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Research Article

Plant species composition and product utility pattern of Garo homegardens in Meghalaya, India

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Abstract
Home garden is a traditional landuse system practiced by many rural households in the tropical region. The composition and management practices within homegardens are largely driven by cultural setup and ecological conditions. The present study characterized the plant species composition, utility patterns and management of Garo homegardens in Dadenggre block, West Garo Hill district of Meghalaya, India. Fifty households from 5 villages were randomly selected and interviewed using a semi-structured questionnaire. The homegardens size ranged between 0.07 and 1.29ha, harbouring 132 plant species, out of which 74 species were trees, 19 shrubs and 39 herbs. Among the perennials, *Areca catechu* (areca nut) was the most common contributor to household earnings. When species were grouped into 9 utility classes (timber, medicinal, fruit, fuelwood, fodder, vegetables, ornamental, spice, and others), highest number was for fuelwood, followed by vegetables and fruits. The average household income was Rs. 318/100m^2, the highest contribution from the sale of vegetables. Various home garden management activities were conducted, engaging family members and generating employment for others. Animal rearing is common in many households and the application of animal manure and household waste has helped maintain soil fertility of homegardens' soils. Homegardens are integral to the Garo society, contributing significantly to household needs and activities.

Keywords: Income, Landuse, Management, Relative occurrence, Soil fertility

INTRODUCTION

A homegarden is generally defined as a piece of land surrounding a homestead that is cultivated with a diverse mixture of perennial and annual plant species arranged in a multi-layered vertical structure, often in combination with raising livestock (Kumar and Nair, 2004).Worldwide, home gardens are a community's most adaptable and accessible land resources and are an important component in reducing vulnerability and ensuring food security (Buchmann, 2009). This is achieved by an array of products that support daily household needs, nutritional requirements and income through the sale of surplus produce. Food plants (fruits, vegetables, legumes and pulses) are generally more represented in many homegardens (Mekonen *et al.,* 2015; Whitney *et al.,* 2018; Ramli *et al*., 2021) and according to Marsh (1998) homes obtained more than 50% of the vegetables, fruits, tubers, and yams from their garden. This ensures higher dietary diversity (Rammohan *et al.,* 2019) enriched and balanced with nutritive components of proteins (Sahoo and Rocky, 2019), vitamins and minerals (Renuka *et al.*, 2019). There is overwhelming evidence to suggest that homegardens significantly contribute to household income by the sale of produce (Bargali *et al.,* 2015; Vinujan *et al.,* 2016), opportunity to save by consuming home grown food (Habtamu *et al.,* 2015) and provide

employment benefits to the local people (Rocky and Sahoo, 2018).

In North East India, traditional home gardens have been maintained as a part of rural survival strategy over generations. Besides the climatic conditions that make it ideal for year-round growth of food sources, the region often faces a shortage of essential food items due to the adverse weather condition in the difficult terrain. Consequently, a homegarden is an essential land use of the region and many reports have featured the diversity of food resources and benefits of homegardens (Sahoo, 2009; Tangjang and Arunachalam, 2017; Konyak *et al.,* 2022). Bibliographical evidence suggests a significant difference in species selection for traditional home gardens primarily driven by altitudinal/climatic regime and traditional beliefs and day-to-day requirements of the farming people (Mendez *et al*., 2001; Zhang *et al.*, 2020; Yinebeb *et* al., 2022)

The Garo tribe is one of the three major tribes inhabiting the western part of Meghalaya. It is an agrarian society largely practicing *Jhum* or shifting cultivation. A study by Pandey *et al.* (2022) depicts the agro-biodiversity richness of the *Jhum* landscapes of the Garo community contributing to their nutritional security and food sovereignty. Apart from *Jhum* land, home garden is a common land use that local people depend on for their daily needs. Besides providing multiple products of both market and non-market value homegardens are the repository of biodiversity of many traditional crop varieties. While the bird's eye review of the literature reveals that plant composition studies on home garden of the Khasi tribes of Meghalaya have been carried out (Tynsong and Tiwari, 2010; Bshar, 2017), the homegardens managed by traditional Garo society have not been properly studied yet in terms of their composition, structure and function. Therefore, proper documentation and scientific interventions are necessary for their conservation and for ensuring sustainable services from these traditional landuse systems.The present study aimed to characterize the structural and functional attributes of Garo tribe homegardens in the West Garo Hill district of Meghalaya.

