Gathering Edible Wild Plants in a Mountain Village of West Java, Indonesia: Diversity of Species, Utilizations, and Local Perceptions

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ABSTRACT

The main objective of this study was to collect local knowledge about edible wild plants among villagers in the mountainous region of West Java. Snowball sampling was used to identify informants who could be considered experts. Semi-structured interviews were conducted to collect ethnobotanical data. A total of 88 species of edible wild plants belonging to 70 genera and 45 plant families were recorded. Of these, approximately one-tenth belong to the Asteraceae family. More than half of the plants are herbaceous. The parts of each species considered food vary, from the vegetative structures to the immature reproductive organs. Fruits and leaves are mostly used. Most of the plants listed are eaten raw. Only half of all species are native. The remaining half is made up of exotic species. Among the exotic species, neophytes outnumber archaeophytes. 23 species of wild plants treat 22 medical conditions. Only 13 plants were available for sale in the local markets. In general, knowledge about edible wild plants is preserved among a small group of custodians and may be declining due to socio-economic and cultural changes, especially the development of tourism and the perception that wild plants are famine food which, in turn, associated with poverty.

Keywords: Ethnobotany, Local knowledge, Medicinal plant, Mountain village, Wild food

INTRODUCTION

Plant gathering is probably one of the oldest economic activities in human history, and wild plants have always been an important food source for humans (Greaves and Kramer, 2014). Although agriculture is now the main source of plant resources, wild plants remain an essential part of the diet and livelihoods of many societies (Biscotti et al., 2015; de Medeiros et al., 2017; Luo et al., 2019; Yang et al., 2020; Guo et al., 2022; Hussain et al., 2023; Jigme and Yangchen, 2023). Wild plants, both native and introduced species, which grow and reproduce naturally without cultivation or human intervention, may also include escapee domesticated species, and widely found in forests, agroforestry, fallow and temporary open spaces, riverbanks, roadsides, and even among weeds in agricultural fields, often used as food resources (Sujarwo and Keim, 2017; Bhatia et al., 2018; Motti, 2020), including plants that are said to have medicinal properties (Shomkegh et al., 2016; Papageorgiou et al., 2020; Chandra and Uniyal, 2021; Mulyanto et al., 2024a). In rural areas around the world, wild plants are also considered not only as an important supplement to meet household needs (Ghanimi et al., 2022; Asfaw et al., 2023), but also as an additional source of income as there is always a market for valuable wild plants (Cruz-Garcia and Price 2014; Badimoet et al., 2015; Kebebew and Leta, 2016; Borelli et al., 2020; Mallick et al., 2020; Bajgai et al., 2023; Anbessa et al., 2024). Some of the wild plants collected and used

by the local people are exotic (Motti and Motti, 2017; Lautenschläger et al., 2018; Gras et al., 2019; Luczaj et al., 2024).

Species introductions can be unintentional, often when people bring species to new locations for trade purposes or when new immigrants bring them to provide familiar foods, materials, or medicines (Alencar et al., 2013; de Medeiros et al., 2017; Wagh and Jain, 2018; Nguanchoo et al., 2023; Panyadee, 2023). Studies have shown that the plants and plant products introduced to an area from far away can have overwhelming cultural and ecological impacts (Pfeiffer and Voeks, 2008; Wehi et al., 2022; Turner, 2023). They serve as examples of how people tend to incorporate new plant-related objects and experiences into their own languages and culture, and how these are transformed by the new resources and experiences (Wootton and Shackleton, 2023). Despite the long history of native plants in a region, exotic plants played a very important role (Chamorro and Ladio, 2021). Some ethnobotanists suggested that when exotic plants are used in local medicinal systems, they enrich the systems by occupying niches vacated by native plants and expanding the possibilities for treating diseases (Albuquerque, 2006; Alencar et al., 2014; de Medeiros et al., 2015; Júnior et al., 2015; de Medeiros et al., 2017). However, economic and cultural changes have led to an increasing number of both native and exotic plant resources that were traditionally known and utilized now being unknown. With the development of the agricultural industry and global supply chains, it is easy to find a variety of cultivated foods in markets all year round (Kodirekkala, 2017). As a result, the utilization of edible wild plants has decreased, leading to fewer species being consumed in many places (Schunko et al., 2022). This means that local knowledge is quickly lost and is most often only held by older people (Cruz et al., 2014).

The Indonesian province of West Java is geographically surrounded by volcanoes, resulting in high fertility and a wide variety of plant species. Although still limited, ethnobotanical studies conducted in the province have shown widespread use of wild plants, highlighting their important role in nutrition, food security and income generation (Pratama et al., 2019; Sriwahjuningsih and Putri, 2022; Yanty et al., 2024). Researchers are increasingly recognizing the importance of these plants as an essential reserves for meeting the needs of rural people. However, most studies have focused primarily on medicinal species (Rahayu et al., 2020; Rahayu et al., 2022), with little attention to edible wild plants (Pratama et al., 2019), and none at all to exotic wild plants. Furthermore, studies in West Java found that while villagers continue to use wild plants, their consumption is only declining due to a lack of knowledge and limited availability (Pratama et al., 2019; Rahayu et al., 2024). Other socio-cultural factors found elsewhere, such as people's perceptions of wild plants (Pawera et al., 2020; Lubin et al., 2021; Schunko et al., 2022; Oluoch et al., 2023; Gillani et al., 2024), were not taken into account at all. Complementing previous studies in West Java, this study investigates local knowledge on the diversity and use of edible wild plants, whether native or exotic, in a very special place: a mountain village with a long colonial history as a buffer village located in one of the oldest tea plantation in the province.

METHODS

Study area

This field study was conducted in Mekarsari village (7°08'27.7"S 107°30'19.8"E) in West Java, Indonesia (Figure 1). The village and its farmland are surrounded by two

contrasting but historically liked landscapes: the 6 km^2 Gambung Tea Estate, to the north, and the 80 km^2 Mount Tilu Nature Reserve, the second largest nature reserve in the province, to the south. The estate is one of the oldest in Java, established in 1874 by a Dutch planter and still managed under the management of a state-owned enterprise. Located at an altitude of 1,000-1,800 meters above sea level, the average annual temperature ranges from 16^0C to 25^0C and rarely dropping below 14^0C or exceeding 27^0C. The rainy season lasts for seven months (October to May) with an average annual rainfall of around 2,068 mm.

