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The diversity and traditional use of home garden plants near Kerinci Seblat National Park, Indonesia

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Abstract. *Suwardi AB, Navia ZI, Mubarak A, Rahmat R, Cristy P, Wibowo SG, Irawan H. 2024. The diversity and traditional use of home garden plants near Kerinci Seblat National Park, Indonesia. Biodiversitas 25: 3284-3299.* Home gardens are traditional agroforestry systems that improve plant diversity and ecosystem services while also having a direct and beneficial effect on human well-being. Each plant species in a home garden provides a variety of ecosystem services, which are linked to specific ecological functions and social drives. Although home gardens are biodiversity hotspots and have recently been identified as essential to tropical biodiversity conservation, the benefits of ecosystem services offered by home gardens are frequently undervalued. This study aims to analyze the diversity, usage, and traditional knowledge of home garden plants among the local communities living near Kerinci Seblat National Park, Indonesia. This study was carried out in four villages from two districts of Bengkulu Province, Indonesia, i.e. Lebong and Rejang Lebong. Field surveys, plant collections, and interviews with local communities were used in this study. Interviews were conducted with 120 informants (30 in each village) selected at random. A total of 218 plant species belonging to 67 families associated with 12 use categories were recorded in the study area. *Capsicum frutescens*, *Musa x paradisiaca*, and *Mangifera indica* are frequently discovered in home gardens. The most diverse categories of plant use in home gardens encompass food, medicine, and ornament, utilizing various parts such as rhizomes, leaves, flowers, and fruits. Home gardens, with their diverse plant species, are considered to have a significant role in household livelihoods, protecting plant genetic resources, and biodiversity conservation.

Keywords: Biodiversity, ecosystem service, home garden, Kerinci Seblat National Park

INTRODUCTION

Home garden plants contribute significantly to sustainable rural living by offering various ecosystem services, encouraging food security, increasing household income, and conserving plant genetic resources (Korpelainen et al. 2023). They include a diverse set of plant genetic resources, including underutilized plants and wild relatives, which are critical for agricultural resilience and adaptation to climate change (Korpelainen et al. 2023; Suwardi et al. 2023). Each plant species in home gardens provides a variety of ecosystem services that are associated with certain ecological functions and social drivers (Andersson et al. 2007; Sarkar et al. 2019). Home gardens, which reflect local knowledge and cultural traditions, have an impact on food plant diversity, seed saving, and traditional food preparation, thereby maintaining cultural heritage and encouraging sustainability. Home gardens, as fundamental components of farming systems, have a substantial impact on community livelihoods by providing a year-round source of food, medicinal herbs, and additional revenue (Adnan et al. 2022). Home gardens are recognized as important sites for transmitting cultural heritage and reservoirs of plant genetic diversity, particularly for including underutilized plants and traditional crops (Ivanova et al. 2021; Suwardi et al. 2022). They also promote agrobiodiversity and provide a diverse range of food products, hence improving food and nutritional security (Suwardi et al. 2020; Santos et al. 2022; Korpelainen et al. 2023), particularly for resource-poor families (Galhena et al. 2013). Home gardens frequently yield surplus produce, allowing gardeners to sell in local markets, generating additional income for household needs such as education, clothing, and infrastructure improvements, thereby contributing to economic resilience and helping communities withstand economic shocks and uncertainties. In addition, home gardens resemble natural forests by regulating micro-environmental conditions, improving soil quality, and increasing carbon sequestration potential, which promotes sustainable living practices (Sarkar et al. 2023).

Despite their significant role in social and environmental sustainability, home gardens have received limited scientific attention in many regions (Calvet-Mir et al. 2012). While studies underscore the importance of home gardens in promoting plant diversity, ecosystem services, and livelihoods (Suwardi et al. 2023; Reang et al. 2023), comprehensive studies on factors influencing plant diversity, including agroecological aspects, remain sparse. The limited documentation of useful plant species in home gardens impedes a deeper understanding of their contributions to biodiversity conservation and livelihood sustainability (Wujung et al. 2022). Furthermore, there is a notable lack of in-depth studies on home garden ecosystems in regions such as West Bengal, India, necessitating extensive study to assess biodiversity patterns and adaptation strategies (Bista et al. 2022). On the other side, the loss of traditional knowledge among local communities jeopardizes the long-term viability of home garden plants, particularly wild ones. For instance, in Kerala, although the elderly possess valuable information on medicinal plants and their uses, only a portion of these recorded species are currently utilized for treating illnesses (Sasidharan et al. 2011). Similarly, the erosion of traditional knowledge is also evident among the Kenyan Purko Maasai, where sociocultural factors such as shifts in land tenure and limited learning opportunities contribute to this decline (Hedges et al. 2020). A study in Malaysia highlighted the need to document ethnomedicinal plants in the home garden to preserve traditional knowledge, with many medicinal plants still in use for various ailments (Ramli et al. 2021). In the Napf region, differences in local plant knowledge between adults and younger generations indicate a risk of losing traditional plant knowledge among children and adolescents (Poncet et al. 2021). The loss of traditional knowledge has a substantial impact on the diversity of plant species in home gardens. Traditional knowledge is essential for the protection and use of plant genetic resources, including culturally significant species (Ramaidani and Navia 2022). As highlighted in various studies (Ramli et al. 2021; Korpelainen 2023; Blue et al. 2023), traditional practices and knowledge are critical for the preservation of local habitats and unique cultural identities. Despite the importance of home gardens in social and environmental sustainability, significant research gaps prevent a comprehensive understanding of their contributions. Regional-specific assessments are lacking, particularly in understudied areas, such as Kerinci Seblat National Park, leading comprehensive studies into biodiversity patterns and adaptive strategies. In cases where younger generations lose this knowledge, home garden plant diversity suffers, as illustrated by the decline of traditional plant species and their potential replacement by high-yielding modern cultivars. The rapid erosion of traditional knowledge among younger generations further exacerbates the challenge of maintaining plant diversity and ecosystem services in home gardens. This intergenerational erosion of traditional knowledge underscores the urgency of documenting and preserving ethnobotanical information to ensure the sustainability of home gardens and their valuable ecosystem services. Addressing these gaps, through comprehensive documentation of plant species and traditional knowledge, this study ensures its transmission to future generations, essential for maintaining plant diversity and supporting sustainable home garden ecosystems. This study aims, therefore, to investigating the diversity, use, and traditional knowledge of home garden plants among the local communities living near Kerinci Seblat National Park.

MATERIALS AND METHODS

The study area

This research was conducted near Kerinci Seblat National Park of Bengkulu Province, Indonesia. The province is located at 2°16'S to 3°31'S and 101°01'E to 103°41'E, with elevations ranging from 0 to 1,900 m asl. This area has a tropical climate with two seasons: the rainy season, which lasts from December to March, and the dry season, which lasts from June to September. The average annual air temperature is 28.7°C, while the average annual humidity is 76.8%, and the average annual rainfall is 3,658.1 mm with 23.2 rainy days. Bengkulu Province covers an area of approximately 19,919.33 km^2 and has a population of 2.032 million people, including 1.039 million men and 993 thousand women. Bengkulu province is divided into 10 districts, 129 sub-districts, and 1,514 villages (BPS-Statistics of Bengkulu Province 2022). The ethnobotanical study was carried out in four villages from two districts of Bengkulu Province, Indonesia, i.e. Lebong (Sebelat Ulu and Ketenong Dua villages) and Rejang Lebong (Kayu Manis and Cawang Lama villages) (Figure 1).

Home garden selection

In the study, home gardens from the study areas were selected using a random sampling technique, with support and guidance from the Pinang Belapis and Selupu Rejang sub-district governments acting as key informants to identify suitable study samples. A total of 120 home gardens, also referred to interchangeably as farms, were sampled across four villages, with four home gardens selected from each village.

Data collection

The study employed a multidisciplinary approach to collect data on plant diversity and usage in 120 home gardens between July and September 2023. Prior informed consent was obtained from the head village, and local participants verbally agreed to the dissemination of their traditional knowledge. Local names of the plants were recorded in the presence of the householders, noting the number of individual specimens, their uses, and the parts of the plants utilized. Taxonomic identification was carried out at the Biology Laboratory of Universitas Samudra, Aceh, Indonesia, using plant identification books, herbarium specimens, and confirmation by relevant taxa experts.

Semi-structured interviews gathered information on the role of home gardens in the livelihoods of the gardeners (used interchangeably with ‘farmers’). The interview questions addressed demographic details of the respondents, including age, occupation, and specific information about their gardens and gardening activities. This included the number of family members involved in garden care, the number of uses for each home garden plant, and the management of the home gardens. One representative from each of the 120 home gardens was interviewed, with each interview lasting between 30 and 60 minutes, conducted in Indonesian.

