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Ethnobotanical knowledge and its role in biodiversity conservation of Tatar Sunda, Indonesia

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Abstract. *Luzyawati L, Hamidah I, Nurafifah L. 2026. Ethnobotanical knowledge and its role in biodiversity conservation of Tatar Sunda, Indonesia. Biodiversitas 27 (2): d270218. https://doi.org/10.13057/biodiv/d270218*. Tatar Sunda in Indonesia is an area distinguished by its exceptional biodiversity and enduring cultural heritage. However, this vital biocultural knowledge faces significant threats from modernization and the erosion of intergenerational transmission. To ensure effective biodiversity conservation, it is necessary to integrate biophysical, socio-economic, and cultural dimensions, specifically ethnobotanical knowledge. Therefore, this study aims to document the integration of biodiversity and indigenous ethnobotanical knowledge of Tatar Sunda community, focusing on medicinal and timber plant species and their conservation significance. This study was conducted in five representative communities across West Java and Banten Provinces in Indonesia selected to capture diverse ecological and cultural settings. A mixed-method ethnobiological approach combining qualitative ethnography and quantitative ethnobotanical indices (SUV, FUV, ICF, and FL) was employed. This approach was carried out through observation, semi-structured interviews with 120 local experts, and field documentation. A total of 83 medicinal plant species and 46 timber species were documented. Quantitative analysis revealed strong communal consensus for 23 disease categories and highlighted the high cultural importance of key families, notably Zingiberaceae (medicinal) and Fabaceae (timber). Species from Poaceae family were widely used by the community for both medicinal and timber purposes. Crucially, indigenous conservation practices, such as sacred forest protection (*hutan larangan*), restricted harvesting, and cultural taboos (*pamali*), were found to be crucial for maintaining ecological balance. This study provides a comprehensive baseline, confirming that TEK in Sundanese community is not a relic but a vital, sustainable strategy for biodiversity conservation.

Keywords: Cultural practice, medicinal plants, Sundanese culture, timber plants, Traditional Ecological Knowledge (TEK)

INTRODUCTION

The Tatar Sunda area, comprising present-day West Java and Banten Provinces, Indonesia, is recognized as one of the most biologically significant areas in Indonesia (Gabi and Abdullah 2024), contributing approximately 23.98% of the country's documented biodiversity (Rinandio et al. 2022). This high level of regional biodiversity is deeply influenced by complex geographical conditions and diverse ecosystems, which provide essential plant-based resources for food, construction, and healthcare (Efe and Öztürk 2020; Wulandari et al. 2021). While extensive research has explored specific facets of local knowledge in this area, ranging from traditional medicine (Ramdhani et al. 2021) and edible plants (Iskandar et al. 2023) to broader socio-ecological functions (Suwartapradja et al. 2023), a significant gap remains in the literature. Most current studies are largely fragmented and species-specific, such as those focusing solely on tree ferns (Suryana et al. 2018; Syafni and Bakhtiar 2022) and fail to provide a comprehensive integration of ethnobotanical knowledge with actual community conservation practices. Consequently, there is an urgent need for a holistic, quantitative study that integrates the therapeutic benefits of medicinal plants with the economic value of timber within a conservation framework. This research addresses this gap by linking medicinal plants essential for life-sustaining healthcare with timber resources required for human habitation (Ahoyo et al. 2018; Santini et al. 2023). By evaluating these dual necessities, this study demonstrates how community reliance on biodiversity for fundamental survival drives local stewardship and ensures ecological sustainability against escalating environmental threats (Ansari et al. 2021; Chavan et al. 2023).

According to previous studies, Sundanese people have long preserved the diversity of native plants through deep cultural practices in various uses of plants, as well as providing critical insights into species conservation (Erawan et al. 2018; Cita 2020; Adriani and Fahrudin 2025). The practice of using plants in traditional Sundanese medicine is still widely used, specifically in rural areas (Oktavia et al. 2023; Febriyanti et al. 2024; Febriyanti et al. 2025). In some traditional communities, houses are built from traditional natural materials, and the ecological function of the forest is protected. This indigenous knowledge enables the community to preserve its environment (As'ari et al. 2025). The knowledge also reflects the socio-economic identity of local communities, but is now threatened by a decline in intergenerational transmission (Fernández-Llamazares et al. 2021). Ethnobotany, in particular, bridges the study of plant knowledge with cultural studies, including perceptions of plants and their uses (Ludwig and El-Hani 2020; Turner et al. 2022). This current study specifically focuses on the interaction between humans and plants, including the use of medicines, timber, and conservation practices.

For the Sundanese people, nature is not an object of domination but of respect and stewardship. This worldview, a form of Traditional Ecological Knowledge (TEK), is embedded in traditional ceremonies, ancestral teachings, and philosophical expressions that sustain ecological balance (Prasetyo 2023). In fact, Traditional TEK systems often prove to be highly effective and valid resource management strategies, complementary to modern scientific approaches (Tynshong et al. 2020). Customary law, for instance, often recognizes forests as living entities with spiritual value, believing they host guardian spirits that reinforce conservation taboos (Susanto et al. 2020). These myth-based spiritual beliefs thus function as crucial ecological safeguards (Alexander and Okorie 2024). These local practices reflect the global paradigm of biocultural conservation, which asserts that protecting biological diversity is inseparable from maintaining cultural systems and indigenous knowledge (Fernández-Llamazares and Teixidor-Toneu 2025; Parvin and Begum et al. 2025). However, while this knowledge remains embedded in insulated communities (Iskandar 2017; Partasasmita et al. 2017; Arifiani et al. 2019), its erosion among younger generations (Ihsan et al. 2024) presents a significant risk to global efforts in biodiversity preservation, as it diminishes the repository of adaptive strategies essential for environmental resilience (Reyes-García 2023). This highlights an urgent need to bridge the intergenerational gap by engaging youth with local biodiversity and indigenous knowledge, thereby revitalizing conservation values.

Therefore, this study aims to document plant uses and analyze how ethnobotanical knowledge contributes to biodiversity conservation in the Tatar Sunda cultural area. The current study provides essential baseline data for future ethnobotanical studies, informs conservation planning, and shows the importance of integrating local ecological knowledge into sustainable resource management strategies.

MATERIALS AND METHODS

Study area

A qualitative design with an ethnographic approach was used in this study, which was conducted from May to September 2025 across selected areas in the provinces of West Java and Banten, Indonesia. A total of five representative locations were selected to capture the ecological and biological diversity of Tatar Sunda, such as village settlements, forests, wetlands, coastlines, agricultural fields, and river (Saribanon et al. 2023) (Figure 1).

The selection of these sites was based on ecosystem typology to ensure representative environmental and biodiversity data (Ahmed 2024). In addition, the selection of locations was also based on indigenous communities in Tatar Sunda. Data collection used purposive sampling with an exploratory field method, allowing for targeted observations aligned with the study objectives. Detailed information on each location is presented in Table 1.

