Vegetation structure and floristic composition of Gergeda Anfillo Forest, West Ethiopia

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ABSTRACT

Ethiopia is a tropical country with tropical, subtropical and temperate types of vegetations. However, many vegetation types are not described and characterized. The aim of this study was to assess the floristic composition and structure of the protected Gergeda Anfillo Forest vegetation. The forest was located in Kellem Wollega Zone, southwestern Ethiopia. Stratified sampling method was used for vegetation data collection. Samples were taken from 40 quadrats of 20 m x 20 m (for woody species) that were laid along transect laid about 200 m apart. 120 subplots (1 m x 1 m) were used for herbs in the main plots. A total of 134 (11 endemic) species, 116 genera, and 61 families were recorded. The five most dominant tree species with highest importance value index were *Schefflera abyssinica, Ekebergia capensis, Albizia gummifera, Croton macrostachyus*, and *Olea welwitschii.* The most abundant families were Fabaceae (14 species), Poaceae (11 species), Asteraceae (10 species), and Euphorbiaceae (7 species). Moreover, the forest housed 10 of the 24 national priority tree species and four plant communities were identified by cluster analysis. Structural analysis revealed that the forest is dominated by small sized trees and shrubs. This indicates that the forest is facing selective cutting and/or it is in secondary stage regeneration. Given the non-seasonal climate, less differentiated communities, and high plant diversity, it is possible to conclude that the forest can be categorized as tropical rainforests of western Ethiopia. Thus, protection of the forest is highly recommended.

Key words: Ethiopia, Floristic, Tropical Forest, Vegetation Structure

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INTRODUCTION

The floristic diversity of Ethiopian is appreciated for having more than 800 endemic species, center of origin and/or diversification of globally important crops (IBC, 2012). However, the country is frequently alighted for the diminishing vegetation cover. Because of increasing demand for farmlands, fire wood and livestock feed there was a widespread deforestation (Chaffey, 1980; Million Bekele and Leykun Berhanu, 2001; Feyera Senbeta and Demel Teketay, 2003; Teshome Soromessa *et al.,* 2004). According to Ensermu Kelbessa *et al.* (1992), the limited income generation opportunities had forced the Ethiopian farmers to cultivate and graze marginal lands, which catalyzed the environmental degradation vicious circle.

Loss of forest resources would have negative impacts on ecosystem services, biodiversity conservation (Zerihun Woldu, 2008) as well as socio-economic wellbeing's. Ecosystem disruptions have already threatened a number of plant species (Ensermu Kelbessa *et al.,* 1992). Of course, loss of forest cover and biodiversity due to human-induced activities is an alarming concern in many

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parts of the world (Petman *et al*., 2001; Feyera Senbeta and Demel Teketay, 2003, Vivero *et al*., 2006). To alleviate the global and regional losses, due attention has to be given to the establishment of natural reserves (WCMS, 1992; Fashing *et al*., 2004).

There were many studies of tree community structure and composition which have been conducted throughout the tropics to document and explain the patterns of tree diversity found in the earth's tropical forests (Pitman *et al*., 2001, Reyers, 2004). One outcome of these studies has been the realization that tropical forest tree community structure and composition varies widely not only between forests on different continents (Phillips *et al*., 1994), but also between forests on the same continent (Ter Steege *et al.*, 2000) and even between different sites within the same forest (Proctor *et al.*, 1983).

The highland vegetation of Ethiopia has an altitude of above 2500 m a.s.l., covers 40% of the country (EFAP, 1994; Demel Teketay, 1999; Zerihun Woldu, 1999) and has forests in need of protection to avert biodiversity losses. Gergeda Anfillo Forest was one of such state forests proposed in 1975 as a National Forest Priority Areas (NFPAs) of Ethiopia (EFAP, 1994). It is found in the relatively good forest cover in the southwestern Ethiopia. According to Yonas Yemishaw (2002), all of the NFPAs, are invariably under extreme pressure from settlement, land-use change or conversion in to farming and grazing, coffee plantation by the local community, excessive wood harvesting, and neglect in terms of forest management and protection. Moreover, the protected areas have not been given due consideration by decision makers and NFPAs are left to the interests of other stakeholders, especially communities who are dependent on the local resources and looters (Feyera Senbeta and Demel Teketay, 2003).

Botanical assessments of floristic composition and structural studies are essential in understanding the extent of plant diversity and health of forest ecosystem (WCMC, 1992). The availability of up-to-date data on forest resources is an essential requirement for forest management planning and sustainable resources utilization (FAO, 2007). Even though, there are some general vegetation surveys during the NFPAs selection, perhaps because of its relative remoteness of its location, Gergeda Anfillo Forest was not studied before. Though, the forest has been under protection, its plant diversity and vegetation structure has to be studied for proper protection and monitoring.

