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DIVERSITY OF NON-TIMBER FOREST PRODUCTS (NTFPS) AND THEIR SOURCE SPECIES IN MENAGESHA SUBA FOREST

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ABSTRACT: The objective of this study was to investigate the diversity of Non-Timber Forest Products (NTFPs) and their source species in Menagesha Suba Forest. Data were collected and analyzed from 57 and 285 circular main plots of 400 m^2 and sub-plots of 1 m^2 areas, respectively. Information on the types of NTFPs extracted from the forest was obtained from a socio-economic survey that involved 123 randomly selected households from six Peasant Associations (PAs) nearby the forest. A total of 142 plant species belonging to 56 families were recorded in the forest, and 59 of them were identified to offer NTFPs of one type or another. Nine different types of NTFPs are extracted today from the forest and these include traditional medicine, household utensil, honey and bees-wax, fuelwood, farm implement, animal fodder, edible forest products, smoke wood, and flavoring and spices. The diversity, density and relative abundance of NTFPs' bearing plants varied depending on the type of NTFP under consideration. In conclusion, Menagesha Suba Forest hosts rich diversity of plant species that offer diverse NTFPs. This richness with NTFPs resource can be used as an opportunity to device alternative strategy for the sustainable management of the forest by involving and allowing the local community to utilize the NTFPs resources rather than for destructive uses like timber harvest or conversion to other forms of land use. The incentive from NTFPs utilization could contribute to sustainable livelihoods of the local communities, which if realized, can win their interest for better conservation and development of the Forest.

Key words/phrases: Diversity, Density, Forest conservation, NTFPs, Menagesha Suba.

INTRODUCTION

The natural forests in Ethiopia are disappearing at an alarming rate. In an effort to cope with the rapid depletion of forest resources in the country, the remnant natural high forests, including Menagesha Suba have been designated as National Forest Priority Areas (NFPAs) for conservation. The major objective for NFPAs designation is to protect them for biodiversity conservation (Demel Teketay, 1999). Nonetheless, this objective has hardly

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been achieved due to the strict protectionist or local people exclusion approach in their management. Alternative strategies that integrate local people into the management of the forests are needed if they should be conserved for their biological resources and environmental significance. For two to three decades, many authors argued that utilization of Non-Timber Forest Products (NTFPs) was one possibility to address the need for conservation of forest remnants and simultaneously contributing to local community livelihoods (e.g. Arnold and Perez, 2001). NTFPs are often considered as the black box of integrated forest management (Davidson-Hunt *et al*., 1999), and along with ecotourism, are also promoted as a means to reconcile economic development with biodiversity conservation (Vance and Thomas, 1997).

Ethiopia is one of the tropical countries endowed with rich plant diversity that offer numerous Non-Timber Forest Products (NTFPs) (Mulugeta Lemenih, 2005). The NTFPs of the country are also playing substantial roles in food security and poverty alleviation for a large number of communities in the country (Vivero, 2002). For instance, over 80% of the population of Ethiopia depends on herbal/wild medicines for their primary health care, while over 90% of the rural community depends on fuelwood (firewood and charcoal) for their energy demand (EFAP, 1994; Vivero, 2002).

However, the rationale for forest conservation and development in Ethiopia has been primarily for the production of timber and fuelwood. In general, NTFPs, other than fuelwood, have been neglected at all times in the country. Indeed, the capacity to promote sustainable NTFPs production and utilization as an incentive for forest conservation has been very low in Ethiopia. On the other hand, a closer assessment of the real socio-economic significance of the forest and woodland resources of the country clearly reveals their greater importance through the supply of NTFPs than timber related products. Above all, Ethiopia’s forest-products-related exports have been and still are mainly NTFPs such as gums, incenses, balsam, spices, honey and wax (Vivero, 2002; Mulugeta Lemenih, 2008). According to Mulugeta Lemenih (2008), for instance, in the period from 1996 to 2002 Ethiopia exported 13, 299 tons of natural gums, which generated over 17 million USD, while there has been import of large quantity of timber during the same period.

We herein propose that management of the natural forests of Ethiopia including NFPAs for the production of NTFPs that local people can utilize to augment their livelihoods may offer better option for their sustainable utilization than the present strict protectionist approach. In actual fact, whether NTFPs oriented production can lead to both economic development and biodiversity conservation depends on the forest's composition and productivity of NTFPs. However, very limited studies have been conducted to document the diversity, abundance and other ecological aspects of NTFPs resources in the natural forests including NFPAs of Ethiopia. Few of the studies conducted on NTFPs in the country were confined to the woodlands in some of the low lying areas of the country and the southwestern moist forest (Mulugeta Lemenih *et al*., 2003; Tadesse Woldemariam and Ararsa Regasa, 2004; Tsegaye Bekele *et al*., 2004). NTFPs related studies on the dry tropical afromontane forests, which are the predominant vegetation formation in the country, are scanty (Demel Teketay, 1996).

The objectives of this study were, therefore, to (i) identify NTFPs bearing species and study their diversity, abundance, and density in Menagesha Suba Forest; and (ii) assess the types of NTFPs currently utilized from this forest.

MATERIALS AND METHODS

The study site

The Menagesha Suba Forest is situated some 45 km west of Addis Ababa and located at $38^{\circ}31'$-$38^{\circ}35'$E longitude and $8^{\circ}56'$-$9^{\circ}04'$N latitude (Fig. 1). The mean annual temperature of the area is 16 ^{0}C with an annual rainfall of 1100 mm (Tsegaye Bekele, 1996). Menagesha Suba Forest area is characterized by rolling terrain, with an elevation ranging from 2200-3000 meters above sea level. The soils found on the upper slopes differed from that of the lower slopes and mountain feet. Upper slopes consisted of shallow, yellowish to reddish-brown and stony clays, while the lower slopes were occupied by heavy dark-red silt loam (Zewdu Eshetu, 2000; Eshetu Yirdaw, 2002).

The vegetation of Menagesha Suba Forest varied with altitude, from high forest on the lower slopes to sub-afro-alpine vegetation at higher altitudes (Diro Bulbula, 1997; Feyera Senbeta and Demel Teketay, 2001). It is the habitat of numerous wild animals, including baboons, Colobus monkeys, Bushbucks, Bush pigs, Caracal, Spotted hyena, Wildcat and a variety of many mammalian and avifauna (Feyera Senbeta and Demel Teketay, 2001; Tadesse Hailu, 2001). According to the 2001 record by the forest office of Menagesha Suba, there were 12 PAs surrounding the forest. The total inhabitants of these 12 PAs surrounding the forest were 21,010.

