. 21

Locality: Near tourists' campsite; towards Katavi Game Reserve Head Quartors. **Habitat**: Wooded grassland- open woodland. **Coordinates**: 350939/9251414. **Altitude**: 1332m *a.s.l.* **Canopy cover**: <30%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	• Fire
	Antidesma membranacea	**2**	V		
1	*Borassus aethiopum*	**1**	**V**		
2	*Catunaregam spinosa*	**1**	**V**		
3	*Flacourtia indica*	**3**	**V**		
4	*Gardenia ternifolia*	**1**	**V**		
5	*Lonchocarpus capassa*	**1**	**V**		
6	*Parinari curatellifolia*	**1**	**V**		
7	*Pericopsis angolensis*	**1**	**v**		
8	*Psorospermum febrifuga*	**1**	**V**		
9	*Securidaca longipedunculata*	**1**	**V**		
10	*Senna abbreviate*	**3**		**V**	
11	*Terminalia kaiserana*	**2**	**V**		
12	*Vitex doniana*	**1**	**V**		
TOTAL			**11**	**1**	

CLUSTER NO. 11.

Plot no. 22

Locality: Msabaha Beekeeping camp. **Habitat**: Miombo woodland. **Coordinates**: 358891/9260424. **Altitude**: 1409m. *a.s.l.* **Canopy cover**: <30%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	• Timbering • Cutting • Debarking for ropes • Beekeeping
1	*Brachystegia spiciformis*	**V**			
2	*Cassipourea mollis*	**V**			
3	*Dalbergia nitidula*	**V**			
4	*Diplorynchus condylocarpon*	**V**			
5	*Dischrostachys cinerea*	**V**			
6	*Monotes africanus*	**V**			
7	*Ochna ovata*	**V**			
8	*Pseudolachnostylis maprouneifolia*		**V**		
9	*Psychotria schummaniana*	**V**			
10	*Pterocarpus tinctorius*	**V**			
11	*Securidaca longipedunculata*	**V**			
12	*Steganotaenia araliacea*	**V**			
14	*Syzygium guineense*	**V**			
15	*Terminalia kaiserana*	**V**			
16	*Uapaca kirkiana*	**V**			
17	*Uapaca nitida*	**V**			

18	*Ximenia americana*	**V**			
TOTAL			**17**	**1**	

Plot no. 23

Locality: Msabaha Beekeeping camp. **Habitat**: Dry thicket land. **Coordinates**: 359069/9260256.

Altitude: 1326m. *a.s.l.* **Canopy cover**: <30%.

S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	
1	*Maytenus senegalensis*	**1**	**V**		▪ Wildlife tracks ▪ Wildlife poaching [traditional trap found]
2	*Acacia ?abyssinica*	**1**	**V**		
3	*Allophyllus* sp.	**6**	**V**		
4	*Commiphora africana*	**1**		**V**	
5	*Dombeya rotundifolia*	**1**	**V**		
6	*Flacourtia indica*	**3**	**V**		
7	*Garcinia buchananii*	**3**	**V**		
8	*Margaritaria discoidea*	**3**		**V**	
9	*Maytenus undata*	**4**	**V**		
10	*Mystroxylon aethiopicum*	**3**	**V**		
11	*Ozoroa insigns*	**1**	**V**		
12	*Piliostigma thonningii*	**1**	**V**		
13	*Psychotria ripari*	**6**	**V**		
14	*Sclerocarrya birrea*	**1**	**V**		
15	*Strychnos* sp.	**1**	**V**		

16	*Suderoxylon inerme*	**1**	**V**		
17	*Tricalysia ?coriacea*	**2**	**V**		
TOTAL			**15**	**2**	

CLUSTER 12.

Plot no. 24

Locality: Near Mtambo rive source. **Habitat**: Miombo woodland. **Coordinates**: 359654/9265442. **Altitude**: 1346. *a.s.l.* **Canopy cover**: 30-60%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	**Not known**	
1	*Afzelia quanzensis*	**1**	**V**		▪ Wildfire
2	*Albizia antunesiana*	**1**	**V**		
3	*Commiphora africana*	**1**		**V**	
4	*Diplorynchus condylocarpon*	**3**	**V**		
5	*Ehretia amoena*	**1**	**V**		
6	*Flacourtia indica*	**2**	**V**		
7	*Hymenocardia acida*	**3**		**V**	
8	*Julbernardia globiflora*	**4**	**V**		
9	*Lannea schimperi*	**1**	**V**		
10	*Lonchocarpus capassa*	**1**	**V**		
11	*Margaritaria discoidea*	**2**	**V**		
12	*Markhamia obtusifolia*	**1**	**V**		
13	*Phyllanthus engleri*	**3**	**V**		