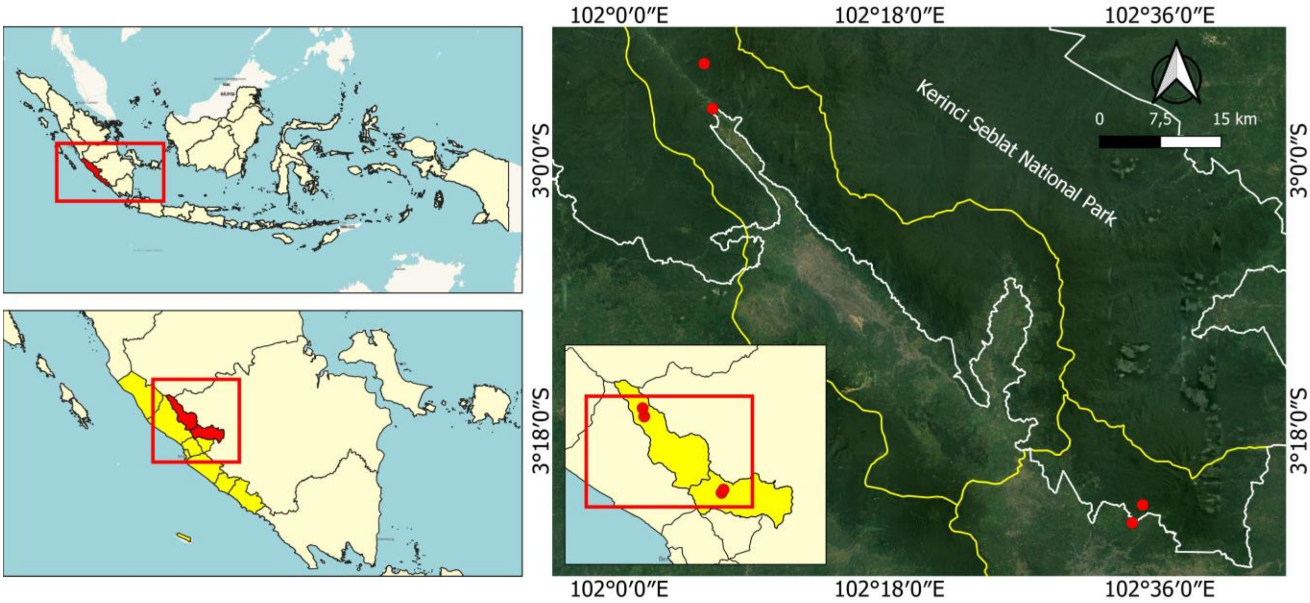

Figure 1. Map of the study area near Kerinci Seblat National Park, showing the study site (●) in Lebong and Rejang Lebong districts, Bengkulu, Indonesia

Data analysis

Relative Frequency Citation (RFC)

The ethnobotanical data was assessed using a relative frequency citation (RFC) index (Vitalini et al. 2013):

$$RFC = FC/N \ (0 < RFC < 1)$$

Where: RFC indicates the local importance of each species and is calculated by dividing the frequency of citation (FC) by the total number of informants participating in the study (N), without taking use categories into account.

Use Value (UV)

The use-value was calculated using the following proposed formula (Tardío and Pardo-de-Santayana 2008):

$$UV = \sum U/n$$

Where: U is the number of use reports quoted by each informant for a given plant species; n refers to the total number of informants interviewed for a given plant.

Jaccard's similarity index (JI)

To compare the similarity of home garden plants among the villages, Jaccard's similarity index was determined using the following Desalegn et al. (2002):

$$JI = \frac{c}{a + b + c}$$

Where: JI is the Jaccard similarity index, 'c' is the number of species shared by both study sites, 'a' is the number of species in study site A only, and 'b' is the number of species in study site B only. The JI values range from 0 to 1; a value of 1 shows complete similarity.

Direct matrix ranking (DR)

The direct matrix ranking, following the methodologies described by Martin (1995) and Cotton (1996), was conducted using four implemented approaches for managing plant species. Respondents were asked to assign use-values to each variable on a scale from 0 to 5, with 5 representing the best implementation and 0 representing not implemented. The scale included 4 for very good, 3 for good, 2 for less implemented, and 1 for least implemented. The average values provided by the respondents for each variable were then calculated, totaled, and ranked to determine the overall effectiveness of each approach.

RESULTS AND DISCUSSION

Plant diversity in the home gardens

The study's findings indicate that home gardens around the Kerinci Seblat National Park (KSNP) exhibit high plant diversity, with a total of 218 plant species identified (Table 1). KSNP is the largest national park in Sumatra island, Indonesia, and a UNESCO World Heritage site, recognized for its diverse wildlife and ecological value. The KSNP is intricately connected to the surrounding agricultural systems, resulting in a dynamic interface between conservation and local livelihoods. The park's great biodiversity, which includes an abundance of plant species, provides a broad genetic pool that can be employed in home gardens to improve food security and nutrition, as well as a critical role in supporting sustainable agriculture in the surrounding communities. The forest ecosystems within KSNP regulate water cycles by providing a consistent and clean water supply, which is essential for agricultural irrigation. This natural water regulation prevents soil erosion and maintains soil fertility, which benefits the nearby farmlands.

Table 1. List of plants in the home garden of Lebong and Rejang Lebong districts, Bengkulu, Indonesia

Family	Botanical name	Local name	Habit	Status	Plant part used	Use (s)	RFC	UV
Acanthaceae	*Andrographis paniculata* (Burm.f.) Nees	*Sambiloto*	S	C	Fr	Medicine	0.075	0.075
	Asystasia gangetica (L.) T.Anderson	*Ara sungsang*	H	W	Le	Fodder	0.183	0.183
	Graptophyllum pictum (L.) Griff.	*Puding hitam*	S	W	Le	Medicine	0.100	0.100
	Nicoteba betonica (L.) Lindau	*Nika*	S	C	Fl	Ornament	0.200	0.200
	Justicia gendarussa Burm.f.	*Gandarusa*	S	C	Le	Medicine	0.267	0.267
	Ruellia tuberosa L.	*Pletekan*	H	C	Le, Fl	Medicine, ornament	0.242	0.317
	Thunbergia erecta (Benth.) T.Anderson	*Bunga kenop*	S	C	Fl	Ornament	0.442	0.442
Amaranthaceae	*Alternanthera brasiliana* (L.) Kuntze	*Bayam ungu*	H	C	Le	Ornament	0.367	0.367
	Alternanthera ficoidea (L.) P.Beauv.	*Kriminil*	H	C	Le	Ornament	0.400	0.400
	Alternanthera philoxeroides (Mart.) Griseb.	*Bayam dempo*	H	C	Le	Ornament	0.275	0.275
	Amaranthus hybridus L.	*Bayam sekop*	H	C	Le	Food	0.733	0.733
	Amaranthus spinosus L.	*Bayam duri*	H	C	Le	Medicine	0.367	0.367
	Iresine diffusa Humb. & Bonpl. ex Willd.	*Bayam merah*	S	C	Fl	Ornament	0.533	0.533
Amaryllidaceae	*Urceolina amazonica* (Linden ex Planch.) Christenh. & Byng	*Lili putih*	H	C	Fl	Ornament	0.742	0.742
	Hippeastrum puniceum (Lam.) Voss	*Amarilis*	H	C	Fl	Ornament	0.192	0.192
	Hymenocallis littoralis (Jacq.) Salisb.	*Lili air mancur*	H	C	Fl	Ornament	0.192	0.192
	Zephyranthes rosea Lindl.	*Lili hujan merah jambu*	H	C	Fl	Ornament	0.158	0.158
Anacardiaceae	*Anacardium occidentale* L.	*Jambu monyet*	T	C	Fr	Food	0.342	0.342
	Mangifera caesia Jack	*Binjai*	T	C	Fr	Food	0.242	0.242
	Mangifera foetida Lour.	*Bacang*	T	C	Fr	Food	0.867	0.867
	Mangifera indica L.	*Mangga*	T	C	Fr	Food	0.917	0.917
	Mangifera odorata Griff.	*Kweni*	T	C	Fr	Food	0.633	0.633
Annonaceae	*Annona muricata* L.	*Sirsak*	T	C	Le, Fr	Food, medicine	0.900	1.333
	Cananga odorata (Lam.) Hook.f. & Thomson	*Kenanga*	T	C	Fl	Ornament, ritual	0.325	0.350
	Monoon longifolium (Sonn.) B.Xue & R.M.K.Saunders	*Glodokan*	T	C	Le	Ornament	0.258	0.258
Apocynaceae	*Adenium obesum* (Forssk.) Roem. & Schult.	*Kemboja*	S	C	Fl	Ornament	0.392	0.392
	Catharanthus roseus (L.) G.Don	*Bunga rutu-rutu*	S	C	Le	Medicine, ornament	0.350	0.400
	Plumeria pudica Jacq.	*Kamboja*	T	C	Fl	Ornament, ritual	0.192	0.250
	Tabernaemontana divaricata (L.) R.Br. ex Roem. & Schult.	*Mondokaki*	S	C	Fl	Ornament	0.192	0.192

