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Woody Species Diversity in Oxytenanthera abyssinica Based Homestead Agroforestry Systems of Serako, Northern Ethiopia

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Abstract
In northern Ethiopia, establishment of exclosures and management of remnant protected natural forests to conserve and enhance forest products and services have been practiced for the past three decades. However, empirical data on the effectiveness of lowland bamboo based homestead agroforestry system in rescuing woody species diversity are lacking. The study was assessed the woody species diversity, density and composition of O. abyssinica based homestead agroforestry systems in Serako, Tselemti district. Data were collected from a total of ninety nine farms and plots with 10m*10m area, ninety from less than five year, five to ten years and greater than ten years domestication of O. abyssinica based homesteads and one exclosure with nine plots as comparison were taken. The study revealed that species density, richness and diversity were significantly higher in the exclosure than in the three homesteads ($p<0.000$). The study showed that a total of 48 tree species in 25 families and 24 tree species in 11 families for the homestead agroforestry systems and exclosure respectively were recorded. Following the age gradient, there was a significant difference in density, richness and diversity between greater than ten and less than five year domesticated O. abyssinica homestead agroforestry systems ($p<0.000$). This study confirmed that woody species diversity was higher for those households that domesticate O. abyssinica on their homesteads earlier than those households that domesticate later on their homesteads. Oxytenanthera abyssinica was not found in the exclosure, showing a distinct conscious selection for planting in the homesteads as agroforestry system. It is suggested that homestead agroforestry systems are effective for increasing biodiversity and socio-economic contributions to rural households.
Keywords: Oxytenanthera abyssinica, woody species diversity, Tselemti

1. Introduction

In northern Ethiopia, establishment of exclosures and management of remnant protected natural forests to conserve and enhance forest products and services have been practiced for the past three decades (Betru et al. 2005; Mengistu 2005; Birhane 2006; Yami et al. 2007; Mekuria et al. 2013). In addition to these practices, homestead agro-forestry systems have good potential to conserve biodiversity and provide socioeconomic benefits to rural households (Senanayake et al. 2009; Arfin et al. 2012; Islam et al. 2013 and Rahman et al. 2013; Seta et al. 2013).

Homestead agroforestry is a practice of integrated land use which dates back for years throughout the drylands of Ethiopian farming system involving mixed cereal-livestock, agrosilvopastoral and silvopastoral systems (Gebrehiwot 2004). The existence of these systems has a great potential for further development and the introduction of new agroforestry systems (*ibid*). Variety of woody species in agricultural systems supplies timber and non-timber products and ecological services, thereby, enhancing socioeconomic and ecological resiliency of the systems (Negash et al. 2011; Abebe et al. 2013; Darcha et al. 2015). Several case studies conducted in the smallholder farmers in southwestern of Ethiopia have experience of homegarden agroforestry for ages (e.g. Abebe et al., 2010; Kebebew et al. 2011; Negash et al., 2011; and 2013 and Bishaw et al., 2013). Empirical study on homestead agroforestry practices around north western Tigray is insufficient. As a result, less attention has been given to homestead agroforestry development towards woody species conservation and addressing household food security.

The rapidly diminishing supplies of forest bamboo through deforestation and the lack of priority in its development and management join forces to erode its status (Kassahun, 2003; Kigomo, 2007; Darcha et al. 2015). One of the options of increasing bamboo resource and other woody species is domestication on farms as homestead agroforestry (Kigomo, 2007, Darcha et al. 2015). However, little study has been conducted about the effectiveness of lowland bamboo based homestead agroforestry system in conserving woody species. This study is therefore proposed to bridge the gap in the literature by investigating woody plant diversity of *Oxytenanthera abyssinica* based homestead agroforestry systems of the study area.

2. Materials and Methods

2.1. The Study area

The study was conducted at '*Serako* Peasant Association (PA), *Tselemti* district, Northern Ethiopia ($13^0 05$'N latitude and $38^{0}08'$ E longitude) between October and December 2014 (Fig. 1). The district is at an altitudinal range of 800 - 2872 m.a.s.l. and it covers a total area of 717,000 ha (TARI, 2002; WARD, 2014).

