Diversity and Utilization of Wild Edible Plant Species from the Uvinza Miombo Woodlands, Tanzania

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Abstract

An assessment of the diversity of wild edible plants utilized by people in Uvinza Miombo Forests, Tanzania was undertaken in 2014-2015. Structured interviews, descriptive statistics and informant consensus were used to collect, compile and analyze data. One hundred and forty-three informants aged over 18 years from four study villages: Uvinza, Basanza, Mwamila and Chakulu were interviewed on the use of wild edible plants. A majority of respondents (86.7%) said they have been using wild plants for foods. Sixty-three wild food plant species were recorded. Highest informant consensus value was for Anisophyllea bohemii Engl. reported by 104 (72.2%) followed by Vitex doniana Sweet, Vitex mombassae Vatke, and Vitex ferruginea Schum Thonn reported by 95 (66.4%), 91 (63.6%) and 91 (63.6%) respondents respectively. Euphorbiaceae, Verbenaceae, Anacardiaceae and Apocynaceae were the major families recorded. Fruit species (82.5%) constituted the largest plant parts collected for food. Seventy-one respondents (68.9%) collected wild food from farmlands. Seventy-seven respondents (76.7%) of the wild food collectors were youths. The local community in the study area possesses indigenous knowledge on uses of wild plants for food. Efforts are needed to create awareness and sensitizing the communities on sound utilization of the particular miombo ecosystem which are important for safeguarding biodiversity.

Key words: Ethnobotany, NTFP, miombo woodlands, wild foods,

Introduction

Miombo woodlands is the local name for woodlands characterized by the predominant presence of miombo trees (*Brachystegia species*). Other miombo include Jubbernadia, and Combretum species. The genus Brachystegia comprises a large number of tree species including *Brachystegia utilis* Burtt Davy and Hutch, *B. longifolia* Benth, *B. microphylla* Harms, *B. manga* De Wild, *B. spiciformis* Benth and many others. Some of the species are important in providing wild food and medicines (Augostino *et al*., 2011; Sawe *et al*., 2014). Miombo woodlands ecosystem occurs in seven countries in Eastern, Central and Southern Africa countries including Tanzania (White, 1983). In Tanzania Miombo woodlands cover about 90 percent of all forested land **(**Mnangwone, 1999**).** According to Abdallah and Monera (2007) Miombo biome is found in the Western and Southern parts of the country where more than 80 percent of people depend on them for food, medicines, firewood and charcoal for cooking, heat and light (Misana *et al*., 1996; MNRT, 2000; Kitula, 2007; Maroyi, 2013; Sawe *et al*., 2014).

About 83 indigenous tree-species, which bear edible fruits and nuts throughout the year (Temu and Chihongo, 1998) and 21 species of edible wild vegetables (MNRT, 2000) have been identified in the Tanzania miombo woodlands. The rural communities recognize and consume a variety of these edible fruits. It is estimated that humans use only 10 percent of the fruit potential and the rest goes to waste, due to poor markets and rudimentary processing technologies (Nshubemuki *et al*., 1997) as well as ignorance. Deforestation is the main driver confronting the miombo woodlands. Expanding agriculture, human settlements, development of infrastructures, provision of water, unplanned bush fire, overgrazing and increasing needs for miombo products are threatening this biome at an alarming rate (Lupala, 2009; Masanja, 2013; Sawe *et al*., 2014). The investigation on wild food plants have been carried out in different

parts of Tanzania and elsewhere in the world, but such research has not yet been done in Uvinza District. This study whose main objective was to assess the diversity and utilization of wild edible plant species in Uvinza District contributed to adding to the knowledge pool on wild food plants utilized and found in the study area and in Tanzania at large.

Methodology

Study Area

Uvinza district was selected for the study because of its importance in natural resources endowment but impacted by constant surge of refugees from Burundi and Congo DRC who impact on the natural resources including overharvesting plant species for food, shelter and medicine. The district covers an area of 10,057.78 km^2 and a total population of 383,640 people with density of 38.1 inhabitants/km^2 with an average household size of 5.4 (NBS, 2013). The area receives a mean annual rainfall ranging between 600mm and 1000mm. Its annual temperature ranges from a minimum of 20^oC to a maximum of 30^oC. Reconnaissance survey of the study area was conducted from November, 5th to 25th, 2011and involved four study villages: Uvinza, Basanza, Chakulu and Mwamila. These villages were selected because they border with Uvinza (16 640 ha), Masanza (5376 ha), Ilunde (6144 ha) and Lugufu (8960 ha) forest reserves (Figure 1.) dominated by miombo woodlands.

