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Floristic Composition, Structure and Regeneration Status of Woody Plants in Nono Sele Forest, Ilubabor Zone, Southwest Ethiopia

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Abstract: The Moist Evergreen Afromontane rainforest, which grows at altitudes of 1500 to 2600 m, dominates the forest vegetation in the highlands of Ethiopia. It is consequently critical to have a thorough understanding of particular vegetation's floristic composition, structure, and relationships in environmental elements that surround this thing. The investigation had been carried out on Nono Sele Forest in the Ilubabor Zone of Oromia National Regional State, in the south-west of Ethiopia, with the objective of deciding the vegetation structure, community type, as well as natural regeneration condition for woody species in the forest. A systematic sampling procedure was used to gather vegetation data. To cover most of the representative of the forest, a total of forty-six plots of 400 m^2 (20 m x 20 m) for trees, within the main quadrat sub-plots of 25 m^2 (5 m x 5 m) for shrubs, herbaceous and climber species, at each corner of the main plots and in the center, five 1 m^2 (1 m x 1 m) for saplings and seedlings of woody plant species. Within the Nono Sele forest, Rubiaceae, Asteraceae, Fabaceae, Celesteraceae, and Euphorbiaceae, are among the richest plant families in the current study. The vegetation was grouped into three different plant community types. Nono Sele Forest is structurally is highly represented by young sized woody species. The forest is also identified by fair regeneration condition, as demonstrated by the fair density of seedlings as well as saplings for the preponderance of the woody species.

Keywords: Nono Sele Forest, Plant Community, Regeneration, Structure

1. Introduction

As a result of belonging to vast scope of elevation as well as high physical heterogeneity, Ethiopia is an important regional hub for biological diversity resources, with high and rocky mountains, flat-topped plateaus and deep gorges, incised river valleys, and rolling plains [31]. Natural vegetation is one of these resources, with floristic and faunistic life forming dynamic ecosystems. Various authors, such as the author [10] have contributed significantly to the description of Ethiopian vegetation types. The research [2] are of the most important vegetation surveys conducted in Ethiopia, with the goal of characterizing community types and their interactions with natural and anthropogenic factors.

Friis, I. et al. [12] categorize Ethiopian vegetation into twelve (12) categories. The following twelve vegetation types have been identified: 1. desert and semi-desert scrubland; 2. Acacia-Commiphora woodland and bushland; 3. Western Gambela wooded grassland; 4. Combretum-Terminalia woodland and wooded grassland; 5. dry evergreen Afromontane forest and grassland complex; 6. moist evergreen Afromontane forest; 7. transitional rain forest; 8. Ericaceous belt; 9. Afroalpine vegetation. 10. riverine vegetation; 11. freshwater lakes, lakeshores, marshes, swamps and floodplains vegetation; 12. salt-water lakes, lake shores, salt marshes, and plant vegetation. The moist evergreen Afromontane forests of this habitat can be found at altitudes between 1500 and 2600 meters on the south-western plateau and in the south-western part of the south-eastern highlands. Accordingly, Ethiopia's moist evergreen afromontane forest includes the Nono Sele forest.

As a result of the inhabitants' need for agriculture and grazing pastures, Ethiopian vegetation, particularly forest resources, is under severe stress. In Ethiopia's highlands, where most of the country's huge mountain massifs are over 1500 meters, forest resources are rapidly dwindling [26]. Even though a number of reasons contribute to the degradation of Ethiopia's natural forests, agricultural expansion is most likely the driving driver Woldemariam (2003). This will lead to the extinction of biodiversity resources as well as their ecosystems [24].

Furthermore, forest loss causes physical damage to ecosystem, resulting in soil deterioration, erosion, and the change of natural resources. Because the forest provides food, household energy, construction and agricultural materials, tourism and recreation benefits, and medicine, its removal would have an influence on the communities' socio-economic structure [15]. As long as, determining the population structure and regeneration state is required in order to build effective forest resource conservation and management [25].

Forests in southwestern Ethiopia cover a large biological gradient and come in a variety of shapes and sizes. The Moist Evergreen Afromontane rainforest, which grows at elevation of 1500 to 2600 m, dominates the forest vegetation in the highlands, while transitional rainforests (500–1500 m) dominate the plains. These forests are home to a variety of indigenous plants as well as wild populations of *Aframomum corrorima, Coffee arabica*, and *Piper capense*, which are significant plants for food and agriculture. *Coffee arabica* is the world's most popular coffee, while *A. corrorima* and *P. capense* are key origin of spices used in cooking.