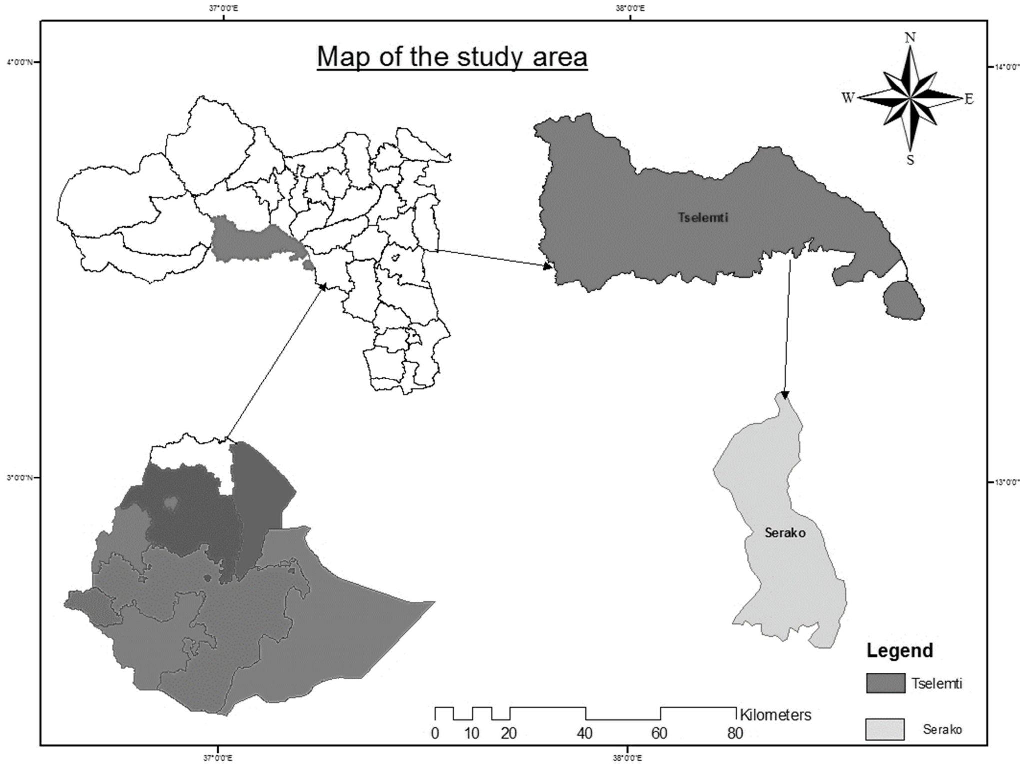

Fig 2: Geographical location of Serako_Tselemti

The agro-climatic condition of the area is hot to dry semiarid lowland plains dictated by a very hot temperature. The maximum temperature ranges from 35.6°C in May to 36.4°C in April, while the minimum temperature is ranging from 15.7°C in December to 21.8°C in May (TNMA, 2014) (Fig. 2). The dry season occur between November to March whereas, the rainy season occurs between June to September, which follows a unimodal rainfall pattern (Fig. 2).