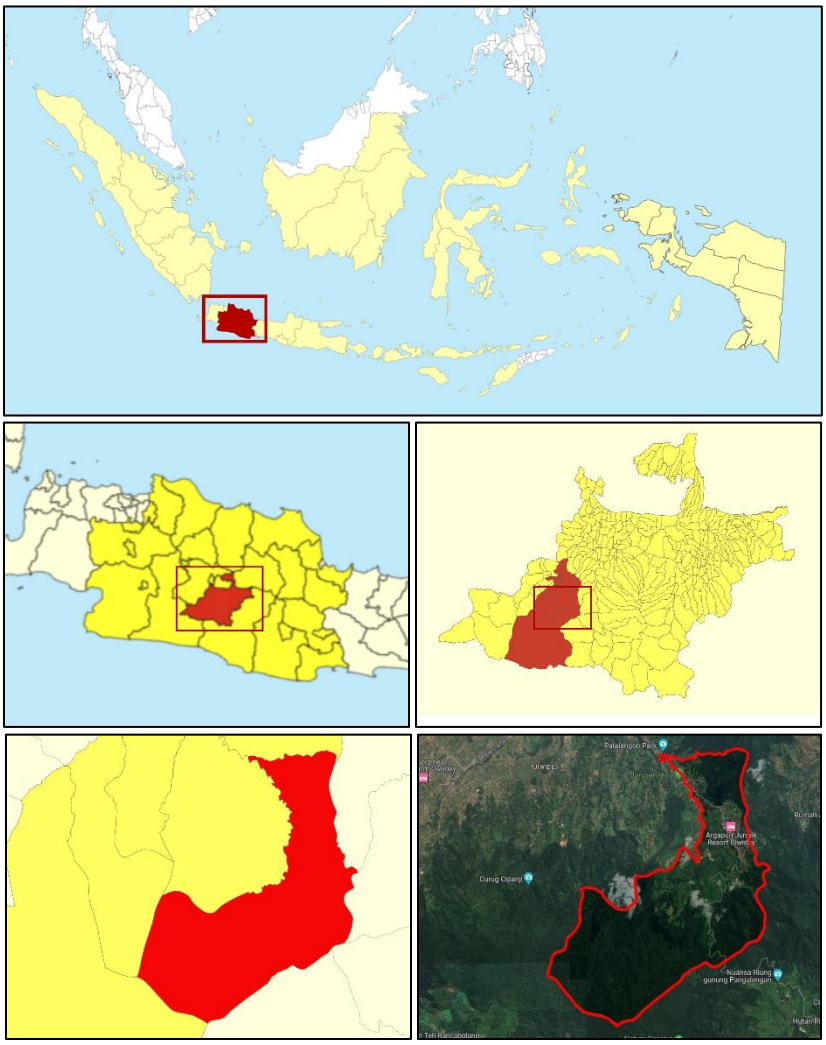

Figure 1. The map of the study area in Mekarsari Village, Pasirjambu Sub-district, Bandung Regency, West Jawa, Indonesia

Due to the cool climate and its historical status as a buffer village that arose with the development of tea plantations during the colonial period, the villagers grew subtropical vegetables such as potatoes, tomatoes, carrots, leeks, cabbage, lettuce, and cauliflowerfor European and Chinese settlers. To this day, these crops are still grown to supply the urban markets 40 to 50 kilometers to the north, in the city of Bandung, the capital of West Java province. As is the case in Java in general, the villagers are considered smallholder farmers with less than one hectare of land. Most villagers make a living from agriculture, but less than 5% of the agricultural population owns land. Most of them belong to the rural working class and make a living from farm works, tea harvesting, or both.

In the southern part of the village, adjacent to the nature reserve, some farmers also grow coffee. In the last decade, due to rising temperatures, some farmers in the northwestern lowlands also grow chili peppers, eggplants, and even lowland crops such as sweet potatoes and cassava. At the same time, tourism has developed thanks to the colonial heritage and the beautiful landscape scenery of the tea plantations, and some villagers have joined this tourist economy. Overall, the rural character of the village is still clearly preserved. However, since the beginning of the 20th century, the villagers have opened up to other populations and their agricultural activities have always been aimed at meeting market demand rather than subsistence.

Data collection

Data were collected through freelists and semi-structured interviews to document information about edible wild plants, including plant names, morphological characteristics, habitat features, parts used, harvesting time, tools used, and collection and consumption methods. Knowledge about wild plants is considered a specific cultural domain. For this reason, those interviewed first in the preliminary survey tended to identify others as more suitable interviewees, as they were perceived as guardians of that knowledge. Using this snowballing technique, a total 22 of informants were recruited, 13 men and 9 women. They were aged between 39 and 79 years old and worked as tea plantation workers, smallholder farmers, and agricultural laborers.

Interviews were conducted in private homes, fields, coffee agroforestry, tea plantations and street stalls with the informants' consent. To facilitate communication with the informants and ensure completeness of information, all interviews were conducted and recorded in Sundanese, the language spoken in the mountainous region of West Java. Plant samples were also examined and labeled with the reported local names. This was done to verify the scientific botanical nomenclature of the plants through cross-checking in the field. Some of the samples were identified in the field using *Flora of Java* (Backer and Brink, 1968) and *The Mountain Flora of Java* (van Steenis 1972) as references and others by a plant taxonomist and deposited in the Herbarium Jatinangoriense managed by the Department of Biology, Universitas Padjadjaran (West Java, Indonesia). Lastly, to update the scientific names of the plants identified, we refer to the Plant of the World Online page (https://powo.science.kew.org/).

Data analysis

After the interviews were conducted, all collected data including plant name, plant taxa, habitat type, collection method and equipment, harvest time, part used, uses, and number of citations were tabulated and organized using Microsoft Excel 2016. The organized data was displayed in tables and grid charts. The data was also calculated based on the frequency of relative citation (RFC) index with the following formula (Tardío and Pardo-de-Santayana, 2008):

$$RFC = \frac{FC}{N}$$

Where FC = number of informants citing a species and N = total number of informants. The RFC value is between 0 and 1, where 1 indicates that the species was mentioned by all informants.

Qualitative data, particularly relating to local definitions and perceptions of edible wild plants as well as the stories informants told about them, were qualitatively analyzed to construct a narrative.

RESULTS

Botanical characteristics of edible wild plants

A total of 88 plant species were recorded as edible collected and consumed by informants. These plants belong to 70 genera in 45 plant families (Table 1). Of these, about one-tenth (n=9) belong to the Asteraceae family (Figure 2). Other important families include Solanaceae and Zingiberaceae, with six and five species, respectively. These families have species that are widespread in the study area, many of which have desirable biological morphologies, such as herbaceous perennials with rosette-shaped leaves in Asteraceae and edible fruits in Solanaceae.

