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An inventory of flora species at Central Bicol State University of Agriculture Pasacao Campus

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Abstract

This study conducted a floristic inventory within the Central Bicol State University of Agriculture Pasacao Campus to identify plant species, assess their abundance, and determine their conservation status. The study aimed to provide baseline data for biodiversity conservation, ecological education, and sustainable campus management using a descriptive quantitative design through systematic sampling across five study sites. A total of 261 individual plants representing 54 species under 32 families were recorded. The dominant families identified were Asteraceae, Fabaceae, Poaceae, and Commelinaceae, which are known for their adaptability to tropical and disturbed environments. Among the sampling sites, Site 5 (Production Area) had the highest species richness with 69 species, while Site 3 (Shrub Area) recorded the lowest with 40 species. Herbs comprised the largest proportion of flora at 48%, followed by shrubs (21%), trees (18%), grasses (9%), and ornamentals (4%). This indicates that the campus vegetation is in an early to mid-successional stage dominated by pioneer species. Conservation status assessment based on DENR DAO 2017 11 and IUCN (2024) showed that 72% of species were classified as Least Concern, 15% as Introduced, 8% as Vulnerable, 3% as Endangered, and 2% as Near Threatened. Notable species included Vitex parviflora (Molave) and Swietenia macrophylla (Mahogany). The findings show that CBSUA Pasacao Campus supports moderately diverse flora and serves as a valuable foundation for biodiversity monitoring, conservation planning, and environmental education. Further studies are recommended to strengthen conservation strategies for native and threatened species.

Keywords: biodiversity, campus ecology, conservation, floristic inventory, sustainable management

An inventory of flora species at Central Bicol State University of Agriculture Pasacao Campus

1. Introduction

Biodiversity is essential for ecosystem stability, resilience, and productivity because it supports ecological processes such as climate regulation, nutrient cycling, pollination, and water purification. Flora, as a major component of biodiversity, plays a key role in maintaining habitats and sustaining ecosystem health (CBD, 2020). However, biodiversity worldwide is rapidly declining due to habitat destruction, climate change, pollution, and invasive species. According to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES, 2019), around one million species are threatened with extinction. In response, global initiatives such as the Kunming-Montreal Global Biodiversity Framework aim to strengthen conservation efforts worldwide (UN, 2023).

The Philippines is recognized as one of the world's megadiverse countries, with thousands of endemic plant species (DENR-BMB, 2020). Despite this richness, biodiversity in the country faces threats from deforestation, urbanization, agricultural expansion, and environmental degradation. Between 2001 and 2020, the Philippines lost about 1.34 million hectares of tree cover (Global Forest Watch, 2021). To address these challenges, the government implemented the Philippine Biodiversity Strategy and Action Plan (PBSAP 2015–2028), which promotes biodiversity conservation and sustainable development (DENR, 2015). Localized biodiversity studies, such as flora inventories, are important in supporting conservation initiatives. Academic institutions and campuses can serve as valuable sites for documenting plant diversity because they often contain a mixture of native, ornamental, and introduced species (Aronson et al., 2017). Flora inventories provide baseline data that support environmental management, conservation planning, and ecological education.

The Central Bicol State University of Agriculture Pasacao Campus in Camarines Sur is situated in a coastal and rural environment with diverse microhabitats such as gardens, agricultural areas, roadsides, and woodlots. Despite its ecological importance, no formal inventory of plant species has yet been conducted on the campus. The absence of documented flora limits opportunities for biodiversity monitoring, conservation planning, and environmental education. Conducting a flora inventory at CBSUA Pasacao Campus is therefore necessary to establish a baseline record of plant species present in the area. The study can support campus sustainability programs, ecological landscaping, and conservation education while also serving as a learning resource for students and researchers. In addition, the inventory aligns with the university's commitment to environmental stewardship and supports the United Nations Sustainable Development Goal 15: Life on Land, which focuses on protecting and restoring terrestrial ecosystems (UN, 2015).

This study aims to identify and document the plant species found within CBSUA Pasacao Campus. Specifically, it seeks to create a baseline flora record, identify species with ecological or cultural significance, and provide data that can guide future biodiversity conservation and sustainable land-use planning within the institution.

Statement of the Problem - Despite being located in a biologically rich province, the Central Bicol State University of Agriculture (CBSUA) Pasacao Campus has not undergone a systematic documentation of its plant biodiversity. The absence of a baseline flora inventory limits the campus's capacity to assess ecological changes, manage green spaces effectively, and integrate biodiversity conservation into academic and extension programs. This study seeks to address the following central problem: What is the current status of flora species diversity within CBSUA Pasacao Campus? To answer this, the study aims to address the following specific questions: 1.) What are the identified plant species present within the campus, and how are they classified taxonomically (e.g., native, endemic, introduced, ornamental, cultivated)? 2.) What is the relative abundance and frequency of occurrence of each plant species across different microhabitats within the campus? 3.) Which species, if any, show

ecological importance, potential conservation concern, or local significance? 4.) How can the data from this inventory support biodiversity conservation, education, and sustainable land-use planning within the campus?