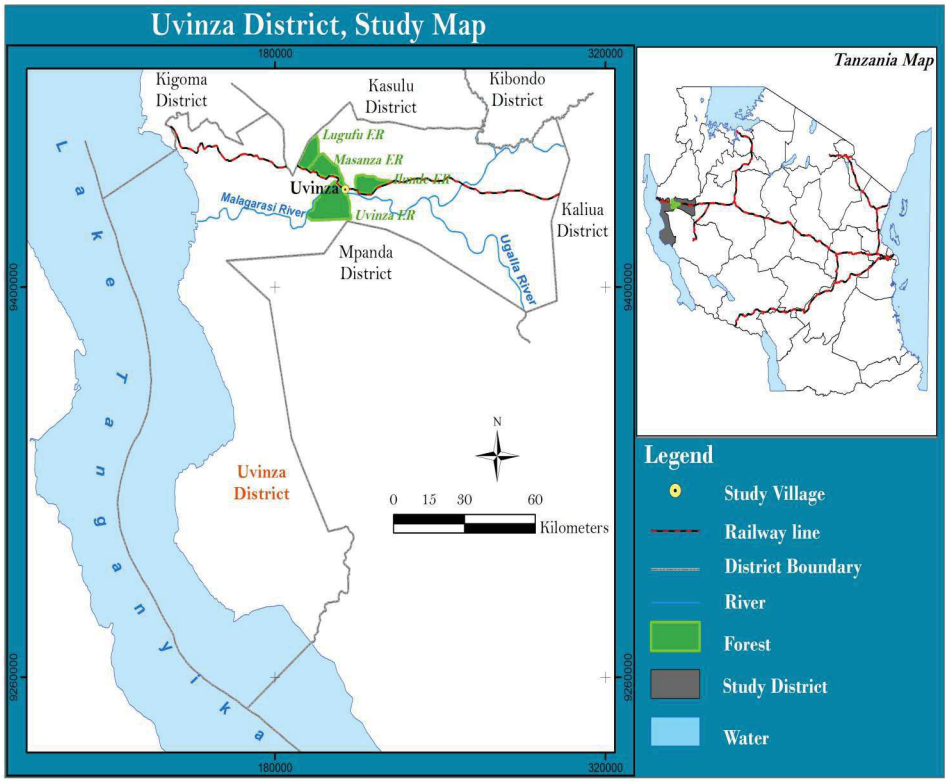

Figure 1. Map of Uvinza District Showing the Study Area

Source: LAB: Institute of Resource Assessment (IRA, UDSM), Jan., 2014.

Sampling Design and Intensity

The study area was selected purposively based on the presence of a large number of forest reserves and background history of ethnobotanical practices. Four villages i.e. Uvinza, Chakulu, Basanza and Mwamila were purposively selected due to their proximity to the forest reserves. A total of 145 sample respondents aged ≥18 years were selected for interview at 2.4% sampling intensity of total number of 6011 households in four villages. First, the numbers of respondents from each village were determined by sampling fraction calculated at 0.024 (Table1). Then respondents from each village were selected randomly from village register book (sampling frame) after assigning random numbers from which respondents were chosen.

Table 1: Households in Study Villages

Village	Number of households	Sampled households
Uvinza	2857	69
Basanza	2000	48
Chakulu	997	24
Mwamila	157	4
Total	**6011**	**145**

Plants Identification

Local botanists assisted in the identification of plants using local names. Botanical plants identification was based on the works by MNRT, (2000); Hamisy *et al.* (2000); Ruffo *et al.* (2002); MNRT, (2011) and Augostino *et al.* (2011).

Data Collection

Primary data were collected through interviewing the local people from the selected villages. This included listings of wild plant species utilized as food by the local people and a number of households currently utilizing wild food. Secondary data were obtained through literature search.

