JUATIKA
JURNAL AGRONOMI TANAMAN TROPIKA
VOL. 8 No. 2 May 2026

DOI :https://doi.org/10.36378/juatika.v8i2.5118
eissn 2656-1727
pissn 2684-785X
pages : 453 – 457

RESEARCH ARTICLE Open Access

Biodiversity Study on Various Land Uses in Jatiarjo Village, Pasuruan Regency

Muhammad Ramdhan Kalandoro Wardoyo[1], Bakti Wisnu Widjajani[1,*], Fitri Wijayanti[1]

Abstract

Biological diversity is part of the ecological chain within the environment or ecosystem. The interrelationship among all living organisms, including microorganisms, flora, and fauna, cannot be overlooked. Biological diversity is often used as an indicator of ecosystem health. Biodiversity can be measured using the biological diversity index introduced by Shannon and Wiener, which serves as a reference for evaluating diversity levels. This research aims to examine existing biological diversity. The study uses the Shannon-Wiener method, which is commonly used to measure species diversity within communities across various land-use types, including Garden Mix 1, Garden Mix 2, fields, and gardens. Each land-use type possesses different vegetation diversity characteristics. Garden Mix 1 combines woody plants and horticultural crops, whereas Garden Mix 2 features a mix of horticultural plants and shrubs. The results of this research may serve as a recommendation and as a foundation for further sustainable studies, such as carbon stock research and biodiversity assessments.

Keywords: Diversity Biological, Pasuruan Regency, Shannon Wiener, Use of Land, Vegetation, Wealth Type

1. Introduction

Biological diversity is a fundamental pillar of the global environmental and ecosystem order. The relationships among all living organisms, ranging from microorganisms to flora and fauna, form an ecological chain that is inseparable and essential for environmental sustainability. Indonesia is classified as a tropical country, meaning that it possesses a wide variety of biological diversity, including plants, animals, and ecosystems. These variations contribute to the uniqueness of biodiversity in each region, with each area possessing distinct characteristics. This abundance provides significant potential for the sustainable utilization of regional natural resources. Indonesia is internationally recognized as a tropical country with megabiodiversity, hosting more than 38,000 plant species across Indonesian forests (Nisa et al., 2021). The diversity index and the evenness index are important ecological indicators. The diversity index (H') is used to describe the systematic structure of a community and facilitates the analysis of information related to the types and numbers of organisms (Khomsah et al., 2021).

Land use is the final dynamic result of various human interventions and activities on Earth's surface. Its primary function is to provide resources for fulfilling human needs, both physical (material) and non-physical (spiritual) (As-Syakur et al, 2010). Variations in land use can indicate the level of diversity within a region. Farmers' land management practices may create differences in land cover. These differences can have both positive and negative impacts, such as the cultivation of small plants on steep slopes. Identification of the diversity index for each land-use type is one way to evaluate vegetation composition. Such identification can also serve as a form of disaster mitigation for future environmental risks.

This research was conducted with limitations based on the distribution of land-use types. The classification of land use has also been applied in previous studies, such as Abdullah et al. (2022), which examined the soil quality index in dryland areas of Blang Bintang District, Aceh Besar Regency. Mixed gardens are a common land-use type in rural areas and feature a combination of woody plants and horticultural crops. Mixed gardens represent a form of agroforestry in which various plant species are cultivated, including at least one woody species (Susni Herwanti, 2015). This statement indicates that a single land-use type can maintain various potential benefits within the area. In addition to mixed gardens, this study examines two other land-use types: fields and gardens. Field land use

*Correspondence: wisnuswidjajani@upnjatim.ac.id
1) Universitas Pembangunan Nasional "Veteran" Jawa Timur – Jl. Raya Rungkut Madya, Gunung Anyar, Surabaya, Jawa Timur, 60294, Indonesia

refers to land designated for agricultural cultivation activities carried out by communities to meet their daily needs, and this practice is closely tied to cultural traditions (Kamakaula & Uria, 2025). Besides fields, garden land use is also an important attraction for farmers. Garden land refers to areas managed by humans with relatively uniform vegetation, such as vegetable gardens in Jatiarjo Village. Previous biodiversity research in Pasuruan Regency has also been conducted. For example, research by Kurnia et al. (2023) found that understory species in the rehabilitation block of Baung Mountain Nature Tourism Park, East Java, comprised 19 families, 34 genera, and 34 species. The difference between that study and the present research is that this study categorizes observations into four land-use types, allowing differences in land-use characteristics to be identified and analyzed.