MATERIALS AND METHODS

Study area

The study was conducted in Dadenggre block (25.7240° N, 90.1945° E), West Garo Hills of Meghalaya, during 2019-20. The subdivision is located at the extreme north-western corner of Meghalaya and about thirty-eight kilometres from the district town Tura. It shares its borders with Goalpara and Dhubri districts of Assam at its North and West, respectively and the other sides are bordering with East and South Garo Hills District of Meghalaya (Fig. 1). The subdivision covers a total area of 617km^2 comprising 130 villages.In the block, the Am'beng Garos, who call themselves A'chik, are most numerous. Almost 90% of the population's livelihoods depend on agriculture;shifting cultivation is a major livelihood activity in hilly areas, with a few pockets of terrace cultivation in the plain areas. The majority of the people still live below the poverty line.

Data collection

Stratified random sampling was used for data collection. Five villages viz. Dilsigre, Asimgre, Ajrigre, Dadenggre and Sathegre, all speaking the Am'beng dialect, were randomly chosen from the 130 villages within the block. Fifty households (10 each from one village) were then randomly selected to constitute the ultimate unit of study. The study was based on the primary survey and data collected through a semi-structured questionnaire from different heads of the family. The parameters that were included in the questionnaire were basic household information, land holding, crops grown and plants found in homegardens, livestock assets and land management practices adopted.

Different crops and trees were identified and enumerated from the selected homegardens. Identification was carried out using a local flora book (Mao *et al*., 2016) and consulting herbarium at Botanical Survey of India,

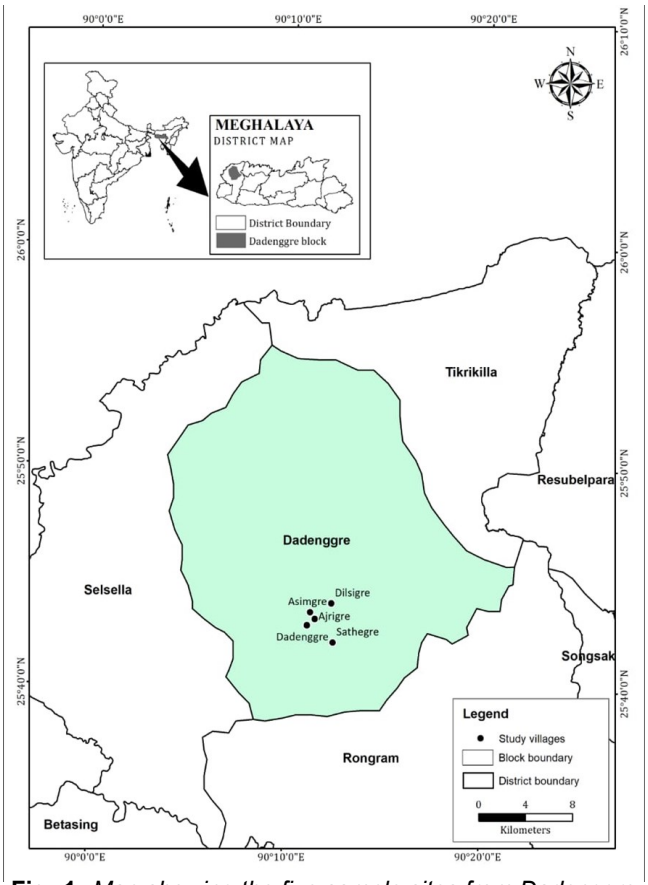

Fig. 1. *Map showing the five sample sites from Dadenggre block of West Garo Hills district, Meghalaya*

Shillong. Information on the use, practice, pattern of extraction of products and management of plant/crop species were noted in the field itself. The species grown in the garden were classified into herbs, shrubs, climbers and trees. Different uses of plants, extraction of home garden products and percent of sales and local market rate were collected from the farmers. Relative occurrence (RO) was calculated by the formula:

Relative occurrence= Number of times a species was recorded in homegardens/Total number of home gardens studied x 100 Eq.1

Five soil sample cores of 0-15 cm depth were collected from each selected home garden and one sample from the nearby forest in April 2019. All the soils were pooled garden-wise and sieved through a 2mm mesh screen. The soil moisture content (SMC) and pH were determined following standard procedures (Anderson and Ingram, 1993). The rest of the samples were air-dried and analyzed for total Kjeldahl nitrogen (TKN) (Bremner and Mulvaney, 1982) using Kel Plus (Pelican model) Available phosphorus was determined by Bray I method (Bray and Kurtz, 1945) and soil organic carbon (SOC) was estimated by Walkley and Black rapid titration method (Walkley and Black,1934). Ammonical-nitrogen and nitrate-nitrogen were estimated by Indophenol Blue Method and Phenol-disulphonic acid method (Anderson and Ingram, 1993) and exchangeable potassium was estimated by the method given in by Gupta (1999) using a Flame photometer.