Objective of the Study - The main objective of this study is to conduct a comprehensive inventory of flora species within the CBSUA Pasacao Campus to provide baseline data for biodiversity assessment, conservation planning, and environmental education. Specifically, the study aims to: 1.) Identify and document the plant species present within the CBSUA–Pasacao Campus and classify them according to their taxonomy and ecological status (e.g., native, endemic, introduced, ornamental, or cultivated). 2.) Determine the relative abundance and frequency of occurrence of plant species across different habitat types within the campus. 3.) Assess the ecological significance and potential conservation value of identified flora. 4.) Provide recommendations for campus-based biodiversity conservation, environmental education, and sustainable land-use practices based on the findings.

Significance of the Study - This research provides multiple layers of significance—ecological, educational, institutional, and societal—emphasizing the importance of local biodiversity assessment within academic environments.

- **CBSUA Administration** – The findings will equip university planners and administrators with crucial baseline data for developing and implementing biodiversity-friendly policies and sustainable land-use practices. It can inform future decisions related to campus landscaping, reforestation, and environmental infrastructure, ultimately aligning with the institution's sustainability goals.

- **Students and Educators** – The documented flora species will serve as a valuable learning material for various academic disciplines such as biology, agriculture, environmental science, and forestry. It encourages field-based learning, scientific inquiry, and student-led research while promoting botanical literacy and environmental awareness across the academic community.

- **Environmental Agencies and Researchers** – The inventory can serve as a reference for regional conservation programs and ecological assessments. It supports national and local efforts under the Philippine Biodiversity Strategy and Action Plan (PBSAP 2015–2028) and provides data that may be used in mapping threatened or endemic species, habitat quality assessments, and restoration planning.

- **Local Community** – By highlighting the rich plant diversity within the campus, the study fosters a deeper understanding and appreciation of local natural resources. It can serve as a model for community-based biodiversity efforts and raise public awareness on the importance of conserving native and endemic plant species. Engagement with local knowledge may also strengthen traditional ecological practices and values.

- **Policy Makers and Extension Workers** – The results of the study may inform policies and outreach programs aimed at environmental conservation, climate adaptation, and sustainable agriculture. It can contribute to the development of community-based biodiversity education and eco-tourism initiatives, potentially offering socio-economic benefits to surrounding communities.

- **Global Biodiversity Goals** – On a broader scale, the study contributes to global environmental commitments such as the United Nations Sustainable Development Goal 15: Life on Land, and the Kunming-Montreal Global Biodiversity Framework, which both underscore the urgency of conserving terrestrial ecosystems and halting biodiversity loss.

Scope and Delimitation - This study focuses on the identification and documentation of terrestrial plant species within the accessible areas of the Central Bicol State University of Agriculture (CBSUA)–Pasacao Campus. It includes visible plants such as trees, shrubs, herbs, and grasses found within the campus grounds. The study is limited to terrestrial flora and excludes fauna, aquatic vegetation, mosses, lichens, fungi, soil analysis, and ecological interactions. It provides a snapshot of plant diversity during the survey period, which may be influenced by seasonal conditions and inaccessible areas. To establish a baseline record of campus flora for future monitoring.

Theoretical Framework - Ecological succession is the natural and gradual process by which ecosystems change and develop over time. It describes how biological communities evolve from simple to more complex forms, beginning with pioneer species and progressing toward a more stable, mature ecosystem known as a climax community.

Ecological succession Theory - Succession is an ecological process that explains how plant communities change over time. It was first introduced by Frederic Clements (1916), who described it as a predictable progression toward a stable climax community. Eugene Odum (1969) later expanded this idea by emphasizing ecosystem functions such as energy flow, nutrient cycling, and stability throughout the stages of succession. Succession is generally classified into primary succession, which occurs in lifeless areas without soil, and secondary succession, which happens in disturbed areas where soil remains. At the Central Bicol State University of Agriculture, vegetation is mainly shaped by secondary succession due to past land use such as farming, construction, and landscaping. Over time, these disturbed areas are naturally recolonized by a mix of native and introduced plant species, gradually forming more complex and stable plant communities. Understanding this process helps explain the current vegetation patterns on campus and supports better planning for biodiversity conservation and ecological restoration.

Habitat fragmentation and landscape ecology further explain how human activities affect ecosystems. Habitat fragmentation occurs when large, continuous habitats are broken into smaller, isolated patches due to urban development, agriculture, roads, and other land-use changes (Fahrig, 2003). This reduces habitat size, limits species movement, decreases genetic diversity, and increases the risk of local extinction. Landscape ecology complements this by studying how the arrangement and connectivity of habitats influence ecological processes (Turner, 1989). It emphasizes that not only habitat size but also spatial structure matters for biodiversity. Connected landscapes support movement, reproduction, and survival of species, while highly fragmented ones weaken ecosystem stability. Together, succession theory, habitat fragmentation, and landscape ecology provide a useful framework for understanding how plant communities develop and respond to disturbance, especially in human-influenced environments like CBSUA Pasacao Campus.

