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Wild plant knowledge and local disaster mitigation in West Java's deforested highland, Indonesia

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Abstract. *Fatimah FZN, Mulyanto D. 2025. Wild plants knowledge and local disaster mitigation in West Java deforested highland, Indonesia. Asian J For 9: 418-427.* Communities in disaster-prone mountainous areas often face limited access to stable food and health resources, making wild plants an essential safety net during emergencies. This study aims to identify the diversity, utilization, and role of wild plants in Disaster Risk Reduction (DRR) in the mountainous areas of West Java, Indonesia. A total of 26 informants were selected purposively according to the established criteria. They were individuals actively involved in wild plant collection and in small-scale domestication. Data were obtained through ethnobotanical surveys, free-listing interviews, and free walking. These data were then analyzed using Relative Frequency of Citation (RFC) and Sørensen's Similarity Coefficient (SSC) to ensure methodological rigor. The study recorded 87 species of wild plants that serve as sources of food, medicine, and multifunctional plants. In crisis situations, wild plants contribute to the four pillars of food security: availability, access, utilization, and stability. This strengthens their role as a community-based DRR strategy. However, a limitation identified in the study area was the lack of use of carbohydrate-rich tubers and long-term preservation techniques. This gap may weaken the community's self-resilience as households would become overly dependent on external assistance when access to food supplies is disrupted. Nevertheless, the domestication of 19 wild plant species in home gardens represents another DRR-relevant adaptive strategy. It can maintain food security and easily accessible medicine at minimal cost, time, and risk. Thus, these findings confirm that knowledge and practices of wild plant utilization are an important part of community-based DRR and play a vital role in strengthening forest-based resilience strategies in disaster-prone areas.

Keywords: Disaster risk reduction, ethnobotany, local knowledge, West Java, wild edible plants

INTRODUCTION

West Java is a region prone to hydrometeorological disasters such as floods and landslides, which can impact community food security. Such disaster can cause crop failures, reduce farmers' incomes, increase food prices, damage distribution channels and markets, and disrupt clean water supplies (Han et al. 2024; Tidiane et al. 2025). Given the impact on local livelihoods, strengthening community-based Disaster Risk Reduction (DRR) is essential as a proactive approach to maintaining resilience. Local knowledge integrated into DRR strategies enables communities to manage resources, ensure food reserves, and strengthen community solidarity for effective collective responses (Kitagawa and Samaddar 2022; Prasad and Nigam 2023; Irawan et al. 2024).

Food security is one component of DRR that requires special attention in disaster-prone areas because communities often face temporary shortages of staple foods. In this context, ethnobotanical resources such as wild plants become increasingly crucial as alternative food sources when formal food systems fail. Wild plants are species that grow naturally and are freely accessible, can function as emergency food sources during such periods. They contain nutrients through edible fruits, leafy vegetables, and tubers, and can be preserved using traditional methods to ensure availability during periods of food insecurity (Cunningham 2001; Erskine et al. 2015; Sarkar and Modak 2023). Local knowledge about wild plants is not only a practical necessity but also part of a cultural heritage passed down from generation to generation. In disaster-prone Southeast Asian countries, this knowledge is integrated into community-based DRR strategies to maintain food security during crises, thereby increasing communities' capacity to adapt to disasters (AmiziAyob et al. 2016; Nazareno et al. 2025).

In West Java, Indonesia, the use of wild plants has also been widely documented (Kulsum and Susandarini 2023; Aulia and Mulyanto 2024; Aulia et al. 2025). However, none of these studies examine how wild plants contribute to household food security during disaster or how they function within community-based DRR strategies. Similarly, research on DRR in West Java focuses on adaptive architecture, traditional agricultural practices, natural resource management, disaster preparedness education, and government mitigation programs (Pancasilawan 2020; Sugandi and Pascawijaya 2020; Nugroho et al. 2023). Yet, it has not considered the potential role of wild plants in resilience-building. As a result, the interaction between wild plant utilization and DRR mechanisms in deforested highlands remains poorly explained.

Thus, the relationship between these two topics is important to study, given that West Java is becoming increasingly deforested, thereby increasing the risk of disasters. This deforestation is due to land-use changes, such as shifting agriculture and logging, which can lead to forest conversion and land-cover loss. Increasing deforestation in mountainous areas also erodes vegetation cover, increasing surface runoff and soil erosion, thereby increasing the risk of flooding and landslides (Higginbottom et al. 2019; Moisa et al. 2022; Ma et al. 2024). Another impact is that deforestation can threaten the diversity of wild plants, reducing the buffer resources for communities in the face of disasters.