Ecological research of a forest's species composition and vegetation structure is essential for determining the types of species present, identifying commercially and ecologically useful plant species, and identifying the most endangered plant species for management and conservation [28]. Several forest research has been undertaken during past. However, there is a scarcity of knowledge on the floristic composition and variety of woody species at Nono Sele area Forest. This Study was started to give fundamental information regarding the floristic composition, structure, and regeneration state of the Nono Sele forest, which provides significant ecological benefits and socioeconomic values to the local households. Describe the floristic composition, major woody plant community type, structure, and regeneration status of woody plants in the Nono Sele forest, South West Ethiopia.

2. Materials and Methods

2.1. Description of the Research Area

The research was excute in the Nono Sele forest, some 700 kilometers south West of Addis Ababa (between 7°40' and 8°9.5' N and 34°55.5' and 35°27' E). It's located in the Oromia Regional State's Nono Sele District of the Ilu ababor Zone. The District is split into twenty administrative kebele (the smallest administrative divisions) with a total size of 165,324 hectares. The natural forest covers around 91 percent attributed to region as well as is found at elevations ranging from 840 to 2448 meters above sea level. Gambela region borders the study area on the west, Bure adjacent on, north, Halu boarder on east, and the Southern Nations, Nationalities, and Peoples Region (SNNPR) on the south.

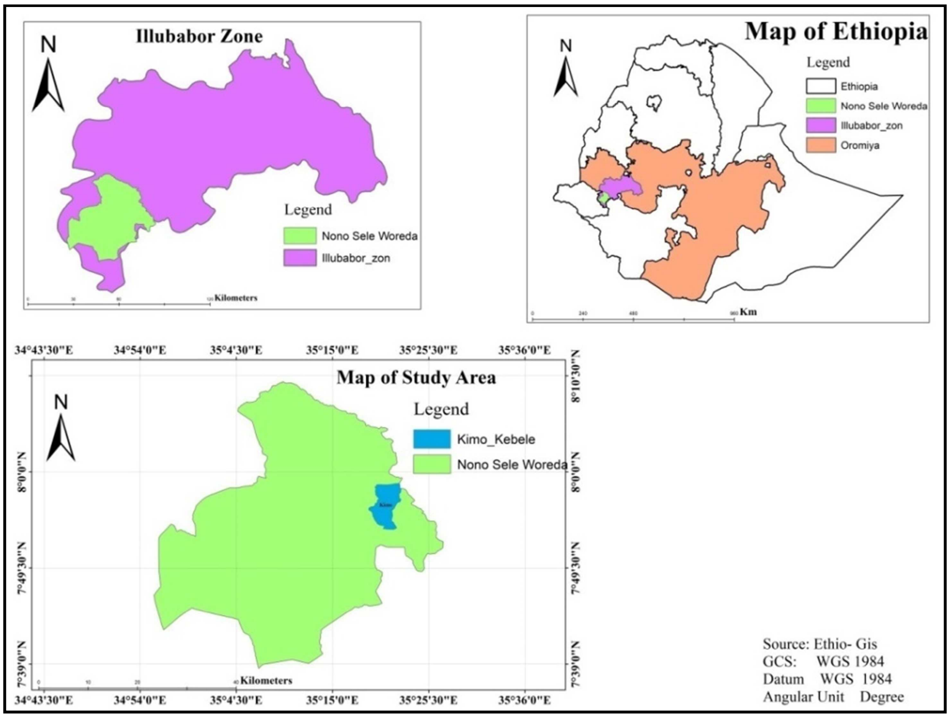

Figure 1. Map of the Study Area.

2.2. Methods

2.2.1. Reconnaissance Survey

During first week on February 2021, a reconnaissance survey was done to acquire over view about research site situation and to choose sample sites.

2.2.2. Sampling Design

The floristic composition, structure, as well as state of regeneration of the Nono Sele forest were investigated using field survey systematic sampling approach. Kent, M. [19] used the vegetation sample approach to guarantee that all types of vegetation and habitat variability were captured. Three parallel lines transect the elevation gradient from north to south, taking into account the edge effect. Along the designated transects, plots of 20 m by 20 m (400 m^2) were constructed. Because to the extensive forest cover, each transect is 500 meters apart. The dimension of one another transect line, the number of plots in one another transect, and the altitude distance vary from transect to transect.

Table 1. *The over all Detail of Transects laid in the Study Area.*

Transect number	Length (Km)	Direction of number of plots	Number of plots	Altitude range (m. a. s. l)
1	1.8	North to South	14	1900-2095
2	1.95	North to south	15	1890-2100
3	2.1	North to south	17	1850-2090

On the three line transects, 46 plots were systematically laid at 100m intervals [1]. In each main plot, one subplot measuring 5m×5m (25m^2) was established for shrub, herbaceous and lianas (climber) species sampling. The seedling and sapling data were gathered out of five 1 m x 1 m subplots, one in each corner and one at the center of the main plot [3, 32, 30, 13, 25].

