Continuity and change in Sundanese use of wild vegetables: A historical ethnobotany analysis

Shofia Az Zahra Aulia, Dede Mulyanto, Budiawati Supangkat Iskandar, Zanisah Man, Wawan Sujarwo

Correspondence

Shofia Az Zahra Aulia[1*], Dede Mulyanto[2,3], Budiawati Supangkat Iskandar[2], Zanisah Man[4,5], Wawan Sujarwo[6]

[1]Anthropology Graduate Program, Faculty of Social and Political Sciences, Universitas Padjadjaran, Coblong 40135, Bandung, Indonesia.
[2]Department of Anthropology, Faculty of Social and Political Sciences, Universitas Padjadjaran, Jatinangor 45363, Sumedang, Indonesia.
[3]Center for Environment and Sustainability Science, Universitas Padjadjaran, Coblong 40134, Bandung, Indonesia.
[4]Anthropology and Sociology Program, Faculty of Social Sciences and Humanities, Universiti Kebangsaan Malaysia, Bangi 43600, Selangor, Malaysia.
[5]Center for Research in Development, Social, and Environment, Faculty of Social Sciences and Humanities, Universiti Kebangsaan Malaysia, Bangi 43600, Selangor, Malaysia.
[6]Research Center for Ecology and Ethnobiology, National Research and Innovation Agency (BRIN), Cibinong 16911, Bogor, Indonesia.

*Corresponding Author: shofia21003@mail.unpad.ac.id

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Research

Abstract

Background: Java's favorable climate and volcanic soils have supported a rich variety of edible plants, shaping biodiversity and food systems. The Sundanese of West Java have a culinary tradition emphasizing fresh vegetables, especially **lalab**, which are raw or lightly cooked and served with chili paste **(sambal)**, that historically played a central dietary role.

Methods: Historical data were sourced from J. J. Ochse's *Indische Groenten* (1931) and additional colonial-era materials, augmented by secondary references. Wild vegetable species were taxonomically authenticated through Plants of the World Online and cross-referenced. Species cited in recent studies were classified as "persistent," whereas absent species were considered "forgotten." Botanical characteristics, edible parts, consumption methods, and biogeographical origins were examined to identify diachronic patterns.

Results: A total of 232 wild species (158 genera, 68 families) were historically documented, primarily herbaceous, with leaves most used. Recent studies, however, report merely 50-100 species. Persistent taxa are mainly perennial herbs, used raw or minimally processed. Forgotten taxa include forest-associated trees and ferns, seasonally available annuals, species requiring detoxification or complex processing, and taxa with commercially cultivated relatives. Introduced species from several floristic regions signify prolonged plant exchange and migration. Sociohistorical transformations, including wartime deforestation, post-independence land transfer, the Green Revolution, commercialization, and agroforest simplification, diminished access to wild vegetables.

Conclusions: This study shows that using historical documents in ethnobotany research is important for revealing people-plant relationships and cultural trajectories over time. Diachronic perspectives are essential for revitalizing traditional plant knowledge and strengthening food traditions amid biodiversity loss and cultural change.

Keywords: Diachronic ethnobotany, **Lalab** vegetables, Sundanese cuisine, Unconventional food, Wild plants

Background

Vegetables are among the most important plant-based foods due to their rich content of essential nutrients and bioactive compounds (Cruz-Garcia & Price 2012, Hernawati *et al.* 2022, Sujarwo *et al.* 2016). They include various edible plant parts, both reproductive and vegetative, and are typically consumed either raw or cooked with a starchy staple (Cruz-Garcia & Price 2012, Siemonsma & Piluek 1994). Generally, vegetables have common characteristics, with only a few conforming to a strict classification. Cultural interpretations differ, regardless of botanical classification (Russo 2021).

Modern agriculture and commercial food systems focus mainly on cultivated vegetables, although many communities have historically depended on a broader range of plant resources, including wild vegetables (Batoro *et al.* 2018, Milião *et al.* 2022, Parkash 2021, Sajeev *et al.* 2023). Typically, wild vegetables grow and reproduce naturally without human intervention or cultivation and are often gathered from forests, fallow, or disturbed areas for use as food (Aulia & Mulyanto 2024, Motti & Motti 2017, Sujarwo *et al.* 2016). These plants are an important part of traditional diets, ensuring food security, particularly during times of scarcity (Asfaw *et al.* 2023, Bhandary 2021, Gillani *et al.* 2024, Hussain *et al.* 2023, Jigme & Yangchen 2023, Sriwahjuningsih & Putri 2022). They are also considered an additional source of income (Anbessa *et al.* 2024, Borelli *et al.* 2020, Cruz-Garcia & Price 2014, Guo *et al.* 2022, Inimbock *et al.* 2023). Recent ethnobotanical studies have shown a decline in the abundance, diversity, and use of wild food plants in western Java and other parts of the world (Acosta-Naranjo *et al.* 2021, Aulia & Mulyanto 2024, Kodirekkala 2017, Lubin *et al.* 2021, Pawera *et al.* 2020, Rahayu *et al.* 2024, Schunko *et al.* 2022). However, many of these studies rely on contemporary perceptions and assumptions rather than empirical historical evidence, and diachronic analyses that contextualize these long-term transformations are lacking.