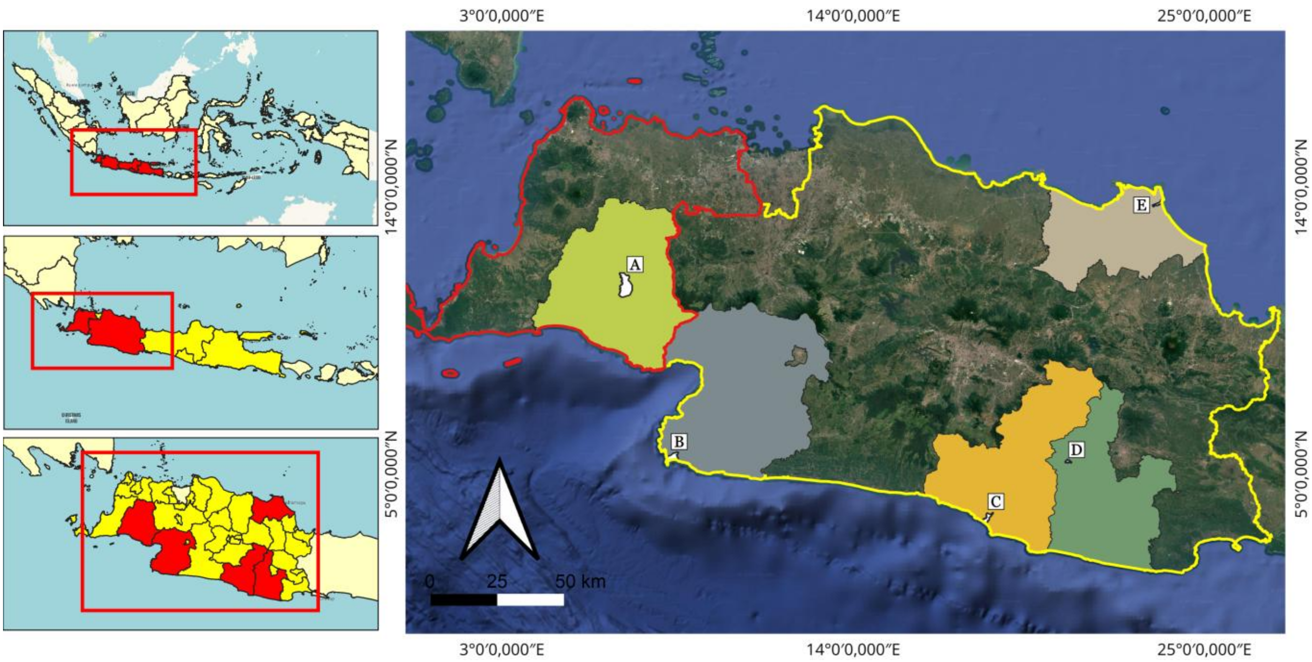

Figure 1. Location of Tatar Sunda in several districts (Lebak, Sukabumi, Garut, Indramayu, and Tasikmalaya) in Banten and West Java Provinces, Java Island, Indonesia. In the Google Earth satellite image, the yellow outline indicates West Java Province, and the red outline indicates Banten Province. The study sites were: A. Suku Baduy, B. Ujung Genteng, C. Kampung Dukuh, D. Kampung Naga, E. Pabean Ilir

Table 1. Geographic details of fieldwork sites

Villages	GPS coordinates	Land-use categories
Pabean Ilir, Indramayu	6°16'00"S, 108°19'28"E	Wetlands, coastlines, village settlements, paddy fields
Ujung Genteng, Sukabumi	7°22'22"S, 106°26'22"E	Wetlands, coastlines, village settlements
Kampung Dukuh, Garut	7°06'21"S, 07°36'05"E	Village settlements in montane area, bamboo groves, forest, small-scale horticulture
Kampung Naga, Tasikmalaya	7°21'59"S, 08°05'08"E	Village settlements in valley ecosystem is surrounded by forests, river, agricultural fields
Suku Baduy, Lebak	6°35'50"S, 106°13'33"E	Agricultural fields, river, forests, village settlements in montane area

Data collection

An ethnobiological framework was adopted as outlined in previous studies (Albuquerque et al. 2014; Iskandar 2017). This approach emphasized the study of indigenous ecological knowledge, specifically ethnobotany and ethnoecology, that was embedded in the daily life and cultural practices of local communities (Turner et al. 2022). The primary data were collected through direct observation and semi-structured interviews. This method was similar to the one used in a study Ridwan et al. (2023) where a semi-structured interviews was carried out with the local experts, aimed at documenting traditional knowledge of plant use for medicinal purposes and for housing or tools, including usage methods and conservation practices. Data collection was supported by photographic and written documentation of ethnobotanical practices.

Informants were selected using snowball sampling technique (Bartl and Paolocá 2024). Initial key informants were identified based on their in-depth knowledge of local plant use, and subsequent informants were nominated by previous participants. A total of 120 participants were interviewed to ensure comprehensive coverage of ethnobotanical knowledge collected across the five research locations. The distribution of participants across each research area is detailed in Table 2. The observed variance in the number of informants was primarily due to differences in the population size of each site. The informants comprised traditional leaders, custodians, local elders, women, youth, healers, farmers, and general community members residing in these areas. The age of participants ranged from 18 to 86 years, and for analytical purposes, they were grouped into three age categories, young adults (18-30), middle-aged: 31-50), and elders: >50). Interviews were carried out following a prepared guide that was dynamically adapted based on emerging insights (Albuquerque et al. 2019; Purwanto et al. 2020). To ensure data validity, the principle of saturation was applied separately to each location. Saturation was confirmed when three consecutive interviews in a specific site yielded no new species or uses. This site-by-site approach ensured that even in locations with fewer residents, data collection only stopped because the information had become redundant, not because of the smaller population size.

Ethical guidelines from the International Society of Ethnobiology (2006) were observed to ensure the responsible and respectful engagement with indigenous knowledge holders. Prior informed consent was secured from all participants through a verbal agreement before the commencement of the interviews. The study adhered strictly to local ethical guidelines and was executed with the formal approval and active participation of the community leadership. In addition, the study followed the Convention on Biological Diversity regulations and the Nagoya Protocol on Access and Benefit Sharing (Silvestri et al. 2020).

Data analysis

The collected qualitative data were analyzed through cross-verification, summarization, and thematic synthesis to construct a coherent narrative (Bartl and Paolocá 2024; Salmona and Kaczynski 2024). Triangulation was applied to validate findings, drawing from observations, interviews, and participatory methods. The analysis involved data reduction of informant narratives, descriptive synthesis of observational outcomes, and thematic tabulation of interview results. During this phase, synonymous terms and conceptual redundancies were systematically merged to streamline the dataset and ensure interpretive consistency.