Table 1. List of edible wild plant gathered in study area

Taxa	Vernacular name	Life form	Part used	RFC
Alismataceae				
Limnocharis flava (L.) Buchenau	*Génjér*	Perennial	Aerial part	1
Altingiaceae				
Liquidambar excelsa (Noronha) Oken	*Rasamala*	Tree	Young leaf	1
Amaranthaceae				
Alternanthera philoxeroides (Mart.) Griseb.	*Gobrag sila*	Perennial	Leaf	0.18
Amaranthus blitum L.	*Séngang*	Annual	Leaf, stem	0.95
Anacardiaceae				
Mangifera laurina Blume	*Pari*	Tree	Fruit	0.86
Apiaceae				
Centella asiatica (L.) Urb.	*Antanan*	Perennial	Aerial part	1
Eryngium foetidum L.	*Walang*	Perennial	Leaf	0.68
Oenanthe javanica (Blume) DC.	*Téspong*	Perennial	Aerial part	1
Araceae				
Schismatoglottis longipes Miq.	*Cariwuh*	Perennial	Aerial part	0.84
Schismatoglottis calyptrata (Roxb.) Zoll. & Moritzi	*Solémpat*	Perennial	Aerial part	0.68
Xanthosoma sagittifolium (L.) Schott.	*Taleus*	Annual	Tuber	0.54
Araliaceae				
Hydrocotyle sibthorpioides Lam.	*Kingkilikan*	Perennial	Leaf	1
Arecaceae				
Caryota maxima Blume	*Suwangkung*	Palm	Young frond	1
Caryota mitis Lour.	*Saray*	Palm	Young frond	0.82
Pinanga coronata (Blume ex Mart.) Blume	*Bingbin*	Palm	Young frond	0.59
Asteraceae				
Acmella oleracea (L.) R.K.Jansen	*Jotang alit*	Perennial	Leaf	0.68
Bidens pilosa L.	*Hareuga*	Annual	Leaf	0.82
Blumea balsamifera (L.) DC.	*Sembung*	Shrub	Leaf	0.82
Emilia sonchifolia (L.) DC.	*Jongé*	Annual	Leaf	0.86
Erechtites valerianifolius (Link ex Spreng.) DC.	*Sintrong*	Annual	Leaf	1
Erigeron sumatrensis Retz.	*Jalantir*	Annual	Leaf	0.68
Galinsoga parviflora Cav.	*Loséh*	Annual	Leaf	0.27
Taraxacum officinale Web.	*Jombang*	Perennial	Leaf	0.91
Tithonia diversifolia (Hemsl.) A.Gray.	*Kembang konéng*	Shrub	Leaf	0.09
Athyriaceae				
Diplazium esculentum (Retz.) Sw.	*Paku minyak*	Fern	Young frond	0.86
Diplazium proliferum (Lam.) Kaulf.	*Kembang paku*	Fern	Bublet	0.63

Basellaceae				
Anredera cordifolia (Ten.) Steenis	*Binahong*	Perennial	Leaf	0.54
Begoniaceae				
Begonia coriacea Hassk.	*Cariang lembur*	Perennial	Shoot	0.36
Brassicaceae				
Nasturtium officinale W.T.Aiton	*Saladah*	Perennial	Aerial part	1
Bromeliaceae				
Ananas comosus (L.) Merr	*Ganas sabrang*	Perennial	Fruit	0.72
Cannaceae				
Canna indica L.	*Ganyol*	Perennial	Tuber	0.77
Clusiaceae				
Garcinia dioica Blume	*Ceuri*	Tree	Fruit	0.22
Cucurbitaceae				
Cyclanthera brachystachya (DC.) Cogn.	*Bobonténgan*	Annual	Fruit	1
Diplocyclos palmatus (L.) C.Jeffrey	*Koréh kotok*	Perennial	Fruit	0.77
Cyperaceae				
Rhynchospora colorata (L.) H.Pfeiff.	*Teki bodas*	Perennial	Rhizome	0.09
Euphorbiaceae				
Euphorbia heterophylla L.	*Katomas*	Annual	Leaf	0.36
Euphorbia thymifolia L.	*Jukut gelang*	Annual	Leaf, stem	0.86
Ricinus communis L.	*Kaliki*	Shrub	Fruit	0.22
Fabaceae				
Leucaena leucocephala (Lam.) de Wit	*Peuteuy sélong*	Tree	Seed	1
Mimosa pigra L.	*Jukut riut*	Shrub	Root	0.13
Senna occidentalis (L.) Link	*Kasingsat*	Perennial	Seed	0.5
Fagaceae				
Castanopsis argentea (Blume) A.DC.	*Saninten*	Tree	Seed	1
Castanopsis tungurrut (Blume) A.DC.	*Tunggeureuk*	Tree	Seed	1
Loranthaceae				
Scurrula oortiana (Korth.) Danser	*Mangandeuh*	Epiphyte	All part	0.95
Marantaceae				
Maranta arundinacea L.	*Garut*	Perennial	Tuber	0.73
Melastomataceae				
Melastoma malabathricum L.	*Haréndong*	Shrub	Fruit	1
Moraceae				
Ficus montana Burm.f.	*Amis panon*	Tree	Fruit	0.91
Ficus variegata Blume	*Kondang*	Tree	Fruit	0.86
Muntingiaceae				
Muntingia calabura L.	*Kérsen*	Tree	Fruit	0.86
Musaceae				
Musa acuminata Colla	*Cau kolé*	Perennial	Flower	1
Myrtaceae				
Syzygium polycephalum (Miq.) Merr. & L.M.Perry	*Kupa gowok*	Tree	Fruit	0.82
Oxalidaceae				
Oxalis barrelieri L.	*Calingcing*	Perennial	Aerial part	0.13
Oxalis corniculata L.	*Calingcing bonténg*	Perennial	Fruit	0.13
Oxalis triangularis A.St.-Hil.	*Calingcing beuti*	Perennial	Tuber, stem	0.68
Passifloraceae				
Passiflora edulis Sims.	*Nagri*	Perennial	Fruit	1
Passiflora ligularis Juss.	*Konyal*	Shrub	Fruit	1
Phyllanthaceae				
Antidesma bunius (L.) Spreng.	*Huni*	Tree	Fruit, leaf	0.73
Glochidion borneense (Müll.Arg.) Boerl.	*Marémé*	Tree	Leaf	0.95
Piperaceae				
Peperomia pellucida Kunth.	*Seréh cina*	Annual	Leaf	0.18
Plantaginaceae				
Plantago major L.	*Ki urat*	Perennial	All part	0.86
Poaceae				
Bambusa vulgaris Schrad. ex J.C.Wendl.	*Awi haur*	Bamboo	Shoot	0.86