Araceae	*Anthurium andraeanum* Linden ex André	*Kuping gajah*	T	C	Fl	Ornament	0.358	0.358
	Anthurium plowmanii Croat	*Bunga ekor*	S	C	Fl	Ornament	0.175	0.175
	Caladium bicolor (Aiton) Vent.	*Keladi*	H	C	Fl	Ornament	0.192	0.192
	Colocasia esculenta (L.) Schott	*Talas*	H	C	Tu	Food	0.817	0.817
	Dieffenbachia seguine (Jacq.) Schott	*Daun bahagia*	H	C	Le	Ornament	0.108	0.108
	Epipremnum aureum (Linden & André) G.S.Bunting	*Sirih gading*	H	C	Le	Ornament	0.108	0.108
	Epipremnum pinnatum (L.) Engl.	*Ekor naga*	H	C	Le	Ornament	0.175	0.175
	Philodendron erubescens K.Koch & Augustin	*Sri rejeki*	C	C	Le	Ornament	0.183	0.183
	Thaumatophyllum xanadu (Croat, J.Boos & Mayo) Sakur., Calazans & Mayo	*Raja congo*	H	C	Le	Ornament	0.200	0.200
	Spathiphyllum cochlearispathum (Liebm.) Engl.	*Tulip*	H	C	Le	Ornament	0.258	0.258
	Spathiphyllum wallisii Regel	*Lili perdamaian*	H	C	Le	Ornament	0.192	0.192
	Syngonium podophyllum Schott	*Singonium*	H	W	Le	Ornament	0.258	0.258
	Typhonium blumei Nicolson & Sivad.	*Keladi tikus*	H	W	Le	Medicine	0.183	0.183
	Xanthosoma sagittifolium (L.) Schott	*Kimpul*	H	W	Tu	Food	0.150	0.150
	Zamioculcas zamiifolia (G.Lodd.) Engl.	*Daun dollar*	H	C	Le	Medicine	0.192	0.192
Araliaceae	*Polyscias fruticosa* (L.) Harms	*Daun kedondong*	S	W	Le	Medicine, ornament	0.175	0.200
	Polyscias guilfoylei (W.Bull) L.H.Bailey	*Daun berlangkas*	S	C	Le	Medicine, ornament	0.242	0.275
	Heptapleurum arboricola Hayata	*Daun wali songo*	S	C	Le	Ornament	0.117	0.117
Araucariaceae	*Araucaria columnaris* (G.Forst.) Hook.	*Bunga terumbu*	T	C	Le	Ornament	0.192	0.192
Arecaceae	*Adonidia merrillii* (Becc.) Becc.	*Pinang putri*	P	C	Le	Ornament	0.183	0.183
	Cocos nucifera L.	*Kelapa*	P	C	Ro, st, le, fr	Medicine, building materials, handicraft, food, ritual	0.942	2.525
	Salacca zalacca (Gaertn.) Voss	*Salak*	P	C	Fr	Food	0.067	0.067
	Phoenix reclinata Jacq.	*Palem senegal*	P	C	Wp	Ornament	0.117	0.117
	Rhapis excelsa (Thunb.) A.Henry	*Palem jari*	T	C	Wp	Ornament	0.033	0.033
	Rhopalostylis sapida H.Wendl. & Drude	*Nikau*	P	C	Wp	Ornament	0.050	0.050
	Wodyetia bifurcata A.K.Irvine	*Palem ekor tupai*	P	C	Wp	Ornament	0.025	0.025
Asparagaceae	*Cordyline fruticosa* (L.) A.Chev.	*Andong*	T	W	Le	Medicine	0.267	0.267
	Dracaena angustifolia (Medik.) Roxb.	*Daun suji*	S	C	Le	Food, medicine	0.192	0.242
	Dracaena reflexa Lam.	*Song india*	S	C	Le	Ornament	0.042	0.042
	Dracaena sanderiana Mast.	*Bambu rejeki*	S	C	Le	Ornament	0.050	0.050
	Dracaena surculosa Lindl.	*Debu emas*	S	C	Le	Ornament	0.058	0.058
	Dracaena suffruticosa (N.E.Br.) Byng & Christenh.	*Bambu jepang*	S	C	Le	Ornament	0.092	0.092
	Dracaena trifasciata (Prain) Mabb.	*Lidah mertua*	H	C	Le	Medicine, ornament	0.058	0.075
	Yucca aloifolia L.	*Yuka belati*	S	W	Tu	Ornament	0.058	0.058
Asphodelaceae	*Dianella tasmanica* Hook.f.	*Lili*	S	C	Le	Ornament	0.100	0.100

Asteraceae	*Ageratum houstonianum* Mill.	*Bandotan*	S	W	Le	Medicine	0.683	0.683
	Centratherum punctatum Cass.	*Kancing lurah*	S	W	Le	Medicine	0.183	0.183
	Cyanthillium cinereum (L.) H.Rob.	*Sawi langit*	S	W	Le	Medicine	0.142	0.142
	Emilia sonchifolia (L.) DC.	*Tempuh wiyang*	S	W	Le	Medicine	0.275	0.275
	Erigeron karvinskianus DC.	*Maroon daisy*	S	W	Le	Medicine, ornament	0.175	0.217
	Erigeron sumatrensis Retz.	*Situduh langit*	S	W	Le	Medicine	0.192	0.192
	Galinsoga quadriradiata Ruiz & Pav.	*Rumput liar kuning*	S	W	Le	Herbicide, fodder	0.200	0.242
	Gymnanthemum amygdalinum(Delile) Sch.Bip.	*Daun afrika*	S	W	Le	Medicine	0.367	0.367
	Mikania micrantha Kunth	*Sembung rambat*	S	W	Le	Medicine	0.267	0.267
	Sonchus arvensis L.	*Tempuyung*	S	W	Le	Medicine	0.242	0.242
	Synedrella nodiflora (L.) Gaertn.	*Jotang kuda*	H	W	Le	Herbicide	0.183	0.183
	Zinnia elegans Jacq.	*Kembang kertas*	S	C	Le	Medicine, ornament	0.850	0.867
	Zinnia haageana Regel	*Kembang zinia*	S	C	Le	Medicine, ornament	0.742	0.792
Balsaminaceae	*Impatiens balsamina* L.	*Pacar air*	H	C	Fl	Ornament	0.617	0.617
Begoniaceae	*Begonia cucullata* Willd.	*Riang-riang*	H	C	Le	Medicine, ornament	0.267	0.317
	Begonia rex Putz.	*Haring*	H	C	Le	Medicine, ornament	0.175	0.208
Bignoniaceae	*Mansoa alliacea* (Lam.) A.H.Gentry	*Stepanot ungu*	C	C	Fl	Ornament	0.117	0.117
Brassicaceae	*Rorippa indica* (L.) Hiern	*Sawi lemah*	S	W	Le	Food	0.275	0.275
Bromeliacee	*Ananas comosus* (L.) Merr.	*Nenas*	S	C	Fr	Food	0.508	0.508
Cactaceae	*Epiphyllum oxypetalum* (DC.) Haw.	*Bunga wijaya*	C	C	Fl	Ornament	0.183	0.183
	Opuntia cochenillifera (L.) Mill.	*Kaktus centong*	H	C	Fl	Ornament	0.175	0.175
Campanulaceae	*Hippobroma longiflora* (L.) G.Don	*Bunga kitolod*	S	W	Le	Medicine	0.192	0.192
Cannaceae	*Canna × hybrida* Rodigas	*Bunga tasbih*	H	C	Fl	Ornament	0.325	0.325
	Canna indica L.	*Bunga tasbih*	H	C	Fl	Ornament	0.517	0.517
Caricaceae	*Carica papaya* L.	*Pepaya*	H	C	Le, Fr	Food, medicine	0.950	1.792
Cleomaceae	*Cleome rutidosperma* DC.	*Maman lanang*	S	W	Le	Herbicide	0.175	0.175
Clusiaceae	*Garcinia atroviridis* Griff. ex T.Anderson	*Asam glugur*	T	C	Fr	Food, medicine	0.492	0.858
	Garcinia mangostana L.	*Manggis*	T	C	Fr	Food	0.267	0.267
Commelinaceae	*Tradescantia spathacea* Sw.	*Nanas kerang*	S	C	Le	Ornament	0.508	0.508
Costaceae	*Hellenia speciosa* (J.Koenig) S.R.Dutta	*Pacing tawar*	S	W	Le	Food, medicine	0.192	0.283
Crassulaceae	*Kalanchoe pinnata* (Lam.) Pers.	*Cocor bebek*	H	C	Le	Medicine, ornament	0.367	0.417
Cucurbitaceae	*Cucurbita moschata* Duchesne	*Labu kuning*	C	C	Fr	Food	0.225	0.225
	Luffa acutangula (L.) Roxb.	*Gambas*	C	C	Fr	Food	0.700	0.700
	Luffa aegyptiaca Mill.	*Blustru*	C	C	Fr	Food	0.433	0.433
	Sicyos edulis Jacq.	*Labu siam*	C	C	Fr	Food	0.550	0.550
	Zehneria guamensis (Merr.) Fosberg	*Markisa*	C	W	Le	Medicine	0.100	0.100
Cyperaceae	*Rhynchospora berteroi* (Spreng.) C.B.Clarke	*Lalang*	S	W	Le	Medicine	0.133	0.133
Euphorbiaceae	*Acalypha wilkesiana* Müll.Arg.	*Sablo*	S	C	Le	Medicine	0.275	0.275
	Manihot esculenta Crantz	*Ubi kayu*	S	C	Tu, Le	Food	0.867	0.867
	Euphorbia hirta L.	*Patikan kebo*	S	W	Le	Medicine, fodder	0.192	0.200
	Euphorbia neriifolia L.	*Patah tulang*	T	C	Le	Ornament	0.092	0.092
	Euphorbia tithymaloides L.	*Sigsag*	S	C	Fl	Ornament	0.233	0.233
	Excoecaria cochinchinensis Lour.	*Sambang darah*	S	C	Le	Medicine, ornament	0.192	0.283
	Jatropha curcas L.	*Jarak pagar*	T	C	Le, St	Medicine, fencing	0.367	0.375
	Jatropha multifida L.	*Jarak*	T	C	Le, St	Medicine, fencing	0.100	0.100