Data Processing and Analysis

Data were analyzed using Statistical Package for Social Science (SPSS) software version 20. Descriptive statistics including mean, frequency and percentage backed up by table and graphic illustrations were employed to describe and summarize the data on wild food plants (habit, source and plant parts used) reported by the respondents.

Informant Consensus (IC)

This assessed the popularity of certain wild food plants according to the reports by the informants. This method was adopted from Alexiades (1996) and Hamisy *et al* (2000). The method quantitatively analyzed for fidelity level which is the percentage of informants

claiming the uses of a certain plant species for the same major purposes and was calculated as (IC%) = (NP/N) X100 where NP= number of informants that cited a particular species for a particular purpose N=total citations.

Results

A total of 143 respondents were interviewed comprising of 60 respondents (42%) in Uvinza village, 45 respondents (31%) in Basanza village, 26 respondents (18%) in Chakulu village and 12 respondents (8%) in Mwamila village. Out of these, 124 (86.7%), reported to have been using wild plants for foods. About 103 respondents (83.1%) collected wild food while 21 respondents (16.9%) purchased wild edible plant foods (Table 2)

Table 2: Household Utilization of Wild Edible Plants

Food collected/purchased	Number of respondents	Percentage of respondents
Collected wild food	103	83.1
Purchased wild food	21	16.9
Total	**124**	**100**

As shown in Fig.2, 71respondents (68.9%) collected wild foods from farmlands, 29 (28.2%) collected from reserved forests; while three respondents (2.9%) collected wild foods from homestead woodlots.

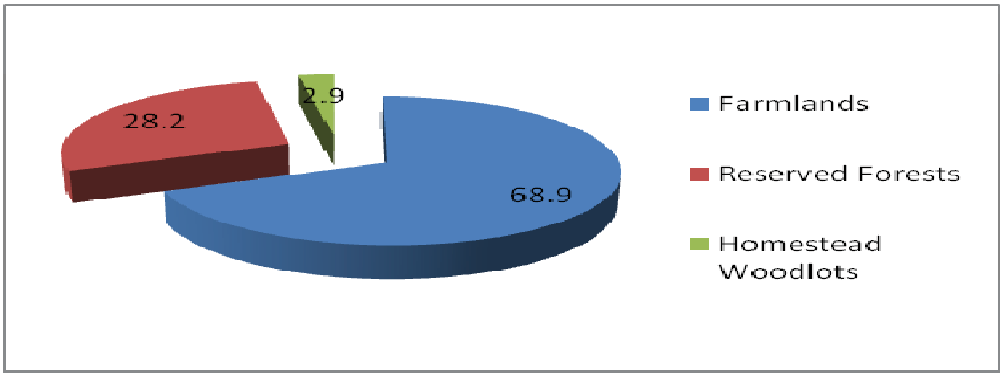

Figure 2: Wild Food Plants Collection Sources

Collection of wild food from their habitats seemed to be age and sex specific, where it was found that 79 (76.7%) of the wild food collectors were youths and few were adults whereby females accounted for 21 (20.4%) and males accounted for only 3 (2.9%) (Table 3).

Table 3: Wild Food Plant Collectors

Group	**Frequency**	**Percentage**
Youths	79	76.7
Adult female	21	20.4
Adult male	3	2.9
Total	**103**	**100**

The wild food collected were mostly consumed in the households but some were sold locally as shown in Fig.3a,*Anisophyllea boehmii*and Figure 3b;*Vitex mombassae*fruits being sold at Mwanga Market, in Kigoma –Ujiji Municipality. No records of external market were recorded in this study.

Figure 3a:*Anisophyllea boehmii*

Figure 3b: *Vitex mombassae*

Important Wild Food Plant species Utilized by Local People in the Study Area

This study recorded 63 wild food plant species collected by the local community. These plant species comprised of 46 genera in 30 families (Table 4).