Thus, this study was designed to make investigations on floristic diversity and related forest attributes of the Gergeda Anfillo Forest. The objectives were to document the floristic composition; identify plant communities; and to determine vegetation structure of the forest.

MATERIALS AND METHODS

Description of the study area

The study area is located in Duli kebele, Anfillo District, Kellem Wollega zone, Oromia Regional State, Ethiopia (Figure 1). It is located about 672 km west of Addis Ababa, 35 Km northwest from zonal capital, Dembidolo and 20 Km east of Mugi town which is the capital of the district. It covers an area of 2518 ha.

The study site is a wet forest with annual mean rainfall of 913.80mm and all month's with moisture surpluses. As the climadiagram indicated the

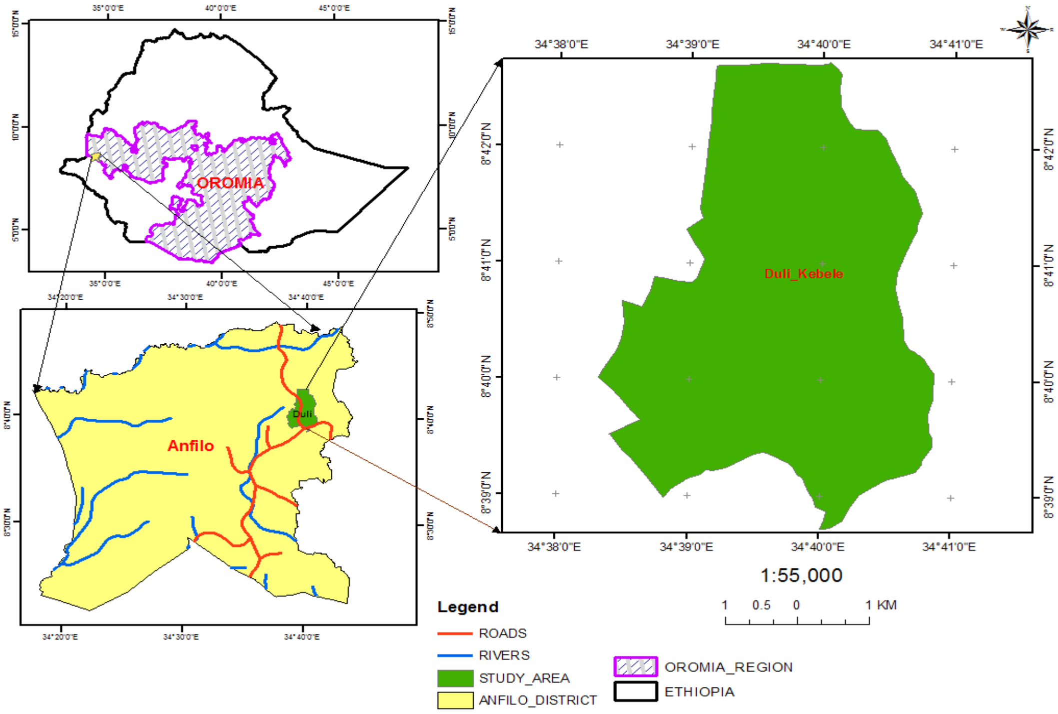

Figure 1: Location map of the study area in Amfilo District of the Oromia Regional State

rainfall is unimodal and temperature is constant throughout the year. This climadiagram (Figure 2) resembles the tropical rainforests rather than the other parts of Ethiopia. However, the temperature is relatively lower than rainforests. This could be explained by the higher altitude of the study area. Climadiagram of the study area was drawn using ten years data of the Anfilo Metrological Station (Figure 2).

Vegetation data collection

Reconnaissance survey was conducted from November 8-12/2012 in order to obtain an impression of the site condition and to determine the sampling methods to be used for vegetation data collection.

Stratified sampling method was used as described by Kent and Coker (1992). A total of 40 (20

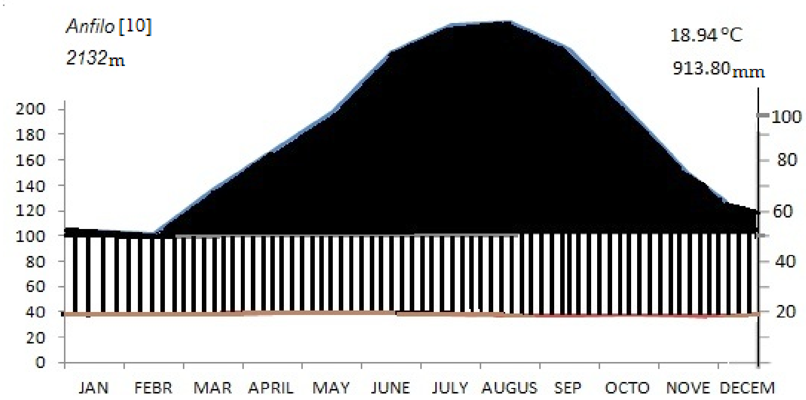

Figure 2. Climadiagram of Gergeda Anfilo area based on Walter, 1985 (Data Source: National Meteorological Agency, Addis Ababa)