Fabaceae	*Archidendron jiringa* (Jack) I.C.Nielsen	*Jengkol*	T	C	Fr	Food, fuelwood	0.483	0.750
	Calopogonium mucunoides Desv.	*Kacang asu*	C	W	Fr	Fodder	0.100	0.100
	Erythrina subumbrans (Hassk.) Merr.	*Dadap serep*	T	C	Le	Medicine	0.092	0.092
	Parkia speciosa Hassk.	*Petai*	T	C	Le, Fr, St	Food, fodder, fuelwood	0.142	0.317
	Gliricidia sepium (Jacq.) Kunth	*Gamal*	T	C	Le	Fodder	0.458	0.458
	Pterocarpus indicus Willd.	*Angsana*	T	C	Le	Medicine, ornament	.158	0.208
	Tamarindus indica L.	*Asam jawa*	T	C	Fr	Food	0.275	0.275
Geraniaceae	*Pelargonium × hybridum* (L.) L'Hér.	*Geranium*	H	C	Le	Medicine	0.108	0.108
	Pelargonium zonale (L.) L'Hér.	*Geranium*	H	C	Le	Medicine	0.125	0.125
Gnetaceae	*Gnetum gnemon* L.	*Melinjo*	T	C	Le, Fr	Food, medicine	0.250	0.325
Hamamelidaceae	*Loropetalum chinense* (R.Br.) Oliv.	*Serut merah*	S	C	Fl	Ornament	0.175	0.175
Lamiaceae	*Coleus scutellarioides* (L.) Benth.	*Miana*	S	C	Le	Medicine	0.183	0.183
	Hyptis capitata Jacq.	*Rumput knop*	S	W	Le	Medicine	0.633	0.633
	Leucas aspera (Willd.) Link	*Lenglengan*	H	W	Le	Medicine	0.183	0.183
	Ocimum basilicum L.	*Kemangi*	H	C	Le	Food	0.308	0.308
	Orthosiphon aristatus (Blume) Miq.	*Kumis kucing*	H	C	Le, Fl	Medicine, ornament	0.850	0.858
	Perilla frutescens var. *Crispa* (Thunb.) H.Deane	*Daun perilla*	H	W	Le	Medicine	0.267	0.267
	Coleus argentatus (S.T.Blake) P.I.Forst. & T.C.Wilson	*Daun bangun-bangun*	S	W	Le	Medicine, ornament	0.183	0.200
	Salvia japonica Thunb.	*Daun sage*	H	C	Le	Medicine	0.225	0.225
	Persea americana Mill.	*Alpukat*	T	C	Fr	Beverages	0.325	0.325
Lythraceae	*Cuphea hyssopifolia* Kunth	*Bunga taiwan*	S	C	Fl	Ornament	0.267	0.267
Malvaceae	*Ceiba pentandra* (L.) Gaertn.	*Kapuk randu*	T	C	Le, Fr	Fodder, handicraft	0.458	0.475
	Durio oxleyanus Griff.	*Durian daun*	T	W	St, Fr	Food, building materials, fuelwood	0.542	0.775
	Durio zibethinus L.	*Durian*	T	C	St, Fr	Food, building materials, fuelwood	0.933	1.408
	Hibiscus rosa-sinensis L.	*Kembang sepatu*	S	C	Le, Fl	Medicine, ornament	0.850	0.908
	Theobroma cacao L.	*Coklat*	T	C	Fr	Beverages	0.108	0.108
	Corchorus aestuans L.	*Yute*	S	W	Le	Food	0.075	0.075
	Malvaviscus arboreus Dill. ex Cav.	*Sepatu kuncup*	S	W	Le	Medicine	0.033	0.033
	Sida rhombifolia L.	*Seleguri*	S	W	Le	Medicine	0.075	0.075
Marantaceae	*Goeppertia ornata* (Linden) Borchs. & S.Suárez	*Bunga belang*	H	C	Le	Ornament	0.092	0.092
	Goeppertia rufibarba (Fenzl) Borchs. & S.Suárez	*Bunga ungu*	H	C	Le	Ornament	0.175	0.175
	Maranta arundinacea L.	*Garut*	H	C	Tu	Food	0.150	0.150
	Stromanthe thalia (Vell.) J.M.A.Braga	*Meranti bali*	H	C	Le	Ornament	0.092	0.092
Melastomataceae	*Bellucia pentamera* Naudin	*Jambu kelelawar*	T	W	Le, Fr	Food, medicine, fuelwood	0.083	0.100
	Miconia crenata (Vahl) Michelang.	*Sikaduduak*	S	W	Le, Fr	Food, medicine	0.192	0.225
	Melastoma malabathricum L.	*Sikaduduak*	S	W	Le, Fr	Food, medicine	0.867	1.167
Meliaceae	*Azadirachta indica* A.Juss.	*Mimba*	T	C	Le	Medicine, herbicide	0.117	0.125
	Lansium domesticum Corrêa	*Lansat*	T	C	Fr	Food, fuelwood	0.725	0.817
	Toona ciliata M.Roem.	*Suren*	T	C	St	Building material and agricultural tools	0.350	0.375