The favorable climate and volcanic soils of Java have long supported a rich diversity of plants, influencing both local biodiversity and cultural practices (Farikha *et al.* 2024, Iskandar *et al.* 2021, Kurniahu *et al.* 2023, Kurniawan *et al.* 2022, Sulistiyowati *et al.* 2022, Triyanto *et al.* 2024). The Sundanese, Indonesia's second-largest ethnic group, predominantly inhabit the mountainous areas of western Java. In general, Sundanese cuisine emphasizes fresh, raw, and minimally processed plant-based foods that use both native and introduced species (Amrinanto *et al.* 2019, Aulia & Mulyanto 2024, Hernawati *et al.* 2022, Iskandar *et al.* 2023). The Sundanese incorporate a wide variety of wild vegetables into their daily diets, which are strongly influenced by local biophysical environments and cultures (Iskandar *et al.* 2023a, 2023b, Iskandar *et al.* 2024, Rahman 2018).

Java's highlands have long been recognized as ideal locations for agricultural and botanical studies. The Buitenzorg Botanical Garden (established in 1817, now Bogor) and the Cibodas Botanical Garden (founded in 1852) served as centers for studying Javan mountain flora and acclimatizing new crops before they were introduced to large-scale plantations (Adam 2020, Amini *et al.* 2023, Boomgaard 1999, Weber 2019). Since the early nineteenth century, botanists and naturalists have documented Java's rich flora, including numerous edible species used by local communities (Mulyanto *et al.* 2023). A significant example is J. J. Ochse's early twentieth-century work, *Indische Groenten* (Dutch East Indies Vegetables), which documented hundreds of vegetables used in the archipelago.

Despite these historical insights, many aspects of traditional plant consumption remained understudied. Reports showing a decline in the use of wild vegetables often lack long-term data, making it difficult to assess actual changes or confirm knowledge loss. Comprehending diachronic plant use is crucial for tracing the protracted dynamics of traditional knowledge, specifically with respect to environmental and cultural constraints (Prakofjewa *et al.* 2022, Sõukand & Kalle 2016, Vandebroek & Balick 2012). Due to dynamic characteristics, ethnobiological knowledge is contingent upon context-practice and diverse transmission pathways (Fonseca-Kruel *et al.* 2019, Reyes-García & Broesch 2013). Integrating historical ethnobiology facilitates temporal depth, enabling a nuanced appreciation for the continuity, transformation, or loss of plant uses over time (Medeiros 2021, Medeiros & Albuquerque 2014, Pieroni 2021, Silva *et al.* 2014).

Based on the discussion above, this study aims to examine wild vegetables traditionally consumed by the Sundanese in the early twentieth century through historical ethnobotanical methods and colonial-era publications, particularly Ochse's *Indische Groenten*. By combining historical reviews with current ethnobotanical literature, this study explores not only the

diversity of wild vegetable plants, their parts used, and consumption methods, but also the continuity, changes, and prospects of these plants in the Sundanese culinary tradition.

Materials and Methods

Data sources

The use of wild vegetables was reviewed by studying published material on the collection and consumption of wild vegetables by the native population of the Dutch East Indies, titled *Indische Groenten* (Dutch East Indies Vegetables, Ochse 1931). This collection was compiled and written by Jacob Jonas Ochse, a Dutch horticulturalist and botanist, in 1929, who worked as an agricultural consultant in the Department of Agriculture. The collection aimed to follow the manual for vegetable growers with a description of the cultivated and wild-growing crops eaten by the native population. It is an expanded edition of Ochse's previous publication, *Tropische Groenten* (Tropical Vegetables, Ochse 1925). This study referred to both collections as primary materials.

Among the literature consulted and used, Ochse mentioned four volumes of *De Nuttige Planten van Nederlandsche-Indie* (The Useful Plants of the Dutch East Indies), by Karel Heyne, head of the Museum for Economic Botany in Buitenzorg (Heyne 1913-1927), and two volumes of *De Landbouw der Inlandsche Bevolking op Java* (The Agriculture of the Native Population in Java), by H.C.H. de Bie (Bie 1901-1902). The necessary building materials concerning the uses of the plants discussed were also compiled from Hasskarl (1845), Miquel (1855-1860), Filet (1888), Clercq and Greshoff (1909), and Backer (1925-1928). These collections were used together as secondary materials. Digital copies of primary and secondary materials used in this study were collected from the Biodiversity Heritage Library (https://www.biodiversitylibrary.org) and Delpher (https://www.delpher.nl).

Ochse's data were not only collected from existing works on the subject but also supplemented or expanded with the help of living material, including a large number of interested parties, both experts and laymen. To obtain more extensive and more certain data, many copies of the previous publication were sent to the officials of the Agricultural Extension Service and the Administration, both in Java and the outer provinces, for evaluation and supplementation. The questionnaires were distributed to agricultural officers to collect 1) native names, 2) heights above sea level, with mention of the places where the plants occur, both in cultivated and wild states, 3) descriptions of any cultivation method, 4) descriptions of the way in which the plant, or parts, is consumed by the population, 5) statements of native names of edible parts and prepared dishes, 6) statements of varieties and deviations possible further details.

While Ochse's collection provides a comprehensive record of wild vegetables utilized in the Dutch East Indies, it is crucial to recognize certain limitations. The data were primarily collected through questionnaires administered to agricultural officers, potentially representing the viewpoints of colonial authorities and local elites rather than those of regular farmers. The geographic coverage in West Java may have been inconsistent, and plant identification relied on several contributors, potentially leading to inaccuracies or discrepancies. Acknowledging these limitations allows for a more critical analysis of the historical data while still appreciating their value in understanding past ethnobotanical knowledge.