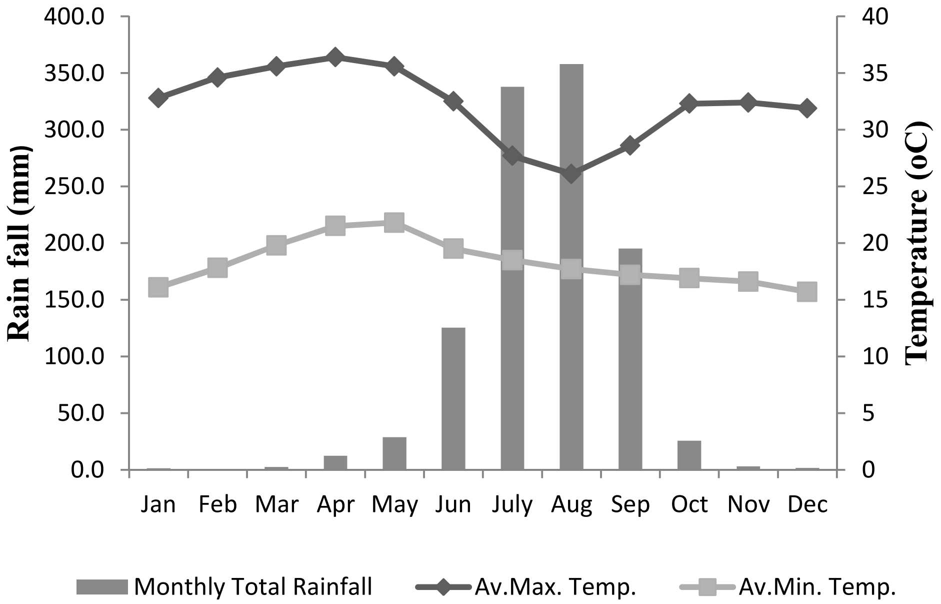

Fig 3: Six year rainfall and temperature of the study area (Source: TNMA, 2014)

The most dominant soil types of the study area are Cambisols, Nitosols and Vertisols, (TARI, 2002). The dominant Combretum-Terminalia vegetation species are *Cordia africana*, *Oxytenanthera abyssinica, Croton macrostachys, Acacia senegal, Boswellia papyrifera, Anogeisus leiocarpus, Tamarinudus indica, Euphorbia tirucalli, Faidherbia albida and Erythrina abyssica* as farm woodlots, scattered on farm , road sides, farm boundaries (WARD, 2014). Mixed farming system is the main livelihood of the community in the study area. The *district* has a total population of 138,858, of which 70,108 are men and 68,750 are women (CSA, 2007). The population density of the *district* is 35.99 people km^{-2}. The population of *Serako* has a total population of 4317 with 2197 male and 2120 female. There are 764 households with 656 male headed and 108 female headed resulting household.

2.2. Data collection

A total of ninety homesteads that had *Oxytenanthera abyssinica* were selected purposively from three villages. Three domestication year of *Oxytenanthera abyssinica* (less than five domestication year, five to ten domestication year and greater than ten domestication years) in total ninety, thirty plots each, as homestead agroforestry and one exclosure with nine plots were taken to compare species diversity. Data were collected at two levels; farm and sample plot from one household. Data's such as total area of homesteads and all plant species that domesticated in homesteads were taken from farm level as overall assessment and the homesteads often display a uniform of farm units which can easily take two sample plots, one representative and another random sample plot of 10*10m (100m2) for both tree and shrub species. Vegetation sampling on exclosure was done on transect lines perpendicular to the contours. A total of three line transects each with an average length of 400 m were laid at a distance of 250 m between them.

To avoid the effect of disturbances the first and the last line transects were laid at a distance of 100 m from the edges. On each line transect, three sample plots were laid at every 100 m along the transect line. The maximum number of plots per transect was 3 in the exclosure. In each plot all woody tree species with a diameter at breast height/ DBH/ > 5.00 cm and height > 3.00 m were considered as trees. In the study tree species saplings were considered with a DBH < 5 cm and DBH > 2.00 cm, and 0.50 m to 3.00 m height. Similarly seedlings were considered as those stems with DBH < 2.00 cm and height < 0.50 m (Mengustu, 2005). Diameters and heights were measured using diameter tape and graduated wooden rod, respectively. Within each sample plot, the number of individual seedlings of different species was directly counted. All woody plants with in the sample plots were identified and recorded. The woody plant species encountered in the plots were identified on spot based on own experience supported by plant knowledge of local elders and useful trees and shrubs of Ethiopia (Azene *et al*., 1993).