For this reason, the diversity of wild plant species can be maintained through small-scale domestication strategies that increase community access to useful wild plants. This practice allows communities to propagate and manage wild plants without the need for intensive genetic selection in their yards or to go far into the forest, which is often impossible during disaster situations (Hou et al. 2025). To examine these relationships more clearly, this study uses a four-pillar food security framework and Optimal Foraging Theory to analyze the roles of wild plant utilization and domestication in DRR.

Therefore, this study aims to document local knowledge of the diversity and use of wild plants, and to examine their role in disaster mitigation strategies through cultivation practices managed by local communities in mountainous areas that have experienced deforestation in West Java.

MATERIALS AND METHODS

Study area

This study was conducted in Cikembang Village (7°12'38.5"S, 107°41'20.1"E) in Kertasari Sub-district, Bandung District, West Java, Indonesia (Figure 1). The village covers an area of approximately 1,370 hectares and has a population density of 547 people per square kilometer. It is located at the foothills of Mount Wayang and Mount Windu, at an elevation of 1,200-1,800 meters above sea level, and serves as the upstream area of Citarum River Basin. Average temperatures ranging from 15°C to 23°C. The rainy season lasts from October to May, with an average annual rainfall of 2.170 mm. This region is a hydro-meteorological disaster-prone area in West Java, particularly flooding and landslides, due to hilly terrain with steep slopes, high annual rainfall, and deforestation.

Ecologically, the study area is located in the Tropical & Subtropical Moist Broadleaf Forests biome, with natural vegetation dominated by evergreen rainforests and semi-evergreen rainforests on drier slopes. Cultivated vegetation around settlements and degraded land now consists mainly of tea plantations and subtropical vegetable farms.

Drivers of deforestation in this region include forest clearing for agriculture and logging during the Japanese occupation, the conversion of colonial plantations to agricultural land after independence, and the intensification of the Green Revolution. Since the 1970s, the expansion of highland vegetable monocultures has increasingly replaced traditional agroforestry, accelerating the loss of forest cover. To address these issues, since 2018, the government has run the Citarum Harum program to encourage reforestation through coffee agroforestry.

Procedures

Data were collected through observation, free listing, and semi-structured interviews. Purposive sampling was used to select households that met the criteria of being actively involved in wild plant collection and small-scale domestication, ensuring that informants could provide relevant ethnobotanical knowledge. Based on a survey of 607 households, 26 households (4.28%) fulfilled the criteria. Informants included 10 men and 16 women, representing farmers, farm laborers, forest managers, and small traders. More women participated, reflecting their ability to identify a higher number of wild plant species (94.25%) during the free-listing interview. The age range of informants, 47 to 77 years, allowed for assessment of knowledge by age group. The final sample of 26 informants was deemed sufficient as no new wild plant species or uses were reported, indicating data saturation. Furthermore, throughout the household survey, informants consistently indicated that no other residents had additional knowledge about wild plant collection or small-scale domestication beyond the selected participants. This suggests that the sample encompasses the primary holders of wild plant knowledge in the study area.

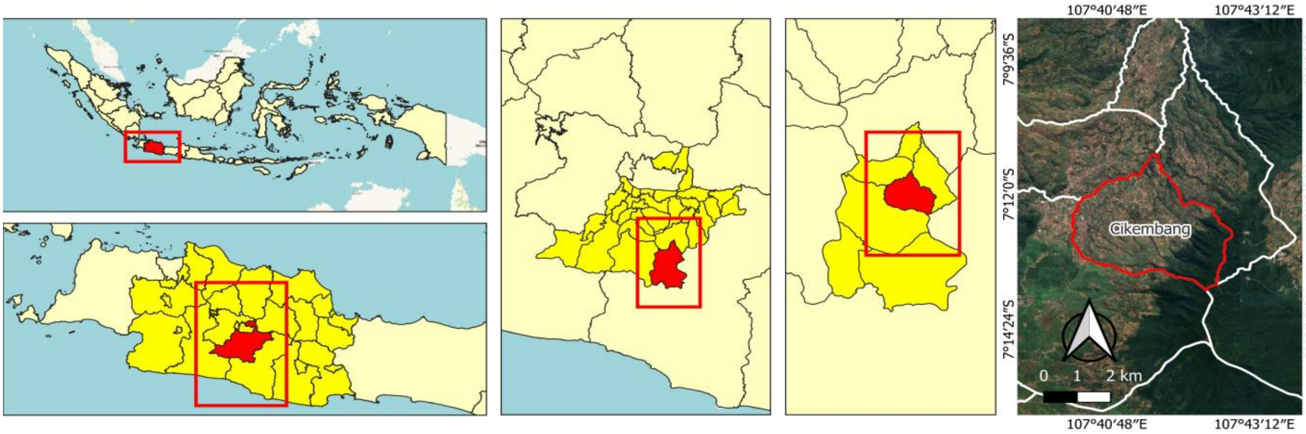

Figure 1. Study area map at Cikembang Village, Kertasari Sub-district, Bandung District, West Java, Indonesia