Plant identification

Data collection was carried out using a modified version of the systematic literature review method for bibliographical studies (Mengist *et al.* 2020), specifically for historical ethnobiological analysis of publication materials (Medeiros 2016, 2019). The stages in the method are described as follows:

Step 1. We recorded all wild vegetables mentioned in the primary materials. In this study, wild vegetables refer to non-cultivated vascular plants, as suggested by Ochse collections and other secondary materials. Only species that could be identified as non-cultivated plants based on their described habitats and growth conditions, such as mountains, fields, and river edges, were extracted. The escaped species, which have been cultivated to some degree and can be found along the banks of rice fields or pools, were also included in the collection under the heading wild vegetables, in line with the historical trajectory. Numerous species introduced by Europeans for nonfood purposes during the colonial era subsequently escaped cultivation and became naturalized in the postcolonial landscape.

Step 2. Sundanese vernacular names were used to link species to the ethnic group. The association between wild vegetables and the Sundanese ethnic group was identified through the use of Sundanese names and descriptions of their uses. Only species mentioned and described in Sundanese culinary terms were collected.

Step 3. All scientific plant names cited in primary and secondary materials were taxonomically validated using the POWO database (https://powo.science.kew.org) to ensure the use of currently accepted nomenclature. Species characterized with illustrations and morphological information from primary sources were compared with botanical plates and descriptions (see Taxonomic validation). Biogeographical status, including native distribution, was also retrieved from POWO. These native distributions were categorized into the eight floristic kingdoms delineated by Liu *et al.* (2023).

Step 4. To contextualize historical data and assess continuity and changes, current ethnobotanical studies of wild vegetables among Sundanese were also collected and reviewed. This includes field-based studies such as those from Sriwahjuningsih and Putri (2022), Suwartapradja *et al.* (2023), Iskandar *et al.* (2023a, c), Rahayu *et al.* (2024), Aulia and Mulyanto (2024), Iskandar *et al.* (2024), Mulyanto *et al.* (2024a), and Alfinandah *et al.* (2025). These works serve as a comparative reference for assessing the current relevance of species recorded in early twentieth-century sources. Continuity was evaluated based on the number of current ethnobotanical studies from West Java that cited the same taxa. A species was considered to persist if it was documented in one or more of these studies, while those lacking recent citations were categorized as forgotten. This study may be a preliminary diachronic comparison of species present in Sundanese local knowledge.

Taxonomic validation

1. To ensure accurate identification and comparison between historical and contemporary data, we used a taxonomic validation process that combined historical texts, modern floristic references, and verified ethnobotanical field studies. This approach aimed to standardize plant nomenclature across time and preserve diachronic knowledge through source triangulation. The comparison adhered to the following general criteria. For species in the primary material that were characterized by botanical illustrations, identification was conducted through visual comparison of the plate with those found in *The Mountain Flora of Java* (Steenis 1972).

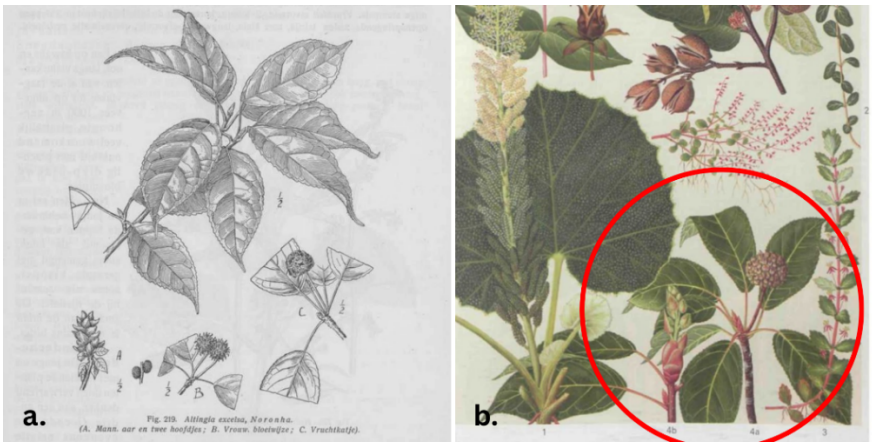

Figure 1. Comparative botanical illustrations of *Altingia excelsa*: (a) morphological drawing *from Indische Groenten* (Ochse 1931); (b) colored plate from *The Mountain Flora of Java* (Steenis 1972), which was used for taxonomic verification.

2. In cases where no illustration was available, identification depended on comparisons of Ochse's morphological descriptions, including habitat, growth form, and edible parts, with entries in established floristic references.
3. All scientific names cited in the historical text were validated using the Plants of the World Online (POWO) database. Outdated or synonymous names were updated in accordance with current taxonomic consensus. For example, *Ophioglossum pedunculatum* was classified under the accepted name *O. reticulatum*, which was applied in this study.
4. Potential vernacular synonyms were reviewed meticulously. To prevent redundancy, several local names used for the same species, based on morphology, ecology, and culinary use, were combined into a single taxon. Conversely, when a single vernacular name was identified as referring to multiple distinct botanical species, such as **suring** (*Rumex rugosus* and *R. sagittatus*), these were maintained as separate entries to represent the taxonomic diversity.
5. Two or more species identified in the historical material as taxonomic synonyms were consolidated into a single taxon. *Pisonia alba* and *P. sylvestris*, previously classified as distinct species, were treated as taxonomic synonyms and unified under *Pisonia alba*.

