

Plant Diversity and Utilization Patterns of Selected Home Gardens in Kollam, Kerala:

A Case Study for Food and Ecological Security in Response to Covid -19 Pandemic

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Abstract

The present study revealed that home gardens of Kollam district of Kerala are having diverse plant resources of both ecological and economic significance. A preliminary vegetation survey was conducted in 10 different home gardens in Kollam district of Kerala. A total of 239 plant species belonging to 202 genera and representing 83 families was encountered from 10 home gardens consisting of 60 trees 25 shrubs and 154 herbs excluding cultivars of *Musa* and *Hevea* spp. The different category of plants studied were 156 ornamental plants, 27 fruits yielding plants, 30 species of vegetables, 150 species of medicinal plants, 24 species of timbers, 16 species of fuel woods, 18 species of spices and 10 species of miscellaneous plants. Among them, the plants enlisted includes IUCN, RETc ategory and endemic species like *Baccourea courtalensis*, *Vateria indica*, *Woodfordia fruticosa*, *Saraca asoka* and *Elaeocarpus ganitrus*. Hence, it is necessary to study in detail whether home gardening in Kerala can be a viable mechanism for biodiversity/ex-situ conservation of agricultural biodiversity. Further, such home gardening can play an important role in advancing food and nutritional security during and after the Covid-19 pandemic and also strengthening the provisioning of numerous ecosystem services in conserving the Biodiversity.

Key words: Ex-situ conservation, Home gardens, Ago-biodiversity

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1. Introduction

Home gardens play an important role in conserving agro-biodiversity, they serve as refuges for crops and wild varieties that were once more widespread in the larger agro-ecosystem. There is an increasing interest in Home Gardens (HGs) as biodiversity hot spots. Also, there is increasing evidence that traditional agroforestry systems (on-farm Conservation) stand as a promising option to conserve it [1]. However, knowledge on how sociocultural characteristics and environment influence knowledge and management of HG species is still limited. Home gardens play an important role in conserving agro-biodiversity [2]. However, the importance of home gardens in the production of food, medicine and timber categories were the most frequent component followed by fruits, timber and vegetables and other useful products for human beings. In many places across the world, home gardening is a traditional conservation system. Where some key versatile plant species are grown by local farmers near their houses [3]. Webb and Kabir [4] reported the home gardening for tropical biodiversity conservation and examined whether home gardening is viable conservation option-even it is an option of 'last resort' in degraded landscapes. Home gardening, the agroforestry practice of planting comprises a mixed patch of livelihood-oriented perennial and annual species with in a clearly bounded area homestead [5]. Home gardens also serve as sink of carbon, thereby playing an ecological role in the current global climate change scenario [6]. Home gardens can also serve as buffer zones around protected areas. Farmers often use home gardens as site for experimentation and introduction of new cultivars arising from exchange and interactions between cultures and communities, or as sites for domestication of wild species. In the present scenario a major challenge created by the Covid-19 pandemic is disrupting access to fresh and nutritious food at affordable prices to large and growing urban population. The problem is worsened by the lack of or weak infrastructure and poor institutional support. Thus, there is a need to adopt more resilient food systems, reduce food waste along the supply chain, and strengthen the growth of local agricultural capabilities through home gardening and urban agriculture.

There is a lack of information and documentation on the traditional home gardens of Kollam district of Kerala. Therefore the present study was carried out on the home garden species diversity and floristic composition and utilization pattern in and around Kollam in the selected ten homes these home gardens farming system will provide fresh vegetables and fruits leading to enriched and balanced diets supplementing proteins vitamins and minerals

[7]. Through supply of medicinal herbs and an opportunity for physical activity, home gardens are also important to human health and wellbeing. Home gardens can improve food security, diversity, nutritious value, and the microenvironment around the family home.

