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Inventorying plant biodiversity in homegardens: A case study in Barak Valley, Assam, North East India

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Homegardens are traditional agroforestry systems with complex structure and multiple functions. To understand the system, the socio-economic and biophysical aspects of homegardens in Dorgakona village, Barak Valley, North East India were studied. Since homegardens are also important sites for *in situ* on-farm conservation, the role of the rural people in the management and preservation of biodiversity in their traditional homegardening systems was examined. The homegarden size falls within the range of 0.02–1.20 ha with an average of 0.30 ha. The total number of species encountered in the homegardens was 122, with fruits as the dominant use-component. The homegardens are the sites of conservation of a large diversity of plants both wild and domesticated, because of their uses to the households. Thus the homegardens were found to be complex systems with plant diversity conserved through their use.

HOMEGARDENS are traditional agroforestry systems characterized by the complexity of their structure and multiple functions. Homegardens can be defined as 'land use system involving deliberate management of multipurpose trees and shrubs in intimate association with annual and perennial agricultural crops and invariably livestock within the compounds of individual houses, the whole tree-crop animal unit being intensively managed by family labour'¹. Homegardens have attracted considerable research attention during the past three decades², mainly due to the following reasons: (i) they contain characteristics which make them an interesting model for research and the design of sustainable agroecosystems, including efficient nutrient cycling, high biodiversity, low use of external inputs and soil conservation potential^{3,4}; and (ii) homegardens have been shown to provide a diverse and stable supply of socio-economic products and benefits to the families that maintain them⁵. Homegardens are the closest mimics of natural forests in their structure and usually have 3–4 vertical canopy layers. Besides the vertical structure, homegardens also have distinct horizontal structure which together help in the efficient utilization of water, light and space, and support diverse wildlife species besides meeting various social and basic

needs of families. Homegardens are important *in situ* conservation sites and in accordance with the Convention of Biological Diversity Article 7,8 and 10(c), inventorization of such areas can help in the identification and conservation of biodiversity while assessing the sustainability of the system. In order to understand the structure and function of homegardens, it is necessary to analyse both socio-economic and biophysical aspects of these systems. A number of studies on the complete inventory of homegardens have been done, including the structure, species composition¹, socio-economic aspects and management zones⁶. In India most of the inventory of homegardens has been concentrated in Kerala^{7,8}. Another study in Karnataka by Shastri *et al.*⁹ highlighted the importance of trees in village ecosystem. However in North East India, except for studies by Ramakrishnan *et al.*¹⁰, Ramakrishnan¹¹, Godbole¹², and Sinha and Das¹³, no data are available on the inventory of traditional homegardening systems. As a step in this direction, an attempt is made in this article to analyse the structure of the traditional homegardens in Barak Valley, Assam, North East India. The main objective of this article is to understand the homegardening systems as practised by rural people in the region, and to provide a base for further scientific studies.

The study was conducted in Dorgakona village (24°41'N lat. and 92°41'E long.), Cachar district, Barak Valley, Assam, North East India. The Barak Valley region, covering an area of 6922 km², is located in southern Assam. The region shares its borders with North Cachar Hills district and Meghalaya in the north; Manipur in the east; Mizoram in the south and Tripura and Sylhet district, Bangladesh in the west. The valley has an undulating topography characterized by hills, hillocks (locally known as *tillah*) wide plains and low-lying waterlogged areas (locally called *beels*). The area experiences a warm, humid climate having a mean annual rainfall of 2660 mm, most of which is received during the southwest monsoon season (May to September). The mean maximum temperature ranges from 25.4 (January) to 32.6°C (August). The mean minimum temperature ranges from 11 (January) to 25°C (August). The study site was originally a tea plantation area dominated by tea-garden labourers. The labourers in the area, like any other tea plantation site in Assam, were brought in from West Bengal, Orissa, Madhya Pradesh, Andhra Pradesh and Tamil Nadu during

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the early 19th century with the rise in tea industry in the state¹⁴.

Fifty homegarden units were selected from the study site. Selection of households was based on size (< 1 ha). However, since majority of the villagers are small holders and large holders represent a small fraction of the village, in the present study, sampling was done mostly for small holders. Each household was surveyed by the schedule^{15,16} method for socio-economic factors and information on homegarden size, and management practices. Parameters such as tree density (> 5 cm DBH), species composition and distribution of plants were directly enumerated. Vertical stratification was measured visually. Plant allocation to specific management zones was identified according to Mendez⁶. Species relative importance values were computed from relative density and relative frequency of occurrence^{17,18}; relative importance values for bamboo species were calculated separately. Plant uses were defined by villagers and each plant was allotted a use category according to its main use. Plant specimens collected were identified with the help of BSI, Shillong, NBPGR, Shillong and other literature^{19,20}.