2.2.3. Vegetation Data Collection

The data was gathered in the Nono Sele forest. Every woody plant species found in each sample quadrant was identified by both local names and codes. All mature plant species counted in each main quadrant had its number of individuals counted. Plant species found out of the sample plots (typically up to 5 m distance) were collected in addition documented as present in order to compile a comprehensive list, if it had not been for included in the later quantitative vegetation data analysis (exclusively assessment of floral composition of the research place). A tape meter was used to measure the DBH of each mature tree and shrub on 1.3 m above the ground. If a woody was multiple or below breast height, the diameter of each branch was measured independently, as well as overall estimation value of the single one was calculated by taking the square root of the sum of all squared stem DBHs. For the purposes of calculating abundance and density, each Single woody having above ground stem growing in a bunch was a single look at individual. Saplings as well as seedlings were counted and documented in each plot. GPS (Geographic position system) was used to measure factors for example elevation and position (latitude and longitude). Suunto clinometers were used to estimate the height of woody species, and Ocular estimation was employed in place of challenging for visibility. In the field, collected species were identified using their common names. Local names were registered, herbarium specimens were gathered, pushed as well as baked pressed and dried appropriately holding plant presses, as well as their botanical names were recognized in Jimma Botanical Garden for species that were impossible to recognize. The species were named in consonance with the Flora of Ethiopia and Eritrea published volumes a trickle of the plants were recognized in the field while most were diagnose at the National Herbarium specimens and using taxonomic key in the Flora of Ethiopia and Eritrea (FEE) [7].

2.3. Data Analysis

2.3.1. Floristic Composition Analysis

Ethiopia has a variety vegetation kind in which heterogeneity flora and fauna exist [16]. Vegetation species composition data allow for community species estimates at both the stand and population levels. Species include individual species abundance and frequency (the distribution of a species across a specified area). The floristic composition in this study is described at genera and family level based on their life forms.

2.3.2. Plant Community Determination

The most popular multivariate approach for analyzing community data is categorization using hierarchical cluster analysis based on floristic composition data. Cluster analysis is a technique for grouping together data (plots or vegetation samples) contingent characteristics or floristic similarities [21]. The number of plots and species obtained from the sample plots were included in the data matrix. Using ward approaches, the cluster was divided into plant community kinds and distinctive species. Each cluster denote a distinct community kind, complete beside distinguishing features as well as dominating species. The first two species along the major species abundance were used to designate each community type. It clusters using the ward approach from version 2.6.

2.3.3. Structural Data Analysis

Vegetation structure was analyzed using the woody species reported over the full plots. So, using micro-soft excel, the following formula were used to examine the frequency, density, height, DBH, basal area, and important value index (IVI) of tree species in the forest.

Frequency of a species: the percentage of plots where a species can be present. The frequency estimation indicates the spatial relationship and is given as a percentage of the total number of plots in which species are recorded. It is calculated with this formula:

$$\text{Frequency (f)} = \frac{\textit{the number of plots where in which that soecies occurs}}{\textit{the total number of plots}} * 100$$

$$\text{Relative frequency (RF)} = \frac{\textit{frequency of species}}{\textit{total frequency of all species}} * 100$$

Density is an enumerate how many members of a species there are in a quadrat [18]. Counting of vegetation groups under investigation is frequently done in quadrats planted many times. Following that, the total number of individuals per species will be determined and compared to the species density per hectare [22].

$$\text{Density (D)} = \frac{\textit{Number of above ground stems of a speccies counted}}{\textit{Sampled area in hectare(ha)}}$$

$$\text{Relative Density (Rf)} = \frac{\textit{Density of species let A}}{\textit{Total density of all species}} * 100$$

[18] describe how the diameter at breast height (DBH): For woody plants with circumferences less than 30 cm, circumference (C)=d, where d is the diameter at breast height, is measured using a measuring tape, and the diameter is afterwards computed from circumference (C)=d.[18]. Caliper was used to measure woody species having a diameter at breast height (DBH at 1.30 m above ground) of greater than 2.5 cm. Furthermore, circumference (D=C/ π, where D=diameter at breast height, C=circumference, and π= constant with a value of 3.14) of each woody species measured using a measuring tape was used to calculate the DBH of those species that are outside of the caliper's range. On the basis of nine DBH classes, the structural data of DBH will be examined. 1) 2.6–7.5cm, 2) 7.6–12.5cm, 3) 12.6–17.5cm, 4) 17.6–22.5cm, and 5) 22.6–27.5cm are the five sizes. 6) between 27.6 and 32.5 cm, 7) between 32.6 and 37.5 cm, 8) between 37.6 and 42.5 cm, and 9) over 42.5 cm [15]. Suunto Clinometers were used to measure the height of woody individual species with a height greater than 2 m, however graded sticks were utilized when the application of this material was limited owing to poor visibility [9]. According to the author [20], the vertical structure of the vegetation in the tropics might be classified as follows:

1. Upper storey: Tree species that reach a height of more than two-thirds of a forest's peak height are included in this layer.
2. Middle Storey: Single woody tree or shrub species having a height larger than one-third of the max height in a specific forest comprise the strata.
3. Lower storey: Single woody tree/shrub species with a height less than one-third of the max height in a specific forest comprise the stratum.