2.3. Data analysis

2.3.1 Species diversity

Diversity, which is synonymous with heterogeneity (Krebs, 1999), comprised species richness and evenness. Indices that combine both richness and evenness in to a single value are diversity indices. Species diversity indices were analyzed using software PAST (Hammer *et al*., 2001). Diversity has emerged as the most widely used criterion to assess the conservation potential and ecological value of a site (Magurran, 1988).

a. Shannon Wiener's diversity index

Shannon diversity index, $H = -\sum_{n=1}^{s} Pi \ln Pi$ = ………………………………………….. (1)

Where:

H = species diversity index;

ln = natural logarithm

Pi = n/N is the proportion of individuals found in the i^{th} species (ranges 0 to 1); and

n = number of individuals of a given species; N = total number of individuals found (Shannon and Wiener, 1949).

Shannon diversity index (H) is taking in to account the number of individuals as well as the number of species. Shannon diversity Varies from 0 for a community with only a single species to a high value for a community with many species, each with few individuals (Krebs, 1999). Shannon diversity index high when it is above 3.0, medium when it is between 2.0 and 3.0, low between 1.0 and 2.0, and very low when it is smaller than 1.0 (Cavalcanti and Larrazabal, 2004).

2.3.2 Species composition

The quantitative analysis was made using data from density, abundance, frequency of distribution of each species in the study sites.

a. Species density was determined by counting the number of individuals in the sample plots and converting the count into hectare basis.

b. Density of a species = $\frac{\text{Total Number of individuals of a species}}{\text{Sample size in hectare}}$

c. Species frequency = $\frac{Number\ of\ sample\ plot\ in\ which\ a\ tree\ species\ occured}{Total\ sample\ plots\ surveyed} * 100$

d. Relative Density (RD) = $\frac{Number\ of\ individuals\ of\ a\ tree\ species}{Tota\ number\ of\ individuls\ of\ all\ tree\ species} * 100$; and

e. Relative frequency (RF) = $\frac{frequency\ of\ occurence\ of\ a\ tree\ species}{Total\ frequency\ occurances\ of\ all\ tree\ species} * 100$

f. Coefficient of Jaccard (Sj) is expressed as follows:

To measure the similarity of exclosure and *Oxytenanthera abyssinica* based Homestead agroforestry of species presence and absence, the most commonly used binary similarity coefficient was used (Krebs, 1999).

Sj = $\left(\frac{c}{a+b-c}\right) * 100$-- (6)

Where: a= total number of species in exclosure site; b= total number of species in homestead Agroforestry; and c= the number of species common in the exclosure and in the homestead Agroforestry.

The range of all similarity coefficient for binary data is supposed to be from 0 (no similarity) to 1 (complete similarity) (Krebs, 1999). Then, a one-way analysis of variance (ANOVA) with a fixed effect model at $P < 0.05$ was used to see the effect of domestication of *Oxytenanthera abyssinica* based woody species diversity and area closure on species diversity, composition and abundances using SPSS Version 16.0. Treatments were further compared using Post hock Gabriel test for their average values at 5% level of probability.

3. Results and Discussion

3.1 Woody species composition and diversity in Oxytenanthera abyssinica based homestead Agroforestry system

3.1.1. Density

The total numbers of woody plant species recorded in the exclosure and in the homestead were sixty one. Overall assessment of sampled homesteads of *Serako* are generally rich in woody species where a total of 48 cultivated plants were grown with an average of 13.83 plants in less than five, 14.27 plants in five to ten and 15.97 plants greater than ten domestication year of *Oxytenanthera abyssinica* as homestead agroforestry (Table 1) when compared to the research study conducted by Zaman et al. (2010) and Islam et al. (2013) in the homesteads of Bangladesh. The most abundant species was *Cordia africana* (76.67%), followed by *Z. spina- Christi* (54.44%) and *C. macrostachys* (25.56%). The frequency of *Mangifera indica* and *Faidherbia albida* were 7.78% of the total sample, which were the least frequent species.