Moraceae	*Artocarpus altilis* (Parkinson) Fosberg	*Sukun*	T	C	Fr	Food	0.642	0.642
	Artocarpus heterophyllus Lam	*Nangka*	T	C	Fr	Food	0.842	0.842
	Dorstenia elata Gardner	*Tusuk konde*	H	C	Fl	Ornament	0.117	0.117
	Ficus punctata Thunb.	*Dolar rambat*	T	W	Fr	Food	0.075	0.075
	Morus nigra L.	*Murbei hitam*	C	W	Fr	Food	0.100	0.100
	Streblus asper Lour.	*Serut*	T	W	Le	Medicine	0.017	0.017
Moringaceae	*Moringa oleifera* Lam.	*Kelor*	T	C	Le	Medicine	0.117	0.117
Musaceae	*Musa acuminata* Colla	*Pisang kepok*	S	C	Fr	Food	0.900	0.900
	Musa x paradisiaca L.	*Pisang*	S	C	Fr	Food	0.983	0.983
Myrtaceae	*Psidium guajava* L.	*Jambu biji*	T	C	St, Le, Fr	Food, medicine, agricultural tools, fodder, fuelwood	0.642	0.942
	Syzygium polyanthum (Wight) Walp.	*Daun salam*	T	C	Le	Food, medicine	0.142	0.158
	Syzygium aqueum (Burm.f.) Alston	*Jambu air*	T	C	St, Le, Fr	Food, fodder, agricultural tools	0.725	0.783
	Syzygium australe (J.C.Wendl. ex Link) B.Hyland	*Pucuk merah*	T	C	Le	Ornament	0.200	0.200
	Syzygium malaccense(L.) Merr. & L.M.Perry	*Jambu bol*	T	C	Fr	Food	0.700	0.700
	Syzygium myrtifolium Walp.	*Pucuk merah*	T	C	Le	Ornament	0.217	0.217
Nyctaginaceae	*Mirabilis jalapa* L.	*Bunga pukul empat*	H	C	Fl	Ornament, medicine	0.175	0.200
Oleaceae	*Jasminum officinale* L.	*Melati*	S	C	Fl	Ornament, ritual	0.325	0.508
Onagraceae	*Ludwigia hyssopifolia* (G.Don) Exell	*Gulma bayeman*	H	W	Ro	Medicine	0.108	0.108
Orchidaceae	*Dendrobium crumenatum* Sw.	*Anggrek merpati*	H	C	FL	Ornament	0.092	0.092
	Spathoglottis plicata Blume	*Anggrek tanah*	H	C	FL	Ornament	0.125	0.125
Oxalidaceae	*Averrhoa bilimbi* L.	*Belimbing*	T	C	Fr	Food	0.267	0.267
	Averrhoa carambola L.	*Belimbing manis*	T	C	Fr	Food	0.683	0.683
Pandanaceae	*Pandanus amaryllifolius* Roxb. ex Lindl.	*Daun pandan*	S	C	Le	Food, medicine, ritual	0.450	0.458
Phyllantaceae	*Baccaurea motleyana* (Müll.Arg.) Müll.Arg.	*Rambai*	T	C	Fr	Food	0.267	0.267
	Baccaurea racemosa (Reinw.) Müll.Arg.	*Kepundung*	T	C	Fr	Food, fuelwood	0.117	0.117
	Phyllanthus amarus Schumach. & Thonn.	*Meniran*	H	W	Le	Medicine	0.025	0.025
	Phyllanthus tenellus Roxb.	*Meniran merah*	H	W	Le	Medicine	0.042	0.042
Piperaceae	*Peperomia caperata* Yunck.	*Begonia*	H	C	Le	Ornament	0.275	0.275
	Piper aduncum L.	*Sirih*	C	W	Le	Medicine	0.075	0.075
	Piper betle L.	*Sirih*	C	C	Le	Medicine, ritual	0.525	0.583
Poaceae	*Axonopus compressus* (Sw.) P.Beauv.	*Jakut pahit*	G	W	Le	Fodder	0.350	0.350
	Cenchrus clandestinus (Hochst. ex Chiov.)	*Rumput kikuyu*	G	W	Le	Fodder	0.367	0.367
	Cymbopogon citratus (DC.) Stapf	*Serai*	G	C	Le	Food, ritual	0.850	0.917
	Eragrostis viscosa (Retz.) Trin.	*Jukut karukun*	G	W	Le	Fodder	0.275	0.275
	Pleioblastus viridistriatus (Regel) Makino	*Bambu kerdil*	G	W	Le	Fodder, ornament	0.117	0.142
	Pogonatherum crinitum (Thunb.) Kunth	*Rumput bambu*	G	W	Le	Ornament	0.175	0.175
	Pseudosasa japonica (Siebold & Zucc. ex Steud.) Makino ex Nakai	*Bambu jepang*	G	W	Le	Ornament	0.133	0.133
	Saccharum officinarum L.	*Tebu*	G	C	St	Beverages	0.425	0.425
	Setaria palmifolia (J.Koenig) Stapf	*Rumput setaria*	H	W	Le	Fodder	0.542	0.542
	Sporobolus indicus (L.) R.Br.	*Rumput smutgrass*	H	W	Le	Fodder	0.400	0.400

Polygalaceae	*Polygala paniculata* L.	*Balsem*	S	W	Le	Medicine, fodder	0.183	0.250
Rhamnaceae	*Ziziphus mauritiana* Lam.	*Bidara*	T	W	Le, Fr	Food, medicine	0.108	0.158
Rosaceae	*Fragaria vesca* L.	*Stroberi*	C	C	Fr	Food	0.075	0.075
	Rosa pendulina L.	*Mawar*	S	W	Fl	Ornament	0.850	0.850
Rubiaceae	*Edrastima uniflora* (L.) Raf.	*Dewandaru*	H	W	Le	Medicine	0.092	0.092
	Ixora coccinea L.	*Asoka*	S	C	Fl	Ornament	0.142	0.142
	Morinda citrifolia L.	*Mengkudu*	T	C	Fr	Medicine	0.133	0.133
	Spermacoce remota Lam.	*Kancing palsu*	H	W	Le	Medicine, fodder	0.017	0.025
Rutaceae	*Citrus* × *aurantiifolia* (Christm.) Swingle	*Jeruk nipis*	T	C	Fr	Food, beverages, medicine	0.592	1.183
	Citrus × *limon* (L.) Osbeck	*Jeruk lemon*	T	C	Fr	Beverages, medicine	0.275	0.325
	Citrus maxima (Burm.) Merr.	*Jeruk bali*	T	C	Fr	Food	0.325	0.325
	Murraya paniculata (L.) Jack	*Kemuning*	S	C	Le, Fl	Medicine, ornament	0.117	0.167
Salicaceae	*Flacourtia rukam* Zoll. & Moritzi	*Rukam*	T	W	Fr	Food, fuelwood, medicine	0.092	0.117
	Homalium ceylanicum (Gardner) Benth.	*Dlingsem*	T	W	St	Building materials	0.025	0.025
Sapindaceae	*Dimocarpus longan* Lour.	*Kelengkeng*	T	C	Fr	Food	0.458	0.458
	Nephelium lappaceum L.	*Rambutan*	T	C	Fr	Food, fuelwood	0.767	0.817
Simaroubaceae	*Brucea javanica* (L.) Merr.	*Pohon makasar*	S	C	Le	Medicine	0.100	0.100
Solanaceae	*Capsicum frutescens* L.	*Cabai rawit*	S	C	Fr	Food	0.983	0.983
	Solanum lycopersicum L.	*Tomat*	S	C	Fr	Food	0.342	0.342
	Solanum melongena L.	*Terong ungu*	S	C	Fr	Food	0.508	0.508
	Solanum torvum Sw.	*Terong pipit*	S	C	Fr	Food	0.200	0.200
Talinaceae	*Talinum paniculatum* (Jacq.) Gaertn.	*Ginseng*	S	C	Ro. Le	Beverage, medicine	0.317	0.442
Urticaceae	*Pilea microphylla* (L.) Liebm.	*Katumpangan*	H	W	Le	Medicine	0.100	0.100
Verbenaceae	*Duranta erecta* L.	*Teh-tehan*	S	C	Fr	Medicine	0.017	0.017
Zamiaceae	*Zamia furfuracea* L.f. ex Aiton	*Zamia*	S	C	Le	Ornament	0.367	0.367
Zingiberaceae	*Alpinia galanga* (L.) Willd.	*Lengkuas*	H	C	Rh	Food	0.867	0.867
	Curcuma longa L.	*Kunyit*	H	C	Rh	Food, beverages, medicine	0.950	2.117
	Kaempferia galanga L.	*Kencur*	H	C	Rh	Food, beverages, medicine	0.858	1.642
	Kaempferia rotunda L.	*Kunyit putih*	H	C	Rh	Food	0.492	0.492
	Zingiber officinale Roscoe	*Jahe*	H	C	Rh	Food, beverages, medicine	0.683	1.642

Note: Habit: H: Herbaceous, S: Shrub, T: Tree, P: Palm, G: Grass, C: Climber; Status: W: Wild, C: Cultivated; Parts used: Ro: Root, Tu: Tuber, Rh: Rhizome, St: Stem, Le: Leave, Fw: Flower, Fr: Fruit

Araceae (15 species) are the most common plants in the home garden, followed by Asteraceae (13 species) and Poaceae (10 species). Moreover, the remaining 64 families are represented by 1 to 9 species each (Figure 2).