Gigantochloa atter (Hassk.) Kurz ex Munro	*Awi ater*	Bamboo	Shoot	0.82
Gigantochloa verticillata (Willd.) Munro	*Awi gombong*	Bamboo	Shoot	0.82
Polygonaceae				
Persicaria perfoliata (L.) H.Gross	*Gamét*	Annual	Leaf	0.82
Rumex rugosus Campd.	*Suring*	Perennial	Leaf	0.77
Rumex patientia L.	*Séli*	Perennial	Leaf	0.5
Pontederiaceae				
Pontederia vaginalis Burm.f.	*Ecéng sawah*	Perennial	Aerial part	0.84
Rosaceae				
Rubus alceifolius Poir.	*Hareueus*	Shrub	Fruit	0.5
Rubus rosifolius Sm.	*Béngbé*	Shrub	Fruit	1
Rubiaceae				
Mussaenda frondosa L.	*Kingkilaban*	Shrub	Fruit	0.59
Paederia foetida L.	*Kahitutan*	Perennial	Leaf	0.91
Rutaceae				
Acronychia pedunculata (L.) Miq.	*Ki jeruk*	Tree	Fruit	0.91
Salicaceae				
Flacourtia rukam Zoll. & Moritzi	*Kupa rukem*	Tree	Fruit	1
Smilacaceae				
Smilax macrocarpa L.	*Canar*	Shrub	Fruit	1
Solanaceae				
Physalis angulata L.	*Cecénét*	Annual	All part	1
Physalis peruviana L.	*Cecénét gunung*	Perennial	All part	1
Solanum americanum Mill.	*Leunca hayam*	Annual	Fruit, leaf	0.86
Solanum lasiocarpum Dunal	*Karundung*	Perennial	Fruit	0.27
Solanum nigrum L.	*Leunca pait*	Perennial	Fruit, leaf	0.91
Solanum torvum Sw.	*Takokak*	Perennial	All part	1
Urticaceae				
Debregeasia longifolia (Burm.f.) Wedd.	*Totongoan*	Perennial	Fruit	0.82
Pilea melastomoides (Poir.) Wedd.	*Pohpohan*	Shrub	Leaf	1
Verbenaceae				
Lantana camara L.	*Saliara*	Shrub	Fruit	0.27
Zingiberaceae				
Amomum hochreutineri Valeton	*Cabut raweuy*	Perennial	Fruit	0.95
Amomum maximum Roxb.	*Rangasa*	Perennial	Fruit	0.41
Etlingera coccinea (Blume) S.Sakai & Nagam.	*Ronghod*	Perennial	Fruit, shoot	0.95
Etlingera solaris (Blume) R.M.Sm.	*Honjé warak*	Perennial	Fruit	0.77
Hornstedtia minor (Blume) Valeton	*Pinding*	Shrub	Fruit	0.68

Another study conducted in a village near Mount Kamojang Nature Preserve also found that Asteraceae was the plant family with the highest number of species collected and consumed by the local people (Sriwahjuningsih and Putri, 2022). Asteraceae is considered one of the largest flowering plant families on Earth (Kurniawan et al., 2022; Nguanchoo et al., 2023), and has been used in the diet and medicine in many places for centuries, as most of the family members are good sources of inulin, which also has antioxidant, anti-inflammatory, and anti-microbial properties (Petropoulos et al., 2019; Rolnik and Olas, 2021).

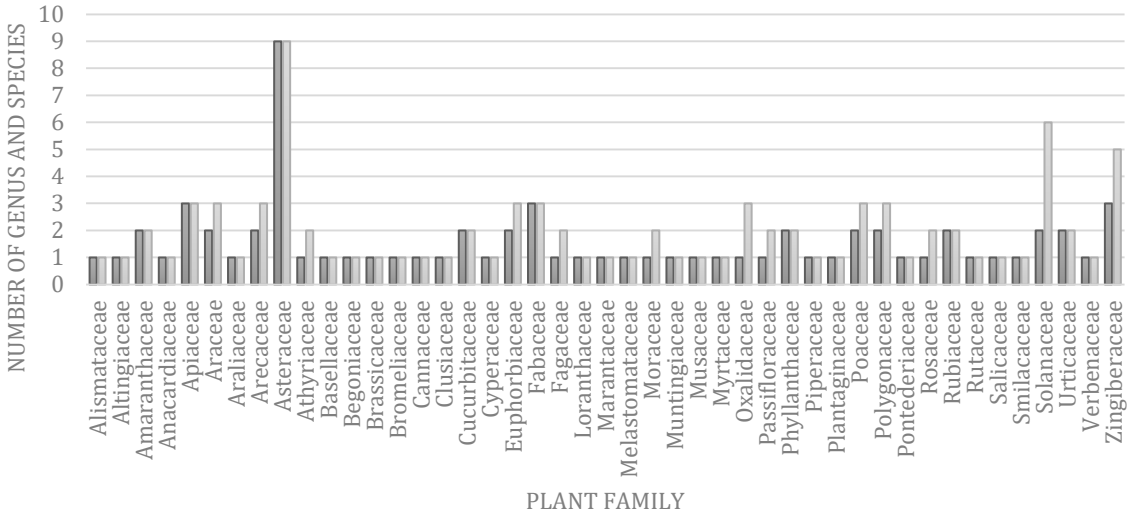

Figure 2. Distribution of species and genera of plant families

Figure 3 shows that more than half (52 species) of edible wild plants are herbaceous. The most important category is perennial herbs (38 species), followed by annual herbs (14 species), trees (14 species), and shrubs (13 species). The dominance of perennials over annuals seems quite logical. For thousands of years, people have been selecting plants that are most likely to be found in the same place the next season. Most of these herbaceous plants have deep roots and rosette leaves that die back during the dry season and regrow during the following rainy season. They also have a remarkable ability to regenerate from any part of the rhizome that has been cut, a key characteristic that allows them to be used sustainably. This is true, for example, of *Centella asiatica*, *Oenanthe javanica*, and *Nasturtium officinale* (Figure 4).