All interviews were conducted with informed consent after the purpose was clarified. Data served solely for research aims and informant confidentiality was upheld. Interviews were held individually or in groups at private homes, plantation areas, and stalls. To ensure data accuracy and completeness, interviews were conducted in Sundanese and Indonesian, depending on the informants' comfort. Free listing interviews recorded wild plant types, local names, habitats, used parts, uses, and processing methods. Meanwhile, semi-structured interviews explored two domains: the transmission of wild plant knowledge and the specific steps involved in small-scale domestication. Then, interview response was recorded separately for each informant. To ensure data consistency, each piece of information about a species was confirmed with the next informant. Data triangulation was also carried out through cross-checking with key informants considered to have more in-depth knowledge of wild plants. Ambiguous species names or those with local synonyms were resolved by asking informants about morphological characteristics and specific uses, thereby facilitating species identification.

Following the interviews, free walking and direct observation activities were carried out in wild plant habitats, such as yards, gardens, and areas around forests, with 2 informants. This activity aimed to document the species mentioned in the interview by taking photos and the identification process. After collecting local names of wild plant species, taxonomic identification was carried out to determine their scientific names using species documentation photos and morphological characteristics, based on informant information or direct observation. The identification process referred to Flora of Java (Backer and Brink 1968) as the primary reference. Wild plant species whose scientific names were unknown were then identified at Jatinangoriense Herbarium managed by the Department of Biology, Universitas Padjadjaran, West Java, and cross-identified by several botanists. Specimen vouchers were not collected, but photo vouchers were used as a basis for species verification. To ensure the validity and current status of the nomenclature, all scientific names were cross-checked and updated using the Plants of the World Online (https://powo.science.kew.org/).

Data analysis

Interview data, including local and scientific names, parts used, habitats, and form of utilization, were summarized using Microsoft Excel 2021, then the classified data were presented in tables and charts. Each documented species was analyzed using the Relative Frequency of Citation (RFC) index to assess its popularity and usefulness in the study area, with the 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. The RFC is calculated as the number of informants who mentioned the species, divided by the total number of informants (26). RFC was used to identify the most frequently cited and commonly used wild plant species, indicating their relevance for food security during disasters.

Sørensen's Similarity Coefficient (SSC) was used to measure the degree of similarity in the composition of wild plant species between two different habitat zones. This value is calculated using the following formula (Albuquerque et al. 2019).

$$SSC = \frac{2a}{(2a + b + c)}$$

Where, the constants a, b, and c represent: a: The number of species found in both habitats (x and y), b: The number of species found only in habitat y, and c: The number of species found only in habitat x. The SSC calculation begins with data compiled from the distribution of species across different habitats (e.g., villages, around villages, forests, and combinations of two habitats for which the SSC value is to be calculated). SSC was applied to assess similarity of species composition among habitats, providing insight into the availability and accessibility of wild plants when certain areas become difficult to access during emergencies.

Qualitative data were grouped thematically into two main domains: the process of knowledge transmission and the process of small-scale domestication. Information obtained from the interviews was compared across informants to identify recurring patterns, and these common themes were used to draw general conclusions about community practices and knowledge. The results are presented in narrative form.

RESULTS AND DISCUSSION

Botanical characteristics of edible and medicinal wild plants

A total of 87 wild plant species were identified to be used as food and medicine by the community in the study area. These species consist of 79 genera and 43 families, with Asteraceae being the most dominant, consisting of 17 species, most of which are edible (Figure 2). Asteraceae emerged as the most dominant family because many of its species are easy to find, grow in various habitats, and tend to grow rapidly in open areas that are often disturbed. Meanwhile, Solanaceae and Fabaceae families had 8 and 4 species, respectively. Some families were represented by only one species, reflecting a scattered taxonomic distribution. Table 1 shows 21 wild plant species with the highest RFC values (RFC>0.60). These species are generally available year-round and easily accessible, allowing them to meet food and medicinal needs when access to other resources becomes limited.