Habitat Fragmentation - Within the Central Bicol State University of Agriculture, the landscape is a mix of grasslands, gardens, groves, and built areas, creating fragmented habitats. These areas support different plant micro-ecosystems but may also face issues such as invasive species and limited ecological connectivity. Understanding this helps explain how plant species are distributed on campus and supports better biodiversity planning and restoration. The Species–Area Relationship (SAR), introduced by Arrhenius (1921), explains that larger areas usually have more species because they contain more habitats and resources. It is expressed as S = cA^z, where S is species number, A is area, c is a constant, and z shows how quickly species increase with area.

Species-Area Relationship - Within the Central Bicol State University of Agriculture, the variety of habitats such as open fields, groves, gardens, and built areas supports diverse plant communities. These microhabitats create different ecological niches that allow a wide range of plant species to thrive, from grasses and herbs to shrubs and trees. The Species–Area Relationship (SAR), introduced by Arrhenius (1921), explains that larger and more diverse areas tend to support higher species richness due to increased habitat availability and resources. This study is grounded on three ecological theories: ecological succession, habitat fragmentation and landscape ecology, and the species–area relationship. Succession explains how plant communities develop over time, with secondary succession being dominant on campus due to past land use such as farming and construction. Habitat fragmentation and landscape ecology describe how mixed land-use patterns shape plant distribution by influencing connectivity and habitat diversity. SAR explains how differences in habitat size affect species richness across the campus. Together, these theories provide a framework for understanding plant diversity in CBSUA Pasacao Campus. Succession explains temporal changes, fragmentation explains spatial patterns, and SAR explains species richness differences. This integrated approach supports the study's goals of identifying flora, understanding their distribution, and guiding biodiversity conservation and land-use planning on campus.

Conceptual Framework - The conceptual framework of this study is based on biodiversity assessment and ecological inventory within the Central Bicol State University of Agriculture. It follows an input–process–output (IPO) model. In the input phase, tools such as field notebooks, GPS, quadrat sampling materials, cameras, and identification guides are used to document plant species across different campus habitats like fields, groves, gardens, and cultivated areas. In the process phase, field surveys are conducted using quadrat and transect methods. Plant species are identified using taxonomic keys and verified through references or expert consultation. Data are then organized based on plant type (trees, shrubs, herbs, grasses), ecological status (native, endemic, introduced, invasive), and habitat. Descriptive statistics are used to assess species richness and distribution. In the output phase, the study produces a complete flora inventory listing all identified plant species, their classifications, and distribution patterns. Visual outputs such as simple maps and charts may also be included. This inventory provides baseline ecological data for the campus, supports biodiversity conservation and environmental education, and helps guide sustainable land-use planning and future ecological studies.

Definition of Terms - This section provides conceptual and operational definitions of key terms used throughout the study to ensure clarity and a common understanding of concepts related to flora inventory and biodiversity assessment.

- **Abundance** is conceptually defined as the number of individuals of a species present within a given area, serving as an indicator of species dominance. In this study, abundance refers to the count and relative presence of individual plant species documented within sampling plots across the campus.

- **Biodiversity** is conceptually defined as the variety and variability of life forms, including plants, animals, fungi, and microorganisms within ecosystems at global, regional, or local levels. In this study, biodiversity specifically refers to the diversity of terrestrial flora species identified and documented within the CBSUA Pasacao Campus.

- **Biodiversity Conservation** is the practice of protecting, managing, and restoring species, habitats, and ecosystems to ensure their long-term sustainability. In this study, biodiversity conservation refers to how the inventory findings can support campus-based initiatives such as ecological awareness, education, and sustainable land-use planning.

- **Conservation Concern** refers to the need to prioritize species or habitats for protection due to threats such as rarity, endemism, habitat loss, or invasive competition. In this study, conservation concern applies to flora species within CBSUA Pasacao Campus that are rare, threatened, or ecologically significant.

- **Ecological Importance** is conceptually defined as the role a species plays in maintaining the structure, function, and stability of an ecosystem. In this study, ecological importance refers to plant species within the campus that provide significant ecological functions such as habitat provision, soil stabilization, or contribution to successional processes.

- **Ecological Succession** is the natural and gradual process through which ecosystems change and develop over time, beginning with pioneer species and progressing toward stable climax communities. For this study, ecological succession is observed in the plant communities across the campus, where secondary succession is most evident due to historical land-use practices such as farming, construction, and landscaping.

- **Endemic species** are conceptually defined as plants or animals that are native to and found only within a specific geographic location. In the context of this study, endemic refers to plant species that are exclusive to the Philippines and are recorded within the CBSUA Pasacao Campus.

- **Flora** generally refers to the plant life of a particular region or time, often describing naturally occurring or indigenous plants. For this study, flora encompasses all terrestrial plants—including trees, shrubs, herbs, and grasses—that are identified within the campus grounds.