Data analysis

Following botanical identification of all the plant species, the list was organized alphabetically according to the currently accepted scientific nomenclature. This list was enhanced with vernacular names, life forms, parts used, consumption forms, ecological status, and native phytochorion. Before further analysis, all were categorized by cultivation status, providing a basis for subsequent data exploration. Each cultivation category was then analyzed through Microsoft Excel to discern patterns. The organized data is shown in tables and charts.

Results

Botanical characteristics

This study identified 232 wild species belonging to 158 genera and 68 families. The most species-rich family was Asteraceae (21 species), followed by Fabaceae (16 species), Amaranthaceae (14 species), Poaceae (10 species), and Moraceae (8 species). These five families are highly diverse, comprising 69 species (29.7%) of the total. According to genus representation, most genera (112; 70.8%) were represented by a single species. A small number of genera, such as Ficus (eight species), Amaranthus (seven species), and Dioscorea (five species), showed significantly greater diversity.

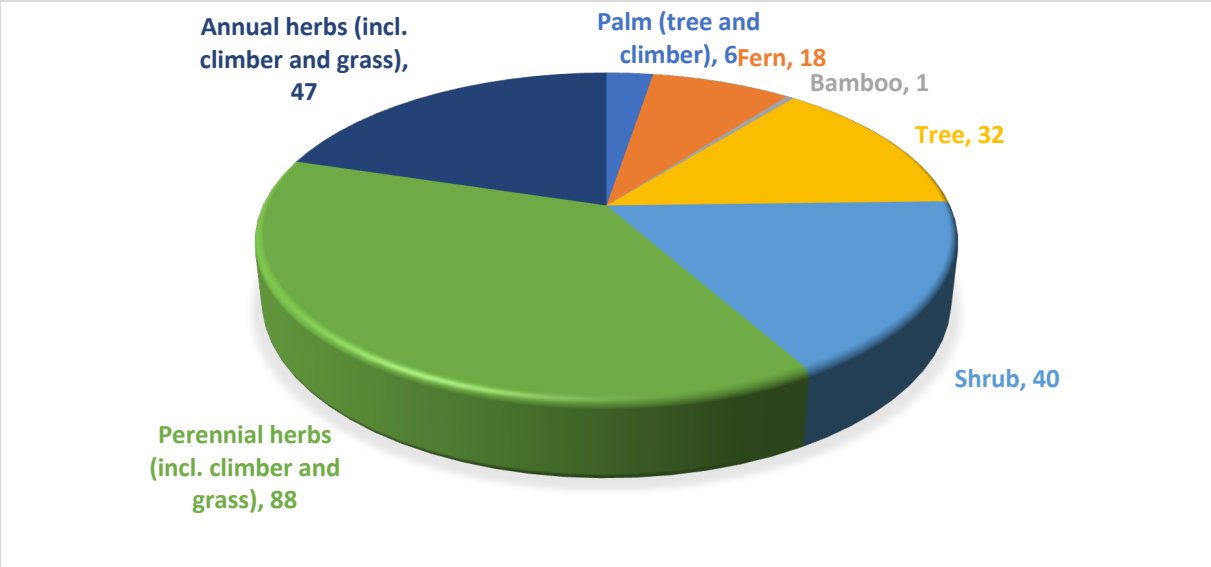

Figure 2. Distribution of plant habits

According to Figure 2, the species identified were primarily herbaceous, with 88 perennial species (37.9%) and 47 annual species (20.3%). Perennial herbs, such as elephant yam (*Amorphophallus paeoniifolius*), valued for year-round availability and nutrient storage capacity, are predominant and considered essential during resource-limited seasons. Annual herbs, such as king's salad (*Cosmos caudatus*), were used opportunistically for their rapid growth and nutritious leaves. Woody species, such as shrubs (17.2%) and trees (13.8%), were also used. Palms (2.6%), such as wax rattan (*Calamus javaensis*), are valued for edible apical buds, while Banyard grass (*Echinochloa crus-galli*) was considered the only bamboo in the wild plant category.

Forms of consumption and parts used

Sundanese cuisine features a wide array of side dishes, which are food items served alongside the main course and add variety to the meal. These side dishes are typically served with steamed rice (**sangu**), a prominent central component of the meal in Sundanese culture. Conceptually, Sundanese call the dishes **réncang sangu** (rice companions), comprising varieties that accompany rice, such as meat **(daging)**, fish **(lauk),** and various vegetable-based dishes. Based on preparation methods and meal functions, vegetable-based dishes can be grouped into several categories.

Lalab, a quintessential element of Sundanese cuisine, refers to raw or steamed vegetables served with sambal, a chili-based condiment or sauce sometimes enhanced with shrimp paste. **Lalab** holds an important culinary function as **réncang sangu**. Another important category includes vegetables that appear in various kinds of dishes, such as **angeun** (vegetables in liquid-based dishes); **tutumisan,** referring to stir-fried vegetables with garlic (*Allium sativum*), shallots (*Allium cepa*), and chilies (*Capsicum annuum*); and **papaisan** (meat or fish seasoned with various spices, wrapped in banana leaves, then steamed, roasted, and ember-grilled over firewood). Sundanese also have indigenous salads, including **urab**, comprising steamed

vegetables with a grated-coconut-based sauce; **loték**, consisting of raw or cooked vegetables combined with a sweet-savory roasted peanut-based sauce; and **karédok**, a fully raw salad dressed in a spicy peanut-based sauce infused with aromatic ginger (*Kaempferia galanga*).