2. Materials and methods

In the present study, the Home gardens were surveyed in and around Kollam district for the floristic composition and the uses of plants in these home gardens and their conservation were conducted in ten home gardens from Kollam corporation and different Panchayaths such as Sasthamkotta, Perayam, Nedumpana, Thrikkovilvattom, Kalluvathukkal, Ezhukone and Aadichanalloor of Kollam district (latitude $10^0 00^1$ N & longitude $76^0 25^1$ E) (**Figure 1**) In the study sites the plant species were observed in the site itself and photographs were taken for the identified. The habits of individual species such as herb, shrub, trees and climbers are recorded. Information regarding utilization pattern of home garden plants were collected by the interaction with the house owners, focusing on: (i) Selection of home garden plants, (ii) utilization pattern of available plant species, and (iii) Traditional management practice for conservation of endemic, Rare, Endangered and Threatened (RET) species. The economically important plants were then classified into different use categories such as Fruits, medicinal, ornamental, timber, vegetables, fuels and miscellaneous. Study were conducted in ten individual homes, the house owners name and location, address and extent of area are furnished. The study sites were noted as 1-10. Figure 1 shows the study sites in Kollam, Kerala.

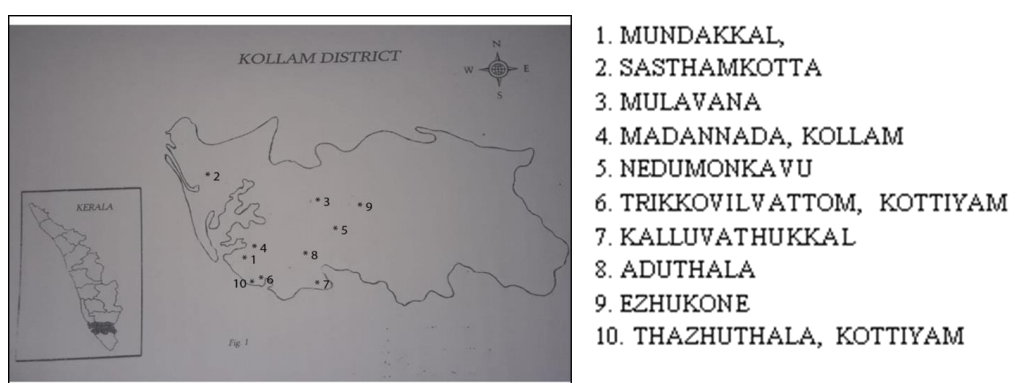


Figure 1. The study sites in Kollam, Kerala.

3. Results and discussions

A total of 239 plant species belonging to 202 genera and representing 83 families was encountered from ten home gardens consisting of 60 trees, 25 shrubs and 154 herbs excluding cultivars of *Musa*. Although the number of trees, documented was higher than shrubs and herbs. The different use category plants are studied, including 156 ornamental plants, 27 fruits yielding plants, 30 species of vegetables, 150 species of medicinal plants, 24 species of timbers, 16 species of fuel woods, 18 species of spices and 10 species of miscellaneous plants are presented. Similar studies were reported on Floristic composition and plant utilization pattern in home gardens of Upper Assam was reported [8, 9]. These small scale home gardens can produce high crop yields of fruits and vegetables through judicious management of inputs needed for achieving sustainability [10]. Agro biodiversity is a confluence of the past, present and future and both tangible and intangible resource critical for both rural and urban food and nutrition security and also the agro biodiversity has a critical role in play in dealing with the issue of under nutrition and hence dynamic conservation of agro biodiversity needs to be alleviating poverty and malnutrition [11].

The majority of home gardens species are useful for different purposes. Plants of ornamentals, medicinal uses, fruits, spices, vegetables timbers, miscellaneous and fuel wood were categorized. The minimal use categories were fuel wood and miscellaneous. Occurrence percentage of different plant species in each category varied among different home gardens. *Mangifera indica*, *Artocarpus heterophyllus*, *Cocos nucifera*, *Azadirachta indica*, *Aloe vera* and *Simaruba glauca* were the common tree species in the study sites than the others. Medicinal plants having different curative properties, were abundant in all the home gardens. Among the most important were *Azadirachta indica*, *Zingiber officinalis*, *Catharanthus roseus*, *Oscimum sanctum* and *Aloe vera*. Most common ornamental plants were *Jasminum sambac*, *Hibiscus rosa-sinensis*, *Catharanthus roseus* and *Portulaca grandiflorum*. Fruits such as *Musa paradisiaca*, *Mangifera indica*, *Artocarpus heterophyllus* and *Anona muricata* were also common. Timber plants, which were commonly found includes *Tectona grandis*, *Swietenia macrophylla*, *Artocarpus hirsutus* and *Artocarpus heterophyllus*. Fuel plants include *Macaranga pelatata*, *Ailanthus excelsa*, *Hevea brasiliensis* and *Cocos nucifera*. Finally, the Spices include