2. Material and Methods

This study was carried out in the village of Jatiarjo, regency of Pasuruan, with coordinates 7°45′13″S 112°39′39″E and an elevation of 665 meters above sea level. This research was conducted from January to March 2025. The researchers found available land : garden mix 1, garden mix 2, and fields and gardens, totaling 1,548 ha. The determination location is in the village of Jatirjo, regency of Pasuruan, due to its abundant potential and diversity. Sampling was carried out by counting all available plants in the plot coverage and noting each plant. Every use: The land was divided into 2 plots as a limit for research across all uses. The method was repeated up to 8 times, so it was divided into 2 plots for each land use.

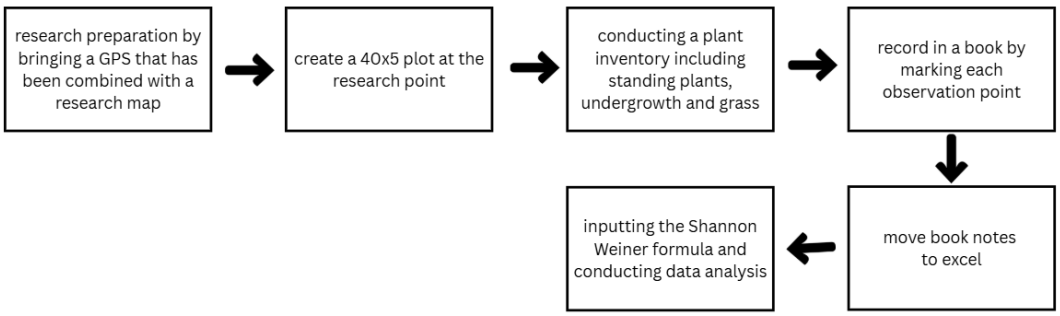

Figure 1. Research flow diagram

Analysis conducted for known diversity biological that is with use index diversity biological *Sahnnon Weiner*, with formula :

$$H = \sum_{i=1}^{s} Pi\ in\ Pi$$

(Shannon-Wiener, 1948),

Where:

H : index diversity Shannon Wainer.
pi : total individuals in the community species.
S : Amount Type .
I : order type .
In : Log 10

The method requires direct, open space, with the observation location at a plot measuring 5 x 40 m. Tools needed: ring, chest of drawers, ballpoint pen, notebook, laptop, and Microsoft Excel 2023. In addition, ArcGIS 8.0 is needed to conduct reference studies using land map points.

3. Results and Discussion

3.1. Diversity in every use of land.

This study examines four land-use types in Jatiarjo Village, Pasuruan, located at an elevation of 665 meters above sea level. The land-use types include mixed gardens, fields, and plantations. The study area covered approximately 1,548.49 ha and included eight research sampling points. Using plots measuring 40 × 5 m, a total of 36 woody and non-woody plant species were identified, as presented in Table 5. Various species were distributed across the four land-use types. Coffee plants occupied the highest position in terms of abundance, with a total of 68 individual trees of various sizes recorded. Coffee plants were widely cultivated because they possess high economic value for the local community in Jatiarjo Village. In addition, fruit plants such as bananas were commonly found, while pine trees also showed relatively high dominance, with a total of 67 individuals identified across the land-use types.

Farmland was the most densely populated land-use type, containing a total of 146 individual plants. The Shannon–Wiener Index was used to measure species diversity and is interpreted as follows: an H' value greater than 3 indicates high species diversity; an H' value between 1 and 3 indicates moderate species diversity; whereas an H' value lower than 1 indicates low species diversity (Bando & Langoy, Ratna Siahaan, 2016).

Table 1. Index Diversity *Shannon Weiner*

Index Diversity type				
No	**Use Land**	**Amount Vegetation**	**Index Value Diversity Type H'**	**Level Of Diversity Type**
1	Garden	146	2.10	Diversity type currently
2	Field	88	2.19	Diversity type currently
3	Garden Mix 1	54	2.28	Diversity type currently
4	Garden Mix 2	56	2.41	Diversity type currently

Note: Observed area of 11.7 ^{m2}; The value of H'>3 indicates that diversity of plants on one-use land is abundant, with H' value 1 < H' (Bando & Langoy, Ratna Siahaan, 2016).

Diversity indices are often difficult to interpret because they combine several components, including species richness and evenness (Nahlunnisa et al., 2016). The assessment in this study was conducted through field sampling, with plot areas determined for each land-use type. Observations and data collection were then conducted to record the number of plant species in each plot. The collected data were processed in Microsoft Excel and analyzed using the Shannon–Wiener diversity index. The assessment conducted in Jatiarjo Village showed that all four land-use types possessed moderate diversity values, indicating relatively balanced environmental conditions and adequate species diversity.