m x 20 m) and 120 (2 m x 2 m) sub-quadrats for woody and none woody plants sampling were used respectively. The method adopted in the phytosociological study was according to the Zurich- Montpellier School. It is based on listing the species occurring in sample square quadrats which were laid along transects lines downhill (altitudinal) gradient and strata were chosen to represent homogeneous vegetation units. The total plots were decided as no new species appear by adding plots (Braun-Blanquet, 1932; Blackman, 1935).

Environmental variables such as altitude and geographic coordinates (latitude and longitude) were taken from the center of each main plot using Geographical Positioning System (GPS). For drawing the climadiagram of the study area ten years (2003 to 2012) data were collected from the office of National Metrological Agency, Addis Ababa. A complete list of plants was recorded from species falling in quadrates, herbarium specimens collected and percent cover of species visually estimated then converted into cover abundance values by the modified 1-9 Braun-Blanquet scale (van der Maarel, 1979). Vernacular names of species were recorded during field work. Identification and nomenclature were based on Flora of Ethiopia and Eritrea (Edwards *et al*., 1995, 1997, 2000; Hedberg *et al*., 1989, 2003). The endemic species and level of threats was based on Ensermu Kelbessa *et al*. (1992) and Vivero *et al* (2005, 2006). Diameter at Breast Height (DBH) of all woody plants having diameter greater than two centimeters measured using a meter tape. Height was estimated by Santo-Clinometers and using calibrated stick.

Data analysis

Vegetation classification was done by using SPSS-version 20 software. Every species was given two figures, the first expressing its abundance-dominance, and the second its sociability. These lists of quadrats were then tabulated in tables of 'presence' or occurrence, from which the species are classified together according to their affinities and fidelity into communities of different types. Community names were given after characteristic species that were easily observed in the forest.

Shannon-Wiener (Magurran, 1988) index of species diversity was used to evaluate diversity. Shannon's Evenness (E) calculated from the ratio of observed diversity to maximum Shannon-Wiener diversity (Kent and Cooker, 1992). The similarity of vegetation types with regard to species composition was assessed using Sorensen's coefficients as described by Grieg-Smith (Kent and Coker, 1992). Density, frequency, height, diameter at breast height (DBH), species importance value (SIV) and basal area were calculated as Kent and Coker (1992) and Muller-Dombois and Ellenberg (1974).

$$\text{Fequency (\%)} = \frac{\text{Number of quadrates in which the species occurred}}{\text{Total number of quadrates studied}} * 100$$

$$\text{Relative frequency} = \frac{\text{Number of occurrence of the species}}{\text{Number of occurrence of all the species}} * 100$$

$$\text{Abundance} = \frac{\text{Total number of individuals of a species in all quadrats}}{\text{Total number of quadrates in which the species occurred}}$$

$$\text{Density} = \frac{\text{Total number of individuals of a species in all quadrates}}{\text{Total number of quadrates studied}}$$

$$\text{Relative density} = \frac{\text{Number of individuals of the species}}{\text{Number of individuals of the species}} * 100$$

$$\text{Relative dominance} = \frac{\text{Total basal area of the species}}{\text{Total basal area of all the species}} * 100$$

The total basal area was calculated from the sum of the total diameter of immerging stems. In trees, shrubs and saplings, the basal area was measured at breast height (1.5m) and by using the formula

$C = \pi d$ Where C = circumferece and d = diameter

Species Important Value (SIV) combines data from three parameters, which include Relative Frequency, Relative Density and Relative Basal area (Kent and Coker, 1992). Importance value index is the most realistic aspect in vegetation study and used to compare the ecological significance of species (Lamprecht, 1989).

Shannon-Wiener index (H') as Magurran (1988): $H' = -\sum P_i \ln P_i$ Where: P = proportion of each species.

The vertical structure of the woody species occurring in the Gergeda Anfillo Forest was analyzed using the International Union Forestry Research Organization (IUFRO) classification scheme (Lamprecht, 1989). The scheme classifies the storey into upper, where the tree height is greater than 2/3 of the top height; middle, where the tree height is in between 1/3 and 2/3 of the top height and the lower storey where the tree height is less than 1/3 of the top height.