More than one-fourth of the density was contributed by only three species, Cordia africana, Oxythenanthera abyssinica and Ziziphus spina- Christi (Table 1). Species such as Ozoroa insignis, Grewia ferruginea, Terminalia brownie, Eucalyptus camaldulensis and Milletia ferruginea exhibited very low densities in the study area. Cordia africana has the highest relative density (19.22%) fallowed by Oxytenanthera abyssinica (15.56%) and Ziziphus spina- Christi in the exclosure (Table 1).

Table 1 Plant species composition of the Oxytenanthera abyssinica based Homestead Agroforestry system

Vernacular name	species scientific name	species family	frequency	Re.frequency	density (ha)	Re. density (ha)
Awhi	*Cordia africana*	Boraginaceae	76.67	16.91	158	19.22
Arkay	*Oxythenanthera abyssinica*	Poaceae	84.44	18.63	128	15.56
Gaba	*Ziziphus spina- Christi*	Rhamanaceae	54.44	12.01	124	15.16
Papaya	*Carica papaya L.*	Caricaceae	18.89	4.17	43	5.28
Gomoro	*Acacia polyacantha*	Fabaceae	20	4.41	39	4.74
Hanse	*Anogeisus leiocarpus*	Combretaceae	21.11	4.66	38	4.6
Tambok	*Croton macrostachys*	Euphorbiaceae	25.56	5.64	38	4.6
Nim	*Melia azedarach*	Meliaceae	12.22	2.7	20	2.44
Tsekente	*Ficus ingens*	Moraceae	10	2.21	19	2.3
Sagla	*Ficus sycomorus*	Moraceae	12.22	2.7	18	2.17
Abetere	*Ziziphus jujube*	Rhamnaceae	8.89	1.96	16	1.89
Memona	*Faidherbia albida*	Fabaceae	7.78	1.72	16	1.89
Mango	*Mangifera indica*	Anacardiaceae	7.78	1.72	14	1.76
Gonoq	*Dichrostachys cinearea*	Fabaceae	6.67	1.47	11	1.35
Aranshi	*Citrus sinesis*	Rutaceae	3.33	0.74	11	1.35
Shiferaw	*Moringa oleifera*	Moringaceae	6.67	1.47	10	1.22
Chea	*Acacia abyssinica*	Fabaceae	5.56	1.23	9	1.08
Amam gime	*Piliostigma thoningii*	Fabaceae	3.33	0.74	9	1.08
Bek. lemin	*Citrus lemon*	Rutaceae	4.44	0.98	8	0.95
Adgi zana	*Sterospermum kunthianum*	Bignoniaceae	4.44	0.98	7	0.81
Awo	*Boscia salicifolia*	unidentified	3.33	0.74	7	0.81
Hatsinay	*Gardenia lutea*	Rubiaceae	5.56	1.23	6	0.68
Lemin	*Citrus aurantifolia*	Rutaceae	2.22	0.49	6	0.68
Zeythun	*Psidium gaujava*	Myrtaceae	3.33	0.74	4	0.54
Aye	*Diospyros mespliforms*	Ebenaceae	4.44	0.98	4	0.54
Ayahada	*Dovyalis abyssinica*	Flacourtiaceae	3.33	0.74	4	0.54
Mekie	*Balanites aegyptiaca (L.) Del.*	Balanitaceae	1.11	0.25	4	0.54
Tirmi	*Acacia persiciflora*	Fabaceae	2.22	0.49	3	0.41
Guramaile	*Vangueria edulis*	unidentified	2.22	0.49	3	0.41
Gosho	*Rhamnus prinoides*	Rhamnaceae	1.11	0.25	3	0.41
Humer	*Tamarinudus indica*	Fabaceae	3.33	0.74	3	0.41
Zibe	*Dalbergia melanoxylon*	Fabaceae	1.11	0.25	3	0.41
Dima	*Adansonia digtata*	Bombacaceae	3.33	0.74	3	0.41
Tiq.berebere	*Schinus molle*	Anacardiaceae	2.22	0.49	3	0.41
Darle	*Sterculia Africana*	Sterculiaceae	1.11	0.25	3	0.41
Bus	*Jacaranda mimosifilia*	Bignoniaceae	3.33	0.74	3	0.41
Beles	*Ficus carica*	Cactaceae	1.11	0.25	3	0.41
Anqua	*Commiphora Africana*	Burseraceae	1.11	0.25	2	0.27
Daero	*Ficus vasta*	Moraceae	2.22	0.49	2	0.27
Chigono	*Albizia amara*	Fabaceae	1.11	0.25	2	0.27
Birbra	*Milletia ferruginea*	Fabaceae	1.11	0.25	2	0.27
Bahrizaf	*Eucalyptus camaldulensis*	Myrtaceae	1.11	0.25	2	0.27
Ziwawie	*Erythrina abyssinica*	Fabaceae	1.11	0.25	1	0.14
Jatrofa	*Jatropha curcas*	Euphorbiaceae	1.11	0.25	1	0.14
Atat	*Maytenus arbutifolia*	Celastraceae	1.11	0.25	1	0.14
Shitora	*Ozoroa insignis*	Unidentified	2.22	0.49	1	0.14
Weyba	*Terminalia brownie*	Combretaceae	1.11	0.25	1	0.14
Tsinkuya	*Grewia ferruginea*	Tiliaceae	1.11	0.25	1	0.14