Table 1. List of the most popular wild food and medicinal plants (RFC>0.60). These species represent the most widely used plants in the community

Taxa, Family	Life form	Part used	RFC
Ageratum conyzoides L., Asteraceae	Annual	Leaf	0.62
Amaranthus blitum L., Amaranthaceae	Annual	Leaf	0.85
Bidens biternata (Lour.) Merr. & Sherff, Asteraceae	Annual	Stem tip	0.73
Bidens pilosa L., Asteraceae	Annual	Leaf	0.73
Castanopsis argentea (Blume) A.DC., Fagaceae	Tree	Seed	0.62
Centella asiatica (L.) Urb., Apiaceae	Perennial	Leaf	0.88
Chromolaena odorata L., Asteraceae	Shrub	Leaf, stem	0.69
Crassocephalum crepidioides (Benth.) S.Moore, Asteraceae	Annual	Leaf	1.00
Cyclanthera brachystachya (DC.) Cogn., Cucurbitaceae	Annual	Leaf, fruit	0.85
Emilia sonchifolia (L.) DC., Asteraceae	Annual	Leaf	0.69
Galinsoga parviflora Cav., Asteraceae	Annual	Leaf	0.62
Mesosphaerum suaveolens (L.) Kuntze, Lamiaceae	Annual	Leaf, shoot	0.62
Morus indica L., Moraceae	Tree	Leaf, fruit	0.69
Nasturtium officinale W.T.Aiton, Brassicaceae	Perennial	Leaf	0.81
Oenanthe javanica (Blume) DC., Apiaceae	Perennial	Leaf	0.81
Physalis angulata L., Solanaceae	Annual	Root	0.69
Pilea melastomoides (Poir.) Wedd., Urticaceae	Shrub	Leaf	0.88
Plantago major L., Plantaginaceae	Perennial	All parts	0.73
Rumex patientia L., Polygonaceae	Perennial	Leaf	0.73
Sida rhombifolia L., Malvaceae	Shrub	Root, leaf, fruit	0.73
Sonchus arvensis L., Asteraceae	Perennial	Leaf	0.85

Regarding life forms, annual and perennial herbaceous plants are the most dominant, followed by shrubs and trees (Figure 3). Herbs dominate because they are more abundant in open and cultivated landscapes, and are easy to hand-harvest. Therefore, they are more frequently utilized by the community. Additionally, 19 species were identified as domesticated, representing 21.83% of the total, with domestication primarily concentrated on food plants (9 species) and multifunctional species (3 species). These domesticated species are generally the most commonly used and easiest to cultivate in home gardens.

Distribution of habitat

The locations of wild plants were divided into three main categories (Figure 4), namely gardens and rice fields (surrounding village), forests, and residential areas (in the village). Most species were obtained from the surrounding village (39%), including vegetable gardens, tea gardens, swamps, and rice fields. Based on Sørensen's Similarity Coefficient (SSC) calculations, wild plants in the surrounding village and the forest had the highest similarity level (SSC=0.37) followed by the village and village surround zones (SSC=0.36), as well as the village and forest zones (SSC=0.29), which showed the lowest species similarity level.

In addition, some wild plants are also obtained from forests, which are natural habitats with relatively little human activity (26%), as well as in villages, including around home gardens, roadsides, and riverbanks (2%). This is because most people are no longer aware of the benefits of wild plants around settlements, leading to logging and disposal. Thus, other species have dual distributions, found in two to three habitats simultaneously. This pattern indicates that species occurring across multiple habitats can still be obtained from alternative locations when access to one habitat is restricted, thereby ensuring their continued availability.

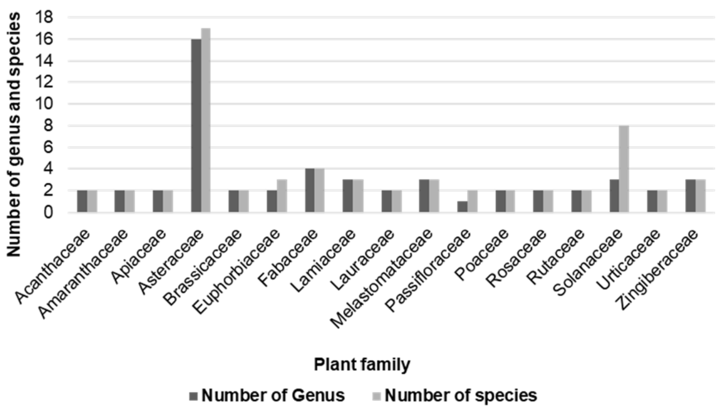

Figure 2. Distribution of plant families represented by two or more species in the study area. Illustrates dominant plant families contributing to local wild plant use

Use of wild plants as food and medicine

In this study, 46% of wild plants were used only for food, 26% only for medicine, and 28% had dual use as food and medicine (Figure 5). Leaves were the most commonly used part for food, either consumed raw or cooked by boiling or stir-frying. Meanwhile, fruits were generally consumed directly. Thus, the consumption pattern of wild plants in the study area focused on simple processing as supplementary food. In addition, there was no utilization of wild tubers or preservation processes for long-term food reserves.

