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Analysis of the Diversity of Standing Vegetation in the CBSUA Campus Area

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Abstract: This study analyzes the diversity of standing vegetation within the Central Bicol State University of Agriculture (CBSUA) campus area to understand the ecological composition and structure of its green spaces. The aim of this research was to determine species richness and identify dominant plant species in each observation plot. The method used was a simple quadrat plot-based inventory by recording plant names and counting the number of individuals across three locations: first location in front of the CEM building (28 × 16 m), second location in front of CANR (21 × 15 m), and third location near the administration building (17 × 11 m). The data were analyzed using basic diversity measurements such as species richness and relative abundance. The results showed variations in the number of individuals among species, with a total of 6 species, dominated by *Canarium ovatum*. In conclusion, the CBSUA campus area exhibits a moderate level of vegetation diversity, with variations in species numbers and tree counts influenced by differences in site characteristics.

Keywords: vegetation diversity, standing vegetation, species richness, CBSUA.

1. Introduction

Biodiversity is a crucial component contributing to ecosystem balance (Verma, 2017). Vegetation, particularly standing vegetation consisting of layers of trees, poles, stems, and seedlings, plays a crucial role in ecosystem maintenance functions such as carbon storage and oxygen supply, soil protection, microclimate regulation, and soil protection, as well as providing habitat for fauna (Franceschi et al., 2022). In higher education institutions, the strategic value of campus vegetation extends beyond its ecological function, as it also serves as a living laboratory and open classroom space that supports environmentally oriented and sustainable research, field learning, and education (Utami et al., 2021). The diversity of standing vegetation is influenced by various environmental, biotic, and area management factors. Khatomy et al. (2023) identified that changes in vegetation conditions due to edaphic factors (soil fertility), topography, climatology (temperature, humidity), and disturbances (exploitation, fire) play a major role in determining the number and distribution of vegetation species in an area. Maharanti et al. (2025) emphasized the importance of land slope in supporting vegetation variation and composition, as it influences hydrological processes and erosion risk.

This research was prompted by emerging issues focused on the degradation of green spaces on campuses due to large-scale physical development and land-use changes. Many campuses in Southeast Asia have experienced drastic reductions in vegetation and green spaces due to rapid and uncontrolled building and infrastructure development and the lack of robust conservation policies (Mansor et al., 2023). The decline in campus environmental quality and the ecological function of vegetation are direct impacts of reduced vegetation cover, which impacts the microclimate, air quality, and overall comfort (Pratama et al., 2021). This phenomenon has raised concerns among researchers, given that campus green areas should serve as a crucial ecological buffer supporting institutional sustainability (Ali, 2025).

The solution to address this issue was to conduct direct analysis of standing vegetation at three different locations on campus. By collecting data on the type and number of stands, measuring plot areas, and observing physical environmental conditions, more detailed information on vegetation structure and composition was generated. This data was then analyzed to determine diversity and dominance, thus providing the basis for developing recommendations for the sustainable management and development of campus green spaces. This study is the first step toward formulating an evidence-based ecological framework for sustainable green campus management. It is expected to illustrate and describe the potential, structure, and composition of campus vegetation, which will inform the sustainable management of green spaces on campus. Furthermore, it also aims to accelerate plant ecology and biodiversity conservation in higher education.

2. Methodology

The research method used was a field survey using vegetation analysis techniques using a simple quadrat plot-based inventory, recording species and the number of individuals at three different locations: in front of the CEM, in front of the CANR, and the area near the Administration Building. In each plot, all types of upright vegetation were identified and the number of individuals was counted. The soil type in CBSUA is alluvial with a pH varying between 5.5–6.8 (Lorio & De Asis, 2021). Then, parameters such as plot area, light intensity, and environmental conditions were recorded. Data were analyzed using basic diversity measures such as species richness and relative abundance.

2.1 Location and Layout of Standing Tree Observation Plots

To ensure methodological clarity and reproducibility, this study presents the spatial distribution and layout of the standing tree observation plots within the study area. The figure 1 provides a detailed depiction of the geographical location of the research site and the systematic arrangement of the plots used for field data collection. This visualization facilitates a clearer understanding of the sampling design and supports the robustness of the observational framework adopted in this study.