RESULTS AND DISCUSSION

The Garo society is entirely casteless. A matrilocal and matrilineal system is prevalent among the Garo tribe. The average population of villages is 344 ranging between 281 and 413 as per the 2011 census. All villages were equally distant from the local (1-5km) and the district market (45-51km). Eighty per cent of the households had medium family sizes (4 to 7 members) and 10% of the households had small (1 to 3 members) and large family sizes (< 7 members) each. All land is privately owned, with an average land holding of 1.6ha. Although a considerable percentage of households have members employed in government services (46%), all households maintained homegardens. The average homegarden size is 0.623ha and ranged between 0.07 and 1.29ha. Based on the average homegarden size against the land holding, it is seen that a significant portion of land resources was diverted for a multi-crop production homegarden system (38.93%). Due to the lack of any comparative figure within the country, when the value was compared to the average percentage of land diverted towards homegarden in Jhapa district of Nepal (14,2%), it was found to be much higher (Benu et al. 2021), reflecting high dependence of households on multiple products. Although the average size of homegardens is comparable to others in the region (Tynsong and Tiwari, 2010; Saikia *et al.,* 2012; Shimrah *et al*., 2018), the range was found to be more variable in the present study. In selected sites of Assam it s reported to be between 0.05 and 0.3ha (Saikia *et al.,* 2012), in Mizoram between 0.10 and 0.60 (Barbhuiya *et al.,* 2016), and in Manipur between 0.01 and 0.3ha (Shimrah *et al*., 2018).

From all selected villages of Dadenggre block, a total of 132 plant species were recorded, out of which 74 species were trees (Table 1), 19 shrubs (Table 2) and 39 herbs (Table 3) species belonging to 96 families. The species diversity of the home gardens in Garo Hills appears to be comparable to a survey by Das and Das (2005), who reported 122 species of plants in the gardens of Barak Valley, Assam but higher than the 73 species reported in Ukhrul district of Manipur (Shimrah *et al.,* 2018). However, exceedingly high species richness has been reported by Saikia *et al*. (2012) in Upper Assam (294 species) from 80 homegardens and in Mizoram (333 species) from 90 homegardens by (Barbhuiya *et al*., 2016), which can be attributed to the larger sampling size in their studies. Based on plant habit, trees had the highest representation (56.06%), closely followed by herbs (29.54%) and shrubs (14.39%), depicting a multi-layered vegetation structure which could offer an advantage in controlling soil erosion and efficient use of resources viz., light and space. Larger home gardens are known to harbour more tree species than smaller gardens, where most species occur in the lower stratum (Leishangthem and Sahoo, 2020).

The highest Relative Occurrence (RO) among tree species was recorded for Arecanut,followed by Mango and Jack fruit (Table 1). Among shrubs, the highest relative occurrence was observed for *Hibiscus safdariffa* followed by *Lycopersicon esculentum* (Table 2) while in the herbaceous plants highest was seen in *Capsicum annum* followed by a local plant Me'jak (Table 3). Areca nut is an important plantation crop and constitutes the region's most important component of homegardens (Tangjang and Arunachalam, 2009). They are self-consumed, but generally, a large share of the produce is sold, providing significant income to households. On the other hand, the high RO of fruit trees and low contribution to average household income (Rs.780/yr; Table 4) indicates a high frequency of trees, but the product is generally self-consumed. Homegardens are primarily established to provide diverse household needs year-round.

The present study classified the productive function of species into 9 categories (Fig. 2) and the highest usage of species was observed for fuelwood (66 species).The number of species that yielded fruits and vegetables was 47 and 49, respectively. Besides their

Table 1. Tree species recorded in five study sites of Dadenggre block, West Garo Hills, Meghalaya