Basal area It's the shape of a plant adjacent the ground surface that's referred to as its outline. It's measured in square meters per hectare [22].

$$\text{Basal area } (m^2) = \pi d^2 / 4 = \pi r^2$$

Where:
π=3.14
d=DBH by m

The Importance Value Index (IVI): is useful intended to comparing the ecological importance of different species. It frequently shows the level of a certain species' dominance, occurrence, and abundance in comparison to other related species in a region by combining data for three criteria (relative frequency, relative density, and relative abundance) [18].

Relative Frequency (RF): the frequency of a species divided by the sum of frequencies of all species multiplied by 100.

Relative Density (RD) is defined as the general number of individuals of a species divided by the sum total magnitude of individuals of all species multiplied by 100.

Relative Dominance (RDO) is the sum basal area of a species per grand sum basal area of each and every species x 100, where dominance is the mean basal areas per species accumulate by the number of individuals of the species.

Generally, IVI=RDO + RD + RF

2.3.4. An Investigation of the Regeneration Condition of Woody Plant Species

Studies on the densities of various size groups, such as seedlings, saplings, and mature plants, aid in determining the state of forest regeneration [14]. By comparing the size (age) classes, the regeneration Condition of trees as well as a plant inside forest was evaluated in this study. To put it another way, the forest's regeneration condition was assessed in addition assimilate operating density ratios in intermediate size groups (ratios between seedlings and mature individuals, between seedlings and saplings, and between saplings and mature individuals). Representative species were used to study the regeneration patterns of tree and shrub populations accordingly the frequency spread of various size classes.

3. Result

3.1. Floristic Composition

Table 2. *Families along Corresponding Number of Species with in Nono Sele Forest Study Area.*

Family	Species number	%
Rubiaceace	11	22.92
Asteraceace	8	16.7
Fabaceae	7	14.58
Celasteraceae	4	8.33
Euphorbiaceae	4	8.33
Other 43 family	14	29.14
Total family	48	100.00

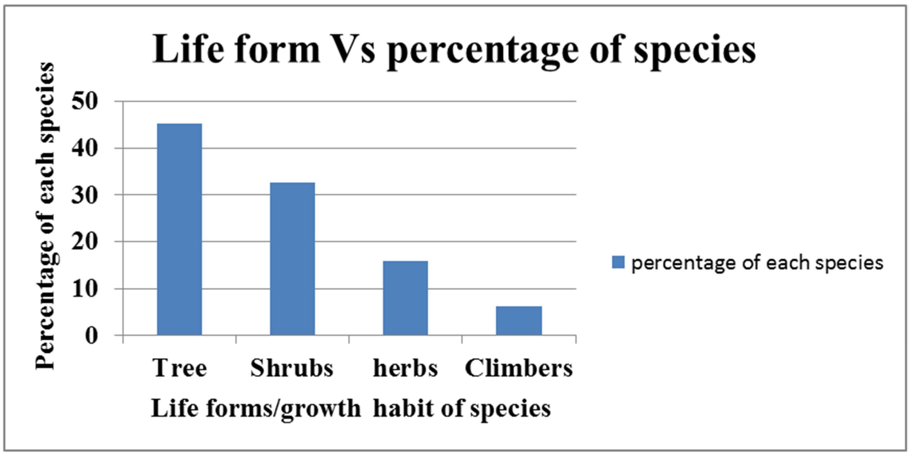

***Figure 2.** Number of Species Under concealed by various habit/life Forms (T= Tree, SH= Shrub, CL= Climber/Liana, H= Herb).*