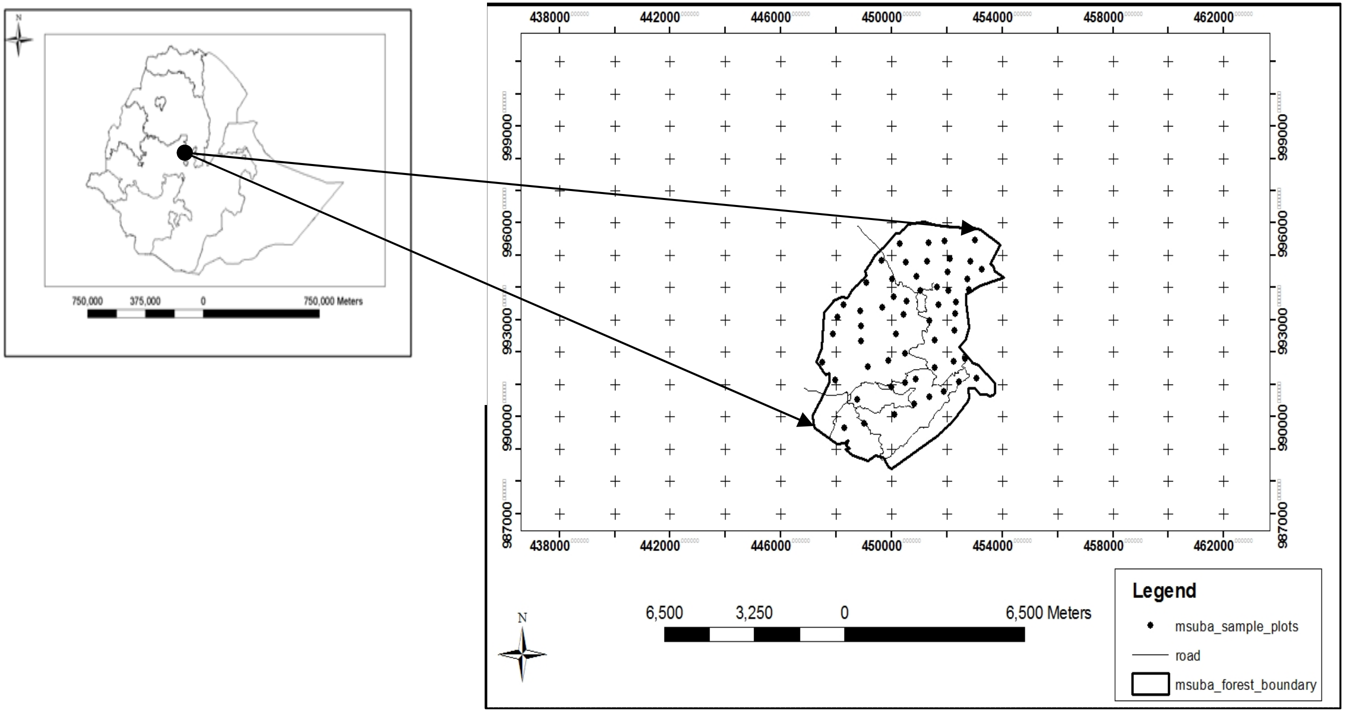

Fig. 1. Map of the study area as well as the layout of the sample plots and transect lines

Methods of data collection

Vegetation data were collected using a systematic sampling scheme by laying transect lines, which were spaced 750 m along the elevation gradient of the forest. The first transect line was laid out at one side of the forest along the gradient, with the help of a compass, and the rest were set up parallel to this first transect line at the specified spacing. The transects covered the altitudinal range between 2200 and 2990 meters above sea level. Circular sample plots of 400 m^2 (11.28 m radius) each were placed along each transect line at 100 m vertical interval (contour interval) from each other. We selected 400 m^2 to make it comparable with most studies that used 400 m^2 plot sizes for floristic studies (e.g. Mulugeta Lemenih *et al*., 2004; Feyera Senbeta et al., 2007). Within each main plot, all woody species found and their density (stem number/plot and per species) were recorded. In addition, within the main plots, five circular sub-plots of a 1 m^2 were formed for herbaceous plant assessment. In these five 1 m^2 sub-plots, stem density of herbs that were indicated to have NTFP values was counted. Additional notes were taken in areas of rapid changes in vegetation and a marked environmental gradient (Kent and Coker, 1992). In total, 57 main and 285 sub-plots were established in the entire forest. Key informants (knowledgeable and/or elderly people in the area suggested by residents of the area) were used to provide local names of the encountered plants. After vernacular names were known, scientific names were identified (Dawit Abebe *et al.*, 2003; Reinhard and Admasu Adi, 1994; Azene Bekele *et al.*, 2004). Voucher specimens were collected and pressed for those plants that were not readily identified in the field for further identification at the National Herbarium, Addis Ababa University (AAU).

Species recorded in each plot were sub-classified into species currently utilized for NTFPs and species with no currently known NTFPs values. The classification and the types of NTFPs extracted from the species identified as providing NTFPs was made through key informant interview and formal questionnaire survey. Questionnaire survey was conducted on 123 randomly selected households from six Peasant Associations (PAs) nearby the Forest. The sample households were selected from three wealth categories (Rich, Medium and Poor), which were categorized based on criteria developed by the key informants. Additional information was also collected through focus group discussion using six groups (one group per PA). The focus group comprised people from different gender and age classes and the size was 8-10 per group.

Data analysis

A checklist of plant species recorded in each plot, including their local uses and parts used was prepared. Data from each plot were analyzed for species diversity, density, relative abundance and frequency for the NTFP bearing species. The parameters analyzed include: Shannon and Wiener index (H`), evenness and species richness, and relative abundance and frequency using appropriate equations. Finally, NTFP producing species were listed and classified according to the traditional uses of their products as obtained from the socio-economic survey outlined above.

RESULTS

Plant species richness and diversity of Menagesha Suba Forest

About 143 plant species belonging to 56 families were identified in Menagesha Suba forest. Of these species 87 (61%) were woody plants, 47 (33%) were herbs and eight (6%) were climber (Appendix 1). The average Shannon-Wiener Index of Diversity (H`), and the average evenness values for the entire forest were 1.593 and 0.678, respectively. Altitude and species diversity of the forest of Menagesha were strongly correlated (Fig.2). Mean species diversity and richness were low at the lower (below 2300) and higher altitudes above 2750m asl, but high at the intermediate altitudes (2300-2750). However, average species evenness was almost similar along the entire altitudinal gradient.

Diversity of NTFPs bearing plants in Menagesha Suba Forest

Of the 142 species recorded in the entire forest of Menagesha Suba, nearly 59 species (41.5%) are identified as offering NTFPs of one type or another. A further 12 species known to provide NTFPs were also recorded during sampling walks along the transect lines but outside the sample plots (Appendix 2).

The average Shannon-Wiener Index of Diversity (H`) and evenness (E) values of the NTFP-bearing species in Menagesha Suba Forest, which are 1.773 and 0.816, respectively (Table 1) are higher than the values for the entire forest, 1.593 for H’ and 0.678 for E. The higher H’ and E values of the NTFPs yielding species indicates their abundance and good distribution in Managesha Suba forest.