Interview data covered local plant names, utilization, preparation methods for medicinal, and the specific plant parts used. The identified plant species were documented by recording or noting their local names, taking photographs, and collecting samples for herbarium preparation. All plant specimens obtained from observations and interviews were coded, identified based on morphological characteristics, and classified according to Angiosperm Phylogeny Group IV (The Angiosperm Phylogeny Group 2016) to inform scientific names and family names. To ensure taxonomic accuracy, species were identified in the field, and their scientific names and families were subsequently verified using the World Flora Online database (https://wfoplantlist.org/). The plant samples were deposited at the Botanical Laboratory, Biology of Education, Universitas Wiralodra.

To quantitatively assess medicinal etnobotany, a set of ethnobotanical indices, including Species Use Value (SUV), Family Use Value (FUV), Informant Consensus Factor (ICF), and Fidelity Level (FL) (Andrade-Cetto and Heinrich 2011), were employed. Meanwhile, in the ethnobotany of timber plants, only SUV, UV, FUV, and ICF were applied. These indices served as essential tools for identifying key species and plant parts for further study, conservation efforts, and potential applications in health, timber utilization, and sustainable development.

SUV referred to an ethnobotanical index that quantified the relative importance of locally known plant species based on the number of uses recorded for each species, applying the following formula:

$$SUV = \frac{\sum U}{N}$$

Where, SUV refers to the use value of a species, U is the total number of citations or mentions of the species, and N is the total number of informants (Phillips and Gentry 1993; Thomas et al. 2009). High SUV scores identify species under intense anthropogenic pressure, signaling potential risks of over-exploitation. To understand the distribution of ethnomedicinal knowledge across different botanical families, FUV was calculated. This index provides insight into the average use value of all species in a given plant family, reflecting its overall contribution to traditional healing practices (Phillips and Gentry 1993; Saensouk et al. 2024).

$$FUV = \frac{\sum UV}{N}$$

Where, ∑UV is the sum of use values of all species in a family. N is the total number of species within that family. FL was used to determine the percentage of those who used certain plant species to treat certain diseases. This reflected individuals' preferences for certain plant species in certain treatments (Jadid et al. 2020).

$$FL = \frac{Np}{N} \times 100$$

Where, Np is the number of respondents who use certain plant species to treat certain diseases, N is total number of respondents who use certain plant species to treat various diseases. FL identifies species with high cultural dependency, marking them as primary candidates for conservation if their populations are declining. The ICF was used to determine medicinal plant species that were considered culturally important and potentially effective (Cordero and Alejandro 2021).

$$Fic = \frac{Nur - Nt}{Nur - 1}$$

Where, Nur denotes the number of useful reports in each disease category, Nt is the number of plant species used, and Fic is ICF. ICF measures the consistency of resource use, which helps prioritize the protection of forest patches containing these validated medicinal and timber resources.

RESULTS AND DISCUSSION

Informant profile

The socio-demographic composition of the respondents in Table 2 reflects a community deeply engaged in plant-based practices. The data, which include the percentage distribution of the total informant number, demonstrates high variance across residency, gender, age, education levels, and occupational categories. The number of informants varied between locations due to demographic differences. In Ujung Genteng, the sample size was smaller because of its lower population density, while more informants were selected in the Baduy area, where people's livelihoods remained closely dependent on nature. This was consistent with previous reports stating that the Baduy community preserved its traditional customs amid the pressures of modernization (Yunita et al. 2024).

The gender distribution of informants in this study was dominated by men, consistent with ethnobotanical studies in other parts of Indonesia showing that men often possessed greater ethnobotanical knowledge due to socio-cultural norms (Azis et al. 2020; Febriyanti 2024). However, other studies reported balanced gender participation, reflecting shared responsibilities between men and women in maintaining and transmitting local wisdom (Bhagawan et al. 2025).

The respondents were adults, with the largest group being elders. This indicated the persistence of traditional knowledge among elder community members. Older respondents tended to have broader knowledge of plants due to their lifelong experience in traditional farming practices and natural resource management (Farikha et al. 2024). However, the smaller proportion of informants young adults still possessed knowledge about ethnobotany. A lack of proactive knowledge transmission posed a significant threat to the conservation of valuable ethnobotanical wisdom as its traditional holders advance in age (Ouma 2022).

Table 2. Socio-demographic profiles of informants (N = 120) in Tatar Sunda area, Indonesia

Distribution	Categories	Number of informants	Percentage (%)
By residence	Pabean Ilir Village, Indramayu District, West Java	27	22.5
	Ujung Genteng, Sukabumi District, West Java	12	10.0
	Baduy in Ciboleger, Lebak District, Banten	31	25.8
	Kampung Dukuh, Pameungpeuk District, Garut District, West Java	21	17.5
	Kampung Naga, Tasikmalaya District, West Java	29	24.2
By gender	Male	66	55.0
	Female	54	45.0
By age range	18-30	21	17.5
	31-50	46	38.3
	>50	53	44.2
By occupation	Traditional leader	15	12.5
	Farmer	20	16.6
	Custodiants (*kuncen*)	5	4.2
	House wife	21	17.5
	Artisans	12	10.0
	Merchant	19	15.8
	Fisherman	14	11.7
	Government employer	8	6.7
	Traditional healer/traditional attenden	6	5.0

Occupationally, most informants were farmers, which reflects the agrarian lifestyle of Sundanese people and their close interaction with the natural environment. The second largest group was housewives who had knowledge of traditional plants, specifically medicinal plants, and played a role in the intergenerational transmission of knowledge. Similar observations have been found in other ethnobotanical studies, where women are considered the key holders of ecological knowledge in the domestic sphere (Kusuma 2025). A small number of participants were traditional leaders, custodians, and government employees, indicating that traditional medicinal and timber knowledge spans various societal roles (Putri et al. 2022). Traditional leaders and healers still serve as key figures in safeguarding and transmitting traditional practices, often acting as community educators and guardians of ritual knowledge (Bhagawan et al. 2025).

Species diversity

Based on interviews and direct field observations, the findings revealed that Tatar Sunda continued to support high levels of biodiversity within each respective ecosystem. Tatar Sunda community used plant resources for medicinal and timber purposes, comprising 45 families with 127 species (Figure 2). A total of 83 medicinal plant species belonging to 42 families and 46 timber plant species belonging to 18 families were recorded. The taxonomic distribution of recorded species reveals a significant concentration within specific botanical families, most notably Arecaceae, Asteraceae, Moraceae, and Zingiberaceae. Arecaceae stands out as the most versatile family, contributing the highest total number of species (n=13), with a balanced distribution between medicinal use and timber provision. This versatility underscores the family's critical role in the socio-economic and structural framework of Sundanese rural life. The prominence of Arecaceae as a multi-purpose family in Tatar Sunda aligns with global patterns where palms are recognized as the most utilized plant family for structural and medicinal needs in tropical areas (Gruca et al. 2015). These dominant families had various species that were used by the community as medicine and timber (houses and household equipment). The results are consistent with previous reports showing that the Arecaceae, Poaceae, and Zingiberaceae families are widely used by indigenous communities in Kalimantan, Indonesia (Suciyati et al. 2021).