Figure 1. Plot placement

The placement of the mini-research vegetation stand plots within the CBSUA area should essentially represent the variety of vegetation conditions and land use on campus while remaining practical for access and measurement. Plots should be spaced sufficiently close together so that each plot represents a different vegetation patch (e.g., near a building, near an organic garden, and near a main road), but still within the same CBSUA campus landscape.

2.2 Map Location Interpretation

a. Plot 1, on the east side in front of the College of Economics and Management, near the main campus road, represents a roadside/open area vegetation stand exposed to more intensive human and vehicle disturbance, with a plot size of 28m ×16m.
b. Plot 2, in the central-southern area, near the College of Agriculture and Natural Resources and the campus agricultural land, can represent a mixed vegetation of cultivated crops, shade trees, and weeds/agroforestry, measuring 21 m ×15 m.
c. Plot 3, on the north side, near the administration building and a more tree-covered area, is suitable for depicting the shadier vegetation of the campus yard, tending towards a semi-urban forest, measuring 17m × 11 m.

2.3 Data Analysis

The data obtained were analyzed using the calculation formula, the importance value index (IVI).

$$IVI_i = RD_i + RF_i + Rdo_i$$

Where:

- $RD_i = \frac{density\ of\ species\ i}{total\ density\ of\ all\ species} \times 100\%$

- $RF_i = \frac{frequency\ of\ species\ i}{total\ frequency\ of\ all\ species} \times 100\%$
- $RDo_i = \frac{dominance\ of\ species\ i}{total\ dominance\ of\ all\ species} \times 100\%$

3. Result and Discussion

Based on the results of the field study in the CBSUA area, a total of six plant species belonging to six different families were recorded, with varying numbers of individuals in each observation plot. Differences in species composition and number of individuals between plots indicate variations in vegetation structure influenced by environmental conditions and the level of dominance of certain species. The species in 1st plot as shown in table 1.

Table 1. Species in 1st plot

Species	Famili	Total
Canarium ovatum	Burseraceae	54
Cocos nucifera	Arecaceae	1
Polyalthia longifolia	Annonaceae	1
Bambusa vulgaris Schrad	Poaceae	2
Total		**58**

source: primary data

In Plot 1, four species from four families with a total of 58 individuals were found. The most dominant species was *Canarium ovatum* from the Burseraceae family with 54 individuals. The high number of *C. ovatum* individuals indicates that this species has good adaptability to local environmental conditions and is likely a primary crop or intentionally cultivated in the area. Meanwhile, other species such as *Cocos nucifera, Polyalthia longifolia*, and *Bambusa vulgaris* were found only in small numbers, so their role in the vegetation community structure is relatively small compared to the dominant species. High dominance is usually caused by the species' adaptability to certain environmental conditions, such as soil and light suitability, as well as the possibility of deliberate planting by humans (Purnama & Soenardjo, 2020). This condition is consistent with the opinion of Roebuck *et al*. (2022) who stated that communities with high dominance tend to have lower levels of species diversity as shown in table 2.

Table 2. Spesies in 1st plot

Spesies	Famili	Total
Cocos nucifera	Arecaceae	1
Albizia saman	Fabaceae	7
Terminalia catappa	Combretaceae	4
Total		**12**

source: primary data

In Plot 2, 3 species from 3 families with a total of 12 individuals were recorded. The dominant species was *Albizia saman* (Fabaceae) with 7 individuals, followed by *Terminalia catappa* (Combretaceae) with 4 individuals, and *Cocos nucifera* (Arecaceae) with 1 individual. The dominance of A. saman indicates its important role as a shade plant commonly found in open areas or campus areas. This composition reflects a more balanced vegetation structure compared to Plot 1, although the species diversity is relatively low. According to Nababan et al. (2024), vegetation communities with moderate dominance indicate relatively stable interspecific interactions as shown in table 3.

Table 3. Spesies in 1st plot

Spesies	Famili	Total
Canarium ovatum	Burseraceae	2
Albizia saman	Fabaceae	2
Terminalia catappa	Combretaceae	1
Total		**5**

source: primary data

Plot 3 had the fewest individuals, namely 5 individuals consisting of 3 species from 3 families. The species found included *Canarium ovatum, Albizia saman*, and *Terminalia catappa*. The absence of a very dominant species indicates that the vegetation in this plot tends to be more scattered, but with a low density. This condition may be influenced by limited growing space, differences in land management, or environmental factors such as light and human activity around the observation area. Hilbert *et al*. (2023) stated that communities with low numbers of individuals but evenly distributed are often found in areas that have experienced minor disturbance or are at a certain stage of succession.