3.2. Plant Community Type Classification

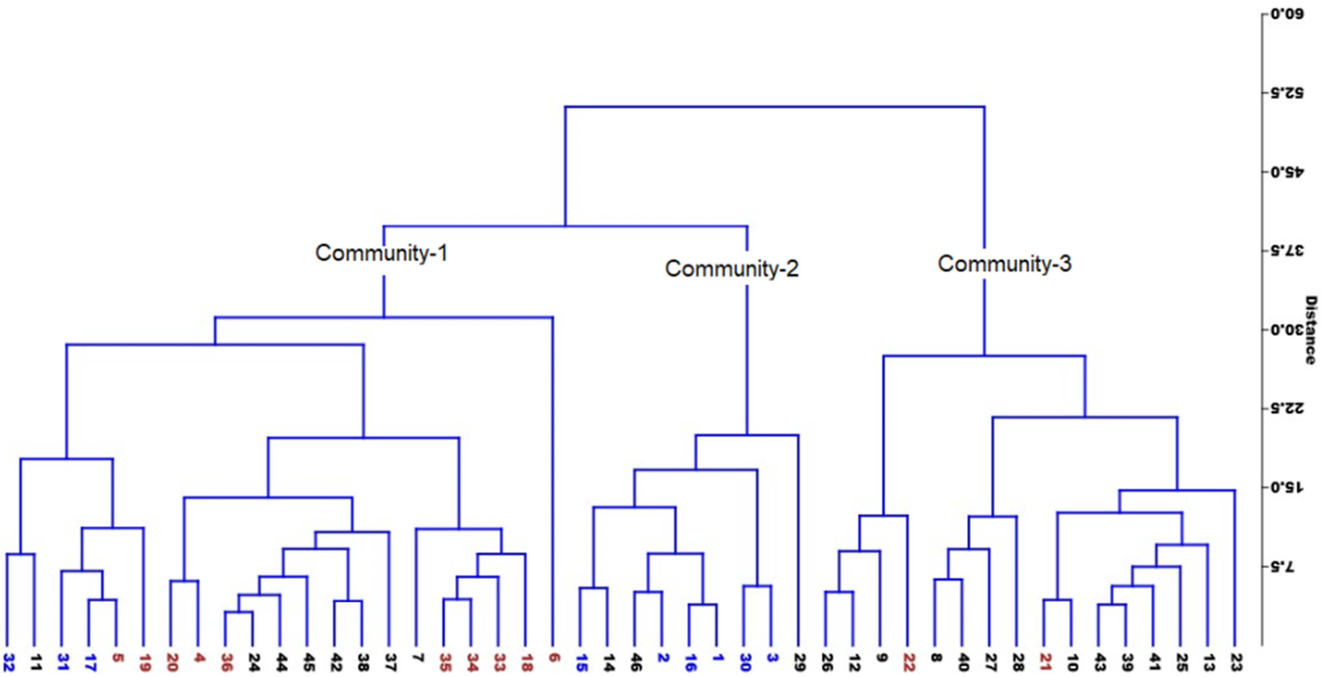

***Figure 3.** Dendrogram of the Vegetation Data Obtained from Hierarchical Cluster Analysis of Nono Sele Forest Using Ward''s Method.*

3.3. Structure

3.3.1. Frequency of Woody Species in Nono Sele Forest

***Table 3.** Frequency and Relative Frequency of ten (10) woody Species of Nono Sele forest.*

Botanical name	Species Frequency	RF
Olea welwitschii	58.70	4.79
Polyscias fulva	52.17	4.26
Ilex mitis	50.00	4.08
Albizia gummifera	45.65	3.72
Millettia ferruginea	32.61	2.66
Schefflera abyssinica	30.43	2.48
Croton macrostachyus	28.26	2.30
Pouteria adolfi-friederici	26.09	2.13
Dracaena steudneri	23.91	1.95
Syzygium guineense	21.74	1.77

3.3.2. Diameter at Breast Height (DBH) of Woody Species in Nono Sele Forest

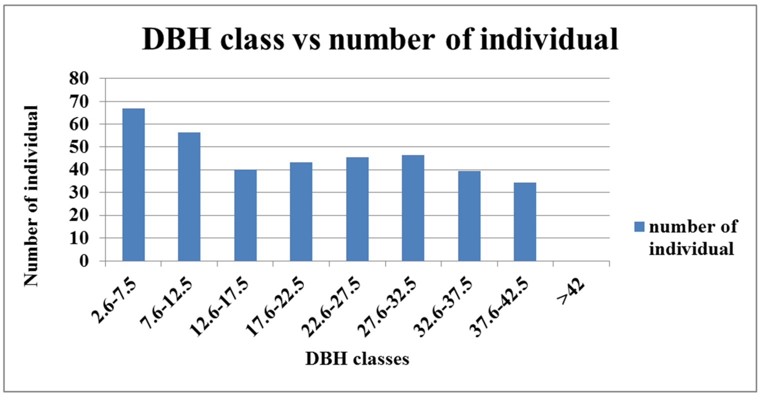

Figure 4. *DBH classes versus the number of individuals/ha of woody plant species in Nono Sele forest (DBH class 1= 2_6-7_5cm, 2=7_6-12_5cm, 3= 12_6-17_5cm, 4=17_6-22_5cm, 5= 22_6-27_5cm, 6=27_6-32_5cm, 7=32_6-37_5cm, 8=37_6-42_5cm and 9= > 42_6cm).*