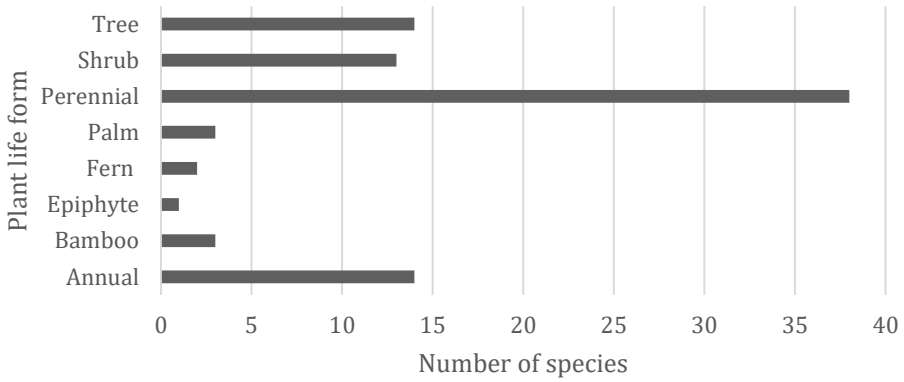

Figure 3. Distribution of plant's life form

Annual plants are also commonly used as vegetables. Under favorable environmental conditions, they produce numerous seeds, have a long storage life, and often germinate easily, although this germination can be interrupted. Examples of annual plants consumed in the study area include *Amaranthus blitum*, *Bidens pilosa*, *Cyclanthera brachystachya*, and *Erechtites valerianifolius*. Most tree species are popular for their fruit, with the exception of *Liquidambar excels*, which is harvested for its young reddish leaves used as a fresh vegetable.

Figure 4. Perennial herbs (example only). a. *Alternanthera philoxeroides*, b. *Oenanthe javanica*, c. *Nasturtium officinale*, d. *Centella asiatica*, e. *Limnocharis flava*, f. *Hydrocotyle sibthorpioides*, g. *Pontederia vaginalis*, h. *Oxalis corniculata*

Many wild plants, especially those used as vegetables, are known to be weeds. Whether they are vegetables or medicinal plants, these are plant species that grow in habitats whose populations have been completely or mainly significantly disturbed by humans, except for crops. Although the weed category is a cultural and ecological concept, these plants share interesting common characteristics, such as high fecundity, rapid growth and adaptability to a wide range of environmental conditions. Informants often refer to the harvesting of certain weeds when manually weeding crops intended for personal consumption, whether for food or medicine. Numerous species, such as *Eryngium foetidum*, *Acmella oleracea*, *Blumea balsamifera*, *Rumex rugosus*, *Erigeron sumantrensis*, and *Galinsoga parviflora* were commonly reported to be collected in this manner. Furthermore, informants frequently noted that plants harvested from cultivated soils were of higher quality than plants harvested from other environments. They reported that the plants were larger, whiter, and more succulent because they were grown in ploughed soil.

Consuming wild plants

Among the various species considered food, the parts used vary, ranging from the vegetative structures to the immature reproductive organs (Figure 5). In some species, only one part is used. However, in other plants, several different parts are consumed. For example, the fruits of *Physalis angulata* are eaten raw as a forest delicacy, while other aerial parts and roots are dried to make an herbal tea to treat rheumatoid arthritis.

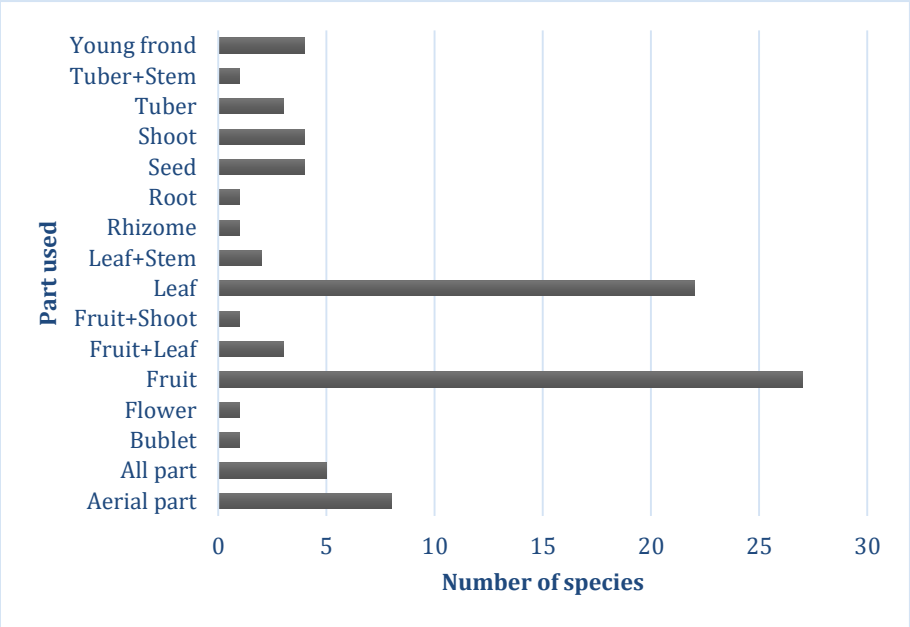

Figure 5. Part(s) of plant used

There are 27 species that are harvested only for their fruits. However, if we also take into account other species that are harvested at the same time for their fruits or some parts, the number of plants whose fruits are edible is 35 species. Most of the fruits are harvested from trees. For example, the fruits of *Acronychia pedunculata*, *Antidesma bunius*, *Castanopsis argentea*, *Castanopsis tungurrut*, *Garcinia dioica*, *Glochidion borneense*, *Flacourtia rukam*, and *Mangifera laurina* are considered delicacies of the forest. Berries are also collected from some shrubs and consumed as fruits (Figure 6).

Figure 6. Species harvested solely for their fruits (example only): a. *Diplocyclos palmatus*, b. *Smilax macrocarpa*, c. *Garcinia dioica*, d. *Ananas comosus*, e. *Debregeasia longifolia*, f. *Rubus alceifolius*, g. *Passiflora edulis*, h. *Acronychia pedunculata*

Another important part is leaves. There are 22 plants that are harvested only for their leaves. According to our informants, this could be related to the Sundanese culinary tradition, which includes many green leafy vegetables in the daily diet. In this context, it is interesting to note that the young fronds of *Diplazium esculentum* are locally classified as green leafy vegetables as well. The leaves of Polygonaceae are eaten raw as a vegetable due to their thin leaves, while those of *Euphorbia heterophylla*, *E. thymifolia*, and *Eryngium foetidum*, which are characterized by thick and coarse leaves are usually cooked before consumption.