(a) (b) (c) (d) (e) (f)

Figure 1. (a) Canarium ovatum; (b) terminalia catappa; (c) albizia saman; (d) cocos nucifera; (e) bambusa vulgaris schrad; (f) polyalthia longifolia

Table 4. Vegetation analysis results

No	Spesies	Total	RD (%)	RF(%)	RDo (%)	IVI (%)
1	*Canarium ovatum*	56	74,67	20	59,15	153,82
2	*Cocos nucifera*	2	2,67	20	0,53	23,19
3	*Polyalthia longifolia*	1	1,33	10	0,34	11,67
4	*Bambusa vulgaris Schrad*	2	2,67	10	0,01	12,68
5	*Albizia saman*	9	12	20	30,71	62,71
6	*Terminalia catappa*	5	6,67	20	9,26	35,93
	Total	75	100	100	100	300

source: primary data

The stand structure in all three plots showed very strong dominance by *Canarium ovatum*, reflected by the relative density value of approximately 74.67% and relative dominance of 59.15%, resulting in the highest IVI (±153.82), so this species plays a major role in compiling the canopy and determining the main community structure in the study site. Other species such as *Albizia saman* (IVI ±62.71) and *Terminalia catappa* (IVI ±35.93) have lower densities but large diameters and fairly even distribution between plots, so they act as co-dominant species that contribute to forming the upper canopy strata even though their spatial control is not as strong as *Canarium*. Research by Hou *et al.* (2023) confirms that dominant species have a key role in regulating community structure and ecosystem function through competition, resource utilization, and influence on other species (mass ratio hypothesis and selection effect).

Species groups with low IVI, such as *Cocos nucifera, Polyalthia longifolia*, and *Bambusa vulgaris*, function primarily as accompanying components due to their low density and relative dominance values, although some have relatively high relative frequencies (Baydo, 2021). Their presence contributes more to species abundance than to spatial dominance or biomass, resulting in a monodominant overall stand structure that is largely controlled by a single dominant species. Ter Steege, H., et al. (2019) stated that monodominance patterns are often found in tropical forests, where a single species is highly dominant in community structure (e.g., >60% of individuals in a plot), while many other species are present numerically but do not contribute significantly to spatial dominance or total biomass.

This study shows that although other species increase species abundance, spatial and resource dominance remains dominated by a single dominant species. A Shannon-Wiener diversity index (H') value of around 0.90 indicates relatively low diversity because the Shannon formula considers both the number of species and the even distribution of individuals, so a community dominated by a single species will result in a small H' value (Setiawan et al., 2021). In such communities, long-term stability is highly dependent on the condition of the dominant species; various studies have shown that the stability of forest ecosystems is often determined more by the stability of the dominant species than by the species richness itself, so that disturbances detrimental to Canarium have the potential to cause major changes in the structure and function of the local ecosystem.

4. Conclusion

This study demonstrates that standing vegetation within the CBSUA campus exhibits low to moderate diversity, characterized by a strong dominance of Canarium ovatum across all observation plots. The high importance value index (IVI) of this species indicates a monodominant stand structure, in which ecosystem stability and canopy formation are largely governed by a single dominant taxon. Variations in species composition and individual abundance among plots highlight the influence of land use, microenvironmental conditions, and human disturbance on vegetation structure.

The low Shannon Wiener diversity index further confirms limited species evenness, suggesting that current campus green spaces provide ecological functions but remain vulnerable to disturbances affecting the dominant species. These findings contribute to urban and campus ecology literature by providing empirical evidence of vegetation dominance patterns in semi-urban institutional landscapes.

From a management perspective, the results emphasize the need for diversification strategies in campus green space planning, including enrichment planting and conservation-based landscaping, to enhance ecological resilience and long-term sustainability. This study offers a baseline dataset for monitoring vegetation dynamics and supports evidence-based development of sustainable green campus policies.

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Conflict of Interest

The authors declare no conflicts of interest.

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