The size of the homegardens sampled ranged from 0.02 to 1.20 ha, with an average of 0.30 ha. This falls within the range of global inventory of other tropical homegardens by Fernandes and Nair¹. In this context, Perera *et al.*¹⁸, recorded the size of Kandyan homegardens in Sri Lanka ranging from 0.05 to 2.50 ha. The average size of West Java homegardens²¹ was 0.0229 ha and the size of Santa Rosa homegardens in Amazon²² varied from 0.0067 to 0.7322 ha. Homegarden size is by and large a function of the population density. Distinct variations in size, diversity and composition were observed within the small holder farmers (< 1 ha) in the study site. With increase in holding size, more variations in species composition were encountered. In larger homegardens, the land is demarcated into more micro zones or management zones and larger areas allotted to areca nut cultivation. Also, well-defined, dense zones were encountered in many such homegardens. In the smaller land holdings, the homegardens are not well demarcated into numerous zones and are usually composed of several species mixed together. Homegardens usually exhibit high diversity. A total of 122 trees and shrubs have so far been identified in the homegardens (Appendix) with 87 tree species, which is much higher than the 68 tree species recorded in Karnataka homegardens⁹, while the total of 122 trees and shrubs recorded is smaller than the 127 species reported from the homegardens of Kerala⁷. Average number of species per homegarden varies with the size of the homegardens. In smaller homegardens, the lowest of eight species were recorded, with more dominance of fruit trees with multiple uses such as *Artocarpus heterophyllus*, *Mangifera indica*, *Musa* sp. etc. In larger homegardens, a maximum of 39 species were recorded and are important sites for the conservation of wild/rare species like *Aquilaria malaccensis*, *Vatica lanceaefolia*, etc. besides other fruit and timber trees. The estimated plant density was

1535 ha⁻¹ and basal cover was 33.86 m² ha⁻¹. The woody plant density in the present study is much higher than the values of 238–319 ha⁻¹ reported by Kumar *et al.*⁷, in Kerala homegardens. Also the basal area is nearer the recorded basal area of 46.17 m² ha⁻¹ (Nandi, Das and Das, unpublished) from the neighbouring semi-evergreen forest and 42.6 m² ha⁻¹ recorded from tropical evergreen forests of the Western Ghats²³. However, the high plant density and the resultant higher basal area can be attributed to the presence of a larger number of areca nut trees and also the inclusion of different bamboo species in the study site. Bamboo was present in majority of homegardens, irrespective of size. The range of species with a mean of 20 recorded in the present study, is lower than the range of 37–65 with mean of 46, recorded in Kandyan homegardens¹⁸, Sri Lanka and an average of 56 species reported in Javanese homegardens²⁴. The smaller number of species can be related to the smaller size of the homegardens surveyed. A number of factors such as socio-economic status, market integration, land-holding size, etc. affect the diversity in homegardens⁸.

Figure 1 shows the detailed socio-economic characteristics of the families surveyed for homegarden ownership. The socio-economic status among the villagers is determined on the basis of criteria such as land size, number of cattle owned and number of earning members in the family, with roofing pattern taken as an additional socio-economic factor in the present study. The villagers surveyed were predominantly small holders (< 1 ha) and 76% of them had paddy land and farming as their primary or secondary occupation. Eighty per cent of the households had from one to five educated members in the family, which were represented mainly by children and adults between the ages of 20 and 40. Few villagers also had an extra land holding for *Imperata*, *Vetiveria* and canes. The homegarden size and diversity were found to be related to the socio-economic conditions of the families that maintain them. Poorer families with no or less paddy land holdings had smaller homegardens and therefore less diversity. They mostly use leaves of *Imperata cylindrica*, *Vetiveria zizanioides* and bamboo as their roofing material. On the other hand, tea garden labourers with larger families and more earning members had larger homegardens (0.13–0.53 ha). Most of the poor labourers use the leaves of *I. cylindrica*, *V. zizanioides* and bamboo as roofing materials. Farmers having paddy land had larger homegardens (but less than 1 ha) compared to the labourers and their roofing materials ranged from the leaves of *I. cylindrica*, *Vetiveria zizanioides* and bamboo to corrugated sheet, depending on their economic condition.

Homegardens exhibit complex structure, both vertically and horizontally. The vertical structure of homegardens is composed of 3–4 canopy layers¹. In the present study, four to five vertical canopy layers have been identified in homegardens (Figure 2) – the emergent layer, the canopy, the understory, the shrub and the herb layer. The emergent layer had a height of 15 m or more and was composed of multipurpose tree species represented in the canopy layer

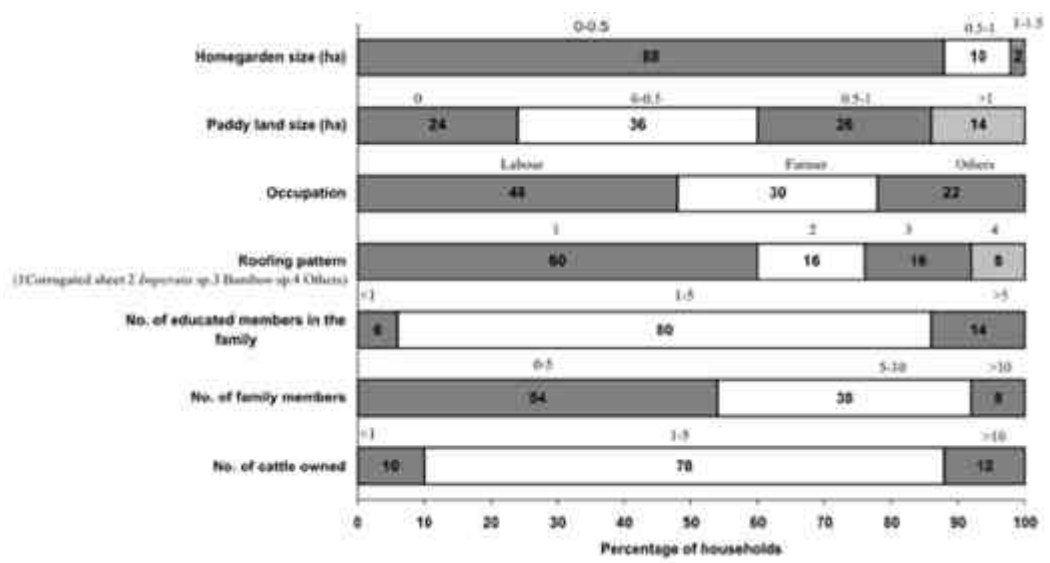


Figure 1. Socio-economic characteristics of homegarden owners.