Sl No.	Vernacular Name	Botanical Name	Family Name	Plant use	RO (%)
1	Gue	*Areca catechu* L.	Arecaceae	Fr, M, Fo, F	64
2	Te'gatchu	*Mangifera indica* L.	Anacardiaceae	Fr, T, F	54
3	Tebrong	*Artocarpus heterophyllus* Lam.	Moraceae	Fr,T, Fo, F	38
4	Komperam	*Psidium guajava* L.	Myrtaceae	Fr, F	28
5	Sokchon	*Alstoniascholaris* (L.) R. Br.	Apocynaceae	F, Fr, T	24
6	Kakji	*Citrus limon* (L.) Osbeck	Rutaceae	V, M	24
7	Che'eng	*Tamarindus indicus* L.	Leguminoceae	Fr, T, F	22
8	Modipol	*Carica papaya* L.	Caricaceae	V	22
9	Kisinat	*Anacardium occidentale* L.	Anacardiaceae	Fr, Nut, F	20
10	Jam ni dol	*Syzygium caryophyllatum (L.) Alston.*	Myrtaceae	Fr, F	20
11	Chengsi	*Firmiana colorata*Roxb.	Sterculiaceae	T, F	18
12	Bolbret	*Toona ciliate* M. Roem.	Meliaceae	F, T	18
13	Sawi	*Caryota urens* L.	Arecaceae	Fr, F	18
14	Snaru	*Cassia fistula* L.	Caesalpiniaceae	Fr, T, F	18
15	Mao	*Hibuscus macrophylious* Roxb. ex Hornem.	Malvaceae	T, F	16
16	-	*Artocarpus stipulate*	Moraceae	Fr, F	14
17	Bolasari	*Lagerstroemia speciosa* (L.) Pers.	Lythraceae	T, F	14
18	Pisbol	*Prunus persica* (L.) Batsch.	Rosaceae	Fr, F	14
19	Narikgel	*Cocos nucifera* L.	Palmae	Fr	12
20	Evergreen	*Cryptomeria japonica* (Thunb. ex L.f) *D. Don.*	Phyllanthaceae	T, O	12
21	Kering	*Oroxylum indicum*(L.) Kurz	Bignoniaceae	V, M, F	12
22	Gambari	*Gmelina arborea* Roxb.	Verbenaceae	T, M, F	10
23	Boldak	*Schima wallichii* Choisy	Theaceae	T,F	10
24	Olmak	*Sterculia villosa* Roxb.	Sterculiaceae	Str, Fr	10
25	Jambura	*Citrus maxima* (Burm.) Merr.	Rutaceae	Fr, F	10
26	Adakakki	*Litsea monopelata* (Roxb.) Pers.	Lauraceae	T, Bar, F	10
27	Letchu	*Litchi chinensis* Sonn.	Sapindaceae	Fr, F	8
28	Pangara	*Erythrina suberosa* Roxb.	Fabaceae	F	8
29	Chram	*Artocarpus chaplasha*Roxb.	Moraceae	Fr, T	6
30	Pakram	*Trema orientalis*(L).) Blume	Ulmaceae	T, Fo, F	6
31	Gimbil	*Careya arborea* Roxb.	Verbenaceae	F,T	6
32	Champa	*Michelia champaca* L.	Magnoliaceae	T, F	6
33	Segun	*Tectona grandis* L.f.	Verbenaceae	T, F	6
34	Angkilmakbil	*Ziziphus mauritiana*Lamk.	Rhamnaceae	Fr, F	6
35	Bolmenggo	*Grewia laevigata* Vahl	Tiliaceae	F	6
36	Bolchu	*Bombax malabaricum*DC.	Malvaceae	F, Thr/Str	6
37	Aritak	*Terminalia chebula*Retz.	Combretaceae	Fr,T, M, Fu	6
38	Chigambal	*Garuga pinnata* Roxb.	Burseraceae	F, T	6
39	Amlengga	*Averrhoa carambola* Linn.	Oxalidaceae	Fr, M, F	6
40	Bolchubret	*Grewia microcos*L.	Tiliaceae	Fr, F	6
41	Jamburabijak	*Citrus reticulate* (L.) Osbeck.	Rutaceae	Fr, M, Fr, F	6
42	Chambu	*Syzygium diospyrifolium* (Wall. ex Duthie) S.N.Mitra	Myrtaceae	Fr, T, F	6
43	Makanchi	*Callicarpa arborea* Roxb.	Verbenaceae	T, F	4
44	Bolchim	*Duabanga grandiflora* (DC.) Walp.	Lythraceae	F,T	4
45	Kimde	*Messua ferrea* Linn.	Guttiferae	Fr, T, F	4
46	Ambare	*Phyllanthus emblica* Gaertn.	Euphorbiaceae	Fr, Fo, F	4
47	Sampal	*Baccaurea ramiflora* Lour.	Phyllantaceae	Fr, F	4
48	Sa'kap	*Ficus hispida* L. f.	Moraceae	F, Fo, V	4
49	Me'cheng	*Zanthoxylum budrunga* DC.	Rutaceae	V, M, F	4

Contd…..