Most other plant families were represented by only one or two species, indicating a more selective or specialized use. This pattern suggests that while a few plant families provide multiple versatile species, the majority contribute unique species that fulfill specific. The presence highlights a strategy of 'botanical selection' rather than mere availability. These minor families are often sought for specific, high-prestige timber or specialized ceremonial medicine. This suggests that the cultural value of a family in Tatar Sunda is not always correlated with its taxonomic richness, but rather with the unique functional niche it occupies. These families were distributed across home gardens, farmlands, forests, and wetlands, playing important ecological and ethnobotanical roles within the landscape of Tatar Sunda. The recorded diversity indicated the richness of Sundanese ethnobotanical knowledge and the community's reliance on a broad spectrum of plant resources. Similarly, the community traditionally depends on it for socio-economic and cultural purposes, with local knowledge influencing utilization (Wardah et al. 2022).

Etnomedicinal knowledge

The high diversity of flora within the Sundanese communities offered substantial ecological and ethnobotanical value. Informant interviews revealed that multiple species were frequently used for medicinal purposes. The respondents also described the preparation techniques and specific applications for various plant parts.

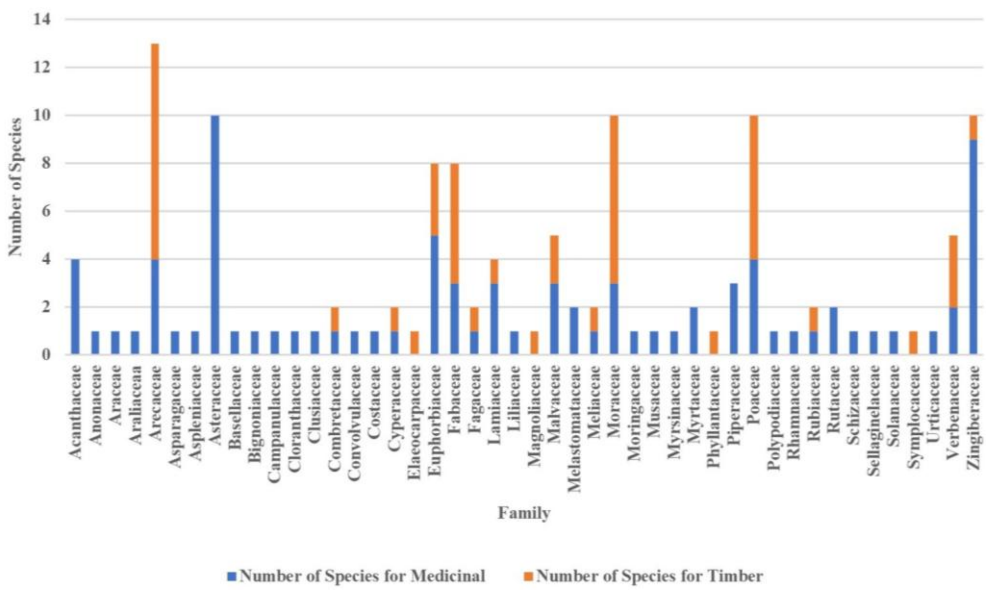

Figure 2. Plant families used for medicinal and timber

Table 3. Medicinal plant species and their associated ethnobotanical uses

Family (FUV) and scientific name	Local name	Habitat type	Part used	SUV	Disease treated (FL)	Preparation
Acanthaceae (0.138)						
Clinachantus nutans (Burm. f.) Lindau	*Hantap*	Fo, Hg, Fl	L	0.092	Fever (100%)	Sq
Graptophyllum pictum (L.) Griff	*Handeleum*	Fl, Hg	L	0.125	Kidney disorders (75%), fever (25%)	D
Sanchezia speciosa Leonard	*Cacak gading*	Fl, Hg	Rh	0.108	Male stamina (100%)	Bo
Strobilantes crispus BI	*Kejibeling*	Hg	L	0.258	Kidney stones (66.67%), fever (33.33%)	D
Annonaceae (0.444)						
Annona muricata L.	*Sirsak*	Fl,Hg	L	0.675	Anti cancer (79%), cancer (21%)	Bo
Araceae (0.037)						
Typhonium flagelliforme (Lodd.) Blume	*Keladi tikus*	Fo, Fl, Hg	L	0.192	Stress medication (100%)	Dr, Bo

Note: Part used: B: Bark, Bu: Bulb, E: Exudate, F: Fruit, Fo: Flower, R: Root, Rh: Rhizome, L: Leaf, S: Stem, Se: Seed, Sr: Sprout; Preparation: Bo: Boiled, C: Cheweed, CMW: Crush Mix Water, Co: Cooked, D: Decoction, Dr: Dried, G: Grated, P: Pounded, Sq: Squezeed, WP: Whitout Processing; Habitat types: Co: Coastal, Fo: Forest, Fl: Farmlands, Hg: Home garden, We: Wetland

Based on data presented in Table 3, a total of 83 plant species were traditionally used by Sundanese Tatar community for medicinal purposes. This included key ethnomedicinal indices such as SUV, FUV, and FL, alongside scientific names, botanical family affiliations, local (vernacular) names, habitat type, traditional indications, plant parts used, and methods of preparation. The community believed that many ailments could be treated with locally available plants, reflecting rich ethnobotanical knowledge and contributing to biodiversity conservation through the sustainable use of native flora. This traditional practice also provided a foundation for the discovery of novel therapeutic agents, as it integrated ancestral wisdom with emerging scientific insights (Sen and Bhakat 2022). Indigenous communities possessed unique ecological knowledge that was invaluable for pharmacological studies. By harnessing ethnomedicinal knowledge, we could explore bioactive compounds, promote species conservation, and address environmental challenges such as climate change (Chakma et al. 2023).

Family Use Value (FUV)

In terms of FUV, the highest values were recorded for Zingiberaceae (4.64), Poaceae (1.88), and Euphorbiaceae (1.70). The high FUV values of these three families were mainly influenced by their cultural importance and the frequent use of particular species within each family (Najem et al. 2019). A total of nine species from the Zingiberaceae family were used for medicinal purposes. Zingiberaceae was one of the most diverse plant families widely used in traditional medicine, primarily through its rhizomes, seeds, and flowers (Bidiarti et al. 2023). Similarly, among the Karo ethnic group, 80% of the species from Zingiberaceae were used for medicinal purposes (Nasution et al. 2018). This pattern is also consistent with findings among Dayak communities, where Zingiberaceae is frequently reported as the most dominant medicinal plant family (Julung et al. 2023). This regional consensus, which is also reflected in studies in Thailand (Junsongduang et al. 2025) and Malaysia (Appalasamy et al. 2022), highlights the deep cultural and therapeutic importance of this family across Southeast Asia. Members of this botanical family were well known for their aromatic qualities (Cao et al. 2020), and also widely utilized for therapeutic purposes (Shahrajabian et al. 2019).