RESULTS AND DISCUSSION

Species composition of Gergeda Anfillo Forest

A total of 134 species from 116 genera and 61 families were documented. Of these, endemic species accounted for 8.2% of the total floristic composition. The most dominant families were Fabaceae, comprising 14 species, Poaceae (11 species), Asteraceae (10 species), Euphorbiaceae (7 species), Celastraceae and Oleaceae (each with 4 species). The remaining families were comprised of three or less number of species. Structurally, plants were 36.56% trees, 26.12% herbs, 20.14% shrubs, 12.68% climbers, 2.24% grasses, and 1.49% epiphytes.

Eleven of the identified plants were endemic to Ethiopia (Table 1) and the forest housed 10 of the 24 national priority tree species listed by EFAP (1994). The trees were: *Albizia gummifera, Celtis africana, Cordia africana, Croton macrostachyus, Ekebergia capensis, Juniperus procera, Olea welwitschii, Pouteria adolfi-friederici, Prunus africana,* and *Syzygium guineense* subsp. *afromontanum.*

Table 1. Endemic plant species of Gergeda Anfillo Forest

No.	Scientific name	Family	Habit	Status
	Bidens ghedoensis	Asteraceae	Herb	LC
	Cirsium dender	Asteraceae	Herb	VU
	Echinops kebericho	Asteraceae	Herb	VU
	Echinops longisetus	Asteraceae	Herb	LC
	Erythrina brucei	Fabaceae	Tree	LC
	Lippia adoensis	Verbenaceae	Herb	LC
	Maytenus addat	Celastraceae	Shrub	NT
	Millettia ferruginea ssp. ferruginea	Fabaceae	Tree	LC
	Solanecio gigas	Asteraceae	Herb	LC
	Tiliacora troupinii	Menispermaceae	Climber	VU
	Vernonia leopoldi	Asteraceae	Shrub	LC

Key: LC = Least Concern; NT = near threatened; VU = Vulnerable

Vegetation community classification

The vegetation classification statistics using SPSS-20 revealed four clusters and two outliers (Figure 3). The clusters identified the four plant communities. In all observed plant communities, species with higher relative abundance and relative frequency are those that were easily observable and repeating themselves in associations. Thus the identified groups are more or less coinciding with the natural associations that anyone can observe. The four communities were named after the characteristic tree and/or shrub species and described below.

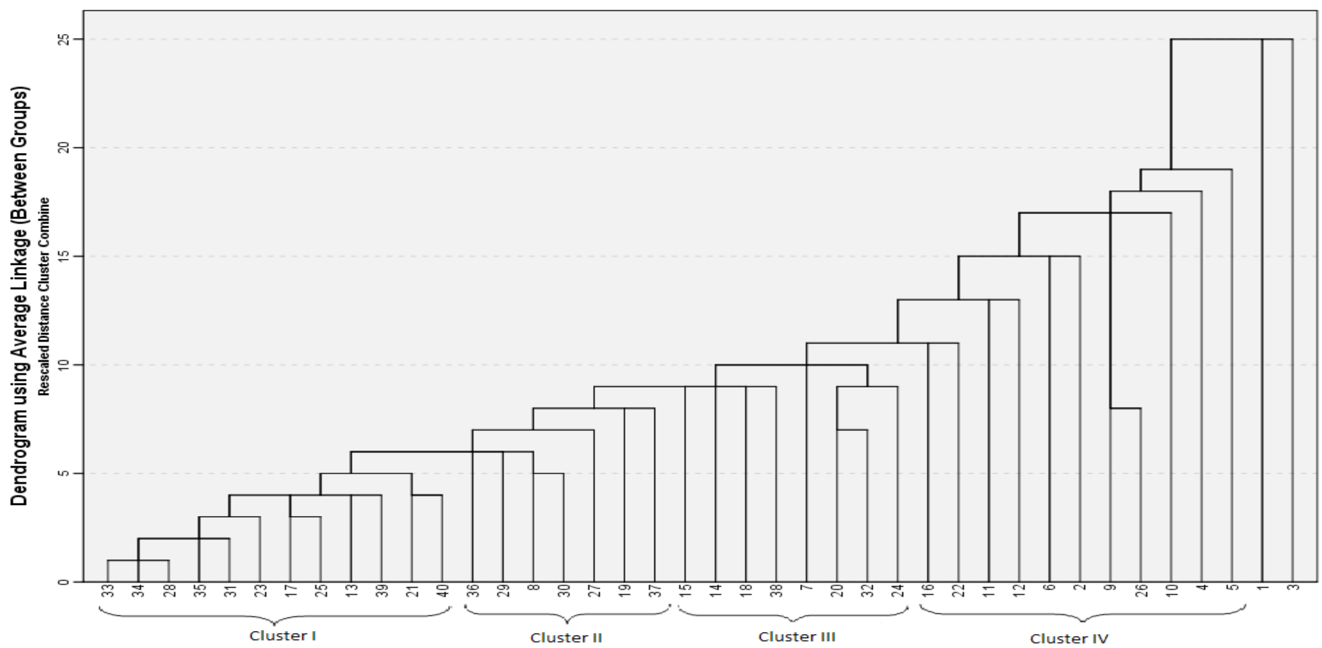

Figure 3. SPSS classification Dendrogram showing community types and two outliers (numbers along X-axis are quadrats)