3.3.3. Height/Vertical Structure

Figure 5. *Vertical Structure of the Woody Plant Species in Nono Sele Forest (Appendex 9).*

3.3.4. Important Value Index (IVI) of Woody Species in Nono Sele Forest

Table 4. *Importance Value Index (IVI) of the dominant Tree Species of Nono Sele Forest (RD=Relative Density, RF=Relative Frequency and RDO=Relative Dominance IVI=Important Value Index).*

Botanical name of species	RD	Relative Do	RF	IVI	%IVI
Olea Welwitschii	8.36	22.95	4.79	36.10	0.123
Ilex mitis	6.19	10.48	4.08	20.75	0.07
Polyscias fulva	7.17	7.16	4.26	18.58	0.06
Albizia gummifera	4.02	9.59	3.72	17.33	0.06
Pouteria adolfi-friederici	2.61	8.37	2.13	13.10	0.04
Syzygium guineense	2.50	5.15	1.77	9.42	0.03
Croton macrostachyus	3.37	3.50	2.30	9.17	0.03
Millettia ferruginea	3.04	1.98	2.66	7.68	0.02
Schefflera abyssinica	1.85	3.09	2.48	7.42	0.02
Dracaena steudneri	2.82	2.42	1.95	7.19	0.02
Galiniera saxifrage	2.93	1.15	2.30	6.39	0.02
Elaeodendron buchananii	1.30	3.39	1.60	6.29	0.02
Macaranga capensis	2.28	1.25	2.48	6.01	0.02
Bersama abyssinica	1.85	1.30	1.95	5.09	0.01
Vernonia leopoldii	2.61	0.14	2.30	5.05	0.01
Rytigynia neglecta	2.39	0.11	2.48	4.98	0.01
Apodytes dimidiate	1.74	1.50	1.60	4.83	0.01
Vernonia amygdalina	2.17	0.19	1.95	4.31	0.01
Teclea nobilis	1.52	1.12	1.60	4.24	0.01
Ficus sur	1.19	1.25	1.60	4.04	0.01
Other 47 plantspecies	37.64	13.67	49.47	100.78	0.34
Total	99.55	99.76	99.47	298.78	0.563