50	Me'gong	*Bauhinia variegate* L.	Caesalpinaceae	F, Fo, V	4
51	Bolasin	*Disoxylum hamiltoni* Hiern.	Meliaceae	T, F	4
52	Kimkol	*Saracaasoca* (Roxb.) Willd.	Caesalpiniaceae	T, F	4
53	Avocado	*Persea americana* Mill.	Loresia	Fr, F	4
54	Sojona	*Moringa oleifera* Lam.	Primulaceae	Fr, M, V	4
55	Agatchi	*Dillenia indica* L.	Dillienaceae	V, Fr, F	4
56	Naspati	*Pyrus communis* L.	Rosaceae	Fr, F	4
57	Jam dal'gipa	*Eugenia jambolana* Lam.	Myrtaceae	Fr, F	2
58	Gurjan	*Dipterocarpus indicus*Bedd.	Dipterocarpaceae	F, T	2
59	Te´bil	*Ficus auriculata* Lour.	Moraceae	Fr, F	2
60	Bolbok	*Tetrameles nudiflora* R. Br.	Datiscaceae	T, F	2
61	Chirore	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	F, T	2
62	Bolsil	*Stereospernum chelonoides* (L.f.) DC.	Bignoniaceae	T, F	2
63	Bolong	*Cyathocalyx martabanicus* Hook.f.& Thomson	Annonaceae	F	2
64	Bolsrem	*Eugenia claviflora*	Myrtaceae	Fr, F, T	2
65	Kelbi	*Albizia procera* (Roxb.) Benth.	Mimosaceae	F, T	2
66	Manahei	*Terminalia citrina Roxb. ex Fleming*	Combretaceae	F	2
67	Bolsal	*Shorearobusta* Gaertn.	Dipterocarpaceae	T, F, T	2
68	Bakwe	*Melodinus monogynus* Roxb. ex Lindl.	Apocynaceae	Fr, F	2
69	Denggadoti	*Garcinia kydia* Roxb.	Malvaceae	Fr, F	2
70	Bolgisim	*Diospyros toposia* Buch-Ham.	Ebenaceae	F, T	2
71	Mandal gitchak	*Erythrina stricta* Roxb.	Fabaceae	F	2
72	Arjun bol	*Terminalia arjuna* (Roxb. ex DC.) Wight &Arn	Combretaceae	T, F	2
73	Tejpat	*Cinnamomum tamala* (Buch.-Ham.) T.Nees & Eberm.	Lauraceae	S	2
74	Miskuri	*Morus alba* L.	Moraceae	Fr, M, V, F, Fo	2

RO : Relative Occurrence; V: Vegetables; T:Timber; F:Fuelwood; Fr:Fruit; M:Medicinal; S:Spices; Fo:Fodder; Bar:Bark; Str:String; Thr:Thread; O:Ornamental

use as food, many plants are also used in folk medicines, including *Hibiscus safdariffa* (RO= 40%), *Zingeber officinale* (RO 34%), *Curcuma longa* (RO 34%), *Citrus limon* (RO 24%) and *Musa paradisica* (18%). Currently, food plants have a significant role in the health care systems of many rural as well as urban communities as foods are increasingly used to promote better health and prevent chronic illness. In many countries of Southeast Asia, daily foods such as cereals, vegetables and fruits provide medicinal benefits (Shi *et al*., 2011). An interesting observation in the study is the large number of ornamental species (48) maintained in the homegardens, which shows the interest of Garo people in adorning their surroundings as well.

Home gardens are a vital source of income for the subsistence economy and contribute to the self-sufficiency of many rural households perched in remote places often secluded from markets and modern production centres.The main crops raised in the garden for marketing were *Zingiber officinale*, *Curcuma longa*, *Areca catechu, Ananas cosmosus, Caricapapaya*, *Citrus spp*., *Anacardium occidentale*, etc. The average annual household income from homegarden was Rs. 19870/- (Table 4), which amounts to Rs. 318/100m^2. The earning was lower than the average income reported by Tynsong and Tiwari (2010) from homegardens of the *War Khasi* community of Meghalaya, which was Rs. 3514 for an average home garden size of only 750m^{2}and from Mizoram which was as high as Rs. 1304/100m^2 (Rocky and Sahoo, 2018). The highest income contributor from homegardens surveyed in the study is from sale of vegetables (Rs. 5529/yr). Although it can be more labour and resource-intensive, vegetable crop cultivation is generally found to be remunerative and provides all-year-round food supply (Prasai *et al*., 2021; Eibl *et al.,* 2000) and is therefore practiced in home gardens. Plantation crops, chiefly areca nut, contribute to household income (Rs. 5360/yr). Another source of income for households is by selling cereal crops, primarily rice (Rs. 5067/yr). However, it is grown in only 10 homegardens (RO=20%), probably in the large ones. Therefore, most households consume the

product with little contribution to additional household income, especially in families with lower land holdings.

Home garden management included fencing, weeding and tree lopping, irrigation, manuring, pruning, thinning, etc. Weeding was the most common management activity (Table 5) engaging children and women. It was carried out 2-3 times a year during the entire cropping period and was done manually. Another routine management practice was fencing of gardens using local bamboo species such as *Bambusa vulgaris* for poles and *Bambusa tulda* as spokes; *Jatropa curcas* and *Erythrina* spp. were commonly used as live fence. Eighty-four per cent of the household gardens were rainfed. However, few households undertook water conservation and management practices by digging trenches (8%) and constructing bunds (6%).Since the structure and composition of homegarden intuitively render it an efficient system of conserving water due to lower evapotranspiration and lower soil moisture losses (Kumar and Nair, 2004), studies directly linking homegardens to water conservation are scanty (Sharma *et al.,*2022). Disease management practices included mechanical removal of infected plants or insects, burning potential sources of inoculum and applying lime.