Curcuma longa, *Zingiber officinalis*, *Tamarindus indica*, *Garcinia gummi-gutta*, *Piper nigrum* etc.

However, the percentage of different use category of plants was narrated in the **Figure 2** and shows highest number of ornamental plants followed by medicinal plants. The plant species shown were 12.55 per cent vegetables and 11.29 percent fruits which exhibit high nutritional and economic significance during the Covid-19 pandemic scenario.

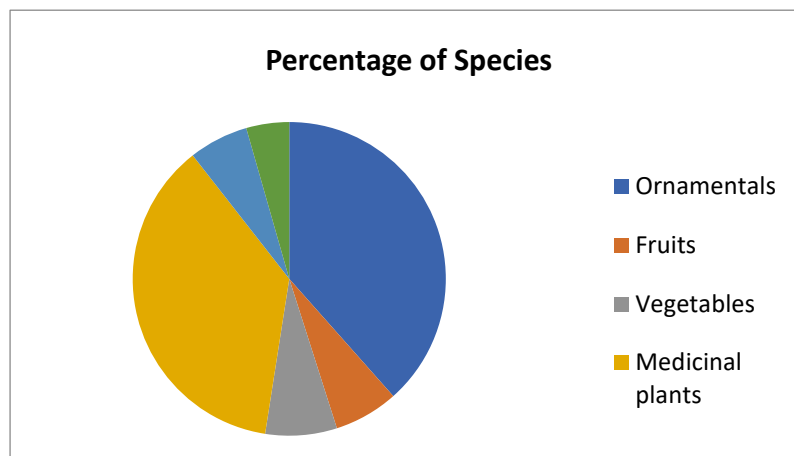


Figure 2. Percentage of species in different use categories in the selected home gardens.

Among the total number of plant species (239) the percentage of occurrence of different habits was not uniform. Maximum percentage i.e., 64.43 % of herbs followed by 25.10 % trees (excluding the cultivars of *Musa* and *Heavea* spp) and minimum of 10.46 % of shrubs (**Figure 3**).

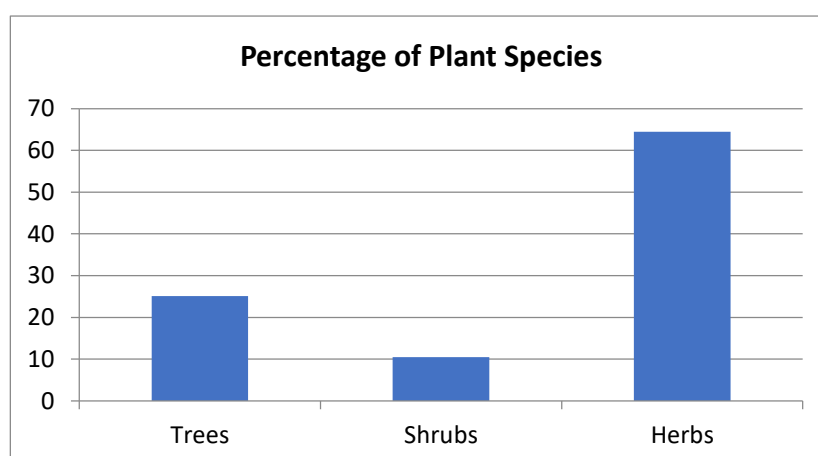


Figure 3. Percentage of species in different growth habits in the selected home gardens.