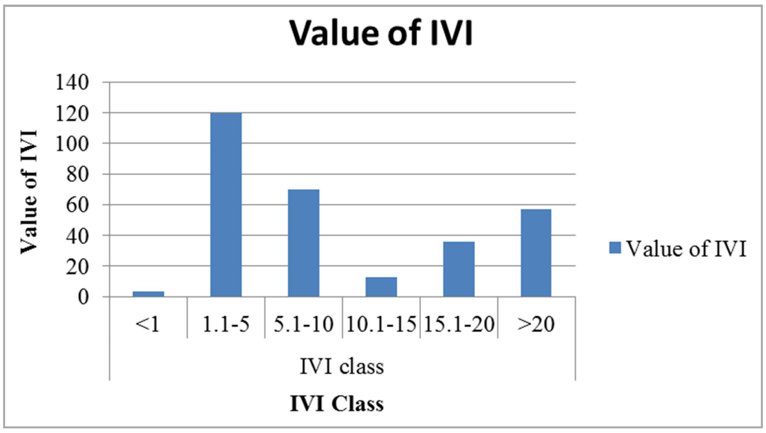

Figure 6. *IVI Class versus IVI of Woody plant Species of Nono Sele Forest.*

3.4. Woody Plant Regeneration in the Nono Sele Forest

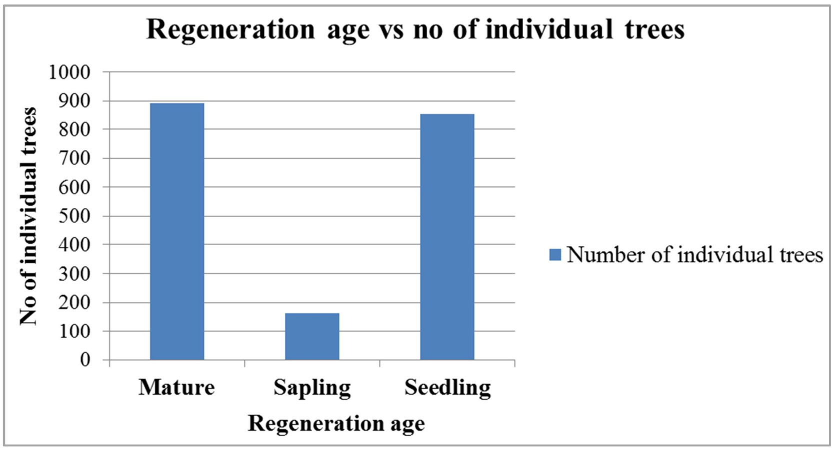

Figure 7. *Regeneration Status of Woody Plants of Nono Sele Forest.*

4. Discussion

4.1. Floristic Composition

In the Nono Sele forest, a Sum of 95 plant species were recognized. There are 83 general and 48 families among the species found. From these species solely 69 species were gathered from the plots and the 26 hasn't been done yet were gathered from out of the plots. They were made up of 43 trees (45.3%), 31 shrubs (32.6%), 15 herbs (15.8%), and 6 climbers (6.3%) (Figure 1). This means the research area's plant community is dominated by trees, with shrubs, herbs, and climbers thrown in for good measure. Rubiaceae, with 11 species (22.92 percent), Asteraceae, with 8 species (16.7%), Fabaceae, with 7 species (14.58 percent), Celasteraceae, with 4 species (8.33 percent), Euphorbiaceae, with 4 species (8.33 percent) were the dominant families inside study area. The five families with most species account around 70.86 percent of all plant species, while the remaining 43 families contributed 29.14 percent.

4.2. Plant Community Type Classification

Nono Sele forest plant Communty was classified into three type. Those are *Olea welwitschii-Polyscus fulva* community type three (III) dominates in natural (untouched) area of forest, *Milleta ferruginia-Syzygium guineense* community type two (II) dominates near river area forest and *Albiza gummifera-Croton macrostachyus* community type one (I) dominates in Coffee forest area (figure 2). There are 46 plots and 69 woody plant species in the input data matrix. Ecological variables that include slope, geographic features, and elevation, as mentioned by the research [26], also influence the spatial of plant communities. These ecological variables may have a comparable effect on the plant community development in the current investigation.

4.3. Structure

4.3.1. Frequency of Woody Species in Nono Sele Forest

Reckoning of frequency of woody species along Nono Sele forest outcome the presence of three Raunkiaer percentage frequency classes (0-20%, 20-40% and 40-60%). Nono Sele woody forest outcome shows that three Raunkiaer percentage frequency classes (0-20%; contain species like; *Elaeodendron buchananii, Apodytes dimidiate, Maesa lanceolata, Teclea nobilis* and a total of 48 species 20-40%; *Millettia ferruginea, Schefflera abyssinica, Macaranga* *capensis, Rytigynia neglecta* and other 13 species and 40-60%; have only four species those are*; Olea welwitschii, Polyscias fulva, Ilex mitis, Albizia gummifera)*. Frequency of the woody plant species as disclosed out of the Raunkiaer percentage frequency classes. Around half of the woody species along study area were scarcely exist species as they were registered in less than 20% of the studied plots.

The result of this study reveals that the high count of species in bottom frequency categories and the minimum number of species in higher frequency classes. These indicate higher heterogeneity in Nono Sele forest these in line with the finding [20]. The high frequency might be due to long-distance dispersal capabilities, which could have occurred mostly through animals /zoochory. This might imply this examined forest is a further suitable environment for these species, and/or that such species have the ability to endure harsh circumstances during their dispersals and early arrival.

4.3.2. Diameter at Breast Height (DBH) of Woody Species in Nono Sele Forest

In this study the most of the trees' individuals are spread in the lower DBH class. The count of individual generally reduces as the DBH class size grows toward the higher DBH classes. This was comparable according to findings [13] from Belete forest.

The DBH class distribution of Nono Sele woody plant species followed a somewhat inverted J-shaped pattern. This pattern, on the other hand, does not capture the overall tendency in population changes as well as identifying processes of a certain species. Analyzing population patterns of every tree and shrub species might give more genuine as well as unique data for forest conservation and management [17, 32, 6].

The initial pattern revealed an inverted "J" curve, or positively distributed structure. This group of species has a large number of individuals in the lower DBH class, which cautiously declines as DBH increases. Species in this pattern have a high rate of reproduction and recruitment. The conventional inverted J-shape is favored as a result. A similar trend was seen in Menagesha Amba Mariam forest [29]. This characteristic shows that the vegetation has a great rate of replication but a low rate of change. Such a pattern, according to the authors [2, 17, 32, 6], is typical population structure as well as indicates the survival of species in better growth status.

The second distribution characteristic include population structure, with species smaller DBH have smaller individuals, unless they miss someplace near to center, and density rises as DBH rises, producing a broken J shape curve. A pattern like this is typical of animals that have a hard time reproducing and recruiting. The third distribution characteristics of population structure is shown, in which the smaller DBH group had lower densities of species, and the density grew toward enhancing DBH, generating J patterns.