14	*Pseudolachnostylis maprouneifolia*	**1**		**V**	
15	*Pterocarpus angolensis*	**2**	**V**		
16	*Schrebera trichoclada*	**1**	**V**		
17	*Strychnos innocua*	**3**	**V**		
18	*Terminalia kaiserana*	**3**	**V**		
19	*Vitex mombassae*	**1**		**V**	
20	*Xylopia odoratissima.*	**1**	**V**		
TOTAL			**16**	**4**	

Plot 25.

Locality: Near Mtambo river source. **Habitat**: Miombo woodland on flat plain. **Coordinates**: 359897/9265402. Al**titude**: 1356. *a.s.l.* **Canopy cover**: 30-60%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	**Not known**	
1	*Brachystegia boehmii*	**2**	**V**		▪ Wildfire
2	*Brachystegia spiciformis*	**3**	**V**		
3	*Combretum sp.*	**1**	**V**		
4	*Diplorynchus condylocarpon*	**2**	**V**		
5	*Dombeya rotundifolia*	**1**	**V**		
6	*Elaeodendron ?buchananii*	**1**	**V**		
7	*Flacourtia indica*	**1**	**V**		
8	*Hymenocardia acida*	**1**		**V**	
9	*Julbernardia globiflora*	**2**	**V**		

10	*Kigelia Africana*	**1**	**V**		
11	*Margaritaria discoidea*	**3**		**V**	
13	*Pseudolachnostylis maprouneifolia*	**2**		**V**	
14	*Psorospermum febrifuga*	**2**	**V**		
15	*Steganotaenia araliacea*	**1**	**V**		
16	*Vitex mombassae*	**1**	**V**		
17	*Zanha Africana*	**1**	**V**		
TOTAL			14	3	

CLUSTER 13

Plot no. 26

Locality: Kanono. **Habitat**: Miombo woodland. **Coordinates**: 361693/92700186. Al**titude**: 1378. *a.s.l.*

Canopy cover: <30%.

S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	
1	*Brachystegia microphylla*	**3**	**V**		▪ Wild fire
2	*Cassipourea mollis*	**1**	**V**		
3	*Julbernardia globiflora*	**3**	**V**		
4	*Oldifieldia somalensis*	**2**		V	
5	*Pseudolachnostylis maprouneifolia*	**1**	**V**		
6	*Pterocarpus angolensis*	**1**	**V**		
7	*Strychnos innocua*	**1**	**V**		
TOTAL			**6**	**1**	

Plot no. 27

Locality: Kanono. **Habitat**: Miombo woodland. **Coordinates**: 361442/9270174. Al**titude**: 1442. *a.s.l.* **Canopy cover**: <30%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	
1	*Albizia antunesisiana*	**2**	**V**		▪ Wildfire
2	*Brachystegia spiciformis*	**3**	**V**		
3	*Craterispermum schweinfurthii*	**2**	**V**		
4	*Diospyros kirkii*.	**1**	**V**		
5	*Diplorynchus condylocarpon*	**3**	**V**		
6	*Ekebergia benguellensis*	**1**	**V**		
7	*Elaeodendron schweinfurthii*	**1**		**V**	
8	*Julbernardia globiflora*	**2**	**V**		
9	*Lonchocarpus capassa*	**1**	**V**		
10	*Ochna ovata*	**1**	**V**		
11	*Pericopsis angolensis*	**2**	**V**		
12	*Pseudolachnostylis maprouneifolia*	**3**		**V**	
13	*Pterocarpus angolensis*	**1**	**V**		
14	*Ximenia americana*	**1**	**V**		
TOTAL			12	2	

CLUSTER 14

Plot no. 28

Locality: Masigo. **Habitat**: Miombo woodland with thicket clumps. C**oordinates**: 353731/9285026. Al**titude**: 1336 *a.s.l.* **Canopy cover**: <30%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	▪ Wildfire
1	*Burkea Africana*	**1**	**V**		
2	*Combretum fragrans*	**2**	**V**		
3	*Dalbergia nitidula*	**1**	**V**		
4	*Diplorynchus condylocarpon*	**4**	**V**		
5	*Gardenia ternifolia*	**1**	**V**		
6	*Oldifieldia somalensis*	**1**		**V**	
7	*Pseudolachnostylis maprouneifolia*	**3**		**V**	
8	*Pterocarpus angolensis*	**2**	**V**		
9	*Pterocarpus angolensis*	**1**	**V**		
10	*Strychnos innocua*	**2**	**V**		
11	*Xylopia odoratissima.*	**1**		**V**	
TOTAL			**8**	**3**	

Plot no. 29.