Table 4: List of Wild Food Plant Species Utilized by Local People

Local name	Botanical name	Family name	Habit	Parts used
Mchicha pori (Mfungu) (Sw)	*Celosia trigyna* L.	Amaranthaceae	He	Le
Kinonga (Sw)	*Aerva lanata* (Linn.)Juss. Ex. Schult	Amaranthaceae	He	Le
Mchicha pori (Sw)	*Amaranthus spinosa* L	Amaranthaceae	He	Le
Mfotofoto(To)/(Mnyangala /Mhilihili(Sw)	*Sorindeia madagascariensis* Thouars ex D.C.	Anacardiaceae	Tr	Fr
Mkonochuma (Sw)	*Rhus natalensis* Krauss	Anacardiaceae	Sh	Fr
Mkeri (Sw)	*Rhus vulgaris* Meikle	Anacardiaceae	Sh	Fr
Mng'ong'o (Sw.)	*Sclerocarya birrea* (A.Rich) Hoechst	Anacardiaceae	Tr	Fr
Mshindwi (Ha)	*Anisophyllea boehmii* Engl.	Anisophylleaceae	Tr	Fr
Mshindwi (Ha)	*Anisophyllea pomifera* Engl.	Anisophylleaceae	Tr	Fr
Mtopetope (Sw)	*Annona senegalensis* Pers.	Annonaceae	Tr	Fr
Mtopetope (Sw)	*Annona stenophyla* Engl. & Diels	Annonaceae	Tr	Fr
Musalasi (Ny)	*Friesodielsia obovata* (Benth.)Vardc.	Annonaceae	Sh	Fr
Mabungo	*Saba comorensis* (Bojer ex	Apocynaceae	Li	Fr

makubwa (Sw)	A.DC.) Pichon			
Mabungo madogo (Sw)	*Dictyophleba lucida* (K.Schum.) Pierre.	Apocynaceae	Li	Fr
Mbungo mkavu (Sw)	*Salacia leptoclada* Tul.	Celastraceae	Li	Fr
Umunyonza (Ha)	*Carissa edulis* (Forssk.) Vahl	Apocynaceae	Sh	Fr
Mvuma (Sw)	*Borassus aethiopum* Mart	Arecaceae(Palmae)	Tr	Fr
Mwinika mguu (Sw)/Lukungwisa(To)	*Asparagus africanus* Lam.	Asparagaceae	Sh	Fr
Mgagani (Sw)	*Gynandropsis gynandra* (L.) Briq	Capparidaceae	He	Le
Msunguti (Sw.)	*Acokanthera schimperi* (A.D.C.) Schweinf.	Apocynaceae	Sh	Fr
Umusalasi (Ha)Kasolyo (To)	*Garcinia buchananii* Baker	Clusiaceae	Tr	Fr
Mtunu(Sw.)	*Harunanga madagascariensis* Lam. Ex Poir.	Clusiaceae	Tr	Fr
Matembele pori (Sw)	*Ipomoea cairica* (Linn.) Sweet	Convolvulaceae	He	Le
Mbula (Sw)	*Parinari curatellifolia*(Planch.ex) Benth.	Crysobalanaceae	Tr	Fr
Mbula (Sw)	*Parinari exselsa* (Engl) R. Grah	Crysobalanaceae	Tr	Fr
Msindi (Sw)	*Diospyros mespiliformis* Hochst. ex A. DC.	Ebenaceae	Tr	Fr
Makusu (Sw)	*Uapaca kirkiana* Mull Arg.	Euphorbiaceae	Tr	Fr
Mchenza mwitu (Sw)	*Uapaca sansibarica* Pax	Euphorbiaceae	Tr	Fr
Mtalala (Sw)	*Uapaca nitida* Mull. Arg.	Euphorbiaceae	Tr	Fr
Mkarakara (Sw.)	*Bridelia mincrantha*	Euphorbiaceae	Tr	Fr