Regarding traditional medicine, 23 species were identified as effective for treating 34 disease types, both when consumed orally and applied topically. Figure 6 shows the ten diseases with the highest frequency of plant use by the community. For oral treatment, the leaves and roots are most often boiled and then drunk. Communities also have the practice of mixing several types of plants, such as the roots of *Physalis angulata, Sida rhombifolia*, and *Plantago major*, to treat gout and rheumatism. Some medicinal plants are processed into more varied dishes aside from herbal remedies. For example, *Moringa oleifera* leaf is cooked as a clear vegetable soup to control diabetes, and *Morus indica* leaf is made into an omelet with free-range eggs for blurred vision. Topically, wild plants are commonly used as first aid for open wounds, including cuts and abrasions. The species most often used for first aid for wounds are *Ageratum conyzoides* and *Chromolaena odorata*, by applying the leaves or stems to the skin.

Socio-cultural aspects of edible and medicinal wild plants

Table 2 shows that the informants in this study were mostly women (61.54%) and had broader knowledge of food and medicinal plants, including for treating children. Meanwhile, men had extensive knowledge of wild plants in the forest because they were often involved in activities such as farming, bird hunting, and collecting firewood. Most of the informants were rural workers (73.08%) on vegetable plantations, and wild plants were often collected during weddings and then taken home for use.

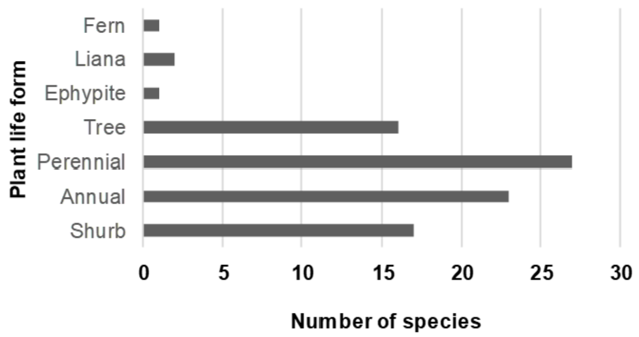

Figure 3. Distribution of plants by life form in the study area. Shows the dominance of annual and perennial herbs, indicating community preference for easily accessible wild plants

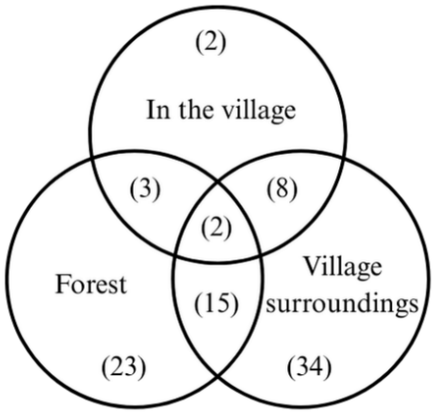

Figure 4. Distribution of wild plant across three main foraging sites. Shows that gardens and forests are the primary harvesting sites

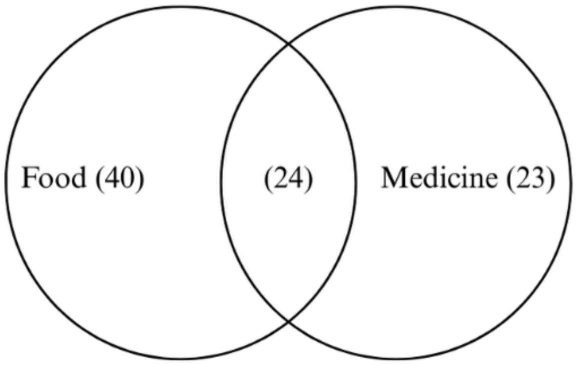

Figure 5. Distribution of utilization of edible and medicinal wild plants. Illustrates the proportion of species used as food, medicine, or for both functions

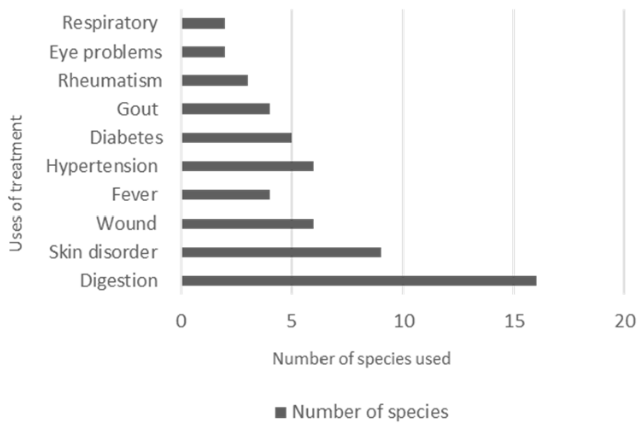

Figure 6. Ten most common diseases treated with wild plants. Shows the frequency distribution of disease categories most commonly treated in the study area