The FUV of Zingiberaceae was considerably higher than that of Asteraceae, even though both families had an equal number of species. However, in Asia and the Americas, Asteraceae represented one of the most species-rich families (Babu 2022; Kachura and Harris 2022; Ralte et al. 2024). This indicated that FUV was not necessarily correlated with species richness in a family, but rather allows for understanding the significance and utility of a whole plant family by the community under study (Benabderrahmane et al. 2024). It is evident that FUV is more strongly controlled by the cultural relevance and the prevalence of use of specific taxa at the species level in each family (Ghafouri et al. 2025). The high utility of these families reflects a specialized biocultural niche; therefore, this family should be prioritized in germplasm conservation to ensure that high-demand species do not face genetic erosion due to continuous harvesting.

Species Use Value (SUV)

Based on the analysis of SUV from 83 recorded species, the highest values were obtained for *Zingiber officinale* Roscoe (1.73), *Kaempferia galanga* L. (1.35), *Zingiber zerumbet* (L.) Roscoe ex Sm. (1.04), and *Allium cepa* L. (0.98). These four species were most frequently cited by informants due to their easy availability and dual function as both culinary ingredients and medicinal plants. Their popularity stemmed from their multiple health benefits and ease of cultivation, leading to their use as household staples (Pratap et al. 2017; Yönak and Emre 2024). *Zingiber officinale* was particularly recognized for its anti-inflammatory activity and other pharmacological properties (Kopustinskiene et al. 2022). Sundanese people often use the plant in herbal medicine. Several other studies on ethnomedicine reported the plant as a medicine (Arablou and Aryaeian 2018; Ali et al. 2024; Ramadhan and Cahyanto 2024; Gupta et al. 2025). These findings underscore the significant cultural importance and pharmacological potential of these species for modern medicine. As 'cultural keystones' in the Tatar Sunda area, their high SUV reflects an intense utilization pressure; while widespread cultivation currently mitigates the vulnerability of common staples, these values serve as a critical conservation red flag for less domesticable species. Consequently, high-demand plants that remain difficult to cultivate must be prioritized for protection to prevent over-harvesting and the depletion of wild populations (Ahoyo et al. 2018).

Fidelity Level (FL)

The FL value was used to determine the specific utilization of each plant species and its preference compared to others. In Tatar Sunda community, FL values ranged from 10.95% to 100%, showing varying degrees of informant agreement on the specific uses of each species (Table 3).

High informant agreement (Fidelity Level = 100%) was observed for several disease categories treated by multiple species. These included major categories such as wounds (6 species), diabetes (5 species), fever (5 species), and stomach ailments (5 species). Scientific validation supports many of these high-consensus uses. For instance, the use of *A. cepa* for fever is substantiated by its anti-inflammatory properties (Chakraborty et al. 2022; Elattar et al. 2024), and the application of specific species for eye pain is confirmed to mitigate oxidative stress (Imelda et al. 2023a; Imelda et al. 2023b). Likewise, treatments for skin diseases, such as the anthelmintic-confirmed use of *Merremia umbellata* (Linnaeus, 1753) Halber (Nahar et al. 2020), and dysentery, using species like *Ficus hispida* L.f. (Saensouk et al. 2024), are validated. The consensus on diabetes remedies, such as *Nypa fruticans* (Nugroho et al. 2020) and *Acmella paniculata* (Wall. ex DC.) R.K.Jansen (Raihandhany et al. 2024), highlights the local integration of diet and health.

In contrast to these high-consensus categories, the study also documented numerous monospecific treatments, where a single plant species was cited for a specific ailment. These applications ranged widely, from remedies for stress relief and anemia to treatments for rheumatism, high cholesterol, and hemorrhoids. Other specific uses included stimulants for stamina, analgesics for headaches, menstrual pain relief, and antidotes for poisoning. The efficacy of these targeted remedies is often supported by their phytochemical profiles (Mirgane et al. 2021; Khatoon et al. 2025). Notably, some of these specific uses are validated ethnomedicinally in Ghana (Boakye et al. 2023) or extend into veterinary care (Maroyi 2024).

High FL values for the diseases mentioned above indicated a strong consensus of knowledge. This affirmed the ethnobotanical value for pharmacological study (Babu 2022). Conservation of these plants was essential for maintaining biodiversity and preserving ethnomedicinal knowledge, emphasizing the interconnection between ecological balance and cultural heritage (dos Reis et al. 2023).

Informant Consensus Factor (ICF)

In this study, Tatar Sunda community used medicinal plants to treat 49 types of diseases. The ICF values for these categories ranged from 0.00 to 1.00, reflecting varying levels of agreement among informants regarding the selection of plant species for each ailment (Figure 3). Based on Figure 3, the highest ICF values were observed for 23 diseases (1.00), including anemia, anti-cancer treatment, bite wounds, blood circulation, boils, bone strengthening, breast inflammation, dysentery, dysmenorrhea, hair blackening, hemorrhoids, joint pain, kidney disorders, lactation, nausea, nephrolithiasis, obesity, poisoning, postpartum treatment, respiratory disorder, stress medication, urticaria, and vomiting. These high values suggested that some plant species were repeatedly cited by multiple informants for the same condition, indicating high ethnomedicinal agreement and possibly reflecting the perceived efficacy of the traditional remedies.

A high ICF value revealed that the species was widely recognized and frequently used by the community as a medicinal resource for treating specific ailments (Alfinandah et al. 2025). Meanwhile, asthma (0.91), internal heat (0.96), and headaches (0.96) showed the lowest ICF values, reflecting a lack of consensus. This divergence is driven by the high accessibility of modern over-the-counter (OTC) medicines and the subjective nature of these symptoms, which leads to fragmented, individualized remedies rather than standardized protocols (Abebe and Teferi 2021). As institutionalized healthcare becomes the primary choice for common or chronic ailments, traditional knowledge for these categories is increasingly substituted, reducing the collective agreement typical of more specialized treatments (Kharchoufa et al. 2021).