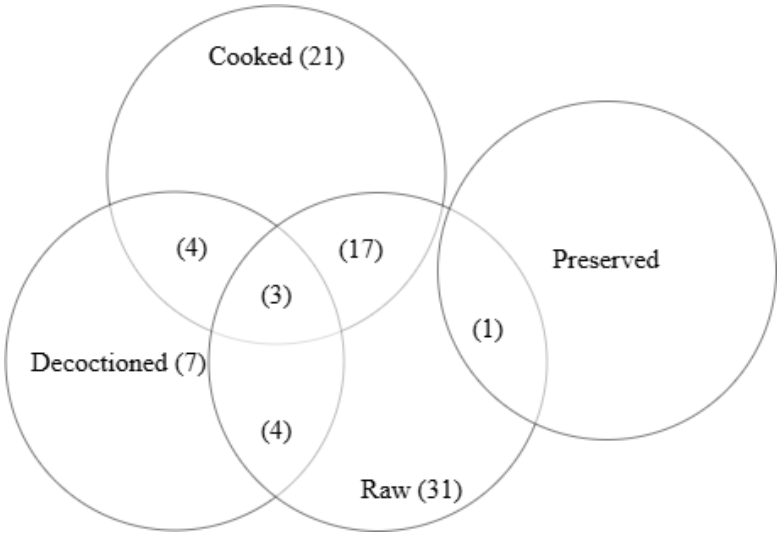

Figure 7. Distribution of consumption and preparation methods

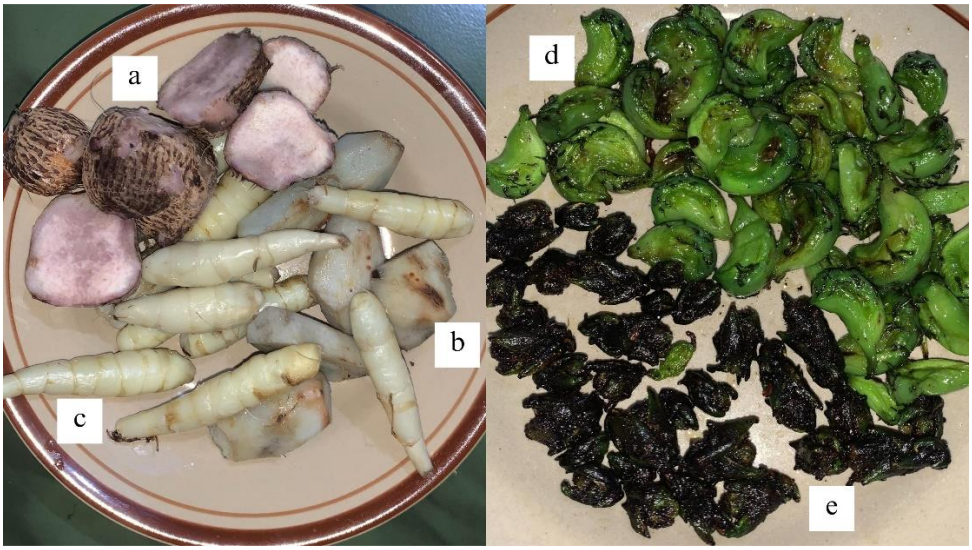

Figure 8. Boiled roots and tubers of a. *Xanthosoma sagittifolium*, b. *Canna indica*, c. *Maranta arundinacea*, cooked fruits of d. *Cyclanthera brachystachya* and bulblets of e. *Diplazium proliferum*

Overall, the leaves, fruits or stems of 56 species (63.63%) recorded in this study can be eaten raw (Figure 7). The other 32 species can be cooked in different ways known to the local people (boiled, stir-fried, roasted, grilled). Species considered to be hard should be cooked, such as the the fruits of *Cyclanthera brachystachya*, bulblets of *Diplazium proliferum*, and tubers of *Xanthosoma sagittifolium*, *Canna indica* and *Maranta arundinacea* (Figure 8).

There are three species of bamboo, namely *Bambusa vulgaris*, *Gigantochloa atter*, and *Gigantochloa verticillata* whose young shoots are collected for food or sold in local markets in the study area, whereas in other areas of West Java, only the first two are collected (Yanty et al., 2024).

Decoctions are commonly used to prepare herbal teas, and 18 species are recommended for this preparation in the study area (Figure 7). For example, all parts of *Scurrula oortiana*, the aerial parts of *Physalis angulata*, *P. peruviana*, *Plantago major*, the leaves of *Peperomia pellucida*, and the roots of *Solanum torvum* are decoctioned and used as medicines or foods. Only one species is preserved: *Smilax macrocarpa* fruits, which are consumed fresh as fruits but are also preserved in sugar, especially during the harvest season.

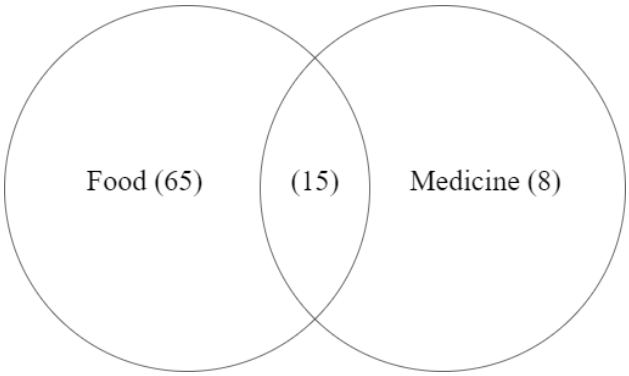

Figure 9. Distribution of utilization of edible wild plants harvested in study area

The study recorded 15 wild plant species known and used for food and medicine purposes. For example, the leaves of *Erechtites valerianifolius* are not only eaten as vegetables but also boiled or decoctioned to treat systolic pressure. In addition to the fruits eaten as forest delicacies, the aerial parts of *Physalis angulata* and *P. peruviana* are also decoctioned or dried and boiled to make a tea to treat rheumatoid arthritis. Only eight species are specifically used medicinally. For example, the roots of *Mimosa pigra* are used as a decoction to strengthen immunity, the whole parts of *Scurrula oortina* are used to treat systolic pressure and neoplasm, the leaves of *Anredera cordifolia* are used to treat myalgia, and the fruits of *Mussaendra frondosa* to treat furuncles. There are a total of 23 plants that can be used as medicines when needed (Figure 9). The number of wild plants used as medicinal ingredients is much less than the number known and used in other more isolated areas of West Java, where 41 wild plant species are only used to treat maternal postpartum recovery (Mulyanto et al., 2024a). This is probably related to the availability and accessibility of modern medicines in the study area.

Twenty-two diseases or medical conditions are treated with edible wild plants. The number of species with purported medicinal properties ranges from five species for rheumatoid arthritis to one species used to treat gastric dilatation-volvulus, furuncle skin infections, nasopharyngitis, and dyschezia (Figure 10).