Local knowledge about edible and medicinal wild plants is acquired from parents through oral transmission and direct experience from an early age. This knowledge is also acquired through personal experience with trial and error. One method is to observe animals, such as caterpillars, to assess the safety of plants. Age contributes to variations in knowledge. Informants over 60 showed broader recognition of wild plants, while many noted that younger generations are becoming less familiar with these species due to reduced exposure and increased reliance on digital technology.

Discussion

The role of wild plants in disaster risk reduction

The high diversity of wild plants used by local communities also holds potential as an adaptive strategy in post-disaster situations. Globally, wild plants serve as complementary foods and freely accessible medicines when conventional food sources are disrupted by economic and ecological factors (Asprilla-Perea and Díaz-Puente 2019; Campbell et al. 2021). A similar role is documented in mountain communities of West Java and Central Java, where wild plants are used as emergency food sources during times of scarcity due to crop failure, prolonged drought, or socio-political crises (Aulia and Mulyanto 2024; Farikha et al. 2024). Comparable patterns are found across Southeast Asia. In Lombok, Indonesia, Malaysia, and Philippines, wild tubers from the genus *Dioscorea* are used as emergency food during floods, droughts, and typhoon (AmiziAyob et al. 2016; Indriyatno et al. 2024; Nazareno et al. 2025). Meanwhile, in Timor Leste, tubers are dried and stored to cope with extreme rainy seasons caused by the La Niña phenomenon (Erskine et al. 2015). These studies demonstrate the dual role of wild plants: reactively as emergency food and preventively through food preservation that increases household resilience.

To that end, wild plants serve as a coping mechanism for vulnerable households during disasters that disrupt the four main pillars of food security, namely availability, access, utilization, and stability (Chhay et al. 2023). In the study area, the availability of wild plants is abundant and diverse, serving as important sources of both food and medicine. The existence of these wild plants provides alternative food and medicine when cultivated commodities are difficult to access during disaster situations. In terms of accessibility, wild plants are relatively easy to reach because they grow naturally in various habitats close to human daily activities, such as settlements, gardens, and forests. In addition, wild plants can be obtained for free, making them a solution when staple food prices rise and income decreases.

Then, regarding utilization, the high consumption rate of wild leaves also contributes to nutritional value because leaves contain high water content (70-80%) and photosynthetic products, as well as active compounds such as essential oils, phenols, potassium, and chlorophyll, which support both nutritional and medicinal functions (Nasution et al. 2023). Their processing is relatively simple, does not require significant cost, and is generally safe for consumption with minimal side effects (Alfinandah et al. 2025).

The five species with the highest RFC Index (Table 3) comprise leafy plants that have the potential to be a source of emergency nutrition due to the rich micro and macronutrients. The energy value of wild vegetables *Crassocephalum crepidioides, Centella asiatica,* and *Pilea melastomoides* is higher than that of the cultivated vegetable *Amaranthus tricolor* (16 kcal/100 grams). Furthermore, the calcium and iron content is comparable to or even higher than that of *Ipomoea aquatica* (67 mg Ca; 2.3 mg Fe) and *Brassica rapa* (56 mg Ca; 1.1 mg Fe). Important vitamins such as A, C, E, and B complex also play a role in maintaining immune function during crises. The micronutrient content in leaves is certainly higher than in instant and ultra-processed foods, which are often distributed as emergency food aid. Furthermore, the habit of consuming fresh leaves is part of the Sundanese cultural identity, and the Sundanese have historically consumed more plant-based protein from vegetables than animal products (Rahman 2018; Iskandar et al. 2023).

However, the nutritional values in food composition tables do not always reflect the amount of nutrients actually absorbed by the body, as bioavailability can vary depending on how the food is processed. In the study area, many types of wild leaves are consumed raw. Fresh consumption like this may help retain certain heat-sensitive micronutrients compared to prolonged cooking. Nevertheless, nutrient absorption is still influenced by individual physiological conditions and eating habits.

In addition to food, medicinal plants such as *A. conyzoides* and *C. odorata* are important for treating wounds that commonly occur during disasters. The active compounds in both species, such as flavonoids, saponins, and tannins, enhance antioxidant, antibacterial, and anti-inflammatory activities, which are effective in stopping bleeding, reducing infection, and accelerating cell regeneration during the wound healing process (Sirinthipaporn and Jiraungkoorskul 2017; Oso et al. 2018; Ayorinde 2022). Similar topical uses of these species for wound healing have been reported in other regions, including India and Sub-Saharan Africa (Das et al. 2023; Fisher et al. 2025; Rafiu et al. 2025).