The percentage of households that reared livestock, especially cattle and poultry were very high (92% and 98%, respectively; Table 6), while goats and duck were not as common (40% and 32% households, respectively). Cattle were primarily reared for ploughing paddy field because the local community does not largely consume milk. Since income from livestock was not recorded, it implied that animals were reared for self-consumption during the festive season and social celebration. Pig rearing mostly depended on household family size because leftover food is generally fed to them; therefore, not all households reared pigs (78%). One of the advantages of a multi-component farming system is animal-based manure and fertiliser production. However, only 36% of the households applied cattle manure in their garden. Probably, the average cattle population of 2.78 per household is unable to generate a sufficient quantity of manure for the entire garden of most households. Some other soil-enriching substitutes included poultry odure, vermicompost, stubble and household waste (Table 5).

Under the current management practices fertility of soils in homegardens is relatively well maintained. The moisture content was higher in homegarden soils (11.72%) than in forest soil (11.70%). Similar trend was observed for available phosphorus, exchangeable potassium and ammonical nitrogen (Table 7). It is generally regarded that homegardens possess a closed nutrients cycling, much similar to tropical forests (Sheeba, 2015, Vieira *et al.,* 2016). Moreover, the higher content of ammoniacal nitrogen and available phosphorus in the case of home garden soil may be due to the application of household wastes and livestock manure by

Table 2. Shrub species recorded in five study sites of Dadenggre subdivision, West Garo Hills, Meghalaya

Sl. No.	Vernacular Name	Botanical Name	Family Name	Plant use	RO (%)
1	Gal'da	*Hibiscus safdariffa*	Malvaceae	V, M	40
2	Baring belati	*Lycopersicon esculentum* Mill.	Solanaceae	V	32
3	Te'rik	*Musa paradisica* L.	Musaceae	Fr, M, V	18
4	Dorai	*Abelmoschus esculentus*(L.) Moench	Malvaceae	V	18
5	Ta'bolchu	*Manihot esculenta* Crantz	Euphorbiaceae	V	16
6	Baring	*Solanum melongena* L.	Solanaceae	V	14
7	Donggam	*Clerodendrum colebrookianum* Walp	Verbenaceae	V, M	10
8	Samsureng	*Clerodendrum serratum* Spreng .	Verbenaceae	V, M	8
9	Kejul	*Elaeis guineensis* Jacq.	Arecaceae	Oil	8
10	Naga baring	*Solanum anguivi*Lam.	Solanaceae	M, V	6
11	Jong'aki'tong	*Amblyanthus glandulosus* (Roxb.) A.DC.	Rutaceae	Fr	4
12	Sokkua	*Elaegnus conferta*	Elaeagnaceae	Fr	4
13	Gong	*Alpinia malaccensis* (Burm. f.) Roscoe	Zingeberaceae	V, M	4
14	Kimka	*Solanum cernuum Vell.*	Solanaceae	V, M	4
15	Mendu	*Cajanus cajan* (L.) Millsp.	Fabaceae	Fr, M	4
16	Sapota	*Manilkara zapota* (L.) P.Royen	Sapotaceae	Fr, Fo	4
17	Tulsi	*Ocimum sanctum* L.	Lamiaceae	M	4
18	Te'chikeng	*Canthium dicoccum* (Gaertn.) Merr.	Rubiaceae	Fr, F	2
19	Dalim	*Puniaca granatum* L.	Puniacaceae	Fr, F	2

RO : Relative Occurrence; V: Vegetables; T:Timber; F:Fuelwood; Fr:Fruit; M:Medicinal; S:Spices; Fo:Fodder; Bar:Bark; Str:String; Thr:Thread; O:Ornamental

Table 3. List of herb species recorded in five study sites of Dadenggre block, West Garo Hills, Meghalaya