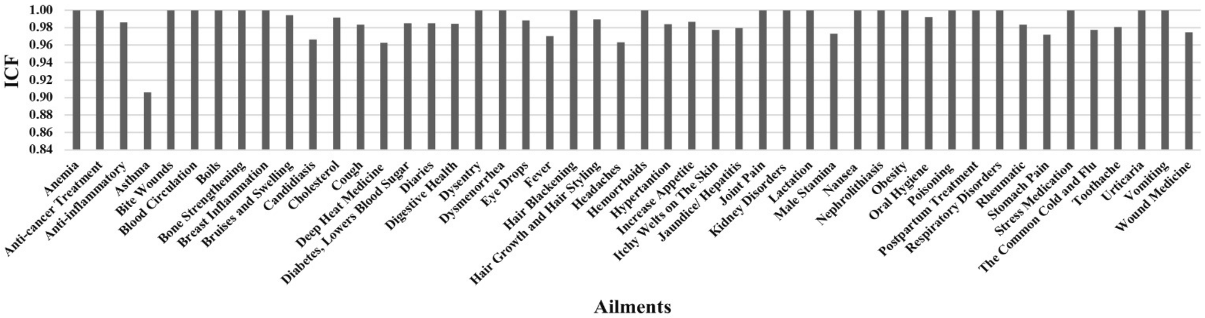

Figure 3. ICF value for each identified ailment category

Plant part and preparation

Several parts of medicinal plants were reported to be used by Tatar Sunda community for ethnomedicinal purposes (Figure 4). Based on frequency of use, leaves were the most commonly used plant part, followed by fruits and rhizomes, and roots. The dominance of leaf use was consistent with other ethnomedicinal studies, showing that leaves were preferred due to their ease of collection, sustainability, and high concentrations of bioactive secondary metabolites (Bhagawan and Kusumawati 2021; Shriwas et al. 2023). The utilization of medicinal leaves in Indonesia represents a profound ancestral legacy, where the generational transmission of ethnobotanical knowledge provides a robust empirical foundation for sustaining health and treating ailments (Dewi et al. 2024; Nur and Suwandi 2025). Different plant parts, such as rhizomes, fruits, and flowers, contained distinct bioactive constituents that exhibited antioxidant, anticancer, and anti-inflammatory properties (Bhat 2021; Ponnusamy and Balakrishnan 2023). The rhizome-type was considered to have a sharper taste and aroma sensation (Nurshillah et al. 2022). Despite their pharmacological potential, ethnomedical knowledge related to these plant parts was often ignored by the allopathic medical community, specifically in efforts to integrate traditional therapies with conventional biomedicine (Valentin et al. 2025). The preference for leaves and other above-ground parts contributed positively to conservation efforts, as it avoided uprooting the entire plant. This sustainable harvesting practice helped maintain local biodiversity. However, bulbs and sprouts were used by only a small proportion of respondents.

The diversity of preparation methods reflected the richness of ethnopharmacological knowledge embedded within the community and adapted to the specific therapeutic indications of each plant species. Most plants were used after being boiled or extracted, and the decoction was consumed orally. A smaller number of species were eaten raw as *lalapan* (traditional fresh salad).

Ethnobotanical of timber

In addition to medicinal knowledge, local management of timber species also reflects sustainable resource use embedded in cultural norms. A total of 46 plant species were documented for material purposes, including construction, furniture, and handicrafts (Table 4). This extensive use reflects a wealth of ethnobotanical knowledge for meeting housing needs and contributes to biodiversity conservation (Das et al. 2019). Traditional architectural designs in these indigenous communities, for instance, typically incorporate a variety of plant components, from stems (used as solid wood or processed bamboo culms) to leaves and basal leaf sheaths.

Family Use Value (FUV)

Based on FUV analysis, the three families with the highest values were Fabaceae (4.07), Poaceae (3.25), and Arecaceae (2.63). The high FUV values in these families revealed a strong community dependence on tree species belonging to these groups. This trend was consistent with findings from previous studies, which identified Arecaceae, Fabaceae, and Poaceae, as among the most commonly used families for constructing houses, furniture, and various household tools (Kouakou et al. 2020; Ramos et al. 2021; Stefańska et al. 2021; Dukarska and Mirski 2023; Pisani et al. 2023).

Fabaceae had the highest SUV, but the family did not have the highest number of species. These findings confirmed that FUV was not necessarily determined by the number of species within a family, but rather by the relevance and intensity of their use in daily life (Ghabbour et al. 2024). For instance, the Fabaceae included many economically important species were widely used for construction and furniture making (Olaga et al. 2024; Shah et al. 2024), and their characteristics included having hard and durable wood (Ijaz et al. 2017).

In the Poaceae family, *Imperata cylindrica* (L.) Raeusch. was utilized as roofing material by the Dukuh Village community (Figure 5). Its fibrous structure provides strong insulation, reducing heat gain (Mendoza and Co 2019; Rottenberg 2024), and its use for this purpose is widespread across Indonesia (Aulia and Veronica 2024). In contrast, the Naga Village community used *Etlingera coccinea* (Blume) S.Sakai & Nagam. leaves as roof underlayers (Figure 6), whose broad leaves offer effective thermal insulation for indoor comfort (Aleksejeva et al. 2024).

In the Arecaceae, *Metroxylon sagu* Rottb. was traditionally used by the Baduy as a roofing material, where its leaves formed the base layer topped with *ijuk*, coarse black fibers derived from the leaf sheaths of *Arenga pinnata* (Wurmb) Merr.. The structure of Baduy roofing was shown in Figure 7. *Ijuk* was also applied by other indigenous groups, such as those in Kampung Naga and Kampung Dukuh. However, there is a difference in the underlayer used beneath the ijuk. While the Baduy used *M. sagu* leaves, these communities applied alternative plants, discussed under Zingiberaceae and Poaceae. However, coastal communities in Pabean Ilir Village used *N. fruticans* leaves directly as roofing, without an underlayer (Figure 8). This practice reflected an ecological adaptation to the coastal environment, emphasizing area diversity in traditional architectural materials.