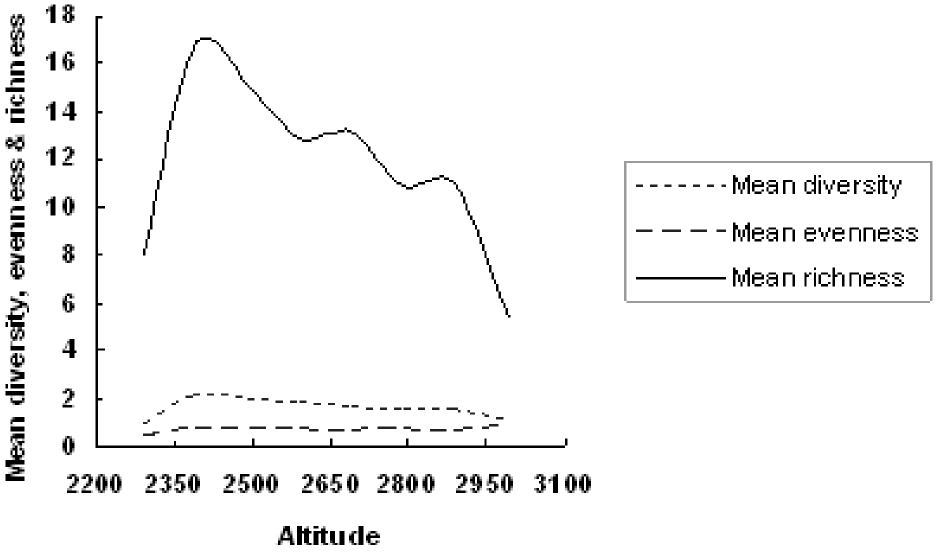

Fig. 2. Mean diversity, evenness and richness of plant species along altitudinal gradient in Menagesha Suba Forest, central Ethiopia.

Table 1. Diversity of NTFPs extracted by local community from Managesha Suba Forest, Central Ethiopia.

No.	Type of NTFPs	Number of families	Number of species	Average Density/ha	Shannon diversity index (H`)	Shannon Evenness index (E)
1	Medicinal plants	31	40	11525	2.864	0.834
2	Household utensils	14	16	6425	2.303	0.831
3	Honey bee flora	10	15	5900	2.110	0.779
4	Fuel wood	12	14	7775	2.308	0.875
5	Farm implements	10	11	4850	1.983	0.827
6	Edible wild plants	7	8	2125	1.268	0.708
7	Smoke wood	4	5	1150	1.485	0.923
8	Animal fodder	4	4	1150	1.044	0.753
9	Spices	2	2	1125	0.590	0.837
	Average				1.773	0.819

Types of NTFPs extracted from Menagesha Suba Forest

Nine different types of NTFPs of socio-economic significance to the local community living in and around the forest of Menegesha Suba were identified (Table 1). The average density of NTFPs-bearing plants (number of individuals/ha) varied with the type of NTFP under consideration. The highest density was observed for medicinal plants (11, 525 individuals/ha), and the lowest for spice-producing plants (1125 individuals/ha). The relative abundances of NTFPs-bearing species also showed variation depending on the type of NTFP considered. Detailed account of each of the NTFPs extracted from the forest is presented in the subsequent sections.

Medicinal plants

In the Mengasha Suba Forests, 40 plant species of which 31 were within the sample plot and nine outside, offered medicinal support for the community (Table 2). Parts of these plants used for medicinal applications are also included in Table 2. The nine medicinal plants recorded from the sample plots are *Cucumis prophetarum, Cymbopogon* sp., *Dombeya torrida subsp. Torrida* (J. F. Gmel.) P.Bamps, *Echinops* sp., *Eleucine jaegeri, Foeniculum leontis, Velutinea vulgare, Milletia ferruginea* and *Taverniera abyssinica*. The first five with highest diversity index in the group of medicinal plants, that represented about 42.2 % of the total medicinal plants diversity, were *Myrsine africana, Hagenia abyssinica, Eucalyptus globulus, Satureja punctata* and *Satureja abyssinica*.

The most frequently encountered traditional medicine bearing species was *Olea europea subsp. cuspidata* (frequency=77.2%), while the most abundant species; *Myrsine africana* had a frequency value of 63.2%. Four species with medicinal value (*Myrsine africana, Embelia schimperi, Sidroxylon oxyachanta, Olea europea subsp. cuspidata*) occurred in more than 50% of the plots, indicating the high distribution of these species in the entire forest. Results from group discussions and key informant interviews indicated that out of 40 plant species considered for medicinal plants, about ten species are used against both veterinary and human diseases. The remaining 30 species are commonly used for the treatment of human ailments (Table 2).

Table 2. Diversity, density, abundance and frequency of medicinal plants in Menagesha Suba Forest, Central Ethiopia.

No.	Botanical name	Average density/ha	Relative abundance (%)	Frequency (%)	Shannon index (H`)	Parts used
1	*Achyranthes aspera*	575	5	12.3	0.150	Root
2	*Bersama abyssinica*	100	0.9	43.9	0.041	Root
3	*Brucea antidysenterica*	75	0.7	15.8	0.033	Leaf, bark, fruit
4	*Calpurnia aurea**	100	0.9	1.8	0.041	Leaf
5	*Clematis simensis*	125	1.1	1.8	0.049	Leaf
6	*Croton macrostachyus*	100	0.9	8.8	0.041	Leaf/sap
7	*Dodonia angustifolia**	25	0.2	1.8	0.013	Leaf
8	*Embelia schimperi*	75	0.7	50.9	0.033	Seed
9	*Eucalyptus globulus**	1150	10	12.3	0.230	Leaf
10	*Hagenia abyssinica*	1400	12.1	7.0	0.256	Seed
11	*Jasminum abyssinicum*	25	0.2	10.5	0.013	Root
12	*Kalanchoe petitiana**	300	2.6	22.8	0.095	Leaf/root
13	*Myrsine africana*	1750	15.2	63.2	0.286	Seed
14	*Ocimum lamifolium*	300	2.6	1.8	0.095	Leaf
15	*Olea europea subsp. cuspidata*	350	3	77.2	0.106	Leaf
16	*Pteridium aquilinium*	150	1.3	5.3	0.057	Leaf
17	*Phytolacca dedocandra*	100	0.9	1.8	0.041	Leaf/Root
18	*Premna schimperi*	50	0.4	10.5	0.024	Leaf
19	*Prunus africana**	75	0.7	19.3	0.033	Leaf/bark
20	*Rhamnus prenoids*	75	0.7	5.3	0.033	Fruit
21	*Rumex abyssinicus*	125	1.1	1.8	0.049	Root
22	*Satureja abyssinica**	975	8.5	5.3	0.209	Whole plant
23	*Satureja punctat*	1125	9.8	12.3	0.227	Whole plant
24	*Sidroxylon oxyachanta**	450	3.9	66.7	0.127	Root bark
25	*Senecio gigas**	300	2.6	17.5	0.095	Leaf
26	*Solanum gigantum*	175	1.5	7.0	0.064	Fruit
27	*Stephania abyssinica*	200	1.7	10.5	0.070	Root
28	*Teclea nobilis**	250	2.2	5.3	0.083	Root
29	*Thymus schimperi*	825	7.2	1.8	0.189	Whole plant
30	*Verbascum sinaiticum**	75	0.7	3.5	0.033	Root
31	*Vernonia amygdalina*	125	1.1	1.8	0.049	Leaf root
	Total	11525			2.864	

* Plants used for the treatment of both human and livestock diseases

Edible wild plants

Seven plant species were identified in the entire forest of Menagesha Suba to provide edible plant materials (Table 3). Among the seven species identified, *Urtica simensis,* had the highest diversity value, representing 24.2% of the diversity of the total number of edible wild plants of the forest. Some of the species providing edible fruits such as *Rubus apetalus*, *Carissa spinarum* and *Rosa abyssinica* are climbing shrubs. *Carissa spinarum* was the most abundant and frequently occurring species of this group.