Locality: Masigo. **Habitat**: Forest patch within Miombo woodland. C**oordinates**: 353524/9284884. Al**titude**: 1324 *a.s.l.* **Canopy cover**: >60%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	
1	*Bequartiodendron magalisamontanum*	**1**	**V**		▪ Wildfire ▪ Cutting ▪ Debarking
2	*Boscia salicifolia*	**2**	**V**		
3	*?Manilkara ?mochsia*	**11**			
4	*Euphorbia candelabrum*	**3**		**V**	
5	*Garcinia buchananii*	**6**	**V**		
6	*Mystroxylon aethiopicum*	**2**	**V**		
7	*Olea capensis*	**2**	**V**		
8	*Rawsonia lucida*	**3**	**V**		
9	*Strychnos sp.*	**2**	**V**		
10	*Zanthoxyllum chalybeum*	**1**	**V**		
TOTAL			**9**	**1**	

Plot no. 30

Locality: Msima. **Habitat**: Mimbo woodland. C**oordinates**: 369646/9275286. Al**titude**: 1199 *a.s.l.* **Canopy cover**: 30 – 60%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	**Not known**	
1	*Ambiygonocarpus andongensis*	**2**	**V**		▪ Wildfire

2	*Brachystegia spiciformis*	**4**	**V**		▪ Beekeeping[hives]
3	*Burkea Africana*	**1**	**V**		
4	*Combretum ?fragrans*	**1**	**V**		
5	*Combretum ?psidioides*	**1**	**V**		
6	*Diosypyros kirkii.*	**3**	**V**		
7	*Diplorynchus condylocarpon*	**2**	**V**		
8	*Faurea saligna*	**1**	**V**		
9	*Margaritaria discoidea*	**1**		**V**	
10	*Ozoroa insigns*	**1**	**V**		
11	*Pterocarpus angolensis*	**1**	**V**		
12	*Ximenia americana*	**1**	**V**		
TOTAL			**11**	**1**	

Plot no. 31.

Locality: Msima. **Habitat**: Mimbo woodland. C**oordinates**: 369401/9275234. Al**titude**: 1183 *a.s.l.*

Canopy cover: <30%.

S/N	SCIENTIFIC NAME	FREQUENCY	MELLIFEROUS STATUS		REMARKS
			Bee fodder	Not known	
1	*Albizia antunesiana*	**2**	**V**		▪ Wildfire ▪ Bee keeping[hives]
2	*Brachystegia microphylla*	**2**	**V**		
3	*Bridelia scleroneura*	**1**	**V**		
4	*Crossopteryx febrifuga*	**1**	**V**		
5	*Diplorynchus condylocarpon*	**3**	**V**		

6	*Ekebergia benguelensis*	**1**	**V**		
7	*Entada abyssinica*	**1**	**V**		
8	*Flacourtia indica*	**2**	**V**		
9	*Isoberlinia angolensis*	**2**	**V**		
10	*Julbernardia globiflora*	**3**	**V**		
11	*Pseudolachnostylis maprouneifolia*	**1**		**V**	
12	*Ximenia americana*	**2**	**V**		
TOTAL			**11**	**1**	

Plot no 32.

Locality: Kariaguru. **Habitat**: Mimbo woodland. C**oordinates**: 384291/9267036. Al**titude**: 11245m. *a.s.l.* **Canopy cover**: <30%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	▪ Severe wildfire
1	*Brachystegia boehmii*	**3**	**V**		
2	*Bridelia scleroneura*	**1**	**V**		
3	*Combretum* sp.	**1**	**V**		
4	*Crossopteryx febrifuga*	**2**	**V**		
5	*Julbernardia globiflora*	**5**	**V**		
6	*Lannea schweinfurthii*	**1**	**V**		
7	*Ochna ovata*	**2**	**V**		
8	*Pterocarpus angolensis*	**1**	**V**		
9	*Tamarindus indica*	**1**	**V**		

TOTAL	**9**	**0**	

Plot no. 33.