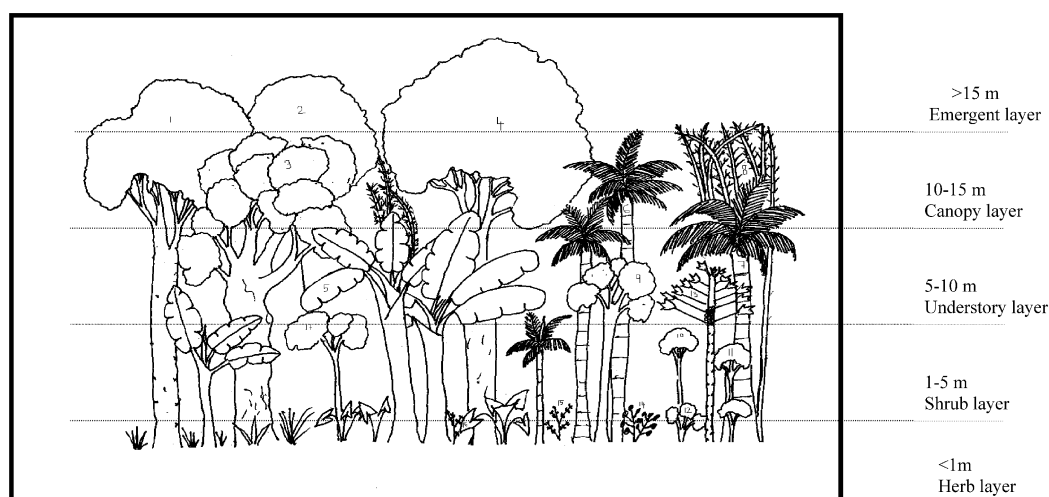


Figure 2. Vertical stratification in a typical homegarden in Barak Valley, Assam. 1, *Erythrina variegata*; 2, *Toona ciliata*; 3, *Artocarpus heterophyllus*; 4, *Bombax ceiba*; 5, *Musa* sp.; 6, *Areca catechu*; 7, *Cocos nucifera*; 8, *Bamboo* sp.; 9, *Melia azedarach*; 10, *Vitex* sp.; 11, *Ziziphus mauritiana*; 12, *Cajanus cajan*; 13, *Carica papaya*; 14, *Ervatamia coronaria*; 15, *Ocimum sanctum*; 16, *Alocasia macrorrhiza*; 17, *Citrus* sp.

such as *Artocarpus lakoocha*, *Bombax ceiba*, *Tamarindus indica*, *Tetrameles nudiflora* and *Toona ciliata*. The canopy layer was between 10 and 15 m with species such as *Areca catechu*, *Artocarpus chama*, *Artocarpus heterophyllus*, *Cassia siamea*, *Dillenia indica*, *Gmelina arborea*, *Lagerstroemia speciosa*, *Mangifera indica*, *Sterculia foetida*, *Sterculia villosa*, *Syzygium cumini*, *Terminalia chebula*, *Zanthoxylum limonella*, and *Bamboo* sp. (*Bambusa cacharensis*, *Bambusa vulgaris*). The understory layer had the height of 5–10 m and was dominated by *Citrus* spp., *Cocos nucifera*, *Ficus* sp., *Litchi chinensis*, *Melia azedarach*, and *Oroxylum indicum*. The shrub layer had the height of 1–5 m and was composed of shrubs like *Hibiscus rosa*

sinensis, *Nyctanthes arboritrists* and saplings of species forming the upper layers, whereas the herb layer was less than 1 m and was mainly composed of vegetables, ornamentals and medicinal species like *Adhatoda vasica* and *Calotropis gigantea*. All the five layers were not present in all homegardens. The canopy, shrub and herb layers were common in all homegardens. A few species such as *A. heterophyllus*, *A. lakoocha*, *M. indica* and *T. ciliata* were encountered in all strata. In some homegardens, certain tree species from the canopy layer rise up to a height of 15 m or more, forming a gap in the otherwise continuous layer and thereby allowing light to pass through them to the layers below. The shade provided by the upper layers supports a

large number of shade-loving climbers like *Piper nigrum* and herbs like *Alocasia macrorrhiza*. Perera *et al.*¹⁸, in their study of Kandyan homegardens in Sri Lanka, recorded four vertical layers. From the ground layer comprising herbaceous food crops, forage, medicinal and other crops to the upper canopy of fast-growing multipurpose trees, the gradient of light and relative humidity creates different niches, enabling various species group to exploit them²⁵. The structured layer also contributes to soil nutrient enrichment through leaf litter and prevents soil erosion in homegardens²⁶.