The number of plant families and species in home gardens around KSNP reflects substantial diversity, with a total of 59 families recorded, each containing between one and 15 species. This highlights significant conservation efforts and the preservation of local biodiversity. Families such as Araceae, Asteraceae, and Poaceae stand out with the highest number of species, while others like Arecaceae and Fabaceae are also quite dominant. However, the findings of this study differ from those of Ganesan et al. (2021), who discovered that the Euphorbiaceae, Rutaceae, and Zingiberaceae families included the most species in home gardens in Parit Raja, Batu Pahat, Johor. These differences demonstrate significant regional variations in dominating plant families within home gardens, emphasizing diverse biodiversity profiles determined by local environmental factors, such as climate and soil conditions. The combination of these environmental conditions dictates which ecological niches different plant families can inhabit (Kudrevatykh et al. 2021; Mo et al. 2022), resulting in distinct plant communities. The variation in plant families across regions, especially in tropical areas, is also influenced by factors such as genetic structure, disturbance levels, and cultural landscapes. Studies have shown that genetic diversity and the structure of plant species in home gardens are shaped by domestication effects, propagation methods, and connectivity between wild and domesticated populations (Ferrer et al. 2021). Additionally, the spatial and seasonal diversity of wild food plants in home gardens varies across different spatial configurations and seasons, affecting the composition and management of plant species (Cruz-Garcia and Struik 2015). Moreover, the floristic composition, biomass, and tree cover in home gardens reflect the cultural landscapes they are embedded in, leading to differences in species richness and abundance among mountain slopes, small hills, and floodplains in tropical regions (Alcudia-Aguilar et al. 2018). Understanding these regional distinctions is crucial for comparative plant diversity studies, as it gives vital insights for conservation efforts and sustainable plant resource management.

The study discovered a total of 218 species of home garden plants, including *Capsicum frutescens*, *Musa x paradisiaca*, and *Mangifera indica*, which are commonly found in home gardens. The number of species (218) in this study area is lower compared to 310 home garden plant species in Calakmul, Campeche, Mexico (Neulinger et al. 2013), but higher compared to 188 home garden plant species in the Eastern Amazon, Brazil (Pauletto et al. 2023), 173 species in the East Aceh region, Indonesia (Suwardi et al. 2023), 133 species in Tubah Sub-Division, North-West Region, Cameroon (Wujung et al. 2022), and 127 species in Parit Raja, Batu Pahat, Johor (Ganesan et al. 2019). Various factors influence the diversity of plant species in home gardens, including the age of the gardener, which has been identified as a significant influencer (Wujung et al. 2022). In addition, garden size correlates positively with species diversity and richness, while different levels of disturbance in garden areas affect species richness and density differently (Patel et al. 2022). These findings underscore the complex interplay of environmental factors, such as climate and soil quality, that have a substantial impact on plant growth and diversity in these home gardens. Cultural and agricultural practices are also important, as regions with broad plant-use traditions tend to have greater species variety. Moreover, regions with active conservation efforts and sustainable gardening methods are likely to have a greater variety of home garden plants. These distinctions highlight the complex interplay of ecological and cultural aspects in producing home garden plant varieties worldwide.

Utilization of home garden plants

The study's findings show that home gardens in the study area provide various species of plants used for different purposes. These plants are utilized for food, medicine, spices and condiments, ornamental plants, firewood, and ritual needs (Figure 3).

Home gardens near KSNP play a crucial role in both providing essential nutritional nourishment and enhancing community food security and self-sufficiency. These gardens enrich local diets with a diverse array of nutrient-rich vegetable crops, ensuring a consistent supply of fresh produce throughout the year, which is especially vital for accessing nutritious foods amidst environmental challenges (Chadha 2023). By cultivating these gardens, local communities foster a deep connection to their land, preserve traditional farming methods, and celebrate their culinary heritage. Recent studies underscore the therapeutic benefits of gardening, showing improvements in mental health and overall well-being attributed to the connection with nature and engagement in traditional practices (Pantiru et al. 2024). Understanding the complex dynamics of home gardens, influenced by human behavior, is essential for effective management and community engagement (Goldenberg et al. 2020; Bahru et al. 2021; Delahay et al. 2023). Gardening activities have been linked to reduced anxiety and stress levels, facilitated by the serene environments created through vibrant colors, textures, and fragrances that promote relaxation and a stronger bond with nature. These gardens also attract pollinators, such as butterflies, and enhance overall garden aesthetics (Shackleton and Ratnieks 2016). Gardeners derive immense satisfaction from nurturing their plants, further strengthening their connection with the environment and boosting emotional well-being and quality of life. Moreover, home gardens serve diverse purposes, including the cultivation of plants for firewood such as *Durio zibethinus* and *Psidium guajava*, ensuring sustainable energy practices, and the preservation of species used in traditional and spiritual ceremonies such as *Plumeria pudica* and *Cananga odorata*, thereby safeguarding cultural heritage. These multifaceted roles underscore the significance of home gardens in meeting both material needs and cultural values within communities.

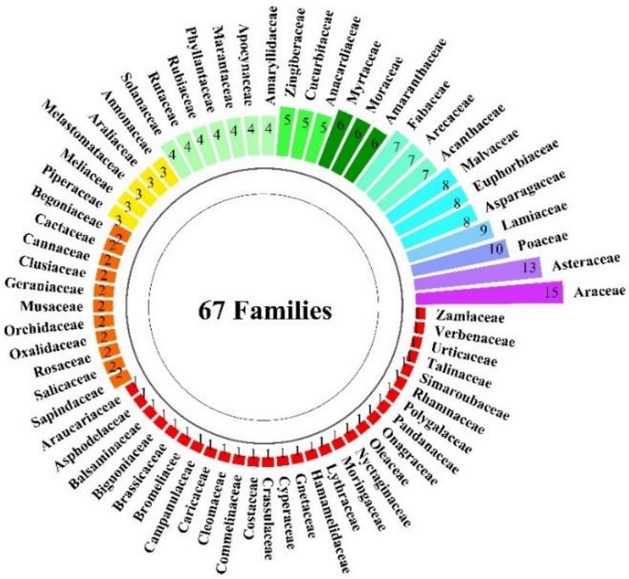

Figure 2. Plant species composition in home garden

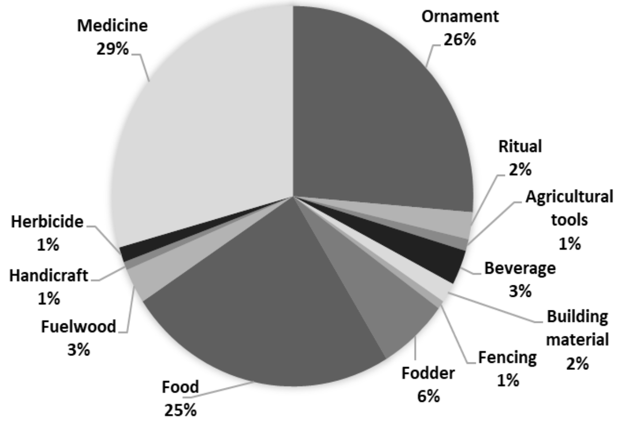

Figure 3. Utilization of home garden plants in the study area

The study's findings illustrate a wide range of RFC values for plant species in home gardens, ranging from 0.017 to 0.983 (Table 1), highlighting significant variation in their importance and frequency of use. Species such as *Capsicum frutescens* (RFC=0.983), *Musa x paradisiaca* (RFC=0.983), *Mangifera indica* (RFC=0.933), and *Durio zibethinus* (RFC=0.933) emerge with high RFC values, underscoring their pivotal roles in local communities for daily consumption and culinary practices (Figure 4). Beyond staple crops, the RFC values also showcase a diverse array of cultivated species, including *Alpinia galanga* (RFC=0.867) for spices, *Rosa pendulina* (RFC=0.850) for ornamentals, and *Musa acuminata* (RFC=0.900) for fruits. This diversity reflects sustainable management practices where communities harness various plants for culinary, medicinal, and aesthetic purposes, highlighting home gardens as repositories of biological and cultural heritage. Managing these gardens sustainably is crucial for preserving local biodiversity, ensuring ecosystem stability, and enhancing community well-being. Even species with lower RFC values, such as *Streblus asper* (RFC=0.017) and *Spermacoce remota* (RFC=0.017) provide insights into local ecological adaptations and resource management practices, contributing to a comprehensive understanding of the complex relationships between plants, people, and their environment.