Table 1. Distribution of plant parts used (N=232)

Plant part(s)	No. of species	% of total
Aerial part	56	24.1
Bud	7	3.0
Bud, shoot	3	1.3
Flower	2	0.8
Flower, bud	1	0.4
Flower, seed	1	0.4
Flower, shoot	1	0.4
Frond	13	5.6
Fruit	7	3.0
Fruit, shoot	1	0.4
Leaf	**68**	**29.3**
Leaf, bud	6	2.6
Leaf, bud, fruit	1	0.4
Leaf, fruit	3	1.3
Leaf, flower	6	2.6
Leaf, shoot	9	3.9
Rhizome	1	0.4
Seed	4	1.7
Shoot	26	11.2
Shoot, flower	3	1.3
Tuber	8	3.4
Tuber, fruit	1	0.4
Tuber, leaf	1	0.4
Whole parts	3	1.3

Leaves were the most consumed plant part (29.3%), followed by aerial parts (24.1%), shoots (11.2%), and fronds (5.6%), mainly because of the role as **lalab**, which favors quick, raw, or lightly cooked preparations. Examples include aerial parts of Asiatic pennywort (*Centella asiatica*) and marsh pennywort (*Hydrocotyle sibthorpioides*), and also young shoots of pointed myrtle (*Syzygium acuminatissimum*). Fern fronds, especially fiddlehead ferns (*Diplazium esculentum*), were highly valued for their versatility and could be used in many dishes, such as cooked **lalab**, stir-fries **(tumis)**, and salads. Reproductive parts were used infrequently (as less than 5%) and were limited to species such as American black nightshade (*Solanum americanum*), which has multiple uses, including **lalab**, **tumis**, and **karèdok**.

Some leafy vegetables serve as substitutes for spices, including Ming aralia (*Polyscias fruticosa*), which enhances meat- or fish-based dishes. A specific category includes fermented products, exemplified by the detoxified seeds of rattlebox (*Crotalaria pallida*). The seeds were processed through **ngadagé,** a method that involves boiling, washing, wrapping in banana leaves for fermentation, and subsequently frying, mixing with **oncom,** or serving as **sambal goreng**. Monkey hand (*Piper peltatum*) leaves play a crucial role in the **pais** technique, serving as an edible wrapper for fish before it is slowly cooked over ashes. The red juice of Malabar spinach (*Basella alba*) can be processed into **gincu** powder, a natural food colorant.

Biogeographical status

The botanical data indicate that wild plants native to Java, including endemic species such as voodoo lily (*Amorphophallus variabilis*) and locust bean (*Parkia intermedia)*, constitute the predominant portion (64.7%). In addition, various wild vegetables used by the Sundanese were Indo-Malesian species (4.7%), including Albert palm (*Caryota rumphiana*).

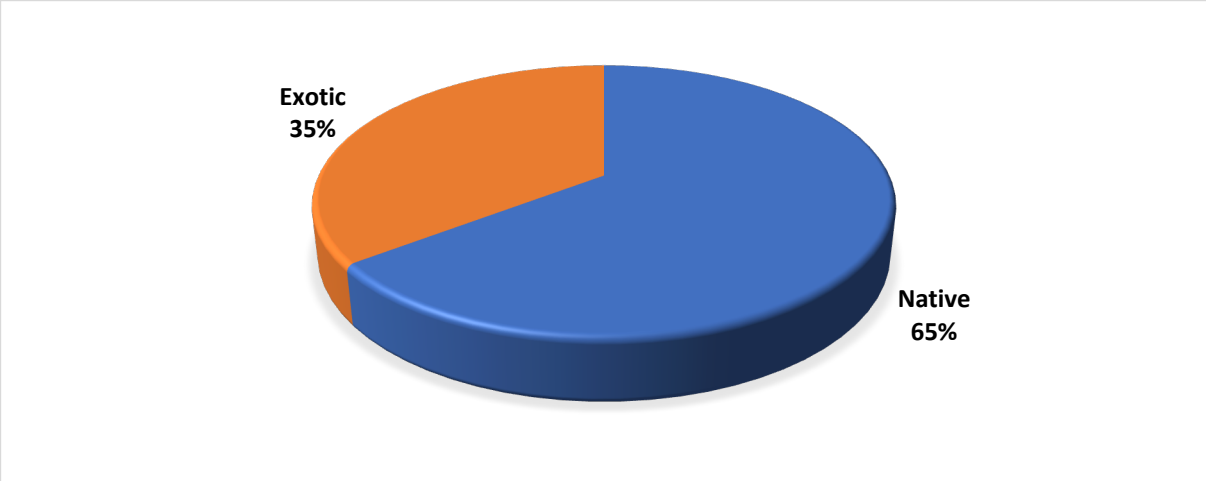

Figure 3. Percentages of native and exotic statuses

A significant percentage of wild vegetables (14.7%) are Neotropical species, presumably introduced through the Columbian Exchange via colonial or international trade networks, such as wild cosmos (*Cosmos caudatus*) (Ahda *et al.* 2023). Neotropical species further enhance Java's flora, including rose cactus (*Leuenbergeria bleo*) and leaf cactus (*Pereskia aculeata*). Moreover, the influence of the maritime Silk Road, which connects Asia, Africa, and Europe through maritime trade, is consistent with the presence of African, Saharo-Arabian, and Holarctic species, including finger millet (*Eleusine coracana*), which is native to Saharo-Arabia and Africa (Castillo *et al.* 2016, Fuller *et al.* 2019).