Locality: Kariaguru. **Habitat**: Miombo woodland. C**oordinates**: 384115/9266832. Al**titude**: 12475m. *a.s.l.* **Canopy cover**: 30-60%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	▪ Fire ▪ Cutting ▪ Debarking
1	*Albizia antunesiana*	**1**	**V**		
2	*Brachystegia spiciformis*	**1**	**V**		
3	*Bridelia scleroneura*	**1**	**V**		
4	*Dalbergia nitidula*	**1**	**V**		
5	*Dichrostachys cinerea*	**1**	**V**		
6	*Diospyros kirkii*	**1**	**V**		
7	*Diplorynchus condylocarpon*	**2**	**V**		
8	*Julbernardia globiflora*	**2**	**V**		
9	*Pterocarpus angolensis*	**1**	**V**		
10	*Schrebera trichoclada*	**1**	**V**		
11	*Terminalia kaiserana*	**1**	**V**		
12	*Ximenia americana*	**2**	**V**		
TOTAL			**12**	**0**	

CLUSTER 17

Plot no. 34

Locality: Ulaya. **Habitat**: Miombo woodland. Coo**rdinates**: 381804/9258168. Al**titude**: 1202m. *a.s.l.* **Canopy cover**: <30%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	▪ Wildfire
1	*Acacia tortilis*	**1**	**V**		
2	*Brachystegia boehmii*	**1**	**V**		
3	*Catunaregam spinosa*	**1**	**V**		
4	*Combretum sp.*	**3**	**V**		
5	*Dichrostachys cinerea*	**2**	**V**		
6	*Diplorynchus condylocarpon*	**1**	**V**		
7	*Parinari curatellifolia*	**7**	**V**		
8	*Phoenix reclinata*	**1**	**V**		
9	*Phyllanthus engleri*	**5**	**V**		
10	*Pseudolachnostylis maprouneifolia*	**2**		**V**	
11	*Sclerocarrya birrea* sbsp c*affra*	**1**	**V**		
12	*Terminalia kaiserana*	**2**	**V**		
13	*Terminalia mollis*	**2**	**V**		
14	*Ximenia americana*	**1**	**V**		
TOTAL			**13**	**1**	

Plot 35

Locality: Ulaya. **Habitat**: Open Miombo woodland. Coo**rdinates**: 381849/9258412. Al**titude**: 1200m. *a.s.l.* **Canopy cover**: <30%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	▪ Minor grazing ▪ Bees found
1	*Brachystegia utilis*	**7**	**V**		
2	*Burkea Africana*	**1**	**V**		
3	*Maytenus senegalensis*	**1**	**V**		
4	*Pericopsis angolensis*	**1**	**V**		
5	*Pseudolachnostylis maprouneifolia*	**3**		**V**	
6	*Psychotria schummaniana*	**1**	**V**		
7	*Pterocarpus angolensis*	**2**	**V**		
8	*Terminalia kaiserana*	**2**	**V**		
TOTAL			**7**	**1**	

CLUSTER 18

Plot no. 36

Locality: Matwiga. **Habitat**: Miombo woodland. Coo**rdinates**: 375163/9257654. Al**titude**: 1216m. *a.s.l.* **Canopy cover**: 30 - 60%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	▪ Wildfire.
1	*Borassus aethiopum*	**1**	**V**		
2	*Brachystegia boehmii*	**1**	**V**		

3	*Brachystegia utilis*	**4**	**V**		
4	*Crossopteryx febrifuga*	**1**	**V**		
5	*Dalbergia nitidula*	**1**	**V**		
6	*Hymenocardia acida*	**1**		**V**	
7	*Isoberlinia angolensis*	**2**	**V**		
8	*Julbernardia globiflora*	**2**	**V**		
9	*Monotes tomentellus*	**4**	**V**		
10	*Oldifieldia somalensis*	**1**		**V**	
11	*Pseudolachnostylis maprouneifolia*	**1**		**V**	
12	*Strychnos innocua*	**3**	**V**		
13	*Terminalia kaiserana*	**3**	**V**		
14	*Uapaca kirkiana*	**2**	**V**		
15	*Uapaca nitida*	**2**	**V**		
16	*Vitex mombassae*	**1**	**V**		
TOTAL			**13**	**3**	

Plot no. 37

Locality: Matwiga. **Habitat**: Miombo woodland. Coo**rdinates**: 375194/9257902. Al**titude**: 1216m. *a.s.l.* **Canopy cover**: 30 – 60%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	▪ Wildfire.
1	*Borassus aethiopum*	**3**	**V**		
2	*Brachystegia utilis*	**6**	**V**		