Plant species citation frequency in home gardens is influenced by a variety of factors, including sociocultural characteristics, environmental conditions, and management practices. Research indicates that variables such as age, gender, and phytochorological zones can impact the knowledge and management of plant species in home gardens (Idohou et al. 2014). Moreover, the composition and diversity of plants in these gardens are shaped by agroecological and socioeconomic factors, with elevation, commercialization, urbanization, and fragmentation playing significant roles (Kehlenbeck et al. 2007). Location-specific factors and the socioeconomic status of gardeners further influence plant biodiversity patterns in urbanized areas, resulting in shifts in species composition based on proximity to urban centers and the ecosystem services provided by the plants (Clarke et al. 2014). Studies exploring the citation frequency of plant species in home gardens highlight their cultural and practical importance. For example, Mayori (2014) emphasized the role of traditional medicines in peri-urban areas of South Africa, with species like *Carica papaya* and *Catharanthus roseus* being frequently cited. Similarly, Pamungkas (2013) underscored the significance of traditional plant uses in Tambakrejo, Malang, focusing on food, medicinal, and economic plants, while Yinebeb (2022) discussed the multifunctional nature of home gardens in Northwest Ethiopia, noting variations in plant diversity across different agroclimatic zones. Zhang (2020) highlighted the diverse functions of plants in Tsang-la communities in Southwest China, particularly vegetables, ornamentals, and fruits.

The study's findings reveal significant variation in the use value of plants in home gardens, highlighting their diverse roles in daily life (Figure 5). Several plants have exceptionally high use values, indicating their critical importance. For instance, *Cocos nucifera* has a use value of 2.525, demonstrating the utility of nearly every part of the tree, from the fruit and trunk to the leaves. Other plants with high use values include *Psidium guajava* (UV=0.942), *Mangifera indica* (UV=0.917), and *Musa x paradisiaca* (0.983), reflecting their popularity as fruit commodities. Similarly, *Curcuma longa*, with a use value of 2.117, is widely utilized as a spice and valued for its therapeutic benefits in traditional medicine. *Annona muricata*, with a use value of 1.333, is notable for its delicious fruit and medicinal leaves.

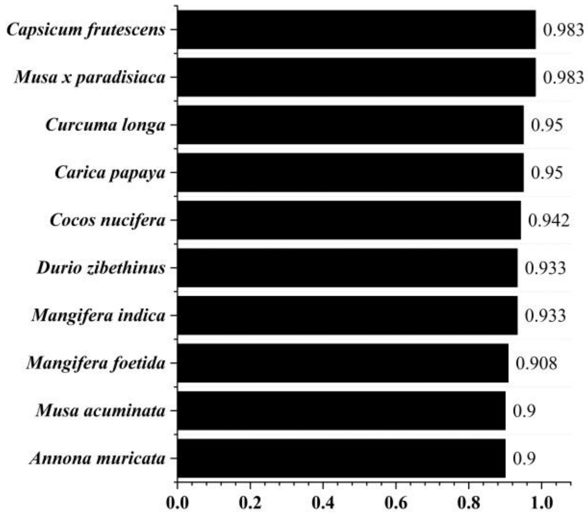

Figure 4. Relative frequency citation (RFC) of home garden plants

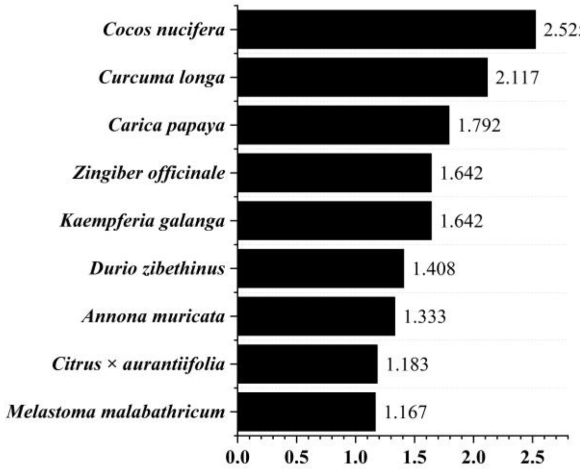

Figure 5. Use value (UV) of home garden plants in the study area

Roots, rhizomes, and tubers are mostly utilized in beverages and food, with 484 use reports for roots and 483 for rhizomes. Plant stems are used for agricultural tools, building materials, and fuelwood, with 349 use reports. The most useful part is the leaves, which are used for fodder, food, medicine, ornamentation, and ceremonies, with 2,376 reported uses. Flowers and fruits are most commonly used for ornamentation and foods, with 3,144 and 1,779 use reports, respectively. Fruits are commonly used as food (2,775 use reports), leaves as medicinal (1,285 use reports), and flowers as ornament (1,614 use reports) (Figure 6).

The most diverse categories of plant use in home gardens encompass food, medicine, and ornament, utilizing various parts such as rhizomes, leaves, flowers, and fruits. Medicinal and aromatic plants (MAPs) hold significant importance across economic, social, cultural, and ecological dimensions for local communities globally. These plants serve diverse industries including pharmaceuticals, perfumes, cosmetics, toothpaste, soap, beverages, and food products (Pergola et al. 2024). Furthermore, the study identifies plants utilized for agricultural tools, building materials, handicrafts, herbicides, ornaments, and rituals, underscoring their pivotal roles in local economies, social practices, and cultural heritage conservation. This dual significance of plants highlights their crucial contribution to both the utilization and preservation of natural resources and cultural traditions.

Comparison of species diversity and use among villages

The Jaccard similarity index between study areas provides valuable insights into the biodiversity of home garden plant species across different areas (Figure 7). The similarity indices between Sebelat Ulu, Ketenong Dua, Kayu Manis, and Cawang Lama provide insights into the distribution and composition of plant species across these study areas. Sebelat Ulu shows moderate similarity indices with Ketenong Dua (53.6%), Kayu Manis (42.7%), and Cawang Lama (40.7%), indicating varying degrees of species overlap. Ketenong Dua and Cawang Lama exhibit a slightly higher similarity (43.1%), while Ketenong Dua and Kayu Manis have the lowest similarity (36.3%). Notably, Kayu Manis and Cawang Lama demonstrate the highest similarity (56.5%), suggesting potentially similar environmental conditions or species exchange between these areas.

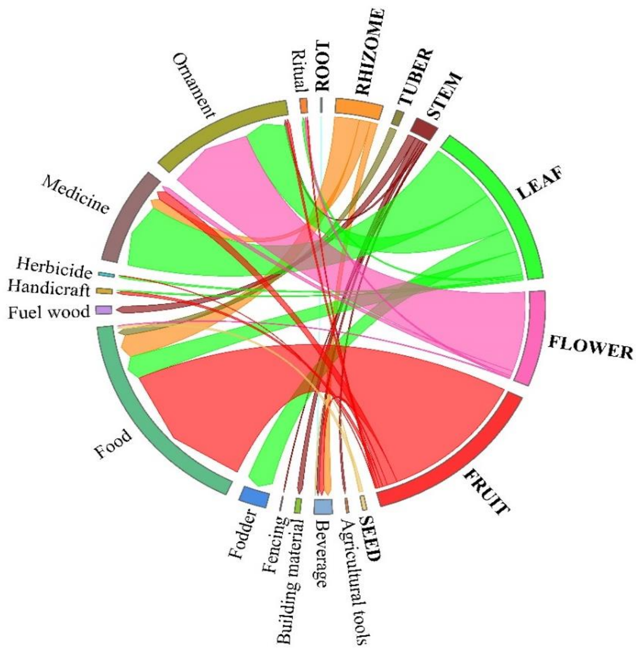

Figure 6. Distribution of 9,581 use reports across eight plant parts and 12 different use categories in 120 home gardens of Bengkulu, Indonesia

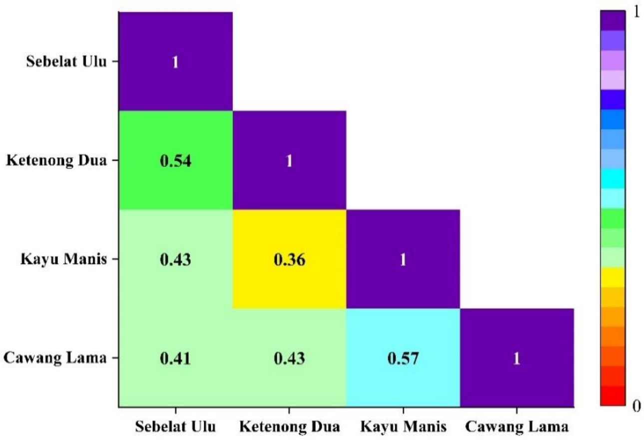

Figure 7. Jaccard Similarity Index of home garden plant species across different area

These variations likely reflect differences in environmental factors, geographical distance, and ecological processes influencing species distribution. Environmental distance is a measure of the similarity in environmental conditions between two geographic locations and is important considering the chances of survival for a species that has been transported from one location to another (Tzeng 2022). Understanding these patterns is crucial for biodiversity conservation and ecosystem management, providing a foundation for future research on ecosystem dynamics and environmental sustainability in the region (Tzeng 2022).