A small but unique group of species originates from Holarctic origins (2.6%), including patience dock (*Rumex patientia*) and garden sorrel (*Rumex rugosus*). These were most likely introduced through European colonial exchanges or through temperate-zone agricultural development in Java's mountain regions.

Continuity and change

Current ethnobotanical studies only cite 63 (27.2%) of the 232 species. Many described species that persist are perennial herbs or prevalent weeds that thrive in disturbed environments, including many aquatic and wetland taxa that endure in paddy-field ecosystems. Numerous species were consumed both raw and cooked, allowing straightforward preparations that enabled their integration into daily meals. Consequently, they are used predominantly as direct food sources, rather than for specialized uses like spices, food colorants, edible wrappers, or plants requiring intricate processing—categories for which cultivated or industrial alternatives are increasingly available.

Table 2. Selected examples of wild plants used as vegetables by Sundanese in the early twentieth century (cited in current ethnobotanical reports from West Java)

Taxa	Vernacular name	Used as or used in					Current ethnobotanical reports from West Java
		A	B	C	D	E	
Alismataceae							
Limnocharis flava L. Buchenau	**Gendot**		√				Alfinandah *et al.* 2025, Aulia & Mulyanto 2024, Iskandar *et al.* 2023a, Iskandar *et al.* 2024, Rahayu *et al.* 2024, Sriwahjuningsih & Putri 2022.
Apiaceae							
Centella asiatica L. Urb	**Antanan gede**	√	√				Alfinandah *et al.* 2025, Aulia & Mulyanto 2024, Iskandar *et al.* 2023a, Iskandar *et al.* 2023c, Rahayu *et al.* 2024, Sriwahjuningsih & Putri 2022.
Hydrocotyle sibthorpioides Lam.	**Nyalinyit**	√	√				Alfinandah *et al.* 2025, Aulia & Mulyanto 2024, Iskandar *et al.* 2023a, Iskandar *et al.* 2023c, Sriwahjuningsih & Putri 2022.
Oenanthe javanica Blume DC.	**Tespong**	√					Alfinandah *et al.* 2025, Aulia & Mulyanto 2024, Iskandar *et al.* 2023a, Iskandar *et al.* 2024, Rahayu *et al.* 2024, Sriwahjuningsih & Putri 2022.

Aspleniaceae						
Diplazium esculentum Retz. Sw.	**Paku beunyeur**	√	√	√	√	Alfinandah *et al.* 2025, Aulia & Mulyanto 2024, Iskandar *et al.* 2023a, Iskandar *et al.* 2024, Rahayu *et al.* 2024.
Diplazium proliferum (Lam.) Kaulf.	**Paku careham**			√		Aulia & Mulyanto 2024.
Asteraceae						
Bidens pilosa L.	**Ajeran**	√	√			Alfinandah *et al.* 2025, Aulia & Mulyanto 2024, Iskandar *et al.* 2023c, Rahayu *et al.* 2024, Sriwahjuningsih & Putri 2022.
Cosmos caudatus Kunth	**Randa midang**	√	√	√	√	Alfinandah *et al.* 2025, Iskandar *et al.* 2023a, Iskandar *et al.* 2024, Rahayu *et al.* 2024, Suwartapradja *et al.* 2023.
Emilia sonchifolia L. DC.	**Jonge**	√	√	√		Alfinandah *et al.* 2025, Aulia & Mulyanto 2024, Iskandar *et al.* 2023c, Rahayu *et al.* 2024, Sriwahjuningsih & Putri 2022
Brassicaceae						
Nasturtium officinale W.T.Aiton	**Salada aer**	√	√	√	√	Alfinandah *et al.* 2025, Aulia & Mulyanto 2024, Iskandar *et al.* 2024a, Sriwahjuningsih & Putri 2022.
Fabaceae						
Leucaena leucocephala Lam. de Wit	**Peuteuy selong**	√		√	√	Alfinandah *et al.* 2025, Aulia & Mulyanto 2024, Iskandar *et al.* 2023a, Iskandar *et al.* 2023c, Iskandar *et al.* 2024, Rahayu *et al.* 2024, Suwartapradja *et al.* 2023.
Melastomataceae						
Melastoma malabathricum L.	**Harendong**			√		Aulia & Mulyanto 2024, Iskandar *et al.* 2023c, Mulyanto *et al.* 2024a, Rahayu *et al.* 2024.
Pontederiaceae						
Pontederia vaginalis Burm.f.	**Eceng cikur**		√	√	√	Alfinandah *et al.* 2025, Aulia & Mulyanto 2024, Iskandar *et al.* 2023a, Iskandar *et al.* 2024, Sriwahjuningsih & Putri 2022.
Solanum nigrum L.	**Leunca**	√		√	√	Alfinandah *et al.* 2025, Aulia & Mulyanto 2024, Iskandar *et al.* 2023c, Mulyanto *et al.* 2024a, Rahayu *et al.* 2024, Sriwahjuningsih & Putri 2022, Suwartapradja *et al.* 2023.
Solanum torvum Sw.	**Takokak**			√		Alfinandah *et al.* 2025, Aulia & Mulyanto 2024, Iskandar *et al.* 2023a, Iskandar *et al.* 2023c, Iskandar *et al.* 2024, Rahayu *et al.* 2024, Sriwahjuningsih & Putri 2022, Suwartapradja *et al.* 2023.
Urticaceae						
Pilea melastomoides Poir. Wedd.	**Pohpohan**	√	√			Alfinandah *et al.* 2025, Aulia & Mulyanto 2024, Iskandar *et al.* 2023a, Iskandar *et al.* 2023c, Rahayu *et al.* 2024, Sriwahjuningsih & Putri 2022.