- **Frequency of Occurrence** refers to the consistency with which a species appears in sample plots or habitats. In this study, frequency is measured by recording how often a species occurs across quadrats or transects in CBSUA Pasacao Campus.

- **Habitat** is conceptually defined as the natural environment in which a species or group of species lives, providing essential conditions for growth and survival. Operationally, this study considers habitats as the different environments within CBSUA Pasacao Campus, such as grasslands, gardens, groves, and open fields, where plant species are found.

- **Herbaceous Plants (Herbs)** are non-woody plants that have soft stems and typically die back at the end of the growing season. In this study, herbs are included as one of the life forms categorized in the flora inventory conducted within the campus.

- **Introduced Species** are those brought into an area where they do not naturally occur, often due to human activity, whether intentionally or accidentally. In this study, introduced species are plant species within the campus that are not naturally occurring in the Philippines but have been cultivated or unintentionally established.

- **Invasive Species** are defined as non-native species that spread rapidly and cause ecological, economic, or social harm. In this study, invasive species refer to non-native plants recorded in the campus that may potentially threaten native and endemic flora.

- **Inventory** is conceptually defined as a systematic listing or record of items, compiled through observation and documentation. For the purposes of this study, inventory refers to the systematic documentation of terrestrial flora species present within the CBSUA Pasacao Campus.

- **Life Form** is conceptually defined as the structural and functional growth form of a plant, such as tree, shrub, herb, or grass. In this study, life form is used as a basis for classifying and categorizing the flora species documented within the CBSUA Pasacao Campus.

- **Local Significance** is conceptually defined as the cultural, educational, or economic value of species within a community. In this study, local significance refers to flora species in the campus that have practical uses (e.g., food, medicine, ornamentals) or serve as learning resources for students and researchers.

- **Native Species** are species that naturally occur in a particular region or ecosystem without human introduction. Operationally, in this study, native species are Philippine plants that naturally grow within the CBSUA Pasacao Campus.

- **Plant Species Diversity** is conceptually defined as the variety and variability of plant species within a given area, reflecting both the number of species and their relative abundance. In this study, plant species diversity refers to the documented terrestrial flora within CBSUA Pasacao Campus, measured through species richness, abundance, and distribution across different microhabitats.

- **Quadrat Sampling** is an ecological method used to isolate a standard unit of area for the study of species distribution within a habitat. In this study, quadrat sampling is applied to selected areas of the campus to estimate and record the presence of plant species within a defined plot.

- **Species Richness** is defined as the number of different species present in a community, landscape, or region, and is commonly used as a measure of biodiversity. In this study, species richness refers to the count of distinct flora species documented within CBSUA Pasacao Campus.

- **Taxonomic Classification** refers to the systematic arrangement of species into hierarchical categories such as family, genus, and species, as well as identifying their ecological origin as native, endemic, introduced, ornamental, or cultivated. In this study, taxonomic classification is applied to organize and describe the flora

species recorded within the campus.

- **Transect Walk** is a sampling method where researchers follow a fixed path or line to record the presence or absence of species. In this study, transect walks are conducted along predetermined routes within the campus to document and assess the distribution of flora species.

- **Woody Plants** are conceptually defined as plants that produce wood as their structural tissue, including trees, shrubs, and lianas. In this study, woody plants are recorded and categorized as part of the flora inventory conducted within the CBSUA Pasacao Campus.

2. Methodology

This section outlines the overall research design and methods employed to achieve the study's objectives. It includes the Research Design, Research Method, Population and Sampling Design, Data Gathering Procedure, and Statistical Treatment of Data used in the documentation and assessment of flora species within CBSUA Pasacao Campus.

Research Design - This study uses a descriptive research design (Sutherland et al., 2022; UNEP, 2021), which is appropriate for observing and recording existing conditions without manipulating variables. It is used to systematically document plant species within the Central Bicol State University of Agriculture, creating a baseline inventory of its floral diversity. The design focuses on field observation and data collection to describe the composition, abundance, and distribution of plants across different campus microhabitats. It is a non-experimental approach that emphasizes "what exists" in natural settings, making it suitable for biodiversity inventories (CBD, 2022). The results provide important baseline data for ecological monitoring, conservation planning, and environmental education.

Research Method - This study uses a field-based observational method to gather accurate baseline data on campus flora (Cunningham et al., 2021). Field observation is commonly applied in biodiversity studies to directly identify, classify, and record plant species within a specific area. In this study, researchers conduct on-site assessments within the Central Bicol State University of Agriculture to document flora species in their natural environment. The method allows both qualitative and quantitative data collection without disturbing the ecosystem. Tools such as field notebooks, GPS devices, identification guides, and cameras are used to ensure accuracy. This approach is effective for producing reliable biodiversity inventory data and aligns with standard ecological documentation practices (Sutherland et al., 2022).