The homegardens appear to be a haphazard mixture of trees, shrubs and herbs. But the locations of most plants were found to be deliberate, which could be distinguished into several management zones. The present study recorded five major management zones in homegardens based on their function, location and composition: (i) bamboo groves (*Bansh tilla*) (ii) betel groves (*Gua baari*) (iii) banana groves (*Kola baari*) (iv) vegetable garden (*Sabje baari*), (v) dense or extended zones. The betel, banana and bamboo groves are so named as they are usually dominated by or composed of pure stands of betel, banana and bamboo. The dense or forest zones were usually composed of a mixture of trees, including wild/rare trees. Such zones fulfil a number of needs of families, ranging from fodder, fuelwood, timber, etc. These zones are also important from the viewpoint of conservation. The betel groves, banana groves and vegetable gardens were usually located near the house for ease of management and harvest. Areca nut constituted the most important component of larger homegardens. Because of its commercial importance, areca farming is practised in most homegardens represented as betel zones. Also, banana is cultivated for commercial benefit in banana zones. It is important to note that a tendency was observed among the larger homegarden owners (<1 ha) to allot more land, especially portions from the dense zones to areca nut cultivation. Even though diversity in such homegardens is remarkable, there is a chance that in future such commercialization of areca nut may reduce species diversity of homegardens. Kumar *et al.*⁷, also observed the adverse effects of 'teak boom' on the species diversity of homegardens in Kerala. Other zones identified in homegardens included the yard, the fence, which in many cases was composed of species like *A. catechu*, *Erythrina variegata*, *Jathropha curcas*, *Moringa oleifera* and *Spondias pinnata*, which serve as poles for fencing or even as live fencing to demarcate the boundary of households. Many of the species were reported to have medicinal properties, which are retained in the traditional knowledge of the people. Similar reports of live fencing have also been made by other workers^{7,27}. Another important zone was the religious zone, which includes the religious place surrounded by sacred trees like *Aegle marmelos*, *Ficus* sp., *Terminalia arjuna*, etc. and ornamentals. *Ocimum sanctum* was found to be a common religious plant in all homegardens. Mendez⁶, in his study of Nicaraguan home-

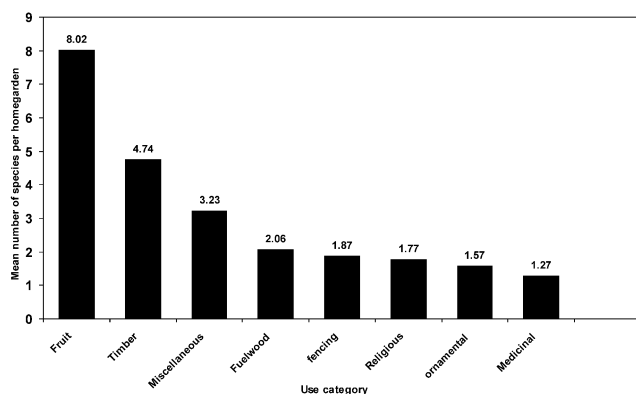
gardens, recorded a total of ten management zones, including the zone of fruit trees and multipurpose trees. In the present study, however, there was no separate zone for fruit trees, which are usually grown scattered in the boundary of the homegarden or grown mixed in the betel or banana zone. Also majority of the trees with multipurpose uses such as timber, fuelwood, etc. were usually grown in the forest zones. All homegardens had a minimum of three zones in contrast to two zones recorded by Mendez⁶. The betel, banana, religious, vegetable and bamboo zones were most frequent in homegardens.

The species relative importance values (RIV; Table 1) show that the most dominant components in homegardens were *A. catechu* (52.7%), *Musa* sp. (22.2%), *A. heterophyllum* (9.4%) and *M. indica* (9.3%). Other important species of homegardens include *T. ciliata*, *Psidium guajava*, *Carica papaya*, *Citrus maxima* and *Cocos nucifera*. The species that have multiple uses as well as commercial importance showed higher RIV due to higher prevalence in homegardens. In another study in Sri Lanka, Perera *et al.*¹⁸ recorded *A. heterophyllum* and *C. nucifera* as the most dominant component with highest RIV value. In the present study, although *A. heterophyllum* is a dominant component of most homegardens, due to commercialization the density and frequency of areca nut is much higher, making it the most common species with higher RIV value. However, as in the other study, trees were the dominant life form. Among the bamboo species *B. cacharensis* had the highest RIV followed by *Schizostachyum dulooa* and *Melocanna baccifera*.

Villagers plant trees mainly for household consumption and income. In Bangladesh, trees are mainly planted by farmers to generate income and for the purpose of household consumption in the form of fruits, firewood, etc.²⁸. Enumerated tree species in the homegardens include those supplying food, cash, fuelwood, timber, shade, fencing and medicine, among which majority are indigenous and some might even be 'Cinderella' tree species²⁹. Eight major plant use categories were identified in homegardens. Figure 3 shows the mean number of species in each use category per homegarden, with the dominant one being the fruit category, followed by timber and miscellaneous. At least three of all the plant use categories were found in 78% homegardens – fruits, timber and fencing. It is relevant to mention here that many of the timber and fruit trees grown in homegardens were also used for fuelwood purpose. Fruit trees were dominated by *A. heterophyllum* and *M. indica*. In the timber category, the most dominant were *T. ciliata* and *S. cuminii*. In addition to providing food, some fruit trees are multipurpose and play an important role during festivals and in rituals²⁷. Examples of such trees include *A. marmelos*, *C. nucifera*, *M. indica*, etc. Miscellaneous use category which includes species used for boat-making, and which yield perfumes, resins, fibre, cane, etc. was mainly composed of plants like *Aquilaria malaccensis*, *Bombax ceiba*, *L. speciosa*, *S. villosa*, *Vatica lanceae-*