Note: A = raw **lalab**, B = cooked **lalab**, C = dishes, D = salads, E = others (e.g., spice substitute, edible wraps, cooked snack, colorant in dishes, or processed taxa before consumption), √ = present

In contrast, "forgotten" species have a unique socio-ecological pattern. Most were forest-associated species, often trees or ferns, whose availability has declined as access to forested areas has diminished. Some were explicitly marked in local nomenclature by the modifier **leuweung** (forest), reflecting historical association with wooded habitats. Many belong to genera that include domesticated or commercially cultivated relatives; yet their wild congeners have been neglected, for example, sweet wild banana (*Musa balbisiana*) and locust bean (*Parkia intermedia)*. Numerous vegetables require intensive processing or detoxification before consumption, such as Asiatic bitter yam (*D. hispida*) and elephant yam (*A. paeoniifolius*), which render them less practical than more readily prepared alternatives. Others include annual herbs such as sessile joyweed (*Alternanthera sessilis*) and little ironweed (*Cyanthillium cinereum*), whose restricted temporal availability diminishes their culinary significance.

Table 3. Selected examples of wild plants used as vegetables by Sundanese in the early twentieth century (absent in current ethnobotanical reports from West Java)

Taxa	Vernacular name	Used as or used in				
		A	B	C	D	E
Amaranthaceae						
Alternanthera sessilis (L.) DC.	**Keremek**	√	√	√		
Araceae						
Amorphophallus paeoniifolius (Dennst.) Nicolson	**Ileus**			√		√
Arecaceae						
Calamus javensis Blume	**Howe omas**		√			
Asteraceae						
Cyanthillium cinereum (L.) H.Rob.	**Leleuncaan**			√		
Cyatheaceae						
Alsophila latebrosa Wall. ex Hook.	**Paku lutung**		√			
Dioscoreaceae						
Dioscorea hispida Dennst.	**Huwi gadung**					√
Fabaceae						
Parkia intermedia Hassk.	**Petir**	√	√			
Lecythidaceae						
Planchonia valida (Blume) Blume	**Putat leuweung**	√				
Musaceae						
Musa balbisiana Colla	**Cau kulutuk**		√	√		
Myrtaceae						
Syzygium acuminatissimum (Blume) DC.	**Ki sireum**	√				
Phyllanthaceae						
Antidesma ghaesembilla Gaertn.	**Onyam**	√				
Polygonaceae						
Persicaria perfoliata (L.) H.Gross	**Gamet leuweung**		√			
Sapindaceae						
Lepisanthes rubiginosa (Roxb.) Leenh	**Ki layu**	√				
Selaginellaceae						
Selaginella caudata (Desv. ex Poir.) Spring	**Paku rane**	√				
Urticaceae						
Oreocnide sylvatica (Blume) Miq.	**Ki nangsi**	√	√			

Note: A = raw **lalab**, B = cooked **lalab**, C = dishes, D = salads, E = others (e.g., spice substitute, edible wraps, cooked snack, colorant in dishes, or processed taxa before consumption), √ = present

Discussion

The preference for consuming leaves is embedded in Sundanese food culture, as seen in **lalaban**, a dish of raw or barely boiled leafy vegetables served with **sambal** (Amrinanto *et al.* 2019, Hernawati *et al.* 2022, Rahman 2018). Ethnobotanical studies have emphasized leaves as the most consumed and traded plant parts in Sundanese markets (Iskandar *et al.* 2018, 2024, Septiani *et al.* 2020). This cultural tendency toward green leaves reflects the concept of **herbophilia**, the prevalent use of wild leafy vegetables (Łuczaj *et al.* 2014). Historically, Sundanese have preferred green-leaved vegetables, as reported by Ochse. Red varieties are often cultivated ornamentally and are avoided because they tend to alter soup color, for example, in *Amaranthus hybridus* (Ochse 1931). This practice stands in stark contrast to that in many Amazonian communities, where leafy greens are disparaged as bitter, medicinal, or fit only for animals. As an alternative, diets tend to emphasize animal protein, starchy tubers, and forest fruits (Katz *et al.* 2012, Łuczaj & Pieroni 2016). Cultural aversions to leafy greens may arise from ecological differences as well as symbolic perceptions, in which greens are associated with famine, poverty, or animal food (Łuczaj 2010, Łuczaj & Pieroni 2016).

Although this study did not directly measure ethnobotanical knowledge loss, the decline from 232 species in *Indische Groenten* to fewer than 100 in recent West Java investigations suggests a narrowing plant-use repertoire (Alfinandah *et al.* 2025, Aulia & Mulyanto 2024, Iskandar *et al.* 2023a, Iskandar *et al.* 2024c, Iskandar *et al.* 2024, Mulyanto *et al.* 2024a, Rahayu

et al. 2024, Sriwahjuningsih & Putri 2022, Suwartapradja *et al.* 2023). This number may overestimate actual knowledge loss, as the current ethnobotanical studies used as comparative references focus on the montane rainforest ecoregion of Western Java. Numerous species cataloged by Ochse, recognized as occurring in the northern lowlands, such as sea purslane (*Sesuvium portulacastrum*), remain underrepresented in current ethnobotanical studies. More spatially comprehensive field research, ideally replicating previous methodologies in both montane and lowland areas, is necessary to gain a more precise understanding of long-term ethnobotanical change.