The importance of home gardens in the production of food, medicine and other useful products for human beings is widely recognized. About 30 species of vegetable and 27 species of fruit yielding crops and 150 medicinal plants were reported in the present study. In addition to increasing access to fresh and nutritious food, home gardens also strengthen supporting, provisioning, regulating, and cultural/social ecosystem services. Site-specific examples of these ecosystem services include: 1) soil formation and primary production for supporting services, 2) food, fiber, fresh water and infra-structure foundation of provisioning services, 3) micro-climate modification, flood control, water purification, soil bioremediation and decontamination for regulating services, and 4) aesthetical, spiritual, recreational, and social for cultural services [12]. More over the percentage of endemic plants (native plants) is higher (which is about 29%) in all sites, non-native plants was higher in ornamental plants (which is about 71 %). Most importantly conservation of IUCN Red listed rare plant species such as *Saraca asoka*, *Woodfordia fruticosa*, *Elaeocarpus ganitrus*, *Vateria indica* are well conserved and signify home gardens as a store house of rare plant genetic resources. In the present study indicates that the home gardens may be the possible option to maintain species ex-situ like a wild edible fruit tree *Baccourea courtallensis* (Mooti pazham) previously found in forests domesticated in the home gardens. In this context, this study focuses on *ex situ* conservation of agro-biodiversity in those small but highly diversified ecological niches generally known as home gardens.

Proper nutrition is vital to maintain good health with stronger immune system. A balanced diet will guarantee a strong immune system that can help to withstand any assault by the virus. Agro biodiversity has a critical role in maintaining nutritional security. Growing tubers is a common practice in home gardens of Kerala such as *Dioscorea alata* (Greater yam/kachil), *Amorphophallus paeoniifolius* (Elephant yam/chena), *Colocasia esculenta* (Chembu), *Manihot esculenta* (Marachini/Tapioca) and these tubers are widely used as famine food with chilly chatni (side dish). Then eat fresh vegetables available in home gardens like *Abelmoschus esculentus* (Okra), *Solanum melogena* (Brinjal), *Solanum lycopersicum* (tomato) and different varieties of chillies like *Capsicum frutescences*, *Capsicum annuum*, *Capsicum chinense*. A combination of *Capsicum frutescences* with tuber is traditional healthy food in Kerala. At last, fruit varieties like *Ananas comosus* (pineapple), *Mangifera indica* (Mango), *Annona muricata* (Mullatha) and varieties of banana such as *Musa velutina*, *Musa*

sapientum, *Musa acuminata* and *Musa paradisiaca*. In the current pandemic situation, the specific fruit, vegetable, and tuber varieties can improve our immune system to combat Covid-19.

Table 1. Species occurrence and their distribution level in selected home gardens of Kollam.

Sl. No.	Species	Samples of Home Gardens (GH)										Percentage distribution (%)
		HG 1	HG 2	HG 3	HG 4	HG 5	HG 6	HG 7	HG 8	HG 9	HG 10	
	Trees				-							
1	<i>Acras sapota</i>	-	-	-	-	-	-	-	+	-	-	10
2	<i>Aegle marmelos</i>	-	-	-	-	-	-	+	-	-	-	10
3	<i>Alianthus excelsa</i>	-	+	-	-	-	-	-	-	-	-	10
4	<i>Alstonia scholaris</i>	-	-	+	-	-	-	-	-	-	-	10
5	<i>Anacardium occidentale</i>	+	+	+	-	-	-	+	+	-	-	50
6	<i>Annona muricata</i>	+	-	+	-	-	-	+	+	-	-	40
7	<i>Annona reticulata</i>	-	+	-	-	-	-	-	-	-	-	10
8	<i>Annona squamosa</i>	-	-	+	-	-	-	+	-	-	+	30
9	<i>Araucaria heterophylla</i>	-	-	+	-	-	-	-	-	-	-	10
10	<i>Areca catechu</i>	-	-	+	-	-	-	-	-	-	-	10
11	<i>Artocarpus heterophyllus</i>	+	-	+	-	+	+	+	-	+	-	60
12	<i>Artocarpus hirsutus</i>	-	-	+	-	-	-	-	-	-	-	10
13	<i>Averrhoa carumbola</i>	-	+	-	-	-	-	-	-	-	-	10
14	<i>Azadiracta indica</i>	-	-	+	-	-	+	+	+	-	+	50
	<i>Baccouria courtallensis</i>	+	-	-	-	-	-	-	-	-	-	10
15	<i>Bambusa bamboo</i>	-	-	-	+	-	-	-	-	-	-	10
16	<i>Bambusa vulgaris</i>	+	-	+	-	-	-	-	-	-	-	20