Table 1. Relative importance values (RIV) of dominant homegarden plants

Frequency of occurrence (%)	Species	Life form	Use	RIV (%)
90 (very common)	Beetel (<i>Areca catechu</i>)	Palm	Fruit/cash	52.73
	Banana (<i>Musa</i> sp.)	Tree	Fruit/cash	22.24
	Jack fruit (<i>Artocarpus heterophyllus</i>)	Tree	Multipurpose	9.37
	Mango (<i>Mangifera indica</i>)	Tree	Multipurpose	9.32
70–90 (common)	Cedrela tree (<i>Toona ciliata</i>)	Tree	Timber	6.66
	Guava (<i>Psidium guajava</i>)	Tree	Fruit	5.08
	Shaddock (<i>Citrus maxima</i>)	Tree	Fruit	4.82
	Papaya (<i>Carica papaya</i>)	Tree	Fruit	4.92
	Bamboo sp.			
	<i>Bambusa cacharensis</i>			100.34
	<i>Schizostachyum dulooa</i>			27.41
	<i>Melocanna baccifera</i>			24.66
	<i>Bambusa vulgaris</i>			22.42
	<i>Bambusa balcooa</i>			21.77
	<i>Bambusa nutans</i>			3.40

**Figure 3.** Mean number of species per use category per homegarden.

folia, etc. Millat-e-Mustafa *et.al.*²⁷, in their study on Bangladesh homegardens, recorded a total of seven primary use categories, with fruit trees as the dominant use component.

An important characteristic of the homegardens was the predominance of indigenous fruit trees. Gajaseneni and Gajaseneni, in their study on³⁰ homegardens of Thailand, also reported the dominance of fruit trees. The fruit trees make an important contribution to the nutrition of households^{31,32}. Among the fruit trees importance is given to *A. heterophyllus* and *M. indica*. Villagers cultivate different varieties of *A. heterophyllus* and *Musa* sp. Besides the common fruit trees, villagers also greatly value certain wild/ lesser known fruit trees such as *A. chama*, *A. lakoocha*, *Garcinia* sp., *Licuala peltata*, etc. and manage them for

food, timber, cash, etc. Fruit trees not only provide food during their life span but also the final harvest of timber generates a cash income. Many species in homegardens are used as fuelwood (e.g. *Macaranga* sp. and *Myrsine* sp.) and it is important to note that growing such species would lessen the pressure on nearby forests. In Kerala, fuelwood plants from homegardens account for 72% of the total fuelwood supply⁷. Certain species in homegardens are also a source of lesser-known uses, for example, the plant *L. speciosa* was reported by the villagers to be used in boat-making. The diversity and species composition of homegardens depend on requirements of the families, preferences and knowledge about use of the species. The diversity of plants maintained in homegardens serves as a source of cash generation during emergency. There were instances when villagers had to sell high-quality timber trees from their gardens to generate quick cash. Bamboo forms an important component of the farming system in the study area and is often managed in a separate zone or land known as bamboo groves (*Bansh tilla*). Kumar³³ mentioned that bamboo resources in Kerala homegardens were dwindling; however, in our study bamboo was found to be present in all homegardens. Based on their utility and preference, farmers have prioritized *B. cacharensis* with multiple uses (construction, agricultural and fishing implements; Figure 4). Many of the products from this bamboo are sold in local markets as a source of additional income. This is followed by *B. vulgaris* and *B. balcooa*, which are also important raw material for paper industry, besides having other uses.

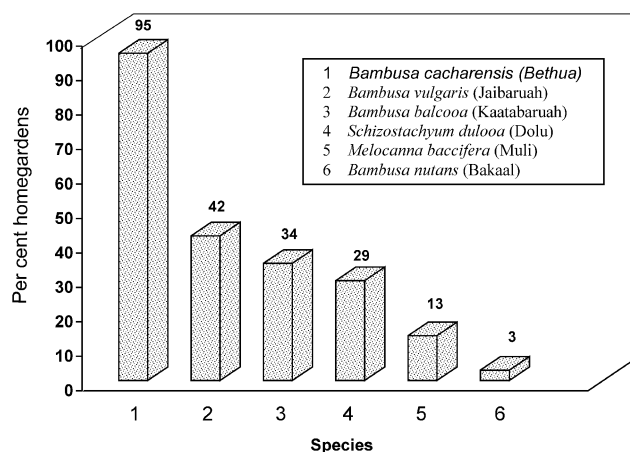


Figure 4. Distribution of village bamboos in homegardens.

Homegardens are important sites for *in situ* conservation of plant diversity^{18,30,34} and can also serve as gene pools for the eroding indigenous tree species. Many wild, rare tree species like *A. malaccensis* and *V. lanceaefolia* are also conserved in homegardens because of their high commercial value. It is to be mentioned that the management of *A. malaccensis* in homegardens is often used as an indicator of social status among the villagers. The social status and high commercial value of *A. malaccensis* acts as a coercion factor for domestication of the species. It was observed that there is an increasing interest towards the cultivation of the plant among villagers in the study area. In Konyak homegardens of Nagaland, Konyak Nagas successfully domesticate *Aquilaria agallocha*¹⁰. Other important rare species conserved include *Caryota urens* and *Licuala peltata*. Homegardens are also the sites for the preservation of underutilized edible species like *Baccaurea sapida*, *Flacourtia jangomus*, *Garcinia* sp., *Meyna spinosa* and *S. pinnata*. Certain plants like *Streblus asper* are managed in homegardens because of their value as a religious and medicinal tree. This species has medicinal properties and

is highly valued for its antiallergenic properties³⁵. An important characteristic of homegardens studied is the presence of several *Albizia* sp. Being involved in tea garden, villagers have special interest in growing various *Albizia* sp. like *Albizia lebbek*, *A. procera*, etc. which are nitrogen-fixers. Many villagers are aware about the fertility being maintained through the litters of these species, which needs further study. In this context, villagers had indicated the importance of *Erythrina* litters in improving soil fertility. The authors, in a separate study, are evaluating the ecological role, besides social and economic role of many other tree species in homegardens.