Community type I: ***Allophylus abyssinicus – Maytenus udata***

This community is located between 1960 and 2314 m a.s.l. It is encountered in 12 relives' (31.58%) inhabited by 66 species. The community had five indicator species (*Myrsine africana, Macaranga capensis, Jasminium abyssinicum, Budleja polystachya* and *Cirsium dender*). The dominant woody species of the shrub layer are: *Dombeya torrida, Euphorbia ampliphylla, Erythrococca trichogyne, Bersama abyssinica, Maesa lanceolata, Schorebera alata, Ekebergia capensis, Allophylus abyssinicus, Arundinaria alpina, Acanthus eminens, Dalbergia lactea, Pterolobium stellatum,* and *Ricinus communis.* The ground cover species are *Rumex abyssinicus, Hypoestes forskaolii, Galium spurium, Eragrostis superba,* and *Cirsium dender*. The climbers in this community are *Stephania abyssinica*, *Hippocratea africana, Embelia schimperi* and *Periploca linearifolia*.

Community type II: *Pouteria adolfi- fredericii– Schefflera abyssinica*

This community type is situated at altitude between 1942 and 2312 m a.s.l. It comprises 7 relives' (18.42 %) and 82 species belong to this community. Compared to the other communities, this community has the largest number of plots distributed all over the forest and contains 82 species. The indicator species of this community are *Erythrococca trichogyne, Entada abyssinica, Clutia abyssinica, Bidens ghedoensis* and *Apodytes dimidiata. Pouteria adolfi-friederici, Schefflera abyssinica, Olea welwitschii* and *Albizia schimperiana* are dominant emergent trees of this community type. Shrubs like *Albizia grandibracteata, Calpurnia aurea, Carissa spinarum, Clutia abyssinica, Grewia ferruginia, Maesa lanceolata, Maytenus undata* and *Vernonia auriculifera* are also common in the forest. *Landolphia buchananii, Hippocratea goetzei* and *Jasminum abyssinicum* are climbers of this community. The herb layer is composed of *Argomuellera macrophylla, Asparagus africanus, Setaria megaphylla, Plantago lanceolata* and *Girardinia bullosa.*

Community type III: *Croton macrostachyus – Syzygium guineense*

The dominant species (mainly based on cover abundance value) in this type is *Croton macrostachyus* and *Syzygium guineense*. This community type is distributed between the altitude between 2206 m and 2306 m a.s.l and found in 8 quadrats (21.05%) containing 69 species. It is dominated by small trees and shrubs which show there is disturbance in the community. It is dominated by *Syzygium guineense, Mimusops kummel, Croton macrostachyus, Ehretia cymosa,* and *Macaranga capensis. Erythrococca trichogyne* and *Ficus vasta* are the two indicator species found in the community. The shrub layer is dominated by *Galiniera saxifraga*, *Maytenus addat* and *Dracaena steudneri*. The ground layer includes *Hypoestes forskaolii, Ricinus communis, Galium Spurium.* A climber *Periploca linearifolia* is also one of the dominant species in the community.

Community type IV: *Millettia ferruginea – Clematis simensis*

This community type lies along the altitudinal range of 2267 to 2298 m a.s.l. and found in 11 relives (28.95 %). This community is dominated by the woody climber, i.e. *Clematis simensis*. The other indicator species with significant indicator values are *Dracaena steudneri, Cyperus distans, Euphorbia ampliphylla* and *Dalbergia lactea. Albizia gummifera, Allophylus abyssinicus, Apodytes dimidiata, Cassipourea malosana, Ekebergia capensis, Entada abyssinica* and

Erythrococca trichogyne are the dominant tree species in the community. The associated shrub species in this community type include *Acanthus eminens, Justicia schimperiana, and Vernonia amygdalina* and climbers found in the community are *Tiliacora troupinii, Hippocratea goetzei, Urera hypselodendron*, and *Landolphia buchananii*.

Species diversity of communities

As it can be seen from Table 2, the study area not only shows species richness but also shows very good Shannon –Wiener Diversity and evenness.

among communities. The highest similarity (least dissimilarity) was observed between communities 1 and 4 (35.2%) followed by community 2 and 4(33.9%) and community 2 and 3(32.7%) due to the communities having close altitudinal similarity and adaptation. Though the similarity coefficients are small (< 50%), they indicate the existence of ubiquitous species with a wide range of tolerance.