The general utility of home garden plants reported being used by gardeners varied across the four study villages. Each village universally uses home garden plants for food, with a 100% rate in all villages. In comparison, the use for medicinal purposes is quite high in Sebelat Ulu and Ketenong Dua (86%), but lower in Kayu Manis (65%) and Cawang Lama (67%) (Table 2).

The findings highlight distinct patterns in the utilization of home garden plants across Sebelat Ulu, Ketenong Dua, Kayu Manis, and Cawang Lama, reflecting differences in culture, local needs, and resource availability. While all villages universally use plants for food, significant variations emerge in other uses. Sebelat Ulu and Ketenong Dua show a higher proportion of plants used for medicinal purposes, indicating a reliance on traditional medicine likely influenced by limited access to modern healthcare—a common scenario in low- and middle-income countries (LMICs) (Savatagi et al. 2022). Agricultural tools and building materials are predominantly sourced from plants in these villages, underscoring a reliance on local resources for farming and construction. In contrast, Kayu Manis and Cawang Lama exhibit a greater emphasis on plants for ornamental purposes, possibly reflecting cultural preferences for aesthetic gardening or better economic conditions.

The introduction of non-native ornamental plants in home gardens can positively impact biodiversity through their functional attributes (Delahay et al. 2003). Differences in firewood usage suggest varying energy sources, with Sebelat Ulu and Ketenong Dua relying more on traditional methods. Moreover, higher percentages of plants used for rituals and handicrafts in Sebelat Ulu and Ketenong Dua highlight the preservation of cultural traditions. These variations underscore the importance of preserving traditional knowledge while addressing the unique needs of each community.

Traditional knowledge in managing plant species

All respondents, regardless of their socio-economic status, managed an average of 103.4±6.2 species in their home gardens, suggesting that the home garden species were valued across all the main socio-economic groups. The home gardens were managed by 2-3 family members. The study's findings show that traditional knowledge has a significant correlation with the effectiveness of agricultural practices and the selection of plants in home gardens in the evaluated villages (Table 3).

Ketenong Dua village distinguishes itself with the highest score of 60.83, indicating a comprehensive understanding and implementation of sustainable agricultural practices such as crop rotation, intercropping, organic fertilizers, natural pest control, and water irrigation management (Table 3).

These practices underscore a commitment to maintaining soil productivity and ecological balance. Similarly, Sebelat Ulu demonstrates strong values in plant use, particularly in organic fertilizers (score 4.63), natural pesticides (score 4.07), and traditional agricultural tools (score 4.63). The community's traditional knowledge includes adeptness in selecting plants suitable for local conditions and employing eco-friendly agricultural practices for pest control and fertilization. In contrast, Kayu Manis village exhibits the lowest score at 44.30, indicating opportunities for improvement in adopting organic fertilizers, natural pesticides, and traditional agricultural tools. This underscores a potential gap in traditional knowledge among farmers, limiting their ability to optimize plant management in home gardens. The significance of traditional knowledge is further emphasized by practices such as using agricultural calendars and natural weather prediction signs, which contribute to stable crop yields and conservation of natural resources like soil and water (Sharma et al. 2020).

Table 2. Comparison of percentage of the general utility of home garden plants among the four study villages

Use	Villages			
	Sebelat Ulu	Ketenong Dua	Kayu Manis	Cawang Lama
Food	100	100	100	100
Medicine	86	86	65	67
Agricultural tools	68	62	40	40
Building materials	40	40	24	22
Firewood	65	68	25	34
Fodder	60	60	60	40
Fishing	53	40	13	13
Ornament	28	32	87	78
Ritual	42	33	13	13
Handicrafts	62	58	13	13

Table 3. Traditional knowledge in managing plant species

Village	Traditional knowledge															Score
	Farming techniques					Agricultural land management				Natural cycles			Use of plants			
	CR	IS	UOF	UNP	WI	SC	FR	GM	WR	PS	NS	AC	OF	NP	AT	
Sebelat Ulu	4.30	4.83	3.17	3.17	4.37	3.17	1.63	4.17	4.00	4.47	4.27	4.40	4.63	4.07	4.63	59.27
Ketenong Dua	4.80	4.93	4.00	3.03	4.30	4.00	1.57	4.93	3.17	4.47	4.23	4.03	4.60	4.17	4.60	60.83
Kayu Manis	4.73	4.87	1.40	1.60	4.73	2.63	1.20	1.27	4.97	4.37	3.93	1.50	1.40	1.17	4.53	44.30
Cawang Lama	4.83	4.97	1.13	1.23	4.80	1.33	2.23	1.53	4.80	4.60	4.07	2.67	1.33	1.20	4.53	45.27

Note: Farming Techniques: Crop Rotation (CR), Intercropping System (IS), Use of Organic Fertilizers (UOF), Natural Pest Control (UNP), Water Irrigation Management (WI); Agricultural Land Management: Soil Conservation Techniques (SC), Field Rotation (FR), Use of Green Manure (GM), Water Resource Management (WR); Natural Cycles: Understanding Planting Seasons (PS), Knowledge of Natural Signs for Weather Prediction (NS), Use of Traditional Agricultural Calendar (AC); Use of plants: Organic Fertilizers (OF), Natural Pesticides (NP), Agricultural Tools (AT)

Integrating traditional knowledge with modern agricultural techniques enhances productivity and resilience in farming systems (Mohan 2021). Such knowledge offers crucial insights for effective natural resource management, enabling farmers to adapt to environmental changes and make informed decisions in plant selection, thereby fostering sustainable and productive home gardens (Redvers et al. 2023). Several factors influence variations in traditional knowledge in managing plant species in home gardens. These include the size of the garden, level of disturbance, and cultural importance of the plants. Studies have shown that larger home gardens tend to have higher biodiversity and species richness, positively impacting traditional knowledge (Patel et al. 2022). Additionally, the level of disturbance in the garden plays a role, with lower disturbance levels correlating with greater tree species diversity and density (Patel et al. 2022). The cultural importance of specific plant species, as indicated by use-value and fidelity values, also influences the traditional knowledge associated with managing these plants (Roy et al. 2022; Navia et al. 2024). Furthermore, the socio-cultural factors and ecological understanding of the environment by individuals contribute significantly to the traditional ecological knowledge applied in home garden management (Cruz-Garcia and Struik 2015).

Local communities possess deep-rooted knowledge about the plants cultivated in their home gardens, encompassing cultivation techniques and diverse uses crucial for daily sustenance and strengthening bonds with the natural environment (Avilez-López et al. 2019). This traditional knowledge, passed down through generations, not only supports food security and medicinal needs but also fosters a profound connection to the land and reinforces cultural identity (Tom et al. 2019). Recognizing and conserving this invaluable knowledge is essential as it forms the foundation for sustainable home gardens and community well-being. Practices such as plant selection, soil management, crop rotation, and natural pest control contribute to the resilience of these gardens amid changing environmental conditions (Whyte 2013). The diversity of plant species cultivated in home gardens is intricately linked to biodiversity conservation, highlighting the critical role of traditional farming practices in sustaining local ecosystems (Delahay et al. 2023). Home gardens serve as repositories of plant genetic diversity, including traditional crop varieties and crop wild relatives, supporting ecological functions and wildlife habitats (Salako et al. 2014). Practices like crop rotation and organic farming methods are pivotal for maintaining ecosystem health and enhancing biodiversity within home garden settings (Galluzzi et al. 2010). By preserving and promoting traditional knowledge associated with home gardening, communities can ensure the long-term conservation of both cultural heritage and ecological integrity (Gbedomon et al. 2017 Syamsuardi et al. 2021). Policy recommendations emphasize the need for comprehensive education and training programs to reinforce traditional farming practices and formal recognition of home gardens to encourage conservation efforts and community engagement in environmental stewardship (Galluzzi et al. 2010).

Overall, the high number of home garden plants mentioned by communities revealed significant local knowledge in the study area. The study discovered that 218 home garden plant species from 67 botanical families were related to 12 use categories, with the most diversified categories of plant use in home gardens being food, medicine, and ornaments. Several species, such as *Capsicum frutescens* (RFC=0.983), *Musa x paradisiaca* (RFC=0.983), *Mangifera indica* (RFC=0.933), and *Durio zibethinus* (RFC=0.933) emerge with high RFC values, underscoring their pivotal roles in local communities for daily consumption and culinary practices. The local people have extensive knowledge of the plants cultivated in their home gardens, including growth techniques and various uses essential to daily sustenance. Recognizing and preserving this invaluable knowledge is crucial considering, that it serves as the foundation for long-term home garden sustainability and community well-being.

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