Population and Sampling Design - The study covers the entire 4.5-hectare Central Bicol State University of Agriculture plant community, including trees, shrubs, herbs, grasses, and ornamental plants. It uses purposive sampling, a non-probability method commonly applied in ecological studies (Kent, 2022), to select representative areas of the campus. Five sampling sites were identified across different land-use zones: the Band and Majorette Rooms (Site 1), Eco Park from ES Building to Admission Office (Site 2), Registrar to Academics Office and English Rooms (Site 3), Academic Building 6 to Laboratory Rooms (Site 4), and the Production Area and surrounding spaces (Site 5). Within these sites, quadrat and transect methods were used depending on vegetation type. Small 1m × 1m quadrats were used for herbs and grasses, while 10m × 10m plots were used for shrubs and trees. This systematic approach ensures representative sampling of plant diversity across different habitats (Sutherland et al., 2022; Kent, 2022).

Data Gathering Procedure - Data gathering is conducted through direct field surveys across the five sampling sites of the Central Bicol State University of Agriculture. A preliminary survey is done to define site boundaries and locate suitable quadrat and transect areas. Sites 1, 3, and 4 focus on ornamental and landscaped vegetation using quadrats placed in gardens and built-up green spaces. Site 2 (Eco Park) uses larger quadrats and transects to sample trees, shrubs, and understory plants. Site 5 covers production areas, grasslands, and semi-natural vegetation. Within each quadrat, plant species are identified and recorded, including scientific name, growth form, abundance,

frequency, dominance, and GPS location. Identification is supported by field guides and databases (Royal Botanic Gardens, Kew, 2023). Unidentified specimens are documented, photographed, and later verified through herbarium comparison or expert consultation. Data collection is done under favorable weather conditions and recorded in field notes and digital spreadsheets for analysis (UNEP, 2021).

Statistical Treatment of Data - Data analysis uses descriptive statistics and biodiversity indices to assess plant diversity within the Central Bicol State University of Agriculture (Jost, 2021). Species frequency is based on the number of sampling units where a species occurs, while relative frequency compares this to total frequency. Dominance is measured through coverage or basal area within plots. Species richness refers to the total number of species recorded, while abundance is the number of individuals per species. Biodiversity is further evaluated using Shannon-Wiener Index, Simpson's Index, and Species Evenness Index, which are standard tools in ecological studies (Sutherland et al., 2022; Jost, 2021). Results are presented using bar charts and pie charts to show frequency, abundance, dominance, and diversity patterns. All computations are processed using Microsoft Excel and related ecological analysis tools.

3. Result and Discussion

This section presents and interprets the results of the floristic inventory conducted within the CBSUA–Pasacao Campus, highlighting the identified plant species, their relative abundance, conservation status, and the implications of these findings for biodiversity conservation and sustainable campus management.

3.1 Taxonomic Classification and Identified Plant Species

A total of 261 individual plants, representing 54 species from 32 families, were recorded in the Central Bicol State University of Agriculture. The dominant families were Asteraceae, Fabaceae, Poaceae, and Commelinaceae, which are commonly found in tropical and disturbed environments due to their adaptability and efficient reproduction (Palma & Dagonio, 2024; Christenhusz & Byng, 2018). Asteraceae species thrive in open areas because of high seed production, while Fabaceae can grow in nutrient-poor soils through nitrogen fixation. Poaceae species are also common in open and disturbed habitats due to their rapid growth and tolerance to environmental stress (Mandel et al., 2019; Soumare et al., 2020).

Table 1
Number of Plant Species per Site and Dominant

Site	Dominant Classification	Most Abundant Families	No. of Individual	Notable Species
Site 1	Herbs, Ornamental	Asteracae, Commelinaceae	46	Tropical spiderwort, Brazilian joy weed
Site 2	Herbs, Trees	Asteraceae, Rutaceae	42	Cinderella weed, Pomelo
Site 3	Shrubs, Herbs	Meliaceae, Musaceae	40	Big-leaf mahogany, Saba banana
Site 4	Herbs, Grasses	Poaceae, Asteraceae	64	Crabgrass, Little ironweed
Site 5	Herbs, Trees	Cyperaceae, Musaceae	69	Mindoro, flatsedge, Saba Banana

Among the five sampling sites, Site 5 (Production Area) had the highest species richness (69), while Site 3 (Shrub Area) had the lowest (40) in the Central Bicol State University of Agriculture. This variation reflects differences in light availability, soil moisture, and disturbance levels. Open and frequently disturbed areas often support more species due to favorable conditions for herbaceous and opportunistic plants (Isbell et al., 2017). The high diversity in the production area may also result from human activities such as cultivation, soil disturbance, and plant introduction, which increase species establishment (Lehmann et al., 2019). In contrast, shrub-dominated areas have lower diversity due to limited light, higher competition, and denser vegetation cover (Kurata, 2021). Overall, the dominance of herbaceous and disturbance-tolerant species suggests a vegetation pattern typical of semi-managed landscapes. The production and open areas function as biodiversity hotspots within the campus,

showing that managed environments can still support high species richness (FAO, 2020; Cruz, 2025).