Twenty four woody plants were found in the selected exclosure (Table 2). This finding is lower when compared with the report of Mekuria et al. (2013). This species difference may be due to difference in age of exclosure and site conditions. The most frequent woody species of the exclosure were Dodonaea angustifolia (77.78%), *Anogeisus leiocarpus* (66.67%) and *Vangueria edulis (66.67)* and *Ficus hochstettelri, Lannea fruticosa* and *Strychnos innocua* were 33.33% of the total sample.

The total densities of woody plants were encountered about 8444 individuals per hectare in the exclosure (Table 2). Most of the density was contributed by three species, *Rhus natalensis, Vangueria edulis* and *Dodonaea angustifolia*. Species such as *Dalbergia melanoxylon*, *Acacia polyacantha, Boswelia papyrifera* and *Ximenia Americana* exhibited very low densities in the study area. *Oxytenanthera abyssinica* was not found in the exclosure and this clearly shows that there was a conscious effort to domesticate the plant.

Statistical analysis displayed that there was very significant difference in density of woody plants ($P< 0.000$) between exclosure and the *Oxytenanthera abyssinica* based homestead agroforestry systems (Table 3). The higher mean value of density in the exclosure could be due to management difference which is in agreement with the result of Mastewal et al. (2006), revealed that the most abundant woody species in the 29-year old exclosure were *Dodonea angustifolia* (293 no./ha), *Acacia etbaica* (225 no./ha), and *Euclearacemosa subsp.schimperi* (207 no./ha). Density of woody plants were higher in the order of greater than ten, five to ten and less than five year of *Oxytenanthera abyssinica* based homestead agroforestry systems but, didn't show significant difference ($P<0.05$, Table 3).