Sl. No.	Vernacular Name	Botanical Name	Family Name	Plant use	RO (%)
1	Ja'lik	*Capsicum annum* L.	Solanaceae	V, S	66
2	Me'jak		-	V	50
3	Samskal	*Eryngium foetidum L*	Umbelliferae	S	42
4	Lau	*Cucurbita foetidissima*Kunth.	Cucurbitaceae	V	40
5	E'ching	*Zingiber officinale* Roscoe	Zingiberaceae	S, M, V	34
6	Holdi	*Curcuma longa* L.	Zingiberaceae	S, M	34
7	Rasin	*Allium sativum* L.	Liliaceae	S, V, M	30
8	Songru	*Amorphophallus Spp.*	Araceae	V	30
9	Me'raku	*Zea mays* L.	Poaceae	Food	26
10	Alu	*Solanum tuberosum* L.	Solanaceae	V	26
11	Mula	*Raphanus sativus* L.	Brassicaceae	V	24
12	Banda kobi	*Brassica oleracea* L.	Brassicaceae	V	22
13	Te'e	*Cucumis melo* L.	Cucurbitaceae	V, Fr	22
14	Mi	*Oryza sativa* L.	Poaceae	Food	20
15	Kangkui	*Momordica dioica* Roxb.exWilld.	Cucurbitaceae	V	20
16	Ta'milang	*Ipomea batata*s (L.) Lam.	Solanaceae	Food, V,	18
17	Chukka	*Rumex acetosa*L.	Malvaceae	V	18
18	Brokoli	*Brassica rapa*L.	Brassicaceae	V	16
19	Anaros	*Ananus cosmosuss* (L.) Merr.	Bromeliaceae	Fr, M	16
20	Besual	*Brassica juncea*(L.) Czern.	Brassicaceae	Oil, V	16
21	Stroberi	*Fragaria virginiana* Mill.	Rosaceae	Fr	16
22	Denggasak	*Amaranthus spinosus*	Amaranthaceae	V	14
23	Chi'gi	-	-	V	14
24	Dhania	*Coriandrum sativum* L.	Umbelliferae	S, M	12
25	Me'krip	*Hibiscus surattensis* L.	Malvaceae	V	12
26	Apolka	*Gymnopetalum chinensis* Lour	Cucurbitaceae	V	10
27	Badam	*Arachis hypogea* L.	Fabaceae	Nut	8
28	Pulkobi	*Brassica oleraca* L.	Brassicaceae	V	8
29	Laisak	*Spinacia oleracea* L.	Amaranthaceae	V	8
30	Ta'ma	*Beta vulgaris* L.	Chenopodiaceae	V	8
31	Chinatong	*Trevesia palmate* (Roxb. ex lindl.) Vis.	Araliaceae	V	8
32	Gachli	*Eichhornia crassipes* (Mart.) Solms	Pontederiaceae	V	8
33	Genasi	*Phaseolus polyanthus* Greenm.	Fabaceae	V, M	6
34	Ka'rek	*Mucuna pruriens* (L.) DC.	Fabaceae	V	6
35	Teraja	*Citrullus vulgaris* Schr. ex Eckl. &Zeyh.	Cucurbitaceae	Fr	6
36	Kerot	*Daucus carota* L.	Umbelliferae	V	6
37	Pudina	*Mentha arvensis* L.	Lamiaceae	S, M	6
38	Asirengga	*Piper thomsonii*(C. DC.) Hook. f.	Asteraceae	S, M	4
39	Grik	*Saccharum officinarum* L.	Poaceae	Juice, M	2

RO : Relative Occurrence; V: Vegetables; Fr:Fruit; M:Medicinal;S:Spices

the farmers, which contributed to the quick release of nutrients in the available form. Nitrate nitrogen (3.29µg g-1) and soil organic matter (0.89%) of homegarden soil were very low compared to forest soil (9.5µg g-1 and 1.96%, respectively). This may be attributed to the fact that in comparatively less disturbed forests, continuous accumulation of litter leads to organic matter building. Usually, in such forests, the inorganic transformation process is slower.

Conclusion

Tropical homegardens are a repository of rich plant diversity that is linked to household needs. They offer culturally appropriate foods that locals enjoy, provide domestic requirements, and ensure income stability. The homegardens of the Garo community in Meghalaya harbour diverse plant species with multiple end uses for food, medicines, construction and fodder. Due to the

Table 4. Average yield and income from home garden produce in five study sites of Dadenggre block, West Garo Hills, Meghalaya

Sl.No	Category	Average yield per home garden (Excluding timber and fuel wood) (kg)	Average income (Rupees per annum)
1.	Fruits	69.76	780.00
3.	Cereals	1634.6	5067.00
4.	Oil crops	5.05	1453.00
5.	Vegetables	139.64	5529.00
6.	Root and tuber crops	56.2	258.00
7.	Spices and condiments	87.5	1348.00
8.	Areca nut	134	5360.00
9.	Others	25	75.00
Total			**19870.00**

Table 5. Crop management practices used by the respondents in 5 study sites of Dadenggre block, West Garo Hills, Meghalaya

Management attributes/practices	Respondents (%)
Weeding	100
Irrigation	
Rainfed	84
Trenching	8
Bunding	6
Disease and pest control	78
Manure and fertilizers used	
Cowdung	36
Poultry odure	12
Vermicompost	12
Stuble	8
Household waste	28

Table 6. Livestock status in five study sites of Dadenggre block, West Garo Hills, Meghalaya