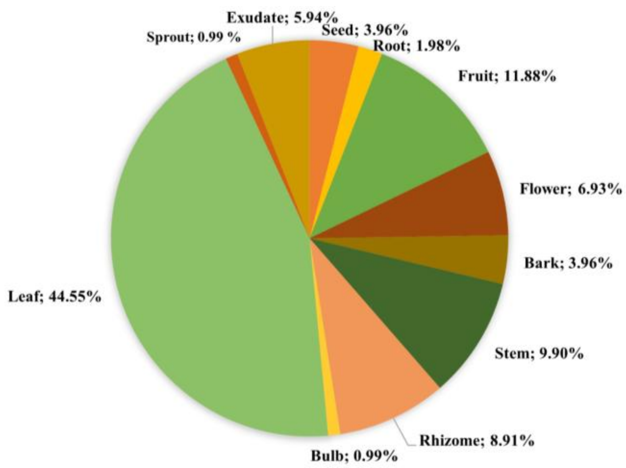

Figure 4. Percentage distribution of plant parts utilized for medicinal purposes

Table 4. Botanical attributes and ethnobotanical indices of timber plants

Family (FUV) and scientific name	Local name	Habitat type	Part use	SUV	Utilization purpose
Arecaceae (2.63)					
Arenga pinnata (Wurmb) Merr.	Aren	Fo, Fl	L, S	0.85	Roofs
Calamus javensis Blume	Rotan lilin	Fo	S	1.00	HA, baskets and cabinets
Calamus caesius Blume	Rotan sega	Fo	S	0.60	FU
Caryota mitis Lour.	Sarai	Fo	B	0.20	Furniture Ropes
Cocos nucifera L.	Kelapa	Fo, Fl, Hg, We, Co	F, L	0.92	HA and BC
Daemonorops rubra (Reinw. ex Mart.) Blume	Pelah	Fo	S	0.27	FU
Metroxylon sagu Rottb.	Sagu/kirai	Fo	L	0.30	Roofs
Nypa fruticans Wurmb	Nipah	We	L	0.18	Roofs
Plectocomia elongata Mart. ex Blume.	Endeuk	Fo	S	0.15	HA
Cyperaceae (0.08)					
Fimbristylis umbellaris (Lam.) Vahl	Mendong	Fl, Hg	Fs	0.28	Handycrafts
Elaeocarpaceae (0.33)					
Elaeocarpus angustifolius Blume	Ganitri	Fo, Fl	S	0.74	BM and handicrafts
Euphorbiaceae (0.28)					
Aleurites moluccanus (L.) Willd.	Muncang	Fo, Hg	S	0.13	BC
Elateriospermum tapos Blume	Tapos	Fo	S	0.51	BC and handicrafts
Mallotus paniculatus (Lam.) Müll.Arg.	Bilik angin	Fo, We	S	0.33	Furniture rope
Fabaceae (4.07)					
Acacia auriculiformis A.Cunn. ex Benth.	Akor	Fo	S	0.21	BC
Acacia mangium Willd.	Akasia	Fo	S	1.42	BC, FU and frames
Albizia chinensis (Osbeck) Merr.	Sengon	Fo	S	1.68	BC, FU and frames
Falcataria falcata (L.) Greuter & R.Rankin	Albasiah	Fo	S	1.46	HA, BC and trays
Pterocarpus indicus Willd.	Angsana	Fo	S	0.55	BC and bridge supports
Fagaceae (0.02)					
Lithocarpus sundaicus (Blume) Rehder	Pasang	Fo	S	0.29	BC, susruk and sinduk
Lamiaceae (0.03)					
Vitex pubescens B.Heyne ex Wall., 1829	Laban	Fo	S	0.25	Leuit
Magnoliaceae (0.25)					
Magnolia sumatrana var. *glauca* (Blume) Figlar & Noot.	Manglid	Fi, Fl	S	0.51	Drum and wooden gong
Malvaceae (0.56)					
Thespesia populnea (L.) Sol. ex Corrêa	Tisuk	Fo	S	0.70	BC
Schoutenia ovata Korth.	Kukun	Fo	S	0.27	Pestle
Meliaceae (1.49)					
Swietenia mahagoni (L.) Jacq.	Mahoni	Fo, Fl	S	1.81	BC, FU, and frame
Moraceae (0.51)					
Artocarpus elasticus Reinw. ex Blume	Teureup	Fo	S, L	0.55	Handicrafts and roofing
Artocarpus heterophyllus Lam.	Nangka	Fl, Hg	S	0.42	drums
Artocarpus lanceifolius Roxb.	Kelidang	Fo	S	0.23	BC
Artocarpus rigidus Blume	Pensar	Fo	S	0.13	BC
Ficus copiosa Steud.	Beunying	Fo	S	0.25	BC
Ficus variegata Blume	Gondang	Fo	S	0.17	Knife sheath
Ficus virens Aiton	Bunut	Fo	S	0.12	BC
Phyllanthaceae (0.01)					
Baccaurea javanica (Blume) Müll.Arg.	Eucit	Fo	S	0.11	BC
Poaceae (3.25)					
Gigantochloa apus (Schult.f.) Kurz	Awi tali	Fo	S	2.44	Boboko, tampiyan, hihid and nyiru
Gigantochloa atroviolacea Widjaja	Awi hideung	Fo, Fl	S	1.46	Shelf, CU and trash cans
Gigantochloa pseudoarundinacea (Steud.) Widjaja	Awi gombong	Fo	S	2.04	Palupuh, bridge and water pipes
Gigantochloa robusta Kurz	Awi Mayan	Fo	S	1.53	FU, CU and trash cans
Imperata cylindrica (L.) Raeusch.	Ilalang	Fl	L	0.25	Roofs
Schizostachyum glaucifolium (Rupr.) Munro	Awi tamiyan	Fo	S	1.56	Boboko, tampiyan, hihid and imitate
Combretaceae (0.13)					
Terminalia catappa L.	Ketapang	Fo, Co	S	0.37	BC
Rubiaceae (0.71)					
Neolamarckia cadamba (Roxb.) Bosser	Jabon	Fo, Fl	S	0.84	BC
Symplocaceae (0.07)					
Symplocos fasciculata (Roxb.) Zoll.	Jirak	Fo	S	0.26	BC
Verbenaceae (1.28)					
Gmelina arborea Roxb. ex Sm.	Jati Putih	Fo, Fl	S	0.73	Household furniture
Peronema canescens Jack	Sunkai	Fo	S	0.43	Lisung and jubleg
Tectona grandis L.f.	Jati	Fo, Fl	S	0.77	FU
Zingiberaceae (0.04)					
Etlingera coccinea (Blume) S.Sakai & Nagam.	Tepus	Fo	L	0.21	Roof base of the house

Note: Part used: B: Bark, F: Fruit, Fs: Fiber stem, L: Leaf, S: Stem; Utilization purpose: Bc: Building construction, BM: Building material, CU: Cubicles, FU: Furniture Ha: Household appliances; Habitat type: Fi: Field, Ga: Garden, Vil: Vilages, Fo: Forest, Co: Coastal, We: Wetland

Figure 5. Roof of houses in Kampung Dukuh, Garut, West Java, Indonesia

Figure 6. Roof of houses in Kampung Naga, Tasikmalaya District, West Java, Indonesia

Figure 7. Roof of a Baduy traditional house, Lebak, Banten, Indonesia

Metroxylon sagu and *A. pinnata* primarily grew scattered across gardens and forest habitats, while *N. fruticans* clustered in the deepest mangrove zones. Beyond their availability, the utilization of these palm-based roofing materials represents a strategic ecological adaptation, offering superior thermal regulation and carbon-neutral benefits compared to modern industrial alternatives. Despite their high utility, the local community avoids over-exploitation, guided by mystical beliefs that associate ecosystem damage with misfortune. This synergy between functional suitability and indigenous taboos ensures a sustainable harvesting cycle, where the use of local biomass for habitation minimizes the community's ecological footprint (Otang-Mbeng et al. 2023).

Species Use Value (SUV)

The SUV analysis identified three species with the highest values, namely *Gigantochloa apus* (Schult.f.) Kurz (2.44), *Gigantochloa pseudoarundinacea* (Steud.) Widjaja (2.04), and *Swietenia mahagoni* (L.) Jacq. (1.81). These species were the most frequently used due to their accessibility, durability, and functional roles in construction and handicrafts. *Gigantochloa apus* ranked highest because it was used in multiple contexts, including building materials, agricultural tools, and crafting household items, such as *boboko* (rice containers), *hihid* (hand fans), *nyiru* (winnowing trays), and *tampiyan* (rice washing trays). Furthermore, its strength and flexibility made it ideal for producing items such as baskets, farm implements, and fences (Rizqi et al. 2025).