3	*Combretum sp.*	**4**	**V**		
4	*Diplorynchus condylocarpon*	**3**	**V**		
5	*Flacourtia indica*	**3**	**V**		
6	*Hymenocardia acida*	**3**		**V**	
7	*Margaritaria discoidea*	**2**		**V**	
8	*Ozoroa insigns*	**1**	**V**		
9	*Pseudolachnostylis maprouneifolia*	**4**		**V**	
10	*Psorospermum febrifuga*	**1**	**V**		
11	*Strychnos cocculoides*	**1**	**V**		
12	*Terminalia mollis*	**1**	**V**		
13	*Terminalia kaiserana*	**3**	**V**		
14	*Turraea robusta*	**2**	**V**		
15	*Ziziphus mauritiana*	**1**	**V**		
TOTAL			**12**	**3**	

CLUSTER NO. 19

Plot no. 38.

Locality: Matwiga plain. **Habitat**: Seasonal water lodging wooded grassland. Coo**rdinates**: 371442/9259330. Al**titude**: 1442m. *a.s.l.* **Canopy cover**: 0%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	
	Acacia drepanolobium	6	**V**		
	Combretum sp.	8	**V**		

TOTAL	**2**	0	

Plot no. 39.

Locality: Matwiga plain. **Habitat**: Miombo woodland. Coo**rdinates**: 371437/9259578. Al**titude**: 1220m. *a.s.l.* **Canopy cover**: <30%.

S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	▪ Wildfire ▪ Abundant tsetseflies
1	*Acacia amithethophylla.*	**1**	**V**		
2	*Acacia tortilis*	**1**	**V**		
3	*Brachystegia spiciformis*	**2**	**V**		
4	*Diospyros* sp.	**2**	**V**		
5	*Diplorynchus conylocarpon*	**7**	**V**		
6	*Grewia ?bicolor*	**20**	**V**		
7	*Julbernardia globiflora*	**15**	**V**		
8	*Lannea humilis*	**1**	**V**		
9	*Lannea schimperi*	**2**	**V**		
10	*Piliostigma thonningii*	**1**	**V**		
11	*Pterocarpus angolensis*	**1**	**V**		
12	*Pterocarpus tinctorius*	**1**	**V**		
13	*Sclerocarrya birrea* sbsp. *birrea*	**2**	**V**		
TOTAL			**13**	**0**	

CLUSTER NO. 20.

Plot no. 40.

Locality: Makolongo. **Habitat**: Miombo woodland. Coo**rdinates**: 366573/9256740. Al**titude**: 1376m. *a.s.l.* **Canopy cover**: 30 - 60%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	
1	*Albizia antunesiana*	**3**	**V**		
2	*Borassus aethiopum*	**1**	**V**		
3	*Brachystegia spiciformis*	**3**	**V**		
4	*Dalbergia nitidula*	**1**	**V**		
5	*Diplorynchus condylocarpon*	**3**	**V**		
6	*Julbernardia globifora*	**15**	**V**		
7	*Lannea schimperi*	**2**	**V**		
8	*Margaritaria discoidea*	**4**		**V**	
9	*Ochna ovata*	**2**	**V**		
10	*Pseudolachnostylis maprouneifolia*	**2**		**V**	
TOTAL			**8**	**2**	

Plot no. 41

Locality: Makolongo. **Habitat**: Miombo woodland. Coo**rdinates**: 366336/9256832. Al**titude**: 1342m. *a.s.l.* **Canopy cover**: 30 - 60%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not knwon	▪ Fire

1	*Brachystegia glaucescens*	**1**	**V**		▪ Water source observed
2	*Brachystegia spiciformis*	**2**	**V**		
3	*Combretum molle*	**1**	**V**		
4	*Combretum psidioides*	**3**	**V**		
5	*Ficus sur*	**4**		**V**	
6	*Margaritaria discoidea*	**8**		**V**	
7	*Pterocarpus angolensis*	**1**	**V**		
8	*Raphia farinifera*	**1**	**V**		
9	*Sterculia quinqueloba*	**2**	**V**		
10	*Strycnos innocua*	**2**	**V**		
11	*Terminalia kaiserana*	**1**	**V**		
12	*Vitex mombassae*	**2**	**V**		
13	*Xylopia parviflora*	**1**	**V**		
TOTAL			**11**	**2**	