3.2 Relative Abundance and Frequency of Occurrence

Relative abundance shows that herbs were the most dominant growth form, accounting for 48% of recorded species in the Central Bicol State University of Agriculture, followed by shrubs (21%), trees (18%), grasses (9%), and ornamentals (4%). The dominance of herbs indicates a vegetation structure typical of moderately disturbed, high-light environments where fast-growing and opportunistic species thrive. Similar findings were reported by Santos et al. (2024), who noted that herbaceous plants dominate open tropical ecosystems affected by human activity such as cultivation or grazing. Garcia and Villanueva (2023) also found that herbs are highly adaptive in tropical lowland areas due to their rapid life cycles and efficient reproduction, allowing them to quickly recolonize disturbed habitats

Table 2
Relative Abundance of Plant Classifications

Classification	No. of Individual	Percentage (%)	Common Example
Herbs	26	48%	Spreading dayflower, Cinderella weed
Shrubs	11	21%	Big-leaf mahogany, river tamarimd
Trees	10	18%	Mango, Molave
Grasses	5	9%	Crabgrass, Tufted lovergrass
Ornamental	2	4%	Brazillan joyweed, Pinto peanut

The dominance of herbaceous species such as *Eleutheranthera ruderalis* and *Commelina diffusa* in the Central Bicol State University of Agriculture indicates their ability to thrive in disturbed environments due to traits like rapid growth, high seed production, and vegetative propagation (Chen et al., 2023). Their widespread occurrence suggests they function as pioneer species that stabilize soil and support early succession. Herbaceous dominance also reflects an early to mid-successional stage, where open conditions favor low-stature plants before woody species establish (Lopez & Kim, 2025). The relatively lower proportion of shrubs (21%) and trees (18%) suggests ongoing disturbance or regeneration, as repeated human activities can limit woody plant growth (Martinez et al., 2024). The low presence of grasses (9%) and ornamentals (4%) indicates a mixed-use, semi-managed ecosystem where natural and cultivated vegetation coexist (Hernandez & Rivera, 2025). Similar patterns were observed in other tropical and urban green spaces where herbs dominate due to mowing and disturbance (Mogîldea et al., 2024; Palma & Dagonio, 2024). Overall, herbaceous dominance highlights both ecological benefits such as soil stabilization and pollinator support, and limitations such as reduced habitat for arboreal species (Reyes & Ventura, 2018). This suggests the need for balanced vegetation management to enhance biodiversity and structural complexity.

3.3 Ecological Importance, Conservation Status, and Local Significance

Of the 54 plant species identified, 72% were classified as Least Concern (LC), 15% as Introduced, 8% as Vulnerable (VU), 3% as Endangered (EN), and 2% as Near Threatened (NT) (DENR–DAO 2017-11; IUCN, 2024). Vitex parviflora (Molave) and Swietenia macrophylla (Mahogany) are the most significant tree species due to their ecological and cultural value. Their declining population highlights the importance of in-situ and ex-situ conservation efforts within the campus and surrounding communities (FAO, 2020).

Table 3
Summary of Species Conservation Status

Conservation Status	No. of Individual	Percentage
Least concern (LC)	39	72%
Introduced	8	15%
Vulnerable (VU)	4	8%
Endangered	2	3%
Near Threatened (NT)	1	2%

Despite this apparent stability, the presence of species categorized as Vulnerable and Endangered within the study area carries significant ecological and conservation implications. Notably, Vitex parviflora (Molave) and Swietenia macrophylla (Mahogany) were recorded among the species of concern. Vitex parviflora, a native Philippine hardwood, is valued for its dense and durable timber and plays an important role in the country's cultural and ecological heritage. However, its populations have declined due to extensive logging and deforestation (Threatened Taxa, 2022). Although the species is currently listed as Least Concern globally by the IUCN, it remains threatened at the national level, as recognized by the Department of Environment and Natural Resources (DENR–DAO 2017-11) and local conservation groups (BINHI, 2024).

Swietenia macrophylla (Mahogany), in contrast, is an introduced species that was widely planted in reforestation and ornamental programs across the Philippines. While it provides ecological services such as shade and carbon storage, its widespread use has raised ecological concerns regarding competition with native tree species and the potential alteration of native forest composition (FAO, 2020). The presence of both V. parviflora and S. macrophylla on campus highlights the dual role of the site in preserving native biodiversity while also hosting introduced species that require careful management to avoid dominance or ecological imbalance. The vegetation composition based on conservation status therefore reflects a dynamic plant community where ecologically stable LC species coexist with a smaller proportion of nationally threatened and introduced taxa. This mixture indicates both the resilience of the local ecosystem and the influence of human activity through landscape modification and planting practices. Continued biodiversity monitoring, protection of native tree populations, and the responsible management of introduced species are recommended to sustain ecological balance. In this context, the study area functions not only as an academic and recreational space but also as a living repository of Philippine plant diversity, emphasizing the importance of campus environments in supporting local conservation initiatives.