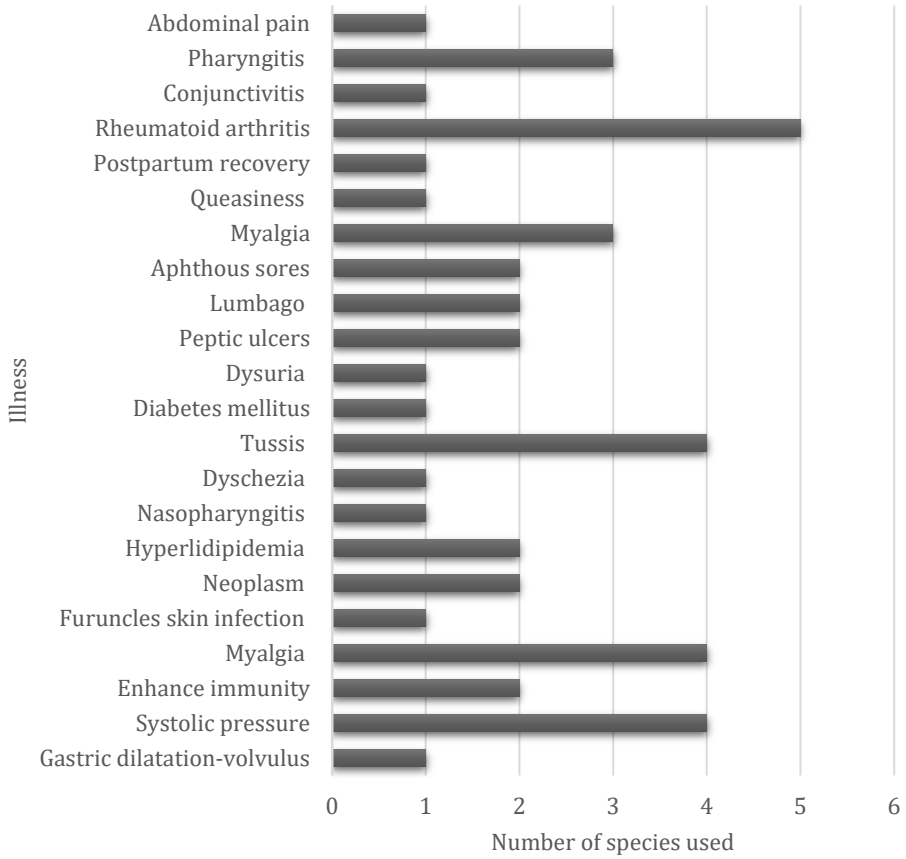

Figure 10. Distribution of illness and number of species to the treatment

In many ethnobiological studies, the uses of some plants are often distinguished as either food or medicine. However, other plants have uses that cannot be distinguished as food or medicine, and there is often overlap between these use categories (Júnior et al., 2015; Esakkimuthu et al., 2018; Xu et al., 2020; de Medeiros et al. 2021; Mulyanto et al., 2024a). This phenomenon has been called the 'food-medicine continuum'. This intersection of food and medicine highlights the complexity of local knowledge, allows for a more integrated understanding of plant uses, and highlights the inseparability of diet and health in the local cultures.

Native and exotic wild plants

Only half of the total species were found to be native; the other half consisted of exotic species. Among the exotic species, neophytes predominated over archaeophytes, 34% vs. 16% (Figure 11). Neophytes were defined as plant species that were introduced after 1492, when Christopher Columbus arrived in the New World and the Columbian Exchange began (Preston et al., 2004). Twelve neotropical neophytes were collected in the study area and were primarily used for medicinal purposes. For example, *Galinsoga parviflora* is used along with other neotropical plants such as *Anredera cordifolia* and *Rhynchospora colorata* to treat myalgia and soreness, while the leaves of *Erchtites valerianifolius* and the roots of *Solanum torvum* are used to treat systolic blood pressure.

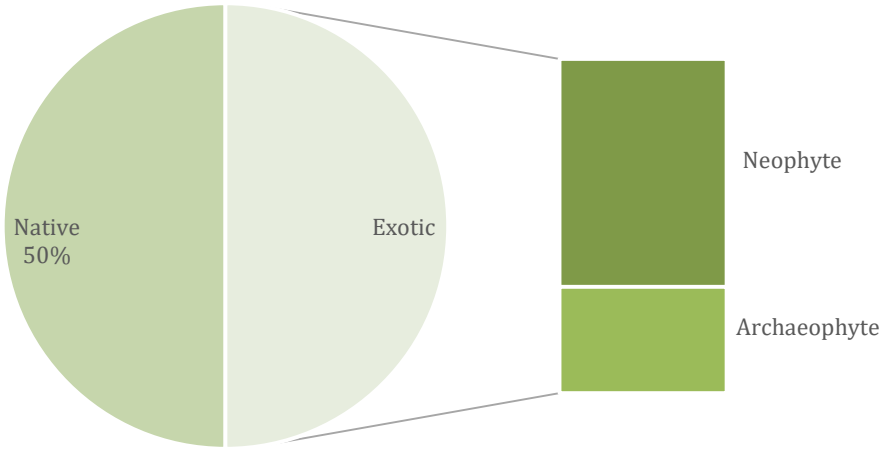

Figure 11. Percentage of native and exotic edible wild plants

Since the study area is a buffer village of Java's oldest tea plantation, the presence of exotic plants, especially neophyte species, is likely related to the Colombian exchange (Nunn and Qian, 2010). During the colonial period, and simultaneously with the introduction and cultivation of important crops and plantation plants originally from the other biogeographical regions, as well as the establishment of botanical gardens for economic purposes by the Dutch East Indies government, other exotic plant species with little or no use as food were also introduced to Java by settlers, either intentionally or unintentionally (Pols, 2009; Kudo et al., 2017; Rahmawati and Rosleine, 2023). In areas close to the botanical gardens and colonial plantations, as in the study area, some of these plants were not only later naturalized but also used as food by the local population (Handayani et al., 2021; Junaedi et al., 2021).

As in other studies, the inclusion of exotic plants in local botanical knowledge can be explained by several factors: their use allows for filling gaps left by native plants and diversifying the spectrum of the system (de Medeiros et al., 2017). Also from the point of view of the local health system, exotic plants increase the range of treatment options for diseases (Albuquerque 2006; Alencar et al., 2014; Júnior et al., 2015).