Table 2. Characteristics of informants. Summarizes gender, age groups, and occupations of informants, showing variation in the number of wild plants cited across demographic categories

Category	%	Number of plant cited	
		Total	Mean
Gender			
Male	38.46	75	39.80
Female	61.54	82	27.88
Age			
40-49	30.77	61	26.63
50-59	34.62	77	33.11
>60	34.62	81	37.00
Main occupation			
Rural worker	73.08	79	29.95
Small trader	7.69	64	51.00
Farmer	7.69	58	44.50
Retired	11.54	52	28.00

Table 3. Nutritional content of wild plants with the highest Relative Frequency of Citation (RFC) index, highlighting their potential contribution to household nutrition during crises

Wild plant species	Nutritional content					
	Energy (kcal)	Protein (g)	Carbohy drates (g)	Calcium (mg)	Iron (mg)	Vitamin
Crassocephalum crepidioides	36	2.6	6.1	398	9.3	A, C, E
Centella asiatica	44	1.8	7.1	146	3.9	A, B1, B2, B3, C
Pilea melastomoides	37	2.5	6.9	744	5.9	A, C, B1
Amaranthus blitum	28	2.8	5.4	276	3.0	A, C, B3, B6, B12, Folat
Sonchus arvensis	16.3	1.6	0.12	232	8.6	A, E, K

Note: Data from food composition table, Indonesian Ministry of Health (2017)

The potential for using wild plants is also supported by their relatively stable year-round availability. Annual herb species are readily available in areas with short dry seasons. In addition, most wild plant species are invasive, meaning they can grow quickly, have high reproductive capacity, and adapt to disturbed habitats (Raihandhany et al. 2023). This stability is crucial to ensuring a sustainable food supply. Thus, wild plants fulfill the four pillars of food security and serve as a DRR strategy.

However, the study area's shortcomings in maintaining food security during disasters include a lack of knowledge about wild tubers as a carbohydrate source and about the process of preserving long-term food reserves. This may be due to the relatively difficult and lengthy processing involved, as well as the availability of instant foods that are often used as alternative food sources. This condition can limit household resilience during prolonged crises, as communities continue to depend on external food aid, thereby reducing their self-resilience. In fact, DRR emphasizes the strengthening and integration of local knowledge as a community-based strategy (United Nations Office for Disaster Risk Reduction 2015), one of which can be applied through the use of wild tubers as an alternative food source.

Furthermore, reliance on instant and ultra-processed foods as emergency foods can undermine the nutritional intake that should come from natural, nutritious sources. Dioscorea itself is a food source rich in carbohydrates, protein, fiber, and various important micronutrients that provide therapeutic benefits for the body and can grow in mountainous areas (Padhan and Panda 2020; Anuar et al. 2023). The preservation process also can be an important step in DRR strategies, as this technique can maintain food availability as a form of anticipation if road access is cut off due to disasters, thereby preventing communities from collecting tubers and wild plants directly from their natural habitats.

Small scale domestication as an adaptive strategy for food security

However, despite shortcomings in the utilization of wild tubers and preservation techniques, the small-scale domestication practices found in the study area could be another strategy to improve food security. In practice, plant parts such as seeds, roots, rhizomes, and stems are usually taken from gardens or forests and then planted in pots or soil in yards. Most wild plants do not require special care and thrive when scattered on the ground. The domestication process does not alter the plant's primary nutritional content, particularly in open fields (Ceccanti et al. 2020). In the study area, domestication did not correlate with species having the highest RFC values, suggesting that food utility and multifunctionality were the main factors in domestication selection. Figure 7 shows species of wild plants that has been domesticated in home gardens.

Home-garden cultivation practices were also found among female farmers in Mizoram, India, who domesticated wild plants in their home gardens for food and medicinal purposes (Swain et al. 2020). In the Peruvian Amazon, Mestizo farmers practice domestication to maintain species availability amid deforestation (Cruz-Garcia 2017). These examples illustrate how domestication is related to Optimal Foraging Theory (OFT), whereby humans seek to minimize the energy (in terms of time, effort, and cost) expended to collect resources of maximum quality (Albuquerque et al. 2015). In this study, OFT is used as a conceptual framework rather than a quantitative model. Indicators commonly used to assess foraging efficiency (travel time, distance traveled, or energy expenditure) are not measured directly. Thus, the application of OFT in this context is interpretive based on observations of community strategies, rather than empirical measurement of foraging costs.