The least similarity (highest dissimilarity) was observed between community 3 and 4 (26.4%), followed by community 1 and 2 and community 1 and 3. i.e., 30.2% and 31.5%, respectively (Table 3); this may be due to conservational variation and variation in disturbance due to anthropogenic activities, i.e., one area which is better protected varies from the one which is highly exposed to deforestation resulting in communities variation.

Table 2: Shannon-Wiener diversity index

Communities	Altitude (m a.s.l.)	Species richness	Diversity index (H')	H'max (Ln S)	Evenness (H'/H'max)
Community 1	1960 - 2314	66	3.331	4.190	0.794
Community 2	1942 - 2312	82	3.532	4.407	0.801
Community 3	2206 - 2306	69	3.381	4.234	0.798
Community 4	2267 - 2298	71	3.591	4.263	0.842

Similarity between plant communities

In order to determine the similarities among plant communities of the study area, similarity ratios were computed following Sorensen`s similarity coefficient (Table 3). Based on this, similarity in species composition slightly varied

Table 3. Sorensen's coefficient of similarity index among communities

Communities	1	2	3
1			
2	0.302		
3	0.315	0.327	
4	0.352	0.339	0.264

Vegetation structure

a) Vertical structure

The tallest tree observed in Gergeda Anfillo Forest was *Pouteria adolfi-fredericii* with 40 m height. Trees in the lower, middle and upper storey were with height range < 13.3 m, 13.3-26.6 m and >26.6 m, respectively. The emergent tree species that occupied the upper storey in Gergeda Anfillo include *Pouteria adolfi-friederici, Albizia gummifera, Croton macrostachyus, Prunus africana, Olea welwitschii, Ficus sur, Schefflera abyssinica,* and *Albizia schimperiana.* In addition, the upper storey had low ratio of individuals to species (Table 4).

The middle layer of Gergeda Anfillo Forest was occupied by species like *Bersama abyssinica*, *Syzygium guineensis, Mimusops kummel, Pittosporum viridiflorum, Maytenus undata, Dombeya torrida, Allophylus abyssinica, Terminalia macroptera, Senna petersiana, Millettia ferruginia,* and *Acacia abyssinica.* The lower storey was largely dominated by shrubs and small trees such as *Clausena anisata, Vernonia amygdalina, Dracaena steudneri, Arundinaria alpina, Grewia ferruginea, Maytenus addat, Maesa lanceolata, Vernonia auriculifera, Myrsine africana,* and *Euphorbia ampliphylla.*

It is important to note that the highest proportion of species was concentrated in the lower storey (61.96%) followed by the middle (26.07%) and upper storey (11.85%) of the vertical structure of the Gergeda Anfillo Forest (Table 4). Similar result was also observed by Ensermu Kelbessa and Teshome Soromessa (2008) in which few species attained the upper story in Bonga Forest.

b) Vegetation height and DBH classes

The height and Diameter at Berst Hight (DBH) graphs were more or less inverted J–shape (Figure 4.) with rogation power curve fitting of $R^2 > 0.8$. When taken together, like the frequency distribution of the DBH classes, the height classes almost attained a regular (normal) distribution pattern except for the last height class that was represented by individuals forming the upper canopy of the forest. More number of individuals per hectare found in lower height and DBH classes, which contributed to larger proportion (42.53%) for height class one. This could suggest that the Gergeda Anfillo Forest is dominated by lower heighted individuals. Such patterns commonly referred to as reverse J-shape distribution showing stable population structures, but there would be variation with respect to individual species when it was analyzed separately.

Table 4. Density, Species number, and individuals to species ratios by story

Story	Height (m)	No of stems	%	No of species	Ratio (individuals/ ha)
Lower	2.50-13.33	599.02	61.96	32	18.7:1
Middle	13.33-26.60	261.67	26.07	23	11.3:1
Upper	>26.60	25.45	11.85	8	3.0:1