17	Carica papaya	+	-	-	-	-	-	-	+	-	-	20
18	Cassia fistula	-	-	+	-	-	-	-	-	-	-	10
19	Ceiba pentandra	-	+	-	-	-	-	-	-	-	-	10
20	Cinnamomum verum	-	-	-	-	-	-	-	+	+	-	20
21	Citrus lemon	+	-	-	-	-	-	+	-	-	-	20
22	Citrus sinensis	+	-	-	-	-	-	-	-	-	-	10
23	Cocos nucifera	+	+	+	+	+	+	+	+	-	-	80
24	Commiphora caudata	-	+	-	-	-	-	-	-	-	-	10
25	Cordyline terminalis	-	-	+	-	-	-	-	-	-	-	10
26	Cycas revoluta	+	-	-	-	-	-	-	-	-	-	10
27	Epipremnum aureum	-	-	+	-	-	-	-	-	-	-	10
28	Ficus bengalensis	-	-	+	-	-	-	-	-	-	-	10
29	Ficus benjamina	-	-	-	-	+	-	-	+	-	-	20
30	Ficus religiosa	+	-	-	-	-	-	-	-	-	-	10
31	Ficus citifolia	+	-	-	-	-	-	-	-	-	-	10
32	Garcinia gummi gutta	-	+	-	-	-	+	+	+	-	-	40
33	Hevea brasiliensis	-	-	-	-	-	-	-	+	-	-	10
34	Macaranga peltata	-	+	-	-	-	-	-	-	-	-	10
35	Mangifera indica	+	+	+	+	+	+	+	+	-	-	80
36	Metrosideros marcopus	-	-	-	-	-	-	+	-	-	-	10
37	Moringa oleifera	-	+	-	-	+	-	-	+	-	-	30
38	Morus nigra	-	+	-	-	-	-	-	-	-	-	10
39	Musa paradisiaca	+	+	+	+	+	+	-	+	+	-	80
40	Nephelium	-	+	-	-	-	-	-	-	-	-	10

	lappeceum											
41	Persea americana	-	-	-	-	-	-	+	-	-	-	10
42	Phyllanthus emblica	-	-	-	-	-	-	-	+	-	-	10
43	Psidium gujava	-	+	+	-	-	-	+	-	+	-	40
44	Punica granatum	-	+	-	-	-	-	-	-	-	-	10
45	Saraca asoka	-	+	-	-	-	+	-	+	-	-	30
46	Simarouba glauca	-	-	+	-	-	-	-	+	-	-	20
47	Strychnus nux - vomica	-	-	-	-	-	-	-	-	+	-	10
48	Swietenia macrophylla	-	+	-	-	+	-	-	+	-	-	30
49	Syzygium malscense	-	-	-	-	-	-	+	-	-	-	10
50	Syzygium samarangense	-	-	-	-	-	-	-	-	-	+	10
51	Tamarindus indica	+	-	-	-	-	-	+	-	-	-	20
52	Tectona grandis	+	+	-	-	+	+	-	+	-	-	50
53	Theobroma cacao	+	-	-	-	-	-	-	-	-	-	10
54	Thespesia populnia	-	+	-	-	-	-	-	-	-	-	10
55	Triphosia trifolia	-	+	-	-	-	-	-	-	-	-	10
56	Vateria indica	-	-	-	-	-	+	-	-	-		
57	Ziziphus mauritiana	-	+	-	-	-	-	-	-	-	-	10
	Shrubs											
58	Allamanda cathartica	+	-	-	-	-	-	-	-	-	-	10
59	Amorphophallus paeoniifolius	-	+	-	-	-	-	-	-	-	-	10
60	Boganvillae glabra	-	-	-	-	-	-	-	-	+	-	10
61	Bougainvillea	-	+	-	-	-	+	-	-	+	+	40