Sl. No.	Livestock category	Total	No. of household	Average no. of livestock	Percentage
1	Cattle	139	46	2.78	92
2	Piggery	103	39	2.06	78
3	Goat	32	20	0.64	40
4	Poultry	339	49	6.78	98
5	Ducks	44	16	0.88	32

Table 7. Soil physico-chemical properties of the home gardens in five study sites of Dadenggre block, West Garo Hills, Meghalaya

Sl. No.	Parameters	Homegarden soil	Forest soil
1	Soil pH	5.4±0.11	5.1±0.10
2	Moisture content (%)	13.72±2.62	11.7±2.30
3	Soil organic carbon (SOC) (%)	0.52±0.09	1.14±0.08
4	Soil organic matter (%)	0.89±0.16	1.96±0.10
5	Available phosphorus (P_2O_5) (µg g^{-1})	4.5±0.41	4.32±0.31
6	Ammoniacal nitrogen (NH_4-N) (µg g^{-1})	3.36±0.52	1.35±0.30
7	Nitrate nitrogen (NO_3-N) (µg g^{-1})	3.29±1.18	9.5±1.10
8	Total Kjeldahl nitrogen (TKN) (%)	0.44±0.06	0.5±0.03
9	Exchangeable potassium (K_2O) (µg g^{-1})	1153 ± 585.49	262.4 ± 580.20

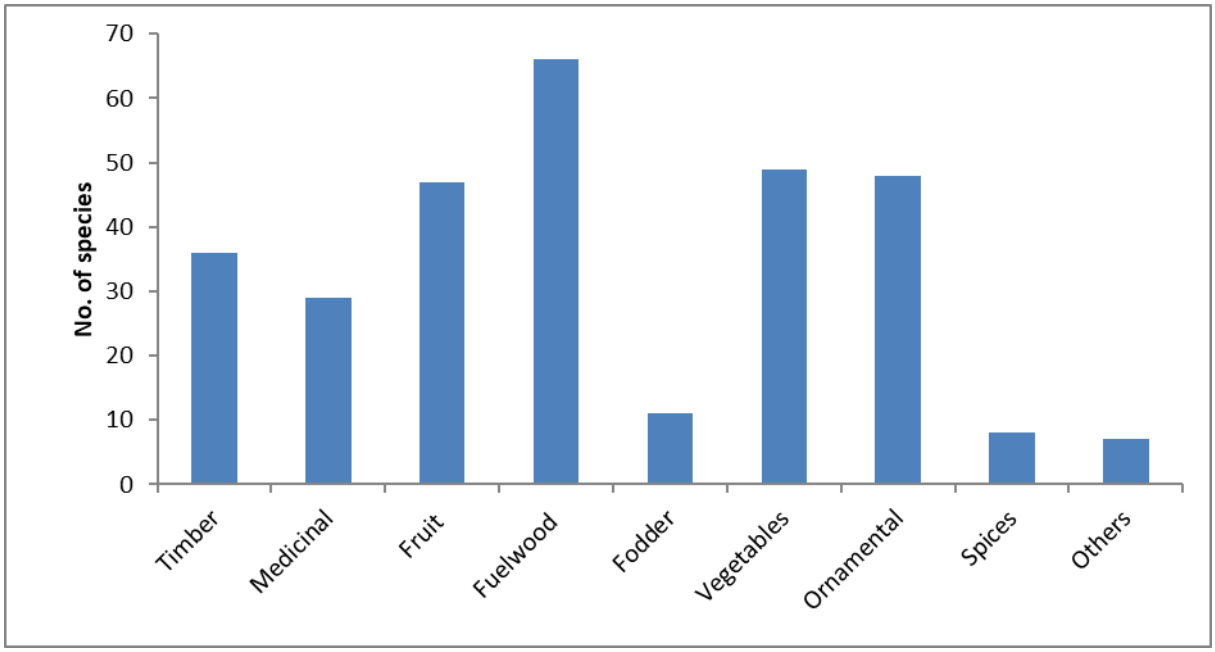

Fig. 2. *Categories of plants used across different gardens in Dadenggre block, West Garo Hills Meghalaya.*

subsistence nature of such cropping systems, the contribution of food plants and plantation crops to family income is not relatively large. However, the amount could be significant for low-income families. The homegardens were traditionally managed using locally available plant and animal resources, creating a sustainable and healthy ecosystem. There are no records of studies on the composition, utility pattern and management practices of homegardens of the Garo community in Meghalaya, and in this regard, the present study is a primer for more in depth investigations in the future. There is a large scope for scientific interventions in terms of crop composition design, use of quality planting materials and modern management for increased productivity and earning.However, a balance must be maintained in view of the land use's cultural identity and conservatory role.

Conflict of interest

The authors declare that they have no conflict of interest.

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