Table 3. Diversity, density, abundance and frequency of edible wild plants in Menagesha Suba Forest, Central Ethiopia.

No.	Botanical name	Average density (Stem/ha)	Relative abundance (%)	Frequency (%)	Shannon index (H`)
1	Rubus apetalus	75	4	14.0	0.118
2	Carissa spinarum	550	26	50.9	0.350
3	Rosa abyssinica	100	5	36.8	0.144
4	Dovyalis caffra	75	4	45.6	0.118
5	Dovyalis vericosa	450	21	43.9	0.329
6	Rumex nurvosus	50	2	1.8	0.088
7	Urtica simensis	825	39	5.3	0.367
	Total	2125			1.514

Animal fodder

Relative to other NTFPs, few species used as animal fodder were identified in Menagesha Suba Forest (Table 4). *Carissa spinarum* is representing the highest density with the highest diversity index. It was observed that *Vernonia amygdalina* was the most important animal fodder for some PAs particularly in Qumbure.

Table 4. Diversity, density, abundance and frequency of animal fodder plants in Menagesha Suba Forest, Central Ethiopia.

No.	Botanical name	Average density/ha	Relative abundance (%)	Frequency (%)	Shannon diversity index (H`)
1	Sidroxylon oxyacantha	450	39	66.7	0.367
2	Carissa spinarum	550	48	50.9	0.353
3	Vernonia amygdalina	125	11	1.8	0.241
4	Rytigynia neglecta	25	2	3.5	0.083
	Total	1150			1.044

Fuelwood

Menagesha Suba Forest is the only source of energy for the people living in the surrounding of the forest. About 15 plant species currently utilized by the community for fuelwood purpose were identified (Table 5). One species (*Acacia dicurrense,* exotic), which was not recorded in the sample plots, is one of the most important plants for fuelwood production with high coppicing and fast growth ability. Key informants confirmed that other plant species are also used as firewood and charcoal in case of fuelwood shortage. Nevertheless, those discussed in table 6 are the ones predominantly used by the local community.

Four species (*Myrsine africana, Eucalyptus globulus, Scolopia thefolia* and *Vernonia leopoldii*) are the most abundant species, which cover about 60.5% of the total fuelwood producing plants. Five species (*Juniperus procera, Olina rochetiana, Olea europea subsp. cuspidata, Sidroxylon oxyachanta* and *Myrsine africana*) frequently occurred in more than 50% of the plots and *Juniperus procera* had the highest frequency value. Four species *Myrsine africana*, *Vernonia leopoldii*, *Erica arborea* and branches of *Cupressus lusitanica* are the most useful plants that supply fuel \`Chibo\` during the Ethiopian New Year and \`Meskel\` festival every year. Therefore, many people are locally involved in selling such materials in the form of small bundles called \`Chibo\` to supplement their livelihood. Stems, leaves and branches are used as fuelwood material from the forest.

Table 5. Diversity, density, abundance and frequency of fuelwood plant in Menagesha Suba Forest, Central Ethiopia.

No.	Botanical name	Average density/ha	Relative abundance (%)	Frequency (%)	Shannon diversity index (H\`)
1	*Olea europea subsp. cuspidata*	350	4.5	77.2	0.140
2	*Cupressus lusitanica*	525	6.8	8.8	0.182
3	*Juniperus procera*	575	7.4	89.5	0.193
4	*Acacia abyssinica*	200	2.6	1.8	0.094
5	*Croton macrostachyus*	100	1.3	8.8	0.056
6	*Erica arborea*	350	4.5	19.3	0.140
7	*Sidroxylon oxyacantha*	450	5.8	66.7	0.165
8	*Eucalyptus globulus*	1150	14.8	12.3	0.283
9	*Eucalyptus camaldulensis*	25	0.3	1.8	0.018
10	*Vernonia leopoldii*	700	9.0	14.0	0.217
11	*Myrsine africana*	1750	22.5	63.2	0.336
12	*Olina rochetiana*	400	5.1	80.7	0.153
13	*Scolopia theifolia*	1100	14.1	43.9	0.277
14	*Calpurnia aurea*	100	1.3	1.8	0.056
	Total	7775			2.308

Honeybee flora

Of the many plants that exist in the forest and surrounding areas, 15 species were most valued for their great potential as bee forage through providing flowers (Table 6). *Hypoestes forskaolii* from the herbaceous plants, *Carissa spinarum* from the shrubs and *Hagenia abyssinica* from the tree species, are the most abundant species for this purpose in their areas of occurrence. *Carissa spinarum* and *Sidroxylon oxyachanta* are the most frequently common species in this group.

Table 6. Diversity, density, abundance and frequency of honeybee flora plants in Menagesha Suba Forest, Central Ethiopia.

No.	Botanical name	Average density/ha	Relative Abundance (%)	Frequency (%)	Shannon diversity index (H`)
1	*Apodytes dimidiata*	150	3	12.3	0.093
2	*Vernonia amygdalina*	125	2	1.8	0.082
3	*Prunus africana*	75	1	19.3	0.055
4	*Carissa spinarum*	550	9	50.9	0.221
5	*Rosa abyssinica*	100	2	36.8	0.069
6	*Hypoestes forskaolii*	1650	28	31.6	0.357
7	*Hypericum revolutum*	75	1	3.5	0.055
8	*Rubus apetalus*	75	1	14.0	0.055
9	*Rubus studneri*	75	1	5.3	0.055
10	*Dovyalis caffara*	75	1	45.6	0.055
11	*Sidroxylon oxychanta*	450	8	66.7	0.196
12	*Croton macrostachyus*	100	2	8.8	0.069
13	*Hagenia abyssinica*	1400	24	7.0	0.341
14	*Vernonia leopoldii*	700	12	14.0	0.253
15	*Leppa sp.*	300	5	8.8	0.151
	Total	5900			2.110

Household utensils and construction material

These NTFPs include all the materials that are used for household furniture and construction materials for house building and boundary fencing. These are important items on which the daily livelihood of the users depends. The Shannon diversity index value showed that household utensils and structural materials are the third largest in terms of species diversity next to medicinal and fuelwood supplying plants in the Menagesha Suba Forest area. *Myrsine africana* has a higher diversity index relative to other species belonging to this group (Table 7).

Table 7. Diversity, density, abundance and frequency of household utensils and structural materials plant species in Menagesha Suba Forest, Central Ethiopia.