The homegardens of the study area like other tropical homegardens were found to be food-producing subsistence-farming systems. The high diversity and complexity in the structure of homegardens fulfil a range of social, economic and ecological functions. The technique of management and high diversity of homegardens reflect the wisdom of traditional culture and ecological knowledge that have evolved over the years. 'Conservation through use'³⁶ approach in homegardens is an element of a complementary conservation strategy. There is an urgent need to strengthen and document such traditional systems of natural resource management for economic viability, ecological sustainability and social acceptability. In this context, it is pertinent to mention the initiative of preparing a 'Peoples Biodiversity Register'^{37,38}, with the objective of documenting and preserving biodiversity and related knowledge of the people. The utilization of village bamboos, a keystone resource selected by the small-holder farmers for its socio-economic and ecological importance, needs to be strengthened for diversification of products through value addition³⁹. This would provide opportunities for development of small-scale rural industries and create off-farm employment and marketing opportunities^{3,40}. It is relevant to mention in this context the suggestion of Garrity⁴¹ that 'only when rural people and poor farmers have a way to earn sustainable, stable livelihoods will the planets' biodiversity be safe'⁴¹.

Appendix. Plant species inventoried in homegardens, including their local name and common uses

Species	Family	Common name	Local name	Use
Trees				
<i>Acacia auriculiformis</i> A. Cunn.	Leguminosae	Australian wattle		Ornamental, timber, nitrogen-fixer
<i>Acacia nilotica</i> (L.) Willd. ex Delile	Leguminosae	Babul	Babul	Ornamental, timber, nitrogen-fixer
<i>Adenanthra pavonina</i> L.	Leguminosae	Bead tree	Roti gaach/saada chandan	Timber, ornamental, seeds used as weights by jewellers
<i>Aegle marmelos</i> (L.) Corr.	Rutaceae	Bel	Bael	Religious, medicinal, fruit, cash
<i>Albizia lebbek</i> (L.) Benth.	Leguminosae	Kokko	Assame siris	Timber, nitrogen-fixer, shade tree
<i>Albizia odoratissima</i> Benth.	Leguminosae	Black siris	Kala siris	Timber, nitrogen-fixer, shade tree
<i>Albizia procera</i> (Roxb.) Benth.	Leguminosae	White Siris	Loha siris	Timber, nitrogen-fixer, shade tree
<i>Alstonia scholaris</i> (L.) R. Br.	Apocynaceae	Devils' tree	Chatim	Medicinal, timber, twig used as toothbrush
<i>Annona reticulata</i> L.	Annonaceae	Custard apple	Aata	Medicinal, fruit, fuelwood
<i>Aquilaria malaccensis</i> Lamk.	Thymelacaceae	Eagle wood	Agar	Fragrance oil, timber, religious
<i>Areca catechu</i> L.	Palmae	Betel nut	Supari	Masticatory, timber, leaf for fencing, cash

(contd...)

Appendix. (Contd...)