	spectabilis											
62	Caesalpinia pulcherrima	-	-	-	-	-	+	-	-	-	+	20
63	Calotropis gigantea	-	-	-	-	-	-	-	-	-	+	10
64	Chrysanthamum spp	-	-	-	-	-	-	-	+	-	-	10
65	Clitoria ternatea	-	-	-	-	-	-	+	-	-	-	10
66	Coccinia grandis	-	-	-	+	-	-	-	-	-	-	10
67	Codiaeum variegatum	-	+	-	+	-	-	-	-	-	-	20
68	Coffea arabica	-	-	+	-	-	-	-	-	-	-	10
69	Colacasia esculenta	-	+	+	-	-	-	-	-	-	-	20
70	Crossandra infundibuliformis	-	-	+	-	-	-	+	-	-	-	20
71	Cyrtostacys renda	+	-	-	-	-	-	-	-	-	-	10
72	Dracaena reflexa	-	-	+	-	+	-	-	-	-	-	20
73	Duranta erecta	-	+	-	-	+	-	-	-	-	-	20
74	Epiphyllum oxypetalum	-	-	-	-	+	-	-	-	-	-	10
75	Gomphrena globosa	-	+	-	-	-	-	-	-	-	-	10
76	Hamelia patens	-	+	-	-	+	-	-	-	-	-	20
77	Hebiscus rosa sinensis	-	-	+	-	+	+	+	+	+	-	60
78	Heliconia rostrata	-	-	-	-	-	+	-	-	-	-	10
79	Hibiscus malvaviscus	-	-	-	-	-	-	-	-	-	+	10
80	Hibiscus waimeae	-	+	-	-	-	-	+	-	-	-	20
81	Ipomoea batatas	-	-	-	-	+	-	-	-	-	-	10
82	Ixora coccinea	-	-	+	-	+	+	-	+	+	-	50
83	Jasminum spp	-	-	-	-	-	-	-	-	+	-	10

84	Lantana camara	+	-	-	-	-	-	-	-	-	-	10
85	Lawsonia inermis	-	-	-	-	+	-	-	-	-	-	10
86	Manihot esculenta	-	+	+	-	-	+	+	-	+	-	50
87	Momordica charantia	+	-	+	+	-	-	-	+	+	-	50
88	Murraya exotica	-	-	-	-	-	-	-	-	-	+	10
89	Murraya koeingii	-	-	-	+	-	-	-	-	-	+	20
90	Nerium oleander	-	-	-	-	+	-	-	-	+	-	10
91	Passiflora edulis	-	+	-	-	-	-	+	-	-	+	30
92	Persea americana	-	-	-	-	-	-	+	-	-	-	10
93	Piper nigrum	-	-	+	+	+	-	-	+	+	-	50
94	Plectranthus colcoides	-	-	-	-	-	-	+	-	-	-	10
95	Plumeria pudica	-	-	-	-	+	-	-	-	-	-	10
96	Plumeria pudica	-	-	+	-	-	-	-	-	-	-	10
97	Plumeria rubra	-	-	-	-	+	-	-	-	-	-	10
98	Prunus savium	-	-	-	-	-	-	-	-	+	-	10
99	Punica granatum	+	-	-	-	+	-	+	-	-	-	30
100	Sasanqua Camellia	-	-	-	-	-	-	-	-	+	-	10
101	<u>Sesbania grandiflora</u>	-	-	-	-	-	-	+	+	-	-	20
102	Strebulus asper	-	-	-	-	-	-	+	-	-	-	10
103	Tabernaemontana divericata	-	+	-	