No.	Botanical name	Average density/ha	Relative Abundance (%)	Frequency (%)	Shannon diversity index (H`)
1	*Acacia abyssinica*	200	3	1.8	0.108
2	*Cupressus lusitanica*	525	8	8.8	0.205
3	*Olea europea subsp. cuspidata*	350	5	77.2	0.159
4	*Croton macrostachyus*	100	2	8.8	0.065
5	*Juniperus procera*	575	9	89.5	0.216
6	*Ekebergia capensis*	75	1	8.8	0.052
7	*Podocarpus falcatus*	250	4	47.4	0.126
8	*Albizia gummifera*	75	1	3.5	0.052
9	*Prunus africana*	75	1	19.3	0.052
10	*Carissa spinarum*	550	9	50.9	0.210
11	*Clematis hirta*	125	2	7.0	0.077
12	*Clematis simensis*	125	2	1.8	0.077
13	*Myrsine africana*	1750	27	63.2	0.354
14	*Scolopia theifolia*	1100	17	43.9	0.302
15	*Sidroxylon oxycahantha*	450	7	66.7	0.186
16	*Tacazzea conferta*	100	1	21.1	0.063
	Total	6425			2.303

Farm implements

Since subsistence agriculture is the main economic activity of people who live around the forest, farm implements such as ploughshares, yokes and their accessories and materials used for processing after harvesting, such as 'Layda' and 'Mensh', are derived from this group of NTFPs and are vital resources for the farming community. During the survey, it was observed that about 11 plant species were used for this purpose (Table 8). Out of these, *Olina rochetiana* was the most important plant for ploughshare production, *Ekebergia capensis*, *Hagenia abyssinica, Albizia gummifera* and *Podocarpus falcatus* for yoke production and *Olea europea subsp. cuspidata* and *Calpurnia aurea* were the most important materials for making of farm accessory implements. Stem is the part used for these materials from all species. Due to the reason that they are found in the plantation forests, the abundance and density of *Hagenia abyssinica* and *Eucalyptus globulus* was higher compared to the other species in this group. However, due to their limited occurrence to a specific area, they had a low frequency distribution in the forest.

Table 8. Diversity, density, abundance and frequency of farm implements plant species in Menagesha Suba Forest, Central Ethiopia.

No.	Botanical name	Average density/ha	Relative Abundance (%)	Frequency (%)	Shannon diversity index (H`)
1	Olina rochetiana	400	8	80.7	0.206
2	Sideroxylon oxyacanthum	450	9	66.7	0.221
3	Olea europea subsp. cuspidata	350	7	77.2	0.190
4	Eucalyptus globulus	1150	24	12.3	0.341
5	Ekebergia capensis	75	2	8.8	0.064
6	Calpurnia aurea	100	2	1.8	0.080
7	Cupressus lusitanica	525	11	8.8	0.241
8	Hagenia abyssinica	1400	29	7.0	0.359
9	Podocarpus falcatus	250	5	47.4	0.153
10	Olea capensis	75	2	5.3	0.064
11	Albizia gummifera	75	2	3.5	0.064
	Total	**4850**			**1.983**

Spice

Spice providing plants are limited both in terms of density and diversity. *Thymus schimperi* and *Leppa* sp. were the only two spice bearing species encountered in the forest during vegetation assessment for NTFPs. It was also observed that most of the people use domesticated spice plants and wild related spices that exist in the home garden. It was observed that *Rosmarinus officinalis* is an important spice-bearing plant, which is cultivated in the home garden for both household use and income generation. The Shannon diversity index (H') for the spice bearing plants was found to be 0.58 only.

Smoke wood and flavoring plants

Some species also provide important products used in fumigating and sanitation of local drinks and milk vessels by smoking (Table 9). *Olea europea subsp. cuspidata* is one of the most frequently occurring species of this category, with higher density and relative abundance, and is widely collected and sold in local markets. *Ekebergia capensis* is also an important species for smoking hives to attract honeybees to the beehives. *Lippa and Vernonia* are widely used for washing household utensils like milk vessels and local drink `farso` making pots.

Table 9. Diversity of smoke wood and flavouring plants in Menagesha Suba Forest, Central Ethiopia.

No.	Botanical name	Average density/ha	Relative abundance (%)	Frequency (%)	Shannon diversity index (H`)
1	Ekebergia capensis	75	7	8.8	0.181
2	Olea europea subsp. cuspidata	350	31	77.2	0.363
3	Vernonia amygdalina	125	11	1.8	0.244
4	Leppa sp.	325	27	8.8	0.352
5	Clerodendron myricoides	275	24	3.5	0.344
	Total	**1150**	**100**		**1.485**

Wild animals

The results of socio-economic survey indicated that many large and small wild animals existed in the forest. These are Anubis baboon, Spotted hyena, Minilik`s bushbuck, Warthog, Leopard, Colobus monkey, Hyraxes, Civet cat and Rodents. Benefit from the wild animals was not direct for the community living in and around the forest, but all respondents at different wealth groups and PAs indicated that they have benefited from the wildlife eco-tourism income through infrastructure construction such as road, water and school. They also approved the increase of wild animals in the forest in relation to the situation a decade earlier. This took place because they reproduced freely and people did not kill them. Hence, some species of animals increased in number much more than others. The Warthog is a species, which greatly increased in number in the forest, owing to its ability to produce large litters. Although respondents showed positive attitude towards wild animals expansion in the forest, from experience it has been observed that some of the wild animals negatively affected the livelihood of the community through crop destruction.

DISCUSSION

The species richness and diversity of the entire forest of Menagesha Suba was relatively high compared to most dry afromontane forests in the country. For instance, only 56 species were recorded from Chilimo forest (Tadesse Woldemariam, 1998), 54 for Jibat (Tamrat Bekele, 1994), 32 for Munessa-Shashamane (Mulugeta Lemenih *et al.*, 2004) and 81 for Dindin forest (Simon Shibru and Girma Balcha, 2004), all of which are dry afromonatne vegetation similar to Menagesha Suba. This shows that Menagesha Suba Forest, as one of the relic dry afromontane forests in the country, is an important biodiversity spot worth for conservation. Species richness and diversity of Menagehsa Suba Forest tend to decline at upper and lower margins of the forests, and get high in the intermediate altitudes.

The reasons for this could be (i) altitude influenced species distribution, and (ii) disturbance by human and livestock at both margins of the forest.

Not only tree species as such was diverse but also NTFPs bearing plant species were found diverse in Menagesha Suba Forest. However, comparison of measures of diversity for NTFPs with other studies in Ethiopia was not possible since there were no similar studies made in other forests of similar formation. Comparison of few of the fragmented studies conducted showed that the diversity of medicinal plants (46% of the NTFPs-bearing species or 21.8% of the entire forest) in Menagesha Suba Forest was much higher than the medicinal plant species in the entire country, which was shown to be a little over 10% of Ethiopia's vascular flora (Dawit Abebe and Ahadu Ayehu, 1993). Similarly, a study by Miruts Giday (2001) on an island in the Lake Zeway revealed that 34 % of the recorded 96 plants own medicinal value, which is relatively higher than the result from Menagesha Suba Forest.