Findings from the garden land-use type were particularly noteworthy because this area contained the highest number of vegetation stands, totaling 146 individual plants, yet exhibited the lowest diversity index value compared to the other land-use types. This condition commonly occurs when a single species dominates, reducing the distribution and abundance of other species. These findings are consistent with the study by Faradila et al. (2025), which reported a low diversity index at Station I due to the dominance of T. sulcata, leading to an uneven species distribution. Coffee plants were the most dominant species identified in the garden land-use type, with 31 individual plants recorded. This dominance is considered one of the primary reasons for the low diversity index observed, as coffee plants were substantially more abundant than other species. The presence of woody vegetation and horticultural crops characterized Mixed Garden 1. The moderate diversity value in Mixed Garden 1 indicates that vegetation structure remains relatively well preserved, despite widespread agricultural activities in the area.

Farmland also yielded interesting findings, as both woody plants and horticultural crops were identified in this land-use type. Shrubs, bushes, and weeds dominated the lower vegetation layer, indicating agricultural activities that utilize previously unmanaged bushland for cultivation purposes. The dominance of coffee plants contributes to lower diversity. Similar conditions were reported in research conducted by Arabika (2019), which demonstrated significant differences in Shannon–Wiener diversity index values between protected forests and production forests. One important finding from that study was the high abundance of coffee plants compared to other species. Therefore, greater attention to biodiversity conditions may help increase the potential for plant diversity and improve agricultural productivity.

3.2. Variety Plant

The study area covered approximately 1,548.49 ha and included eight research sampling locations. Using plots measuring 40 × 5 m, a total of 36 woody and non-woody plant species were identified, as presented in Table 5, across four land-use types. Coffee plants occupied the highest position in terms of abundance, with a total of 68 individual trees of various sizes recorded. Coffee plants were widely cultivated because they possess high economic value in Jatiarjo Village. This was followed by fruit plants such as bananas, while pine trees also showed relatively high dominance, with a total of 67 individuals identified across the land-use types. The observed diversity subsequently became the basis for calculating the Shannon–Wiener Diversity Index (H'), which is used to classify species richness, species diversity, and species evenness.

In the table, one can see the most numerous plants found: coffee plants. There are many coffee plants in the area because it has high coffee productivity, so coffee plants are the most numerous plants there. Coffee plants were taken to fruit, and the beans were processed into coffee for marketing. Next, banana plants are horticultural plants that offer significant benefits to the public by supporting the economy. The diversity of plants in the land garden mixture demonstrates the public's capacity for Tumpeng sari farming. Intercropping is planting two or more plant types on a piece of land at the same time (Ruswandi & Irwan, 2017). The phenomenon is general because, in land use, the potential for more economical, taller crops can be improved through intercropping in agriculture.

In the garden land-use type, pine trees were found growing naturally due to the location being situated in a highland area. Pine trees also possess economic value. According to Rosyid (2015), planting pine trees can support the reforestation of degraded forests and contribute to the timber industry, as pine wood has good fiber quality and desirable coloration. In addition, pine trees can also be utilized for broom production. The average findings

indicated that woody plants, such as coffee plants and bodhi trees, were commonly identified in the study area.

Table 5. Species Diversity Across Land-Use Types

No	Plant Name	Usage Land			
		Garden mix 1 (plants)	Garden mix 2 (plants)	Garden (Plants)	Fields (Crops)
1	Coffee	9	0	49	9
2	Pine	3	1	30	8
3	Banana	4	6	9	31
4	Fern	0	0	9	1
5	Pawpaw	0	5	1	0
6	Sambong	0	0	12	0
7	Jackfruit	0	0	2	0
8	Nettle	0	0	3	0
9	Prunus	0	0	3	0
10	Guava	0	0	0	2
11	Snakefruit	0	0	0	2
12	Jackfruit	0	0	0	1
13	Cassava	0	0	0	17
14	Neem	3	3	0	15
15	Sengon	0	0	2	0
16	Rubber	0	0	1	0
17	Bodhi	0	0	3	0
1 8	Agarwood	0	0	8	0
20	Parasite	0	12	0	0
21	Eucalyptus	5	0	0	0
22	Kwalotan	2	0	0	0
23	Sapodilla Kicik	2	0	0	0
24	Fallopian flowers	0	15	0	0
25	Elephant Cassava	0	0	0	2
26	Ambarella Fence	0	2	0	0
27	Nettle	1	1	0	0
28	Kola	0	2	0	0
29	Longan	2	0	0	0
30	Leucaena	3	0	0	0
31	Mini Ayoga Flower	13	0	0	0
32	Peroba Rosa	0	2	0	0
33	Guava Seed	0	3	0	0
34	Sugarcane	7	0	0	0
35	Taro	0	4	0	0
36	Bamboo	0	0	14	0
Total		54	56	146	88

Note: calculation based on the number of trees in every 8-plot research at 4 points.