The recorded 15% of introduced species reflects a moderate degree of biotic homogenization, a condition commonly observed in landscaped or semi-managed ecosystems where non-native plants are cultivated for ornamental or educational purposes. Such homogenization can reduce native biodiversity by promoting the dominance of widespread generalist species and altering ecosystem dynamics (González-Moreno et al., 2017). While introduced ornamentals enhance the visual appeal and educational value of the campus, they may also compete with native flora for resources and modify soil and light conditions, potentially leading to ecological imbalance if left unmanaged (van Kleunen et al., 2018). Therefore, regular monitoring of introduced flora and the implementation of native plant restoration programs are recommended to prevent potential invasive expansion and sustain ecological equilibrium within the study area. The presence of threatened native species on campus offers a unique opportunity for in-situ conservation, environmental education, and research-based propagation. Establishing native plant nurseries or mini-conservation plots could serve both ecological and pedagogical functions, aligning with the biodiversity goals of the Central Bicol State University of Agriculture (CBSUA) and national conservation strategies. These initiatives support the objectives outlined in the Philippine Biodiversity Strategy and Action Plan (PBSAP) 2015–2028 (DENR–BMB, 2019) and contribute to the global call for nature-positive campuses that foster biodiversity resilience and public awareness (Aronson et al., 2017).

3.4 Implication for Biodiversity Conservation, Education and Sustainable Land Use

The flora inventory provides a scientific baseline for campus biodiversity management and sustainability initiatives. Its integration into research, education, and planning offers several practical applications.

Table 4
Proposed Applications of Flora Inventory Data

Application Area	Proposed Used	Expected Outcome
Biodiversity Conservation	Baseline for native species protection	Enhance ecosystem resilience
Education and Research	Use in field taxonomy and botany classes	Increased student awareness
Campus Greening	Planting native and adaptive species	Improved microclimate and aesthetics
Sustainable Land Used	Integrating flora data in planning	Balanced development and ecology

The flora inventory provides a scientific baseline for biodiversity management and conservation planning within the Central Bicol State University of Agriculture. It helps assess ecological health, identify priority species, and monitor vegetation changes over time. The recorded diversity highlights the campus as a semi-managed ecosystem supporting both native and introduced species, serving as a basis for biodiversity planning and policy development (Mendoza, 2021). The data also have academic value, as integrating the inventory into botany and ecology courses enhances experiential learning. Students gain hands-on experience in species identification and ecological assessment, improving environmental literacy and engagement in sustainability efforts (Paguirigan, 2020).

The campus can function as a living laboratory for education, research, and conservation. Establishing biodiversity conservation zones and ex-situ nurseries for native species such as *Vitex parviflora* and *Swietenia macrophylla* supports conservation goals and awareness programs. Campus biodiversity initiatives also strengthen ecological learning and participation (Turner-Skoff & Cavender, 2019). In addition, using native and climate-adaptive plants in greening programs can improve microclimate conditions and ecological stability (Fajardo et al., 2023). Integrating floristic data into land-use planning helps protect high-diversity areas while balancing development and conservation goals (DENR–BMB, 2019). Overall, the findings show that CBSUA–Pasacao supports diverse but disturbance-adapted flora that can sustain long-term environmental and sustainability initiatives.

4. Summary of Findings, Conclusions, and Recommendations

4.1 Plant Species Composition and Taxonomic Classification

Findings - The floristic inventory conducted within the Central Bicol State University of Agriculture recorded 261 individual plants representing 54 species distributed across 32 families. The identified flora consisted of native, introduced, ornamental, and cultivated species, reflecting both natural ecological processes and anthropogenic landscape management within the campus. Among the recorded families, Asteraceae, Fabaceae, Poaceae, and Commelinaceae were the most dominant. These plant families are commonly associated with tropical and disturbed habitats because of their adaptability and ecological resilience. Their dominance suggests that several species are highly suited to semi-managed environments found throughout the campus. The occurrence of ornamental and cultivated plants further reflects landscaping and beautification practices implemented within the university grounds, while naturally occurring species persisted in relatively less disturbed areas. Overall, the interaction between managed and unmanaged vegetation contributed to a heterogeneous vegetation structure across the campus.

Conclusion - The findings indicate that CBSUA–Pasacao Campus supports a moderately diverse plant community composed of various taxonomic classifications, including native, introduced, ornamental, and cultivated species. The observed diversity reflects the interaction between natural ecological conditions and human activities within the campus environment.

Recommendations - The university should establish a comprehensive plant inventory database and herbarium collection to document identified species for research, instruction, and conservation purposes. In addition, future landscaping and planting initiatives should prioritize native and ecologically significant species to strengthen biodiversity conservation and ecological sustainability within the campus.