The fourth distribution characteristics display a great density of species in the smaller DBH classes as well as fewer species near center, comes after by smaller species in the greater DBH classes. Such a distribution characteristics roughly make a type of fragment inverted J form, which would characterize the great replacement tas well as intermittent recruitment along population structure.

4.3.3. Height/Vertical Structure

From this study the height of woody individuals which are trees and shrubs found in larger numbers on the bottom class storey. A considerable variety of plants and shrubs may be seen on the middle-class floor. In the upper class intervals, there are fewer tree/shrub individuals. Every single woody along various size classes in the woody species height class distribution displayed an inverted J-shaped spatio characteristics. As Tesfaye, G. et al. [28] pointed out, the decline in the frequency of every height class along the higher classes, indicated a preponderance of small-sized individuals in midst of forest, which was typical of the usual pace of regeneration.

4.3.4. Important Value Index (IVI) of Woody Species in Nono Sele Forest

The output of IVI analysis showed that there are both small and large species among the top 15. Those are *Olea Welwitschii, Ilex mitis, Polyscias fulva, Albizia gummifera, Pouteria adolfi-friederici, Syzygium guineense, Croton macrostachyus, Millettia ferruginea, Schefflera abyssinica, Dracaena steudneri, Galiniera saxifrage, Elaeodendron buchan*. Similar methods have been employed in the past [2]. Most ecologically significant species, according to researchers, are colonizer species, this may be immaculate or of their succeeding kind [4, 20, 27] as well as require keep track of controlling to sustain the forest's fidelity colonizer species (or their progeny) of a forest ecosystem was observed in collaborative. One is for giant species with a an extended series of changes as well as small reproduction rate like Pouteria adolfifriederici, Olea welwitschii, and Elaeodendron buchananii, it may be result those that establish themselves much later, and the other is for small-sized species with a fast life cycle as well as great reproduction rate, which include Galiniera saxifrage, Macaranga capensis, and Vernonia leopoldii It is likely because of this that these species (the ones named above) were frequently cited as the most ecologically significant or characteristic species in descriptions of Ethiopia's wet southwest forests [12].

4.4. Woody Plant Regeneration in the Nono Sele Forest

From this study the analysis of seedlings, saplings and mature woody species data, there are a total of 891 different tree and shrub species identified in this finding, a sum of 853 tree and shrub seedlings and 163 saplings were evaluated. At the community extent, the general regeneration quality of the tree species on the research site is inadequate, with "fair" regeneration status. This state might have resulted from over-competition between particular species and weed species, as well as shadow, which limited the ability of others to regenerate. The regeneration of various species in the vegetation is determined by climatic variables as well as biotic intervention [5]. Furthermore, young individuals of any species are highly sensitive to any type of ecological difficulty [8, 28, 23].

5. Conclusion and Recommendation

In the Nono Sele Forest, researchers looked at the floristic composition, structure, and regeneration of plant species. The finding initiate that the forest has a high level of species variety, with a total of 95 vascular plant species detected in the Nono Selle forest. The recognized species are divided into 83 genera and 48 families, with a diverse range of growth types (climbers, herbs, shrubs, and trees). This may imply that the present-day research region is one of the most diverse forest ecosystems in Ethiopia's southwest forest. Rubiaceae, Asteraceae, Fabaceae, Celesteraceae, and Euphorbiaceae are among the most abundant plant groups in the Nono Sele forest. The vegetation was classified into three categories of plant communities. Natural feature correlations that an researcher may identify in the study are replicated in the plant communities created. Nono Sele forest in terms of structure it is dominated by small-sized woody species with 2-3 tree storeys. The majority of woody species have a reasonable density of seedlings and saplings, indicating that the forest has a fair regeneration state. The structural elucidation of DBH and the distribution of height classes in the Nono Sele forest revealed more or less identical tendencies in both parameters. With rising DBH and height classes, the number of tree species in the forest declines, implying a larger proportion of small-sized individuals in the lower classes than in the higher classes, showing good forest recruitment and the rarity of giant individuals. The examination of frequency classes for woody species found that the lower frequency classes had a greater percentage of species and individuals, indicating the forest's floristic heterogeneity.

The consecutive matters are recommended according to the results.

In this examination of population structure and regeneration status, woody species identified indicated to be targeted for feasible intercession in forest management initiatives like encouraging Participatory forest management program.

The result of this research might be used as a starting point for reassessing and monitoring the forest's composition, structure, and regeneration at regular intervals in order to implement suitable conservation measures.

It is critical to conduct comprehensive studies in soil seed banks in the forest, ethno botanical exploration of traditional Ecological Knowledge on the various importances species as well as land use planning systems.

Branding non timber forest products for market to encourage forest management.

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