Species	Family	Common name	Local name	Use
<i>Artocarpus chama</i> Buch-Hum.	Moraceae	Chaplash	Sonapati chaam	Fruit, timber, boat-making, agricultural implements
<i>Artocarpus heterophyllus</i> Lamk.	Moraceae	Jackfruit	Kaathal	Fruit, vegetable, timber, fodder, cash, agricultural implements
<i>Artocarpus lakoocha</i> Roxb.	Moraceae	Monkey jack	Dewachaam	Fruit, timber
<i>Azadirachta indica</i> A. Juss.	Meliaceae	Neem	Neem	Medicinal, religious, timber
<i>Baccaurea ramiflora</i> Lour.	Euphorbiaceae		Bhubi	Fruit, fuelwood
<i>Bambusa cacharensis</i> Majumdar	Poaceae	Bamboo	Bethua	Construction, agriculture, fishing implements, roofing and fencing
<i>Bambusa balcooa</i> Roxb.	Poaceae	Bamboo	Kaata baruah	Construction, paper-making
<i>Bambusa nutans</i> Wall. ex Munro.	Poaceae	Bamboo	Bakaal	Construction
<i>Bambusa vulgaris</i> Schrader.	Poaceae	Bamboo	Jai baruah	Construction, fencing, paper-making
<i>Barringtonia acutangula</i> (L.) Gaertn.	Barringtoniaceae	Hijal	Pani Hijal	Fuelwood, boat-making, small timber
<i>Bauhinia</i> sp.	Leguminosae		Kanchan lakri	Timber, fencing, nitrogen-fixer
<i>Bombax ceiba</i> L.	Bombaceae	Silk cotton	Semul tula	Timber, fibre, cash
<i>Carica papaya</i> L.	Caricaceae	Papaya	Papaya	Fruit, vegetable, medicinal, cash
<i>Caryota urens</i> L.	Arecaceae	Toddy palm	Chaal gua	Timber, fruit
<i>Cassia siamea</i> Lamk.	Leguminosae	Kassod tree	Siris	Timber, ornamental, shade tree
<i>Cinnamomum tamala</i> Nees. and Eberm.	Lauraceae	Indian cassia	Tejpata	Spice, cash
<i>Citrus limon</i> (L.) Burm.	Rutaceae	Lemon	Nimbu	Fruit, medicinal
<i>Citrus maxima</i> (Burm.) Merril.	Rutaceae		Jambura	Fruit, fuelwood, cash
<i>Citrus medica</i> L.	Rutaceae	Citron	Jamir	Fruit, medicinal
<i>Citrus reticulata</i> Blanco.	Rutaceae	Orange	Komla	Fruit, fuelwood, cash
<i>Cocos nucifera</i> L.	Arecaceae	Coconut	Narikal	Fruit, timber, medicinal, leaf for fencing, cash
<i>Crataeva nurvala</i> Ham.	Capparidaceae		Barun	Timber
<i>Cynometra polyandra</i> Roxb.	Leguminosae		Ping	Timber, religious
<i>Delonix regia</i> (Boj.) Raf.	Leguminosae	Gold mohur	Krishna chura	Ornamental, timber
<i>Derris robusta</i> (DC.) Benth.	Leguminosae		Kesiyar siris	Fencing, shade tree
<i>Dillenia indica</i> L.	Dilleniaceae	Elephant apple	Chailta	Fruit, medicinal, small timber
<i>Ehretia acuminata</i> R.Br.	Ehretiaceae	Kodo wood	Kaala huja	Timber
<i>Elaeocarpus floribundus</i> Bl.	Elaeocarpaceae	Olive	Jalpui	Fruit
<i>Embllica officinalis</i> Gaertn.	Euphorbiaceae	Indian gooseberry	Amla	Fruit, medicinal, small timber
<i>Erythrina variegata</i> L.	Leguminosae	Coral tree	Madar/farad	Fencing, timber, nitrogen-fixer, medicinal
<i>Eucalyptus citriodora</i> Hook.	Myrtaceae	Eucalyptus	Vicks	Timber, essential oil
<i>Ficus bengalensis</i> L.	Moraceae	Banyan tree	Bot	Religious, timber
<i>Ficus hispida</i> L.	Moraceae		Dumur	Fuelwood, fodder
<i>Ficus racemosa</i> L.	Moraceae		Jogya dumur	Fuelwood, fodder
<i>Gmelina arborea</i> Roxb.	Verbenaceae	Gamari	Gambhar	Timber, fodder
<i>Garcinia</i> sp.	Guttiferae		Sakhrol	Fruit, fuelwood
<i>Kayea floribunda</i> Wall.	Guttiferae		Korol	Timber
<i>Lagerstroemia speciosa</i> (L.) Pers.	Lythraceae	Queen crape-myrtle	Jarul	Timber, boat-making, agricultural implements
<i>Licuala peltata</i> Roxb.	Arecaceae		Chophi	Leaf fencing, fruit, small timber
<i>Litchi chinensis</i> Sonner.	Sapindaceae	Litchi	Lechu	Fruit, timber, fuelwood, cash
<i>Lindera</i> sp.	Lauraceae		Bot sundhi	Timber,
<i>Litsea</i> sp.	Lauraceae		Sundhi	Timber, boat-making, agricultural implements
<i>Litsea salicifolia</i> (Roxb. ex Wall.) Hook.	Lauraceae		Tejpat sundhi	Timber, fuelwood
<i>Mangifera indica</i> L.	Anacardiaceae	Mango	Aam	Fruit, timber, religious, cash
<i>Macaranga</i> sp.	Euphorbiaceae		Mali	Fuelwood
<i>Melia azedarach</i> L.	Meliaceae	Persian lilac	Bukam	Timber, fuelwood, fodder
<i>Melocanna baccifera</i> (Roxb.) Kurz.	Poaceae	Bamboo	Muli	Construction
<i>Meyna spinosa</i> Roxb. ex Link.	Rubiaceae		Monphol	Fruit, fuelwood, medicinal
<i>Mitragyna rotundifolia</i> (Roxb.) O. Kurtze.	Rubiaceae		Karam	Religious, timber
<i>Moringa oleifera</i> Lam.	Moringaceae	Drumstick tree	Sajna	Fruit, vegetable, fencing, medicinal
<i>Musa</i> sp.	Musaceae	Banana	Kola	Fruit, religious, cash
<i>Oroxylum indicum</i> (L.) Vent.	Bignoniaceae		Nauka lakri	Fuelwood
<i>Parkia roxburghii</i> G. Don	Leguminosae		Longchak	Fruit as vegetables
<i>Plumeria rubra</i> L. var. <i>acutifolia</i> (Poir.) Bailey	Apocynaceae		Kaathali champa	Ornamental
<i>Psidium guajava</i> L.	Myrtaceae	Guava	Sophre	Fruit, fuelwood

(contd...)

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Appendix. (Contd...)