This phenomenon also should be contextualized within West Java's socio-historical transitions, which collectively transformed agroecosystems and diminished habitats for wild plants. During the Japanese occupation (1942-1945), extensive areas of concession forests were cleared for the cultivation of cassava, castor, and upland rice, while logging activities increased to support the war industry, such that by late 1945, primary forests were confined to isolated mountain regions (Mulyanto 2022, Helsdingen & Hoogenberk 1945, Sutter 1959). After independence, numerous cinchona and rubber estates in the West Java highland remained under Dutch control until 1949, when political upheaval enabled elites, peasants, and plantation workers to seize them and convert them into farmland (Sutter 1959). The Green Revolution intensified these processes by promoting **panca usaha tani**, with high-yield rice cultivars, synthetic fertilizers, pesticides, mechanization, and expanded irrigation (Hidayat *et al.* 2020). The codified, systematic weed eradication (Partasasmita *et al.* 2019) may have reinforced the perception of wild species as undesirable.

Since the 1970s, traditional agroforests, which previously sustained various wild and semi-cultivated plants, have been increasingly simplified. This is due to commercialization and Green Revolution policies promoting cash-crop monocultures, such as cabbage, carrots, and spring onions (Iskandar *et al.* 2018b, Parikesit *et al.* 2004). This also happens to monocultural home gardens, as fully commercialized farmers focus on reinvesting in external inputs to enhance yields (Abdoellah *et al.* 2006, Abdoellah *et al.* 2020), thereby decreasing the availability of niches for wild edibles and leading to the disappearance of many culturally significant species from local diets. The decline of cinchona production in the 1980s expedited these developments. By 1998, a significant portion of former concession land had been transformed into intensively cultivated vegetable fields (Wiranova *et al.* 2025), leading to the elimination of fallows and woodland margins. Local dynamics are exacerbated by regional deforestation; West Java lost approximately 40% of its 8650 km² montane forest from 1990 to 2015, primarily at altitudes of 300-1800 m, which are rich in biodiversity and historically significant for foraging (Higginbottom *et al.* 2019).

From the total, 169 species (72.8%) are no longer reported, including 117 native species (78% of the native total). This finding aligns with current studies showing that exotic vegetables dominate the Sundanese market and diet (Aulia & Mulyanto 2024, Iskandar *et al.* 2023a, Mulyanto *et al.* 2024a). Several plants, including Asiatic bitter yam (*Dioscorea hispida*), remain in use and are cited in ancient Java texts, showing cultural continuity (Mulyanto *et al.* 2023, 2024b).

Despite the decline, specific wild vegetables, specifically those with a bitter taste, retain cultural relevance. Eurasian black nightshade (*Solanum nigrum*) is frequently used in multiple Sundanese dishes and is often served in urban restaurants as a symbol of cultural authenticity (Mulyanto *et al.* 2018). This study has documented at least 10 bitter species, often associated with maturity and adult preferences (Hernawati *et al.* 2022). Despite children's typical aversion to bitterness, repeated exposure to family meals promotes progressive acceptance through social learning and imitation (Mennella & Bobowski 2015, Mulyanto *et al.* 2018, Yang *et al.* 2024). Reflecting this continuity, interest in traditional plant-based dishes has increased. Many Sundanese restaurants reintroduce wild vegetables such as watercress (*Nasturtium officinale*) and Java water dropwort (*Oenanthe javanica*) to the menus, **lalaban***,* as symbols of authenticity (Mulyanto *et al.* 2018). In both Sundanese households and restaurants, raw or boiled vegetables served with chili shrimp paste are a defining feature of Sundanese cuisine (Kodir & Moektiwardoyo 2022, Rahman 2018).

Similar trends are growing worldwide; for example, in Japan, the practice of foraging wild vegetables **(sansai)** has gained popularity, specifically among urban dwellers, driven by recreational foraging and the publication of field guides (Osawa 2024). In Europe, fine-dining chefs are progressively foraging or sourcing wild ingredients, integrating them into innovative dishes while fostering ecological awareness (Kalle *et al.* 2020, Sõukand & Kalle 2016, Sulaiman *et al.* 2024).

Conclusions

This study underscores the significance of diachronic analysis in ethnobotany by tracing the transformation of Sundanese biocultural heritage. By comparing early 20th-century documentation with contemporary data, we reveal a numerical decline and significant systemic shift in wild plant knowledge. This structured erosion disproportionately affects species that require

complex processing and those reliant on degraded forest ecosystems, driven by interconnected sociohistorical and ecological factors. The finding shows resilient cultural anchors through the enduring culinary importance of certain bitter and aquatic species. This living legacy requires comprehensive, multi-scale collaboration, including advancing continuous diachronic documentation, implementing ecologically considerate agroforestry, supporting community-driven knowledge preservation, and formulating food policies that integrate cultural values with nutritional security. Targeted interventions, such as educational initiatives for neglected species and the strategic integration of resilient wild vegetables into sustainable landscapes and culinary practices, are needed to revitalize this heritage as an active resource for community well-being and future food security.

Declarations

List of abbreviations: N/A.

Ethics approval and consent to participate: All primary and secondary sources referenced in this article were obtained from open-access libraries.

Consent for publication: N/A.

Availability of data and materials: Summary data are presented in the article's tables and figures, while the full data are provided in the supplementary materials.

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