On the other hand, the diversity of NTFP types recorded in Menagesha Suba Forest were comparable to a study that recorded NTFPs of Shaka and Bench-Maji Zone, in the South-western parts of Ethiopia (Tadesse Woldemariam and Ararsa Regasa, 2004). Of the nine types of NTFPs identified in Menagesha forest, eight of them were similar to NTFPs identified for the Sheka and Bench-Maji Zone. These include food, fodder, local construction materials, medicine, spices, honey, farm implements, household furniture and fuelwood. However, in terms of species composition, the two sites were not comparable. The moist montane forests of South-western Ethiopia are rich in bamboo, wild coffee, and spices such as Korerima (*Aframomum corrorima)* and Timiz/long pepper (*Piper capense)* which are not the components of the Menagesha Suba Forest.

Through designing a holistic management approach in which NTFPs utilization will be a component, the forest can be managed sustainably for its environmental and biodiversity significances. Allowing the local communities to participate in the forest management through utilization and marketing will stop them from illegally intruding into the forest, and unsustainably use NTFPs of the trees. This, if supported with proper environmental policy, will also allow an environmentally sound way of conserving the forest. In fact, the diverse NTFPs recorded from Menagesha Suba Forest are currently offering considerable socio-economic values to the local community. For instance, the sale of NTFPs extracted from the Forest contributes on average to 27.4 % of the annual income of households in the study area, and on average 732 individuals per market day engaged in the sale of different NTFPs collected from Menagesha Suba Forest in four local markets around the Forest (data not included in this article).

CONCLUSION

The results of this study indicated that Menagesha Suba Forest, which is one of the remnant dry tropical afromontane forests in the central highlands of Ethiopia, comprises diverse plant species capable of offering NTFPs of one type or another. The Menagesha Suba Forest is also very rich in floristic composition that is worth conserving for biodiversity value. However, rather than following a strict protectionist approach in the management of the forest, involving local communities in the management by allowing them to benefit from the forest may result in sustainable forest management. Therefore, future management planning of Menagesha Suba Forest needs to consider and include the sustainable utilization of NTFPs. Moreover, research should be carried out on NTFPs productivity and methods of their sustainable harvest.

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Appendix 1. List of plant species recorded in Menagesha Suba Forest.

S/N.	Botanical name	Vernacular names	Family
1	*Acacia abyssinica* Hochst. ex Benth.	Ambo, Lafto (Or.)	Fabaceae
2	*Achyranthes aspera* L.	Dergu (Or.)	Amaranthaceae
3	*Agarista salicifolia* (Lam.) Oliv.	-	Ericaceae
4	*Albizia gummifera* (J.Gmelin)C.A.Smith	Sasa(Am.),Mukka-arba (Or.)	Fabaceae
5	*Alectra sessiliflora* (Vahl) O. Kuntze	-	Scrophulariaceae
6	*Allophylus abyssinicus (*Hochst.*)* Radlk.	Embes (Or.)	Sapindaceae
7	*Apodytes dimidiata* E. Meyer ex Arn	Dannisa/ulifoni (Or),	Lcacinaceae
8	*Artemisia abyssinica* Schtz.-Bip. ex Rich.	Chukugnyi (Or.)	Asteraceae
9	*Asparagus africanus* Lam.	Serrettee (Or.)	Asparagaceae
10	*Barleria ventricosa* Hochst.exNees	-	Acanthaceae
11	*Bersama abyssinica* Fresen.	Azamir (Am.), Lolchisa (Or.)	Meliantaceae
12	*Bidens macropetra* Mesfin	Kelo (Or.)	Asteraceae
13	*Brucea antidysenterica* J.F.Miller	Kumugno (Or.)	Simaroubaceae
14	*Buddleja polystachya* Fresen.	Adado/Chiai (Or.)	Loganiaceae
15	*Calpurnia aurea* (Ait.) Benth. subsp. aurea	Ancabi/Ceka (Or.)	Febaceae
16	*Capparis micrantha* A. Rich	Gumero (Or.)	Capparaceae
17	*Carduus camaecephalus (*Vatke.*)* Olive and Hiern	Kosheshla (Am.)	Asteraceae
18	*Carduus nyassanus* R.E.Fries	Kosheshla (Am.)	Asteraceae
19	*Carissa spinarum* (Forssk.)Vahi	Agamsa (Or.)	Apocynaceae
20	*Celosia argentea* L.	Ababo (Or.)	Amaranthaceae
21	*Celtis kraussiana* Benth.ex Krauss.	Chari (Or.)	Ulmaceae
22	*Chenopodium murale* L.	Tembelel (Or.)	Chenopodiaceae
23	*Clausena anisata (*Willd.) Benth.	Lmmich (Am.)	Rutaceae
24	*Clematis hirsuta* Perr. and Guill.	Hidda (Or.), Azo-hareg(Am.)	Ranunculceae
25	*Clematis simensis* Fres.	Idefeti (Or.)	Ranunculceae
26	*Clerodendron myricoides* (Hochst.) R.Br.ex- Vatke	Meserich (Or.)	Verbenaceae
27	*Crassocephalum sarcobasis(*DC) S.Moore	-	Asteraceae
28	*Crotalaria mildbraedii* Baker f.	-	Febaceae
29	*Croton macrostachyus* Hochst.ex A.Rich	Mokonissa (Or.)	Euphorbiaceae
30	*Cupressus lusitanica* Mill.	Yeferenj tsid (Am.)	Cupressaceae
31	*Delphinium wellbyi* Hemsl.	-	Ranunculceae
32	*Desmanthus virgatus* (L.) Willd.	-	Fabaceae
33	*Discopodium penninervium* Hochst.	Ameraro (Or.)	Solanaceae
34	*Dodonaea angustifolia* L. f.	Kitkita (Am.)	Sapindaceae
35	*Dombeya torrida* subsp. t*orrida* (J. F. Gmel.) P.Bamps	Danisa (Or.)	Sterculiaceae
36	*Dovyalis caffra* (Hook. f. and Harv.) Warb.	Yechaka koshim (Am.)	Flacourtiaceae
37	*Dovyalis vericosa* (Hochst.) Warb.	Likme (Or.)	Flacourtiaceae
38	*Dracaena steudneri* Engl.	Merko, showye (Or.)	Agavaceae
39	*Echinops ellenbeckii* D.Hoffm	Ankakuteh (Or.)	Asteraceae
40	*Echinops giganteus* A.Rich.	Koshishila (Am.)	Asteraceae
41	*Echinops kebericho* Mesfin	Koshishila (Am.)	Asteraceae
42	*Echinops longisetus* A.Rich	Koshishila (Am.)	Asteraceae
43	*Echinops macrochaetus* Fresen.	Koshishila (Am.)	Asteraceae
44	*Echinops sp.*	komborre,sekoru (Or.)	Asteraceae
45	*Ekebergia capensis* Sparmm	Sombo, duduna (Or.)	Asteraceae
46	*Embelia schimperi* Vatke	Enkoko (Am.)	Myrsinaceae
47	*Erica arborea L.*	Asta, Asti (Am.)	Ericaeae

Appendix 1 contd.