Species	Family	Common name	Local name	Use
<i>Sapindus mukorossi</i> Gaertn.	Sapindaceae	Soapnut tree	Sabunphol	Timber
<i>Sapium</i> sp.	Euphorbiaceae		Bolosh	Timber for pools and construction
<i>Schizostachyum duloa</i> (Gamble) Majumdar	Poaceae	Bamboo	Dolu	Fencing and roofing
<i>Semecarpus anacardium</i> L.f.	Anacardiaceae	Marking nut	Bhela	Timber, fuelwood, dye
<i>Spondias pinnata</i> (L.) Kurz.	Anacardiaceae	Hogplum	Amra	Fruit, fencing, medicinal
<i>Sterculia foetida</i> L.	Sterculiaceae		Jungli badaam	Timber, fuelwood
<i>Sterculia villosa</i> Roxb.	Sterculiaceae		Udaal	Fibre, timber, dye
<i>Stereospermum</i> sp.	Bignoniaceae			Timber, fodder
<i>Streblus asper</i> Lour.	Moraceae		Sheora	Religious, medicinal, twig used as toothbrush
<i>Syzygium cumini</i> (L.) Skeels.	Myrtaceae	Java plum	Jaam	Fruit, timber, fodder
<i>Syzygium jambos</i> (L.) Alston.	Myrtaceae	Rose apple	Gulaab jaam	Fruit, timber
<i>Tamarindus indica</i> L.	Leguminosae	Tamarind	Tetul	Fruit, timber
<i>Tectona grandis</i> L.	Verbenaceae	Teak	Shegun	Timber
<i>Terminalia arjuna</i> (Roxb.) Wight and Arn.	Combretaceae	Arjun	Arjun	Religious, medicinal
<i>Terminalia chebula</i> Retz.	Combretaceae	Chebulic	Hurtuki	Religious, medicinal, timber
<i>Tetrameles nudiflora</i> R. Br.	Tetramelaceae	Myrobalan	Golgol tula	Timber
<i>Toona ciliata</i> M. Roem.	Meliaceae		Kuma	Timber, fodder, fuelwood, agricultural implements
<i>Vatica lanceaefolia</i> Bl.	Dipterocarpaceae	Indian mahogany	Dhuna	Aromatic oleoresins, timber
<i>Vitex</i> sp.	Verbenaceae		Awal	Fuelwood, boat-making, agricultural implements
<i>Zanthoxylum limonella</i> (Dennst.) Alston.	Rutaceae		Bajrang	Timber, cork from base of prickles of trunk made into gambling articles
<i>Ziziphus mauritiana</i> Lamk.	Rhamnaceae	Indian jujube	Boroi	Fruit, fuelwood
Shrub				
<i>Adhatoda vasica</i> Nees.	Acanthaceae	Malabar nut	Vaasak	Medicinal, fencing
<i>Bougainvillea spectabilis</i> Willd.	Nyctaginaceae		Kagaaze phul	Ornamental
<i>Caesalpinia pulcherrima</i> Swartz.	Leguminosae			Ornamental
<i>Calamus</i> sp.	Arecaceae		Sundhi beth	Religious, cane
<i>Calamus tenuis</i> Roxb.	Arecaceae		Jali beth	Cane
<i>Cajanus cajan</i> (L.) Millsp.	Leguminosae		Arhar dal	Fruit, vegetable, fencing
<i>Callistemon linearis</i> DC.	Myrtaceae		Brush phul	Ornamental
<i>Calotropis gigantea</i> R. Br.	Asclepiadaceae		Akond	Medicinal
<i>Catharanthus roseus</i> (L.) G. Don.	Apocynaceae		Nayantara	Ornamental
<i>Clerodendron infortunatum</i> L.	Verbenaceae		Bhetkon	Pesticide
<i>Citrus aurantifolia</i> (Christm.) Swingle.	Rutaceae		Kaagzi nimbu	Fruit
<i>Daemonorops jenkinsianus</i> Mart.	Arecaceae		Golla beth	Cane
<i>Eupatorium odoratum</i> L.	Compositae		Bhut palai	Medicinal, religious
<i>Euphorbia nerifolia</i> L.	Euphorbiaceae		Munsa sij	Medicinal
<i>Ervatamia coronaria</i> (Jacq.) Stapf.	Apocynaceae		Togor	Ornamental
<i>Flacourtia jangomus</i> (Lour.) Raesch.	Flacourtiaceae	Puneala	Lukluki	Fruit, fuelwood
<i>Gardenia jasminoides</i> Ellis.	Rubiaceae	Crape-jasmine	Gandharaaj	Ornamental
<i>Gossypium herbaceum</i> L.	Malvaceae	Cotton tree	Kapaash	Fibre
<i>Hibiscus mutabilis</i> L.	Malvaceae	Cotton rose	Sthal padda	Ornamental
<i>Hibiscus rosa sinensis</i> L.	Malvaceae	Hibiscus	Jaba	Ornamental, medicinal
<i>Ixora coccinea</i> L.	Rubiaceae	Ixora	Rangan	Ornamental, fencing
<i>Jatropha curcas</i> L.	Euphorbiaceae	Physic nut	Bherenda	Fencing, medicinal
<i>Lantana camara</i> L.	Verbenaceae	Wild sage		Ornamental, fencing
<i>Melastoma malabathricum</i> L.	Melastomaceae		Nishi	Fuelwood, twigs used as toothbrush, traditional pesticide
<i>Morinda angustifolia</i> Roxb.	Rubiaceae		Bamon lakri	Medicinal
<i>Myrsine</i> sp.	Myrsinaceae		Phutphute lakri	Fuelwood
<i>Nyctanthes arboritrists</i> L.	Verbenaceae	Jasmine	Shefali	Ornamental
<i>Ocimum basilicum</i> L.	Labiatae	Sweet basil	Kaala tulsi	Medicinal
<i>Ocimum sanctum</i> L.	Labiatae	Holy basil	Tulsi	Religious, medicinal
<i>Piper betle</i> L.	Piperaceae	Betel vine	Pan	Leaf used as masticator
<i>Punica granatum</i> L.	Punicaceae	Pomegranate	Dalim	Fruit, fuelwood, medicinal
<i>Rosa indica</i> L.	Rosaceae	Rose	Gulab	Ornamental
<i>Saccharum officinarum</i> L.	Poaceae	Sugarcane	Ganna	Fruit
<i>Tephrosia candida</i> (Roxb.) DC.	Leguminosae	White tephrosia	Metna siris	Fencing, nitrogen-fixer
<i>Thevetia peruviana</i> (Pers.) K. Schum.	Apocynaceae	Yellow oleander	Kolke phul	Ornamental
<i>Saccharum officinarum</i> L.	Poaceae	Sugarcane	Ganna	Fruit

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