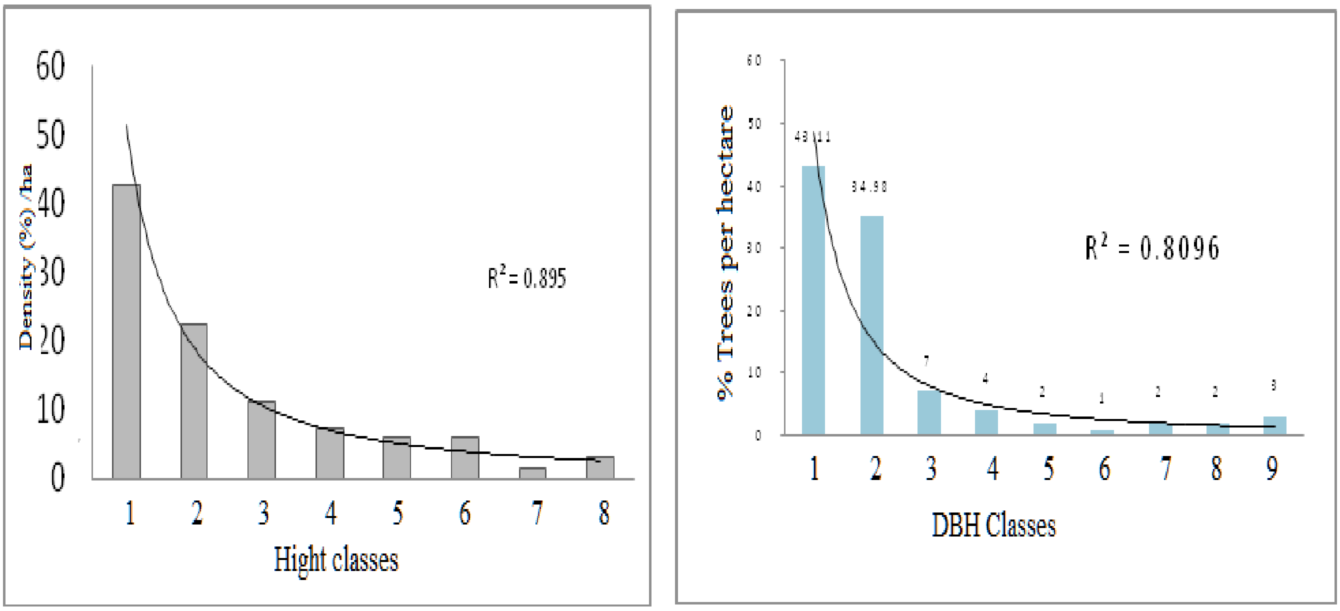

Figure 4. Density (%)/ha of tree/shrub in different height classes (Above) and DBH classes (Left)

Similar height patterns were reported from Chilimo and Menagesha Forests from central plateau of Ethiopia (Tamirat Bekele, 1994), from Denkoro Forest (Abate Ayalew *et al.*, 2006) and from Menagesha Amba Mariam Forest (Abiyou Tilahun, 2009). The highest tree distribution in the lowest height class implies that the forest has been heavily influenced by anthropogenic activities and/ or selective cutting. The dominance of small sized individuals is an attribute of good regeneration potential, indicating the history of anthropogenic disturbances such as deforestation and grazing.

While about 77.64% of the individuals are found in the first two DBH classes (2.1-10 and 10.01-20 cm), the remaining 7 classes altogether account only 22.34%. This shows that Gergeda Anfillo Forest has a similar pattern observed in Dindin Forest (Simon Shibru and Girma Balcha, 2004), and in Menagesha Amba Mariam Forest (Abiyou Tilahun, 2009). The patterns indicate that the vegetation has good production potential, but it has a relatively low recruitment which might have accounted for the existence of selective cutting of large tree individuals.

c) Basal area

The total basal area of the forest is 40.94 m^2 ha^{-1}. There is a considerable decrease in number of individuals with increasing DBH size and basal area. Individuals that attained higher DBH classes are fewer in number while they contributed over 77.69% to the total basal area. The density distribution of tree species does not follow the patterns of basal area with a polynomial curve fitting R^2 = 0.89 (Figure 5). For example, species such as *Schefflera abyssinica* and *Pouteria adolfi-fredericii* having the highest basal area do not necessarily have the highest density. More or less similar results were observed for natural conditions in Wof-Washa (Tamirat Bekele, 1994) and in Masha-Anderacha (Kumilachew Yeshitila and Taye Bekele, 2003).

Height class could reflect the different growth phases or ages of tree species, the stratification and stage of forest succession. Height is a good indicator of the role of species that determines the vertical structure of the stand (Pascal and Pelissier, 1996). Thus, tree that were found in sampling plots were classified into eight height classes.