S/N.	Botanical name	Vernacular names	Family
48	*Eucalyptus camaldulensis* Dehnh	Key baherzaf (Am.)	Myrtaceae
49	*Eucalyptus globulus* Labill	Nechi-bahirzaf (Am.)	Myrtaceae
50	*Flacourtia indica* (Burm. F.) Merr.	-	Flacourtiaceae
51	*Gomphocarpus fruiticosus* (L.) R.Br.	-	Asclepiadaceae
52	*Gouania longispicata* Engl.	-	Rhamnaceae
53	*Haemanthus multiflorus* Martyn	Abrasa (Or.)	Amaryllidaceae
54	*Hagenia abyssinica* (Bruce) Gmelin	Koso (Am.)	Rosaceae
55	*Halleria lucida* L.	Siga (Or.)	Scrophulariaceae
56	*Helichrysum traversii* Chiov.	Eto, fico,heto (Or.),	Asteraceae
57	*Hibiscus trionum* L.	-	Malvaceae
58	*Hypericum revolutum* Vahl	Amja (Or.)	Clusiaceae
59	*Hypoestes forskaolii* (Vahl) R.Sch.	Dargu (Or.)	Acanthaceae
60	*Jasminum grandiflorum* L.	-	Oleaceae
61	*Jasminum abyssinicum* Hochst. ex DC.	-	Oleaceae
62	*Juniperus procera* Hochst. ex Endl.	Yeabesha tsid (Am.)	Cupressaceae
63	*Kalanchoe petitiana* A.Rich.	Bosoqqe (Or.)	Crassulaceae
64	*Laggera tomentosa* Sch. - Bip. ex Oliv	Keskesse (Or.)	Asteraceae
65	*Launaea cornuta* (Oliv.and Hiern) C.Jaffry	Ye seytan gomen (Am.)	Asteraceae
66	*Leonotis ocymifolia* (Burm. f.) Iwarsson.	-	Lamiaceae
67	*Leucas martinicensis* (Jacq.) R.Br	-	Lamiacae
68	*Lippa* sp.	Kusaye (Or.)	Verbenaceae
69	*Lobelia giberroa* Hemsl	Jibira (Am.)	Lobeliaceae
70	*Maesa lanceolata* Forsk	Abaye (Or.)	Myrsinaceae
71	*Malva verticillata* L.	Liti (Or.)	Malvaceae
72	*Maytenus arbutifolia* (Hochst.ex A. Rich)- Wilczek	-	Celastraceae
73	*Maytenus obscura* (A.Rich) Cuf.	Kombolcha (Or.)	Celastraceae
74	*Maytenus senegalensis* (Lam.) Excell	Kombolcha (Or.)	Celastraceae
75	*Myrsine africana* L.	Kechemo (Or.)	Myrsinaceae
76	*Myrsine* sp.	Kechema arba (Or.)	Myrsinaceae
77	*Myrica salicifolia* Hochst. ex. A. Rich	Keteba, Shinet (Or.)	Myricaceae
78	*Nuxia congesta* R.Br. ex Fresen.	Irba (Or.)	Loganiaceae
79	*Ocimum basilicum* L.	kasse,kefo (Or.),	Lamiacae
80	*Ocimum lamifollium* Hochst. ex. Benth	Dargu,muca, (Or.)	Lamiacae
81	*Ocimum* sp.	-	Lamiaca
82	*Olea capensis* (Bak.)Fries and P.S.Grun	Damot woira (Am.)	Oleaceae
83	*Olea europea subsp. cuspidata* (Wall. ex. DC.)- Cifferri.	Ejersa (Or.), woira (Am.)	Oleaceae
84	*Olina rochetiana* A.Jussieu	Dalecho, tife (Or.)	Oliniaceae
85	*Osyris quadripartita* Decn.	Keret, wato, asaso (Or.)	Santalaceae
86	*Otostegia tomentosa* A. Rich.	Yeferes Zeng (Am.)	Lamiaceae
87	*Pentas schimperiana* (A.Rich) Vatke	Kassay (Or.)	Rubiaceae
88	*Pteridium aquilinium* (L) Kuhn.	Anujira gubedu (Or.)	Polypodiaceae
89	*Phytolacca dodecandra* L'Herit.	Endode (Am), haranga (Or.)	Phytolaccaceae
90	*Pinus radiata* D. Don.	-	Pinaceae
91	*Pittosporum viridiflorum*	Bonco, ceka (Or.),	Pittosporaceae
92	*Plantago lanceolata* L.	Korissa (Or.)	Plantaginaceae
93	*Plectocephalus varians* (A.Rich.) C.Jeffrey ex- Cufod.	-	Asteraceae
94	*Plectranthus garckeanus (*Vatke*)*J.K.Morton	-	Lamiacae
95	*Podocarpus falcatus* (Thumb.) Mirb.	-	Podocarpaceae
96	*Premna resinosa* Schauer.	-	Verbenaceae

Appendix 1 contd.

S/N.	Botanical name	Vernacular names	Family
97	*Premna schimperi* Engl.	Totoke,urgesa (Or.)	Verbenaceae
98	*Prunus africana* (Hook.f.) Kalkam.	Mukka raja, (Or.)	Rosaceae
99	*Rapanea simensis* (Hochst. ex A. DC.) Mez	Alge (Or.)	Myrsinaceae
100	*Rhamnus prinoides* L'Herit.	Gesho (Or. Am.)	Rhamnaceae
101	*Rhamnus staddo* A. Rich	Qedida (Or.)	Rhamnaceae
102	*Rhus glutinosa* Hochst. ex. A. Rich	Adessa, tatessa (Or.)	Anacardiaceae
103	*Rhus vulgaris* Meikle	-	Anacardiaceae
104	*Ricinus communis* L.	Gulo (Or.)	Euphorbiaceae
105	*Rosa abyssinica* R. Br.	Gora, Qaqawwe (Or.)	Rosaceae
106	*Rubus apetalus* Poir.	Gumere, haltufa (Or.)	Rosaceae
107	*Rubus steudneri* Schwinef.	Gumere, haltufa (Or.),	Rosaceae
108	*Rumex abyssinicus* Jacq.	Mekmeko (Am.)	Polygonacea
109	*Rumex nervosus* Vahl	Dangago (Or.)	Polygonaceae
110	*Rytigynia neglecta (*Hiern*)*	Wontefulasa (Or.)	Rubiaceae
111	*Satureja* abyssinica (Benth.) Briq.	-	Lamiacae
112	*Satureja punctata* (Benth.) R. Br. ex. Briq.	Tosigny (Am.), deldecha (Or.)	Lamiacae
113	*Schefflera abyssinica* (Hochst.ex A.Rich)- Harms	Arfattu,gatama (Or.),	Araliaceae
114	*Schrebera alata (*Hochst.) Welw.	-	Oleaceae
115	*Scolopia theifolia* Gilg.	Kolfa (Or.)	Flacourtiaceae
116	*Senecio gigas* Vatke.	Yeshikoko Gomen (Am.)	Asteraceae
117	*Senecio myriocephalum* Sch. - Bip. Ex A.Rich.	-	Asteraceae
118	*Senecio ochrocarpus* Oliv and Hiern.	Difu (Or.)	Asteraceae
119	*Sida ovata* Forssk.	Chifreg (Am.)	Malvaceae
120	*Sideroxylon oxyacanthum* Baill.	Bitte, damza (Or.)	Sapotaceae
121	*Smilax aspera* L.	-	Liliaceae
122	*Solanum giganteum* Jacq.	Hide (Or.), ankorcha (Am.)	Solanaceae
123	*Solanum incanum* L.	Hide (Or.)	Solanaceae
124	*Solanum indicum* L.	Hancucu (Or.)	Solanaceae
125	*Solanum sp.*	-	Solanaceae
126	*Stephania abyssinica (*Dill and A.Rich.) Walp.	Itse Iyesus (Am.)	Menispermaceae
127	*Tacazzea conferta* NE Br.	-	Asclepiadaceae
128	*Tagetes minuta* L.	Mish-mish (Or.),	Asteraceae
129	*Teclea nobilis* Del.	Adessa (Or.)	Rutaceae
130	*Thalictrum rhynchocarpon* Dillon and A.Rich.	Sere bizu (Am.)	Ranunculaceae
131	*Thymus schimperi* Roninger	Tosigni (Am.)	Lamiaceae
132	*Trachyspermum ammi* (L.) Sprague ex Turrill	Azmud-Addi (Or.)	Apiaceae
133	*Trifolium rueppellianum* Fres.	Kaddo (Or.)	Leguminosae
134	*Urtica simensis* Steudel	Dobi (Or.)	Urticaceae
135	*Verbascum sinaiticum* Benth.	Gurra-haree (Or.)	Scrophulariaceae
136	*Vernonia amygdalina* Del.	Hebicha (Or.), Grawa (Am.)	Asteraceae
137	*Vernonia leopoldii* (Sch.Bip.ex Walp.) Vatke	-	Asteraceae
138	*Vernonia urticifolia* A.Rich	Reji (Or.)	Asteraceae
139	*Vicia dassycarpa* L.	Ye-ait misir (Am.)	Leguminosae
140	*Zehneria scabra* (L.f) Sond.	Areg-resa (Am.)	Cucurbitaceae
141	Unidentified	Idane (Or.)	
142	Unidentified	Ide-ketisa (Or.)	
143	Unidentified Urera hypselodendron (A. Rich.) Wedd.	Ide-lankisa (Or.)	Urtiacaceae