	(Hochst.) Baill.			
Mliwafwengi (Ny)	*Oldfieldia dactylophylla* (Welw. ex Oliv.) J.Leonard	Euphorbiaceae	Tr	Fr
Mkwaju (Sw)	*Tamarindus indica* L.	Fabaceae (Subfamily Caesalpinioideae)	Tr	Fr
Mchekeche (Sw.)	*Piliostigma thonningii*(Schumach) Milne.Redh	Fabaceae (Subfamily Caesalpinioideae)	Tr	Fr
Mchongoma (Sw.)	*Flacourtia indica* (Burm.f.) Merr.	Flacourtiaceae	Tr	Fr
Mtundanyanya/Mdahamwitu(Sw)	*Hoslundia opposita* Vahl	Lamiaceae	He	Fr
Mtonga (Sw)/Mahongo (Ha)	*Strychnos spinosa* Lam.	Loganiaceae	Tr	Fr
Mtonga(Sw)/Mahongo kome (Ha)	*Strychnos innocua* Delile	Loganiaceae	Tr	Fr
Mtonga (Sw)	*Strychnos cocculoides* Baker	Loganiaceae	Tr	Fr
Mnduwe(Sw) /Mtobo(To)	*Azanza gerkeana* (F. Hoffm) Excell & Hillcoat	Malvaceae	Sh	Fr
Mzambaraupori (Sw)/Ngege (Ha)	*Syzygium guineense* (Wild) D.C.	Myrtaceae	Tr	Fr
Mtundakula (Sw) /Msantu(Sw.)	*Ximenia americana* L.	Olacaceae	Sh	Fr
Mpingi (Sw.)	*Ximenia caffra* Sond	Olacaceae	Tr	Fr
Mlenda mbata (Sw)	*Ceratotheca sesamoides* Endl	Pedaliaceae	He	Le
Mlenda wima (Sw)	*Sesamum angolense* (Welw)	Pedaliaceae	He	Le
Mlenda (Sw.)	*Sesamum calycinum* Welw.	Pedaliaceae	He	Le

Mgogondi (Ny)	*Phyllanthus engleri* Pax	Phyllanthaceae	Sh	Fr
Mkulu (Sw.)	*Berchemia discolor* (Klotzsch) Hemsley	Rhamnaceae	Tr	Fr
Mkunazi (Sw)	*Ziziphus abyssinica* Hochst ex A. Rich	Rhamnaceae	Sh	Fr
Mbuguswa (Su)	*Feretia apodanthera* Delile	Rubiaceae	Sh	Fr
Mviru(Sw) Amagugunwa (Ha)	*Vangueria apiculata* K. Schum.	Rubiaceae	Sh	Fr
Mviru (Sw)	*Vangueria infausta* Burch.	Rubiaceae	Sh	Fr
Mkalya (Sw)	*Zanha Africana* (Radlk) Excel	Sapindaceae	Tr	Fr
Mduyuyu (Sw)/Msolo (To)	*Englerophytum natalense* (Sond.) T.D.Penn	Sapotaceae	Tr	Fr
Mlenda (Sw)	*Corchorus trilocularis* L.	Tiliaceae	He	Le
Mlenda (Sw)	*Corchorus tridens* L.	Tiliaceae	He	Le
Mtalali (Sw)	*Vitex mombassae* Vatke	Verbenaceae	Tr	Fr
Mfudu (Sw)	*Vitex payos* (Lour.) Merr.	Verbenaceae	Tr	Fr
Mfudu (Sw)	*Vitex madiens* Oliv. *subsp. Milanjiensis* (Britten) F. White	Verbenaceae	Sh	Fr
Mfurugenge (Ny)	*Vitex ferruginea* Schum and Thonn	Verbenaceae	Tr	Fr
Mfudu (Sw)	*Vitex doniana* Sweet	Verbenaceae	Tr	Fr
Mkomberonda(To)	*Cissus rubiginosa* (Welw.ex Baker) Planch	Vitaceae	Sh	Fr
Mkomberonda(To)	*Cissus integrifolia* (Baker) Planch.	Vitaceae	Sh	Fr
Mzabibu pori (Sw)	*Ampelocissus Africana* (Lour.) Merr.	Vitaceae	Li	Fr

Key: Parts used = Pu; Back = B; Roots = R; Leaf = L; Fruit = F; Flower = Fl; Seeds = Se;
Stem = St; Habit = Ha; Herb = He; Shrub = Sh; Tree = T; Liana = Li; Climbers = Cl; Epiphytes = Ep

Local names used Sw = Swahili; Ny = Nyamwezi; Ha = Kiha; To = Tongwe

Euphorbiaceae and Verbenaceae families were very popular and each was represented by 5 plant species (7.9%), followed by Anacardiaceae and Apocynaceae families each represented by 4 plant species (6.3%). Families with 3 plant species (4.8%) included Amaranthaceae, Annonaceae, Pedaliaceae, Rubiaceae, Vitaceae and Loganiaceae (Table 5).