In the study area, domestication practices are most likely a response to two primary factors: the high rate of deforestation, which increased the distance between settlements and forests and reduced species diversity, and the frequency of natural disasters, which prompted communities to diversify the number of useful plant species.

Furthermore, the conditions observed in the field reflect OFT parameters, namely time savings, lower energy costs, and reduced risk. The majority of residents in the study area harvest wild plants while working in vegetable gardens or forests, which requires walking long distances and travelling long hours on hilly roads. The cost of time and energy also increases when the weather is unpredictable and can hamper their activities. For those who regularly collect wild plants in the forest, the risk increases due to the threat of wild animals. Therefore, moving wild plant species to home gardens is a strategy to reduce travel and energy costs and minimise risk, in line with the OFT principle.

Figure 7. Examples of domesticated wild plants in home gardens. A. *Strobilanthes crispa*, b. *Graptophyllum pictum*, C. *Anredera cordifolia*, D. *Physalis angulata*, E. *Passiflora ligularis*, F. *Oxalis corniculata*

Gendered knowledge and its role in community resilience

The high level of knowledge among female informants regarding food and medicinal plants reflects the dominant role of women in household affairs, such as cooking and childcare (Hankiso et al. 2023). Other studies report that women are more dominant in food preparation, medicine, decoration, and the use of firewood, while men are more dominant in construction, crafts, technology, and animal feed (De Oliveira et al. 2020; Poncet et al. 2021). This variation in knowledge is influenced by location, type of daily activities, and intensity of interaction with plants (Wiryono et al. 2019).

This gendered division of knowledge contributes to community-based DRR. Women's roles in food preparation and resource management position them as key actors in sustaining food security during crises. Their expertise with diverse edible and medicinal wild plants enables the community to quickly source alternative food and health resources when crop yields drop or market access stalls. These insights also align with the Sendai Framework, which emphasizes strengthening local knowledge and empowering women as key agents in resilience building (United Nations Office for Disaster Risk Reduction 2015). Conversely, men who are accustomed to working in forest areas can also provide alternative food reserves when resources in domestic areas decline.

This is also related to intergenerational transmission patterns, in which women pass down knowledge through domestic activities such as cooking, preparing medicine, and gardening in the yard, while men do so through activities such as gardening on larger plots, collecting firewood, and exploring the forest. This variation in transmission helps preserve knowledge of the use of wild plants across generations and strengthens the community's long-term adaptive capacity. Such continuity is important because orally transmitted knowledge is vulnerable to loss and may disappear if it is not actively maintained (Zubaidah et al. 2020; Navia et al. 2021).

Based on the results of this study, it can be concluded that local food security does not depend solely on the availability of resources but is also determined by the sustainability of intergenerational transmission that keeps local knowledge in use. Therefore, these findings make an important contribution to ethnobotany and DRR studies by showing that local knowledge is part of communities' resilience capacity, a dimension that has rarely been documented in DRR approaches that focus on technical aspects.

Several practical actions can be prioritized based on these finding. Introducing tuber use and a simple preservation method can expand local carbohydrate sources and support long-term food reserves within community-based DRR programs. Existing small-scale domestication practices can be strengthened through knowledge exchange at the family and neighborhood levels, as well as through local government support to cultivate food and medicinal plants in yards. The decline in local knowledge among the younger generation can be further addressed by re-engaging them in activities that facilitate active knowledge transfer with their parents. These steps can support the sustainability of local knowledge and ensure access to alternative food sources when the formal food system is disrupted.

These findings also suggest that the utilization and small-scale domestication of wild plants may help reduce direct harvesting pressure in forest areas. When some food and medicine needs can be met from home gardens, dependence on forest resources is reduced, which may help lower deforestation pressures. Such reduced pressure has important landscape-level implications, as maintaining vegetation cover is closely linked to mitigating flood and landslide risks in mountainous regions. Therefore, the results of this study can provide valuable insights for ecosystem-based disaster mitigation planning in areas surrounding forests.

This study has several limitations that need to be acknowledged. First, the sample size is relatively small, involving only 26 informants from one mountain village, so these findings cannot be generalized to the entire mountain community in West Java. Second, the data rely on informants' memories and reports, so there is potential for bias, as this study cannot verify whether all 87 species mentioned are actually used in crisis situations or are known only to the informants. Validating data on the use of plants in crisis conditions is also challenging because such practices are rare and difficult to observe directly. Third, this study focuses on local knowledge and the potential of wild plants for disaster mitigation, rather than their actual use during disasters. Therefore, future studies should involve a larger sample size, comparison communities, and observations during or after disaster events to strengthen our understanding of the real contribution of wild plants to community resilience.

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