Gigantochloa pseudoarundinacea for constructing bridges, *palupuh* (raised wooden flooring), water pipes, shelves, *bilik* (cubicles), and waste baskets (Figure 9). The unique fiber structure and coloration of these bamboo species contributed to an aesthetically pleasing final product (Lias et al. 2022). These findings provided an important empirical basis for developing forest resource management strategies that balance human needs with ecological conservation.

Culture-based conservation practices

The Sundanese preserved biodiversity and ecosystems through culturally rooted practices, particularly traditional taboos known as *pamali*. Community taboos often restrict activities such as logging or hunting within sacred groves, thereby reducing human impact on these ecosystems (Adeyanju et al. 2022). These sacred prohibitions, inherited from ancestors, functioned as effective mechanisms for regulating human-nature interactions, conserving biodiversity, and maintaining ecological balance.

In Kampung Naga, natural resources such as wood and bamboo were used exclusively for building materials. Architectural forms, materials, and construction methods followed strict customary laws passed across generations (Sekartaji et al. 2021). The conservation of high-use species is bolstered by the presence of *hutan keramat* (sacred forests) and *hutan larangan* (prohibited forests), which serve as undisturbed seed banks for the surrounding landscapes. In these areas, resource extraction is strictly governed by cultural restrictions; for instance, entry is limited to the kuncen (custodian) for ritual purposes only. By forbidding harvesting within these primary zones and instead directing the collection of materials to home gardens or forest fringes, the community effectively creates a buffer system that prevents overexploitation while maintaining the genetic diversity of essential plants.

Kampung Dukuh community similarly protected a 13-hectare sacred forest, governed by customary rules that prohibited any extraction, and even fallen leaves could not be collected. The community also practiced *melak cai*, planting bamboo in the sacred forest to ensure water abundance. Bamboo's fibrous roots enhanced groundwater retention and prevented erosion, supporting long-term ecological stability (Kuok et al. 2024). The high SUV of bamboo reflects a deep cultural reliance that incentivizes the community to protect the sacred forest as a vital water catchment area.

Figure 8. Roof of houses in Pabean Ilir Village, Indramayu, West Java, Indonesia

Figure 9. *Bilik*, *palupuh*, shelves, and waste baskets

The Baduy community enforced comparable restrictions. Specific zones were designated as *hutan lindung* (protected forest), where entry was limited to male guardians and traditional leaders, permitted only four times annually, solely for monitoring forest conditions. When degradation was detected, rituals and reforestation followed. While logging was strictly prohibited, naturally fallen trees could be collected as firewood, adhering to customary law. This grove serve as informal conservation sites, harboring rare and endangered species, including medicinal plants not found elsewhere (Moore et al. 2022). Customary rules are passed down through generations, reinforcing the community's commitment to protecting their natural heritage and biodiversity (Sen and Bhakat 2022). Through these practices, Sundanese communities demonstrated how traditional knowledge and spiritual beliefs served as effective strategies for conservation and sustainable resource management.

Ecological knowledge integrated with cultural practices fostered a holistic ethos, codified in customary laws and taboos that preserved ecosystems. Sacred forests and regulated harvesting exemplified adaptive resilience. By bridging traditional knowledge with scientific analysis, this documentation advanced biocultural diversity discourse and supported community-centered, culturally rooted strategies for sustainable biodiversity conservation. Local communities recognized that maintaining intact forests ensured high-quality construction materials, creating an indirect conservation incentive (Fadiman 2019).

The integration of ecological knowledge and indigenous cultural practices created a holistic environmental ethos, valuing nature as both a spiritual entity and a communal resource. Embedded through customary laws and taboos, these practices serve as effective, demonstrable mechanisms for ecosystem preservation, exemplified by sacred forest protection and regulated resource use. Consequently, TEK represented a vital, sustainable strategy for biodiversity conservation in Tatar Sunda, maintained through intergenerational wisdom. TEK played a crucial role in shaping local cultural values through the sustainable utilization of biological diversity (Chakraborty 2024). Such practices reflected a harmonious ecological relationship between humans and their environment while simultaneously embodying conservation value by promoting the sustainable use of local resources (Rai and Mishra 2024). Likewise, local knowledge contributed to strengthening conservation values that supported biodiversity preservation in the area (Nemogá et al. 2022).

Policy and educational implication

The findings of this study provide a scientific foundation for integrating Traditional Ecological Knowledge (TEK) into formal education and regional policy. At the university level, the documented quantitative ethnobotanical indices serve as practical case studies for biodiversity and ethnobiology curricula. Integrating these data helps students bridge the gap between theoretical biological science and the practical, lived experiences of indigenous communities, thereby fostering scientific literacy and critical thinking regarding sustainable development (Marsandi et al. 2025).

Such pedagogical integration ensures that ethnobotanical knowledge is not merely archived but remains a resource that can be adapted by younger generations to address modern environmental challenges.

From a governance perspective, these results offer critical insights for formulating community-based conservation policies. By identifying 'cultural keystone' species and documenting the efficacy of traditional management systems like hutan larangan, local governments can develop more inclusive regional regulations. The formal codification of these traditional practices into environmental policy, including village authority (*Peraturan Desa*) or biodiversity action plans, establishes a legal framework that empowers local communities as the primary guardians of their natural heritage (Permana et al. 2025). Ultimately, this approach aligns with global conservation targets that increasingly recognize indigenous territories as essential strongholds for biodiversity protection (Georginah 2025).

In conclusion, this study demonstrates that traditional ethnobotanical knowledge of the Tatar Sunda not only sustains local livelihoods but also contributes to biodiversity conservation through cultural norms and ecological awareness. This is evidenced by the versatility of key plant families, such as Poaceae, for both medicinal and timber applications; the strong communal consensus on specific remedies; and the adherence to local wisdom such as *pamali* (taboos) and the designation of prohibited forests. Together, these findings illustrate an effective, culturally embedded mechanism for regulating human-nature interactions and maintaining ecological balance. These results strongly support the implementation of community-based conservation strategies that are culturally anchored, socially inclusive, and environmentally sustainable. Furthermore, future research should focus on assessing the conservation status of the key species identified in this study, to ensure that traditional utilization can be aligned with long-term conservation targets. Consequently, the results also offer pedagogical relevance, providing essential material for integrating TEK into biodiversity and ethnobiology curricula at university levels to foster scientific literacy and critical thinking regarding conservation.

Limitations of this study arise primarily from the use of snowball sampling and the age bias observed among informants, which collectively constrain the full generalizability of the results. Moreover, the lack of phytochemical validation necessitates subsequent experimental research to confirm the reported traditional uses. To bridge this gap, integrating bioactivity assays with ethnobotanical data is essential to validate therapeutic claims, while formal conservation status assessments are needed to ensure the ecological viability of these culturally vital resources.

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