Table 2: Plant species composition of the exclosure

Vernacular name	species scientific name	species family	Frequency	Re.frequency	density (ha)	Re. density (%)
Tetaelo	*Rhus natalensis*	Anacardiaceae	44.44	5.71	2033	24.22
Guramayle	*Vangueria edulis*	Unidentified	66.67	8.57	1422	16.91
Tahses	*Dodonaea angustifolia*	Sapindaceae	77.78	10	1200	14.34
Ziwawie	*Erythrina abyssinica*	Fabaceae	11.11	1.43	622	7.35
Gonoq	*Dichrostachys cinearea*	Fabaceae	33.33	4.29	589	6.98
Gaba	*Ziziphus spina- Christi*	Rhamnaceae	44.44	5.71	556	6.62
Hanse	*Anogeisus leiocarpus*	Combretaceae	66.67	8.57	311	3.68
Tiqu.berebere	*Schinus molle*	Anacardiaceae	55.56	7.14	278	3.31
Enque hibey	*Erythrina abyssinica*	Fabaceae	22.22	2.86	189	2.21
Anqua	*Commiphora Africana*	Burseraceae	11.11	1.43	189	2.21
Kirawih	*Ehretia cymosa*	Boraginaceae	11.11	1.43	189	2.21
Zengerefia	*Lonchocarpus laxiflorus*	Fabaceae	11.11	1.43	156	1.84
Ayahada	*Dovyalis abyssinica*	Flacourtiaceae	44.44	5.71	156	1.84
Sesewe	*Combretum collinum*	Combretaceae	33.33	4.29	122	1.47
Tinquaqiwe	*Strychnos innocua*	Loganiaceae	33.33	4.29	67	0.74
Digudugungi	*Lannea fruticosa*	Unidentified	33.33	4.29	67	0.74
hambohambo	*Cassia singueanea*	Unidentified	55.56	7.14	67	0.74
Afekemo	*Ficus hochstettelri*	Moraceae	33.33	4.29	33	0.37
mul-o	*Ximenia Americana*	Olacaceae	11.11	1.43	33	0.37
meqer	*Boswelia papyrifera*	Burseraceae	22.22	2.86	33	0.37
Tetem agazen	*Astralogus atropilosulus*	Unidentified	11.11	1.43	33	0.37
Awo	*Boscia salicifolia*	Unidentified	11.11	1.43	33	0.37
Gomoro	*Acacia polyacantha*	Fabaceae	11.11	1.43	33	0.37
Zibe	*Dalbergia melanoxylon*	Fabaceae	11.11	1.43	33	0.37

3.1.2. Diversity

Species diversity was higher in the exclosure as compared to that of homesteads with the mean values of 1.87 and 1.33, 1.45 and 1.57 for the exclosure and less than five, five to ten and greater than ten domestication year of *Oxytenanthera abyssinica* based homestead respectively (Table 3, $P<0.05$). This could be due exclosure was well-protected from human and livestock interference. For instance, Mastewal (2006) concluded that exclosures close to roads and villages were more susceptible to human and livestock interference than those far from roads and villages.

There was a significant difference in diversity between greater than ten and less than five year of *Oxytenanthera abyssinica* based homestead agroforestry ($p<0.05$). There was no significant difference in diversity between five to ten and greater than ten domestication year of *Oxytenanthera abyssinica* based homesteads, although greater than ten years of *Oxytenanthera abyssinica* based homesteads had greater diversity value than five to ten domestication year of *Oxytenanthera abyssinica* based homesteads ($p<0.05$).

3.1.3. Richness

The analysis of variance (ANOVA) revealed that exclosure was brought significant difference on species richness ($P< 0.000$, Table 3). Similarly, species were rich in the greater than ten years *Oxytenanthera abyssinica* based homestead Agroforestry as compared to less than five years *Oxytenanthera abyssinica* based homestead Agroforestry ($P<0.000$) level of significance. The result showed a successful restoration of woody plant species richness and diversity in area exclosure compared with the *Oxytenanthera abyssinica* based homestead agroforestry systems which are in line with the studies of Birhane (2002) and Mengustu (2005).

3.1.4. Evenness

Although there was slight difference in numerically, no significance difference was showed ($P=0.39$, Table 3) on species evenness among the exclosure and different aged homestead agroforestry systems. Our finding is in line with the study of Mekuria et al. (2013) reported that no significant difference ($p<0.05$) in evenness value between any of the exclosures ages and the adjacent communal grazing lands.

The evenness values are high to justify uniformity in composition of woody plant species between homestead agroforestry systems than exclosure. This may be due to farmers manage equally multi-functional woody plants than exclosure. The slight decrease in evenness value in exclosure may be due to high species interaction that leads to species competition. Though there were differences in altitude of farms significantly ($P=0.005$), they didn't affect composition and diversity of trees.