Some exotic plants, especially those from the northern hemisphere of Eurasia, were probably introduced to Java intentionally or unintentionally during the colonial period. This is the case, for example, of *Nasturtium officinale*, brought by Portuguese in sixteenth century (van Steenis, 1972), whose Sundanese name is *saladah*, probably derived from the Portuguese term 'salada'. On the other hand, most archaeophytes such as *Taraxacum officinale* and *Solanum nigrum* whose names appear in ancient texts were probably part of the local botanical knowledge from pre-colonial times (Mulyanto et al., 2023; Mulyanto et al., 2024b).

Economic value of edible wild plants

Most edible wild plants are collected solely for personal use as dietary supplements or medicines, but 13 plants are sold at a weekly local market. The economic value of these plants ranges from just 13 cents for a bunch of *Nasturtium officinale* to almost $10 for a kilogram of dried *Scurrula oortiana* (Table 2).

Table 2. List of edible wild plants whose part(s) have economic value

Taxa	Part sold	Range of value (converted into USD)	Selling meter
Bambusa vulgaris	Young shoots (fresh)	0.64 – 1.29	Kilogram
Diplazium esculentum	Young fronds (fresh)	0.32 – 0.64	Bunch
Gigantochloa atter	Young shoots (fresh)	0.64 – 1.29	Kilogram
Gigantochloa verticillata	Young shoots (fresh)	0.64 – 1.29	Kilogram
Limnocharis flava	Leaves (fresh)	0.19 – 0.32	Bunch
Musa acuminate	Flowers (fresh)	0.32 – 0.64	Piece
Nasturtium officinale	Aerial part (fresh)	0.13 – 0.51	Bunch
Oenanthe javanica	Aerial part (fresh)	0.32 – 0.51	Bunch
Passiflora ligularis	Fruits (fresh)	1.61 – 1.93	Kilogram
Pilea melastomoides	Leaves (fresh)	0.32 – 0.51	Bunch
Scurrula oortiana	All parts (dried)	6.43 – 9.64	Kilogram
Smilax macrocarpa	Fruits (fresh)	0.96 – 1.61	Kilogram
Solanum nigrum	Fruits (fresh)	0.96 – 1,29	Kilogram

The aerial parts of *Nasturtium officinale* and *Oenanthe javanica*, also the fruits of *Solanum nigrum* are popular vegetables in individual Sundanese households as well as in urban restaurants serving traditional Sundanese cuisine. In fact, *Solanum nigrum* fruit is one of the recognized vegetables for Sundanese people among other ethnic groups. As found in another study (Mulyanto et al., 2018), the fruit is eaten raw with traditional chili paste as well as cooked, and there are many dishes in the Sundanese cuisine of the study area where the fruit is the main ingredient.

Although the pharmacological effects of this mistletoe are not yet fully understood, it is generally believed that *Scurrula oortina* can treat many diseases, including cancer, therefore these plants will always be in demand.

Socio-cultural aspects of edible wild plants

Some of the plants listed in Table 1, such as *Anredera cordifolia*, *Nasturtium officinale*, *Ananas comosus*, *Maranta arundinacea*, *Syzygium polycephalum*, *Passiflora edulis*, *Physalis peruviana*, and *Solanum nigrum*, are classified as cultivated plants by botanists (Backer and Brink, 1968; van Steenis, 1972) but are considered to be "wild" plants by informants. The informants know that somewhere in Java there are farmers who cultivate these plants as crops. However, from the local point of view, these plants are classified as wild plants (*nu teu dipelak*) because no one deliberately plants or cares (*dioméan*) for them, like those who plant and care for potatoes, carrots, and chilies. This is true, for example, of watercress (*Nasturtium officinale*). Even in Central Europe and the Mediterranean, where watercress has been cultivated since ancient times (Fries-Knoblach and Stockhammer, 2022), it is still considered a wild plant in some countries (Carvalho and Morales, 2010; Christanell et al., 2010; Tardío, 2010; Redžić and Ferrier, 2014; Łuczaj and Pieroni, 2016; Sánchez-Mata and Morales, 2016; Tardío et al., 2016; Tardío and Pardo-de-Santayana, 2016; Venere et al., 2016). In tropical regions of India and South America, the plant is also considered a wild or uncultivated plant harvested in mountainous region and used as food and medicine (Cunya et al., 2019; Kumar et al., 2023; Manohar et al., 2023; Ray and Ray, 2023). So, from emic perspective, as in other regions, watercress in the study area may have first been cultivated and then became wild.

One of the stories we found in the study area is that *Passiflora edulis*, locally known as *nagri* or *buah nagri*, was once planted as an ornamental plant in the home gardens of plantation owners and European employees because of the beautiful color of its flowers and fruits. The local name of the plant reflects this story, as *nagri* means an elite area. Now, no one cultivates it specifically anymore, and to collect it one has to go to the forest edges or wooded valleys. Our informants have a special term for collecting wild fruits, called "*damel konyal*". The term *konyal* itself refers to *Passiflora ligularis* fruit, but the term in the phrase means "wild fruits" and harvesting *Passiflora edulis* as well as other forest fruits are included in this activity.

Another story was that hunger and starvation were widespread in the study area, especially during the Japanese Occupation (1942-1945), the War of Independence (1945-1949), and the Darul Islam Uprising (1949-1962). For about 20 years, food was scarce. Some of the informants remembered or heard from their parents that there was not enough food at the time and wild plants were used instead. Therefore, the edible wild plants they knew from their parents' stories are often called wartime food (*emameun jaman perang*) or famine food (*emameun jaman kalaparan*). According to the informants, edible wild plants have a low social status as "famine food", and knowledge about them is perceived to be decreasing, especially among young people, due to their association with famine and, in turn, with poverty.

Limitations of the study

The limitation of this study is that the data were collected using a free-list technique from informants who were recruited through a snowballing based on the criteria that they were the people considered to be the most knowledgeable locally about edible wild plants. Therefore, the data obtained cannot be considered representative of the knowledge of the entire community. As this is a preliminary study, the results of this study could be used as a starting point for a more comprehensive survey of all members of the community to determine the distribution of knowledge about edible wild plants, including its socio-cultural variables such as gender, social class, age, and occupational background.

CONCLUSION

The number of edible wild plant species known and commonly collected in the study area is greater than the number of species known and collected in some regions of West Java. Fruits and leaves are the most important components. Half of all plants are exotic species, most of which are neotropical, probably introduced by European settlers during the colonial times. The integration of exotic plants into the local taxonomy and uses illustrates the dynamic nature of local plant knowledge. 13 plants are in local markets as food or medicine, providing an important additional source of income for the poor. Although knowledge about edible wild plants still exists, especially among the poor, it also tends to decrease with economic and cultural development. To better understand these issues from a socio-cultural perspective, it is necessary to further explore the perceptions of the majority of the population towards edible wild plants and their harvesters.

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