Appendix 2. List of NTFP bearing plants, purpose for which they are used and parts used in Menagesha Suba Forest, Central Ethiopia.

No.	Botanical name	Life form*	Uses**	Part used
1	*Acacia abyssinica*	T	HHI, FW	Stem
2	*Achyranthes aspera*	H	TM	Root
3	*Albizia gummifera*	T	HHI, FI	Stem
4	*Apodytes dimidiata*	T	HBF	Flower
5	*Bersama abyssinica*	S	TM	Root
6	*Brucea antidysenterica*	S	TM	leaf, bark, fruit
7	*Calpurnia aurea*	S	TM, FW, FI	leaf, stem
8	*Carissa spinarum*	S	WF,AF, HBF, SM	whole plant
9	*Clematis hirsute*	C	SM	Stem
10	*Clematis simensis*	C	TM, SM	leaf, stem
11	*Clerodendron myricoides*	S	SW	root
12	*Croton macrostachyus*	T	TM, FW, HBF, HHI	leaf, stem, flower
13	*Cupressus lusitanica*	T	FW, HHI, FI	stem
14	*Dodonia angustifolia*	S	TM	leaf
15	*Dovyalis caffra*	S	WF, HBF	fruit, flower
16	*Dovyalis vericosa*	S	WF	fruit
17	*Ekebergia capensis*	T	HHI, FI, SW	stem
18	*Embelia schimpri*	S	TM	seed
19	*Erica arborea*	S	FW	stem
20	*Eucalyptus camaldulensis*	T	FW	stem
21	*Eucalyptus globulus*	T	TM, FW, FI	leaf, stem
22	*Hagenia abyssinica*	T	TM, HBF, FI	seed, flower, stem
23	*Hypericum revolutum*	S	HBF	flower
24	*Hypoestes forskaolii*	H	HBF	flower
25	*Jasminum abyssinicum*	S	TM	root
26	*Juniperus procera*	T	TM, FW, HHU	bark, stem
27	*Kalanchoe petitiana.*	H	TM	root
28	*Leppa sp.*	S	HBF, SP, FP	flower, leaf/twings,
29	*Myrsine africana*	S	TM, FW, SM	seeds, stem
30	*Ocimum lamifolium*	S	TM	leaf
31	*Olea capensis*	T	FI	stem
32	*Olea europea*	T	TM, FW, HHU, FI, W	leaf, stem
33	*Olina rochetiana*	T	FW, FI	stem
34	*Pteridium aquilinium*	H	TM	leaf
35	*Phytolacca dedocandra*	S	TM	leaf/root
36	*Podocarpus falcatus*	T	HHU, FI	Stem
37	*Premna schimperi*	S	TM	leaf
38	*Prunus africana*	T	TM, HBF, HHU	leaf/bark
39	*Rhamnus prenoids*	S	TM, beverage	fruit, leaf, stem

Appendix 2 contd.

40	*Rosa abyssinica*	S	WF, HBF	fruit, flower
41	*Rubus apetalus*	S	HBF,WF	flower, fruit
42	*Rubus studneri*	S	HBF	Flower
43	*Rumex abyssinicus*	S	TM	Root
44	*Rumex nurvosus*	S	WF	young stem
45	*Rytigynia neglecta*	S	AF	leaf
46	*Satureja abyssinica*	H	TM	whole plant
47	*Satureja punctata*	H	TM	whole plant
48	*Scolopia theifolia*	S	FW, SM	stem
49	*Sideroxylon oxyacantha*	S	TM,AF,FW,HBF, SM, FI	Root , leaf, stem, flower
50	*Senecio gigas*	S	TM	leaf
51	*Solanium gigantum*	S	TM	fruit
52	*Stephania abyssinica*	H	TM	root
53	*Tacazzea conferta*	C	SM	stem
54	*Teclea nobilis*	S	TM	root, leaf
55	*Thymus schimperi*	H	TM, SP	whole plant
56	*Urtica simensis*	H	WF	young stems, leaf
57	*Verbascum sinaiticum*	H	TM	root
58	*Vernonia amygdalina*	S	TM, AF, HBF, FP	leaf, flower
59	*Vernonia leopoldii*	S	FW, HBF	stem, flower
60	*Cucumis prophetarum****	H	TM	fruit
61	*Cymbopogon* sp***	H	TM	leaf
62	*Dombeya torrida subsp. Torrida****	T	TM	Leaf
63	*Echinops* sp.***	S	TM	root
64	*Eleucine jaegeri****	H	TM	leaf
65	*Foeniculum leontis****	H	TM	root
66	*Velutinea vulgare****	S	TM	Leaf
67	*Milletia ferruginea****	T	TM	Leaf
68	*Taverniera abyssinica****	S	TM	Root
69	*Ficus sur* ***	T	WF	Fruit
70	*Acacia decurrens****	T	FW	Stem
71	*Rosmarinus officinalis****	S	SP	leaf, stem