4.2 Relative Abundance and Frequency of Occurrence Across Microhabitats

Findings - The abundance and distribution of plant species varied among the five sampling sites within the Central Bicol State University of Agriculture due to differences in microhabitat characteristics, vegetation structure, and land-use practices. Site 5 (Production Area) exhibited the highest species richness with 69 recorded individuals, whereas Site 3 (Shrub Area) showed the lowest richness with 40 individuals. These differences indicate the

influence of environmental factors such as sunlight exposure, soil conditions, vegetation density, and human disturbance on species distribution. Herbaceous plants dominated the campus flora, accounting for 48% of the recorded vegetation, followed by shrubs (21%), trees (18%), grasses (9%), and ornamentals (4%). This composition suggests that several areas of the campus are open and moderately disturbed. Species such as Eleutheranthera ruderalis and Commelina diffusa were widely distributed across sampling sites, demonstrating strong ecological adaptability to varying environmental conditions.

Conclusion - Variations in species abundance and occurrence among microhabitats highlight the influence of environmental conditions and campus land-management practices on plant distribution. Open and moderately disturbed habitats favored the dominance of herbaceous species, whereas more stable vegetation structures supported the occurrence of shrubs and trees.

Recommendations - The university should implement vegetation zoning and habitat management strategies to promote a more balanced vegetation structure across the campus. Increasing the planting of native tree and shrub species may improve structural diversity, enhance ecological stability, and provide suitable habitats for wildlife.

4.3 Ecological Importance, Conservation Concern, and Local Significance of Plant Species

Findings - The conservation status of the recorded plant species was evaluated using Department of Environment and Natural Resources Administrative Order 2017-11 and the International Union for Conservation of Nature (2024). Results showed that 72% of the identified species were classified as Least Concern (LC), indicating relatively stable populations. However, 8% were categorized as Vulnerable (VU), 3% as Endangered (EN), 2% as Near Threatened (NT), while 15% were identified as introduced species. Ecologically important species such as Vitex parviflora (Molave) and Swietenia macrophylla (Mahogany) were also documented within the campus. Their presence highlights the potential role of the campus as a refuge for ecologically valuable native and introduced plant species.

Conclusion - Although most plant species documented within the campus are not currently threatened, the occurrence of vulnerable and endangered species emphasizes the need for appropriate conservation measures. Without proper management, habitat disturbance, campus development, and competition from introduced species may threaten ecologically significant plants.

Recommendations - The university should establish designated conservation areas within the campus to protect ecologically important species and their habitats. Furthermore, the establishment of a native plant nursery may support conservation initiatives, ecological restoration, and biodiversity-related educational activities.

4.4 Contribution of the Floristic Inventory to Biodiversity Conservation, Education, and Sustainable Land-Use Planning

Findings - The floristic inventory conducted within the Central Bicol State University of Agriculture provides baseline information on plant diversity, species composition, and ecological distribution. The generated data can support biodiversity conservation initiatives, environmental education, and sustainable land-use planning within the campus. The documented plant diversity also demonstrates the campus's potential to function as a living laboratory for ecological learning, allowing students and researchers to engage in field-based studies, biodiversity assessments, and long-term ecological monitoring. Moreover, the findings can assist university administrators in making informed decisions regarding campus landscaping and infrastructure development while minimizing adverse impacts on existing vegetation and ecological resources.

Conclusion - The floristic inventory demonstrates that CBSUA–Pasacao Campus possesses valuable plant biodiversity that contributes to environmental education, ecological research, and sustainable campus management. Integrating biodiversity information into institutional planning can help balance campus development with environmental conservation objectives.

Recommendations - The university should incorporate the findings of this study into its environmental management and sustainability programs. Educational initiatives such as plant identification guides, biodiversity signage, and field-based ecological activities should also be implemented to enhance environmental awareness among students and faculty members. Additionally, periodic floristic monitoring is recommended to assess changes in plant diversity and ecosystem health over time.

Practical Educational Implications - The findings of this floristic inventory provide several practical implications for education, biodiversity conservation, and campus management within Central Bicol State University of Agriculture and similar academic institutions. For teachers and researchers, the documented plant diversity may serve as a valuable instructional and research resource for biology, ecology, environmental science, agriculture, and conservation-related courses. The campus vegetation can function as a living laboratory where students may conduct field identification, ecological assessment, biodiversity monitoring, and habitat analysis activities. Integrating actual campus biodiversity into instruction can strengthen experiential and place-based learning approaches.

For students, the inventory promotes environmental awareness and appreciation of local biodiversity. Exposure to native, introduced, ornamental, and ecologically significant plant species may enhance students' understanding of ecological relationships, conservation principles, and sustainable environmental practices. Field-based learning activities derived from the study may also improve scientific observation, critical thinking, and research skills. For school administrators and campus planners, the findings provide baseline ecological information that may guide sustainable land-use planning, landscaping, and environmental management programs. The inventory may support the development of biodiversity-friendly policies, conservation zones, native tree planting programs, and ecological restoration initiatives within the campus. Furthermore, integrating biodiversity conservation into institutional planning may help balance infrastructure development with environmental sustainability. More broadly, the study highlights the importance of higher education institutions as contributors to biodiversity conservation and environmental education. By maintaining and monitoring campus vegetation, schools can support ecological sustainability while providing meaningful opportunities for environmental learning and community engagement.

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