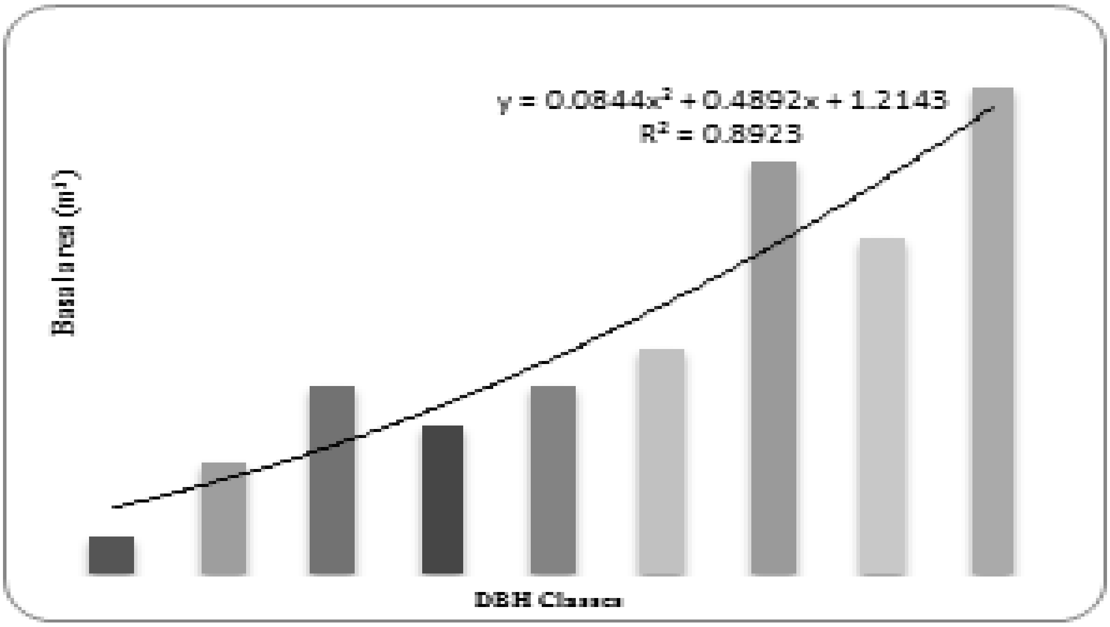

Figure 5. Basal area distribution over DBH classes in Gergeda Anfillo Forest

Species Importance Value (SIV)

In the current study, high SIV was obtained for twenty five tree species. The top ten species are: *Schefflera abyssinica*, *Ekebergia capensis, Albizia gummifera, Croton macrostachyus, Olea welwitschii, Erythrococca trichogyne, Ficus sur, Cordia africana, Dombeya torrida* and *Pouteria adolfi-Frederic* (Table 5). The relative importance of tree species in a forest can better be depicted using measurements of basal area instead of stem counts (Cain and Caston, 1959 cited in Tamirat Bekele, 1994). Therefore, species with the largest contribution in basal area can be among the most important woody species in the forest.

Species importance indicates the relative ecological importance of species in the forest and it is expressed by SIV. The greatest SIV reflects the degree of dominance and abundance of a

Table 5. Top ten plant species in Species Importance Value (SIV) and their rank

No	Species	RD	*RF*	RDe	SIV	Rank
1	*Schefflera abyssinica*	4.13	1.40	1.71	7.24	**1st**
2	*Ekebergia capensis*	4.39	1.21	1.31	6.92	**2nd**
3	*Albizia gummifera*	3.25	1.68	1.62	6.55	**3rd**
4	*Croton macrostachyus*	2.88	1.68	1.91	6.47	**4th**
5	*Olea welwitschii*	4.32	0.93	1.08	6.34	**5th**
6	*Erythrococca trichogyne*	4.76	0.93	0.40	6.09	**6th**
7	*Ficus sur*	3.59	1.21	0.50	5.31	**7th**
8	*Cordia africana*	4.15	0.56	0.43	5.14	**8th**
9	*Dombeya torrida*	1.44	1.40	2.29	5.13	**9th**
10	*Pouteria adolfi- fredericii*	0.92	2.06	2.14	5.12	**10th**

Key: RD = Relative Dominance; RF; Relative Frequency; RDe =Relative Density & SIV= Species Importance Value given species in comparison to other species in the area. It also is used for setting priority /ranking species management and conservation practices. Furthermore, it helps to identify the sociological status (structure) of species in a certain plant community (Kent and Coker, 1992).

CONCLUSION

The vegetation of Gergeda Anfillo Forest showed the glimpse of rich plant diversity of south-western Ethiopia. The study area had high (>100) species composition. It had also good richness of genera and families. Of the recorded species, 11 are found to be endemic. The forest had four plant communities that were less differentiated along altitudinal gradients, indicating the undifferentiated nature of the forest. The mid-altitude community (community II) exhibited the highest richness while community IV which was found at high altitude showed the highest diversity. Given the non-seasonal climadiagram, high plant diversity, structural complexity and less differentiated communities, it is possible to conclude that the Gergeda Anfillo Forest showed the glimpse of tropical rainforest of western Ethiopia. Moreover, the forest can be considered as an important site for national biodiversity conservation. As the forest is a vital national resource, we recommend the conservation of forest biodiversity. Moreover, further investigations, particularly on ethnobotany, soils, and detailed ecology of the forest, are required.

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