Table 5: Major Families of Wild Food Plants Found in the Study Area

Family	Number of species	Percent
Euphorbiaceae	5	7.9
Verbenaceae	5	7.9
Anacardiaceae	4	6.4
Apocynaceae	4	6.4
Annonaceae	3	4.8
Loganiaceae	3	4.8
Pedaliaceae	3	4.8
Rubiaceae	3	4.8
Vitaceae	3	4.8

Plant part used as food

Figure 4 depicts that fruits constituted largest category of 52 species (82.5%) followed by 11 leafy vegetable species (17.5%).

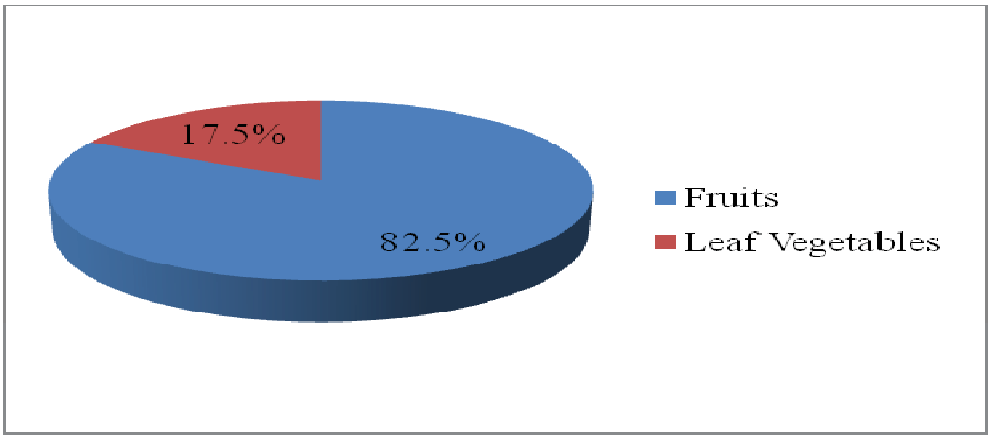

Figure 4: Percentage of Plant Parts Used as Wild Food

Habit of plant used as food

Trees constituted the largest portion of the wild food comprising of 32 species (50.8%), followed by shrubs 16 species (25.4%), herbs 11 species (17.5 %), and the least was lianas with 4 species (6.3%) (Figure 5).

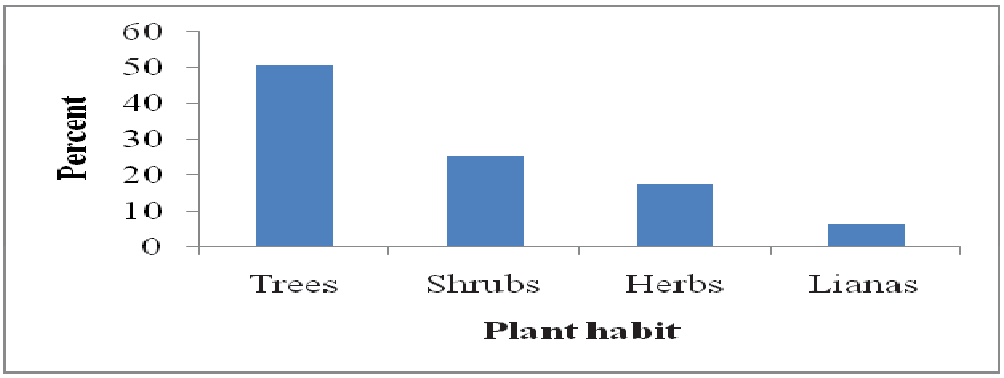

Figure 5: Percentage Growth Forms of Wild Food

Informant consensus

Table 6 shows that *Anisophylea boehmii* Engl. was the most collected wild food reported by 104 (72.7%) respondents, followed by *Vitex domiana* Sweet, *Vitex mombassae* Vatke, and *Vitex ferruginea* Schum and Thonn reported by 95 (66.4%), 91 (63.6%) and 91 (63.6%) informants respectively.