Table 3: Comparisons of woody plant diversity in the exclosure and homestead agroforestry systems

Parameters	Exclosure	Less than five	Five to ten	Greater than ten	P value
Density	1622.2 [a]	740 [b]	816.67 [b]	923.33 [b]	0.000
Diversity	1.87[a]	1.33[b]	1.45[bc]	1.57[c]	0.001
Richness	7.78[a]	4.27[b]	4.73[bc]	5.37[c]	0.000
Evenness	0.85 [a]	0.91 [a]	0.91 [a]	0.92 [a]	0.39
Biophysical					
Altitude		1388 [b]	1401 [a]	1384 [b]	0.005
Slope		7.43 [a]	8.83 [a]	9.03 [a]	0.60

3.1.5. Species similarity

Table 4 indicated that, the lowest mean value of Jaccard similarity coefficient was recorded in the exclosure. In spite of the relatively lower value of Jaccard similarity coefficient in the exclosure, there was no significant difference (p=0.3). Similarity difference between exclosure and the three homestead agroforestry systems to some extent might have resulted from the management. Farmers could domesticate species in their homesteads based on different functional groups. Such as species that have feed, fodder, timber and other values simultaneously.

Table 4: Jaccard similarity coefficient between the study sites

Study sites	>10 old age	<5 old age	5-10 old age	Exclosure
Mean	0.44[a]	0.43 [a]	0.40 [a]	0.16 [a]
P value	0.33	0.33	0.33	0.33
LSD	0.384			

Means with the same letter are not significantly different

4. Contribution of functional groups of woody plants in selected homesteads

From the recorded 61 species, 13 different main uses were identified: 31 species were timber (32%), 16 plants of feed (17%), 14 species of fruit producing species (15%), 13 species of firewood (13%), 6 medicinal plants (6%), 4 species of live fence (4%), 3 ornamental species (3%), 3 species of honey bee flora (3%), and 2 species of cultural value (2%) (Fig 3).

It should be noted that single species can have multiple functions.

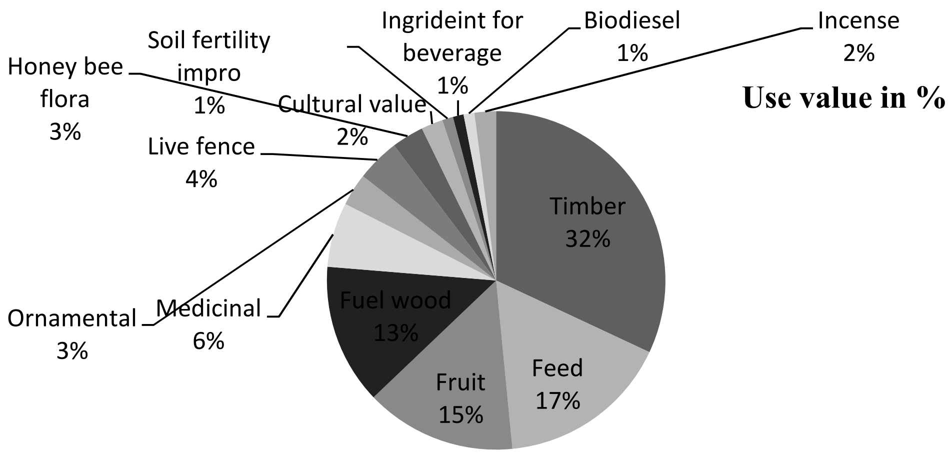

Fig 4: percent of functional groups of woody species of the study area

5. Conclusion

This study concludes that *Oxytenanthera abyssinica* based homesteads agroforestry system can be considered as a means to conserve companion woody plant species and enhance socioeconomic well being of the study area. Density, diversity and richness were higher in the exclosure as compared to that of *Oxytenanthera abyssinica* based homestead Agroforestry systems. Diversity and richness was significantly higher in the greater than ten year compared to less than five year *Oxytenanthera abyssinica* based homestead agroforestry systems. Species dissimilarity was not significant among exclosure and the three homestead agroforestry systems. *Oxytenanthera abyssinica* was not found in the exclosure, showing a distinct conscious selection for planting in the homesteads as agroforestry system.

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