Plot no. 42

Locality: Makolongo. **Habitat**: *Dombeya*, *Annona* and *Phylanthus* woodland. **Coordinates**: 366573/9256740. Al**titude**: 1310m. *a.s.l.* **Canopy cover**: 30 - 60%.					
S/N	**SCIENTIFIC NAME**	**FREQUENCY**	**MELLIFEROUS STATUS**		**REMARKS**
			Bee fodder	Not known	
1	*Acacia tortilis*	**1**	**V**		
2	*Albizia versicolor*	**1**	**V**		
3	*Annona senegalensis*	**2**	**V**		

4	*Bridelia micrantha*	**1**	**V**		
5	*Cussonia kirkii[C. arborea]*	**1**	**V**		
6	*Diospyros* sp.	**1**	**V**		
7	*Dombeya rotundifolia*	**2**	**V**		
8	*Flacourtia indica*	**1**	**V**		
9	*Friesodielsia obovata*	**2**	**V**		
10	*Parinari curatellifolia*	**1**	**V**		
11	*Phyllanthus engleri*	**2**	**V**		
12	*Pterocarpus tinctorius*	**1**	**V**		
13	*Rytignia uhilgii*	**1**	**V**		
14	*Syzygium guineense*	**1**	**V**		
15	*Terminalia kaiserana*	**1**	**V**		
TOTAL			**15**	**0**	

Appendix 8: Coordinates used to draw map and indicate sample plot area

1. SAMPLED SITES [LOCATIONS]

Iloba	352357	9248244
Kanono	361693	9270186
Kaperamigira camp	354123	9249030
Kariaguru	384291	9267036
Kibola river	351899	9248170
Lukimwa junction	367338	9250456
Makolongo	366573	9256740
Masigo	353731	9285026
Matwiga	375163	9257654
Mguru accident corner	356133	9243958
Msabaha camp	359069	9260256
Msima	369646	9275286
Mtalazya	351115	9254692
Mtambo source	359654	9265442
Near Air strip	346175	9259684
Near Kaselu valley	370335	9252192
Peters corner	351963	9248114
Towards RGRHQs	351698	9248844
Ulaya	381804	9258168

2. ROAD

356387	9283326
356387	9283326
353744	9285042
356596	9283178
356765	9283064
356880	9282880
356901	9282698
357050	9282894
462388	9273820

3. PLOT AREA

Plot 1	351963	9248114
Plot 1	351963	9248114
Plot 2	352195	9248198
Plot 3	352357	9248244
Plot 4	351698	9248844
Plot 5	351954	9248882
Plot 6	351115	9254692
Plot 7	351355	9254754
Plot 8	346175	9259684
Plot 9	346422	9259708
Plot 10	356133	9243958
Plot 11	356162	9244234
Plot 12	367338	9240456
Plot 13	367423	9250694
Plot 14	370335	9252192
Plot 15	370229	9252424
Plot 16	354123	9249030
Plot 17	354162	9249274
Plot 18	351899	9248170
Plot 19	352058	9248224
Plot 20	350715	9251272

351813	9248368
351795	9248424
369101	9276782
370551	9276150
384327	9267090
381799	9258136
380771	9258008
378454	9257812
375176	9257606
373518	9258416
372706	9259394
369878	9259120
368115	9259004
367349	9259236
366252	9258584
366361	9257436
351941	9248093
350355	9251392
370359	9252162
367332	9250427

Plot 21	350939	9251414
Plot 22	358891	9260424
Plot 23	359069	9260256
Plot 24	359654	9265442
Plot 25	359897	9265402
Plot 26	361693	9270186
Plot 27	361442	9270174
Plot 28	353731	9285026
Plot 29	353524	9284884
Plot 30	369646	9275286
Plot 31	369401	9275234
Plot 32	384291	9267036
Plot 33	384115	9266832
Plot 34	381804	9258168
Plot 35	381849	9258412
Plot 36	375163	9257654
Plot 37	375194	9257902
Plot 38	371442	9259330
Plot 39	371437	9259578
Plot 40	366573	9256740
Plot 41	366336	9256832
Plot 42	366573	9256740

Appendix 9: Data collection sheet

DATA COLLECTION SHEET FOR MLELE BEEKEEPING ZONE

DATE:----------

DATA COLLECTOR:----------

LOCALITY:----------

COORDINATES:----------

HABITAT:----------

S/N	SCIENTIFIC NAME	FREQUENCY	MELLIFEROUS STATUS		REMARKS