Table 6: Informant Consensuses of Wild Food Plants Used (> 50%)

Botanical name	TotalInformants	Percent%
Anisophylea boehmii Engl.	104	72.7
Vitex domiana Sweet	95	66.4
Vitex mombassae Vatke	91	63.6
Vitex ferruginea Schum and Thonn	91	63.6
Uapaca kikrkiana Mull Arg.	90	62.6
*Uapaca nitida*Mull. Arg	85	59.4
Uapaca sansibarica Pax	85	59.4
Parinari curatellifolia(Planch.ex) Benth	81	51.6
Harunangamadagascariensis Lam. Ex Poir.	72	50.3

Discussion

This study is the first one to document wild edible plant species utilized by the communities in Uvinza District. Sixty-three edible plant species are now known in Uvinza District. People in Uvinza District utilize wild plant species for food. One or more of these plant species were earlier reported by (Mbuya *et al.,* 1994; Ruffo *et al.,* 2002; Woiso, 2003) from other areas of Tanzania. Most of the households collected wild plant foods from wild source in the study area, which agrees with the findings by Ruffo *et al*., (2002) in a study conducted in Tanzania. The collected wild food contributed to household food security during periods of food crisis.

Food crisis in some places of Tanzania is a common phenomenon due to droughts, inherent low soil fertility, pests and diseases, and over selling of crops (Kajembe *et al*., 2000b) as well as period between planting and harvesting. Wild food also provides cash incomes to the rural poor through selling of raw fruits. Lack of engagement of food plant collectors to undertake conservation actions such as reserving their own forests patches, or growing them in their home gardens may exacerbate the continuation of foraging them from their wild source. In this study youths formed the major group of food collectors. This suggests that youngsters are more probably the main

consumers of wild food plants than other age groups. The observation that youths are most involved age group in collecting wild food plants has also been reported elsewhere in Tanzania **(**MNRT, 2000; Ruffo *et al*., 2002) and in Ethiopia (Fentahun and Hager, 2009). This observation opposed to the study conducted in Gweta village, Central Botswana by Badimo *et al*. (2015) who reported that women are the main collectors of wild foods. This difference may be due to the cultural difference of the inhabitants of Gweta village from the villages in the current study site. In the former village, most households are headed by women who explore different means to meet food supply for their families and to supplement sources of income for their families' needs (Badimo *et al*., 2015). The current study highlighted the diversity of wild food used by people in Uvinza miombo woodland. In terms of plant diversity, 63 species of edible plants in 46 genera of 30 families were identified during ethnobotanical survey. There was widespread use of wild edible plants for food needs and income generation. In this study, fruits from *Euphorbiaceae, Verbenaceae* and *Anacardiaceae* families formed the largest portion of wild food collected. The widely used plants were *Anisophylea boehmii* Engl. *Vitex domiana* Sweet, *Vitex mombassae* Vatke, *Vitex ferruginea* Schum and Thonn, *Uapaca kirkiana* Mull Arg., *Uapaca nitida* Mull. Arg., *Uapaca sansibarica* Pax, and *Parinari curatellifolia* (Planch.ex) Benth.

Conclusions and Recommendations

Woody species have significant role in supplementing dietary needs of the rural poor since the largest portion of the wild foods constituted trees, followed by shrubs, herbs and lianas. However, this may be due to seasonal variation in location of wild plant foods in abundance as this study was conducted during dry season, a period when annual plants are difficult to locate. Usually leafy vegetables are mostly abundant during rainy season. Sampling during dry and rainy season is hereby recommended. There should also be efforts to domesticate the reported indigenous food plants to increase the output of the harvested fruits than that collected from

the trees growing naturally. Improvements of fast growing cultivars and other desirable characteristics by uses of proper propagules and hybridization of related species should be done. Biodiversity conservation should be equally assessed to consider the importance of non-timber forest products notably food and medicinal plants. Equally important is the need for further studies on propagation of the reported plants which were ranked high in informant consensus.

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