4. Conclusion

The conditions of the four land-use types, covering Garden Mix 1 and 2, were analyzed using the Shannon Diversity Index, which showed a moderate level of species abundance. Coffee and banana plants were the most commonly found species across all land-use types. The results indicated that each land-use type contained abundant plant diversity, with a total of 36 plant species identified. The moderate index value suggested that vegetation distribution in each area was relatively balanced, while also demonstrating that each area possessed unique characteristics.

References

Arabika, T. (2019). Analisis Biodiversitas di Bawah Tegakan Kopi Arabika (*Coffea arabica*) dan Pinus (*Pinus densiflora*) dengan Perbedaan Manajemen Agroforestri Analysis Biodiversity Under the Arabica Coffee Stands (*Coffea arabica*) and Pine (*Pinus densiflora*) with Difference Management in Agroforestry. *Jurnal Produksi Tanaman*, *7*(12), 2196-2205.

As-Syakur, A. R., Suarna, I. W., Adnyana, I. S., Rusna, I. W., Laksmiwati, I. A. A., & Diara, I. W. (2010). Studi perubahan penggunaan lahan di DAS Badung, Provinsi Bali menggunakan sistem informasi geografis. *Jurnal Bumi Lestari*, 10(2), 200-210.

Baiq Dian Faradila, Agil Al Idrus, & Juliyanti, J. (2025). Species diversity of gastropods in the Bale Mangrove ecotourism area. *Jurnal Biologi Tropis*, 25(1), 145–154.

Bando, A. H., Langoy, M. L. D., & Siahaan, R. (2016). Keanekaragaman vegetasi riparian di Sungai Tewalen, Kabupaten Minahasa Selatan, Sulawesi Utara. *Jurnal MIPA UNSRAT Online*, 5(1), 29-34.

Kamakaula, Y., & Uria, D. (2025). Sistem pertanian ladang berpindah dalam perspektif etnoekologi. *Jurnal Sosial Humaniora dan Pendidikan*, 2(1), 45-53.

Khomsah, M. R., & Zulfikar, Z. (2021). Diversity of weeds species around mango tree (*Mangifera indica* L.) on critical land in

Jombang Regency. *Jurnal Agronomi Tanaman Tropika (Juatika)*, 3(2), 104–116. https://doi.org/10.36378/juatika.v3i2.1547

Kurnia, A., Rahmah, A., & Fahruddin, M. M. (2020). Keanekaragaman tumbuhan bawah di Taman Wisata Alam (TWA) Gunung Baung Pasuruan, Jawa Timur. *Jurnal Biosense*, 3(2), 55–63.

Nahlunnisa, H., Zuhud, E. A. M., & Santosa, Y. (2016). Keanekaragaman spesies nematoda di areal Nilai Konservasi Tinggi (NKT) perkebunan kelapa sawit Provinsi Riau. *Media Konservasi*, 21(1), 91–98. https://doi.org/10.29244/medkon.21.1.91-98

Nisa, R. K., Wisanti, W., Putri, E. K., Kuntjoro, S., & Artaka, T. (2021). Keanekaragaman spesies anggrek di Ranu Darungan Taman Nasional Bromo Tengger Semeru. *LenteraBio: Berkala Ilmiah Biologi*, 10(1), 1–9. https://doi.org/10.26740/lenterabio.v10n1.p1-9

Rosyid, N. (2015). Political ecology and socio-economy dynamics in upland Pemalang District, Central Java. *Komunitas: International Journal of Indonesian Society and Culture*, 7(2), 125–138. https://doi.org/10.15294/komunitas.v7i2.4519

Ruswandi, D., & Irwan, A. W. (2017). Pengaruh pola tanam tumpangsari jagung dan kedelai terhadap pertumbuhan dan hasil jagung hibrida serta evaluasi tumpangsari di Arjasari Kabupaten Bandung. *Kultivasi*, 16(3), 514–521. https://doi.org/10.24198/kultivasi.v16i3.14474

Susni Herwanti. (2015). Potensi kayu rakyat pada kebun campuran di Desa Pesawaran Indah Kabupaten Pesawaran. *Jurnal Sylva Lestari*, 3(1), 113–120. https://doi.org/10.23960/jsl13113-120

Umar, H. A., Endiyani, E., Agustina, S., Irhami, I., Anwar, C., & Irmayanti, I. (2022). Analysis of soil quality index type of land use on dry land in Blang Bintang Sub-district, Aceh Besar Regency. *Jurnal Agronomi Tanaman Tropika (Juatika)*, 4(2), 194–206. https://doi.org/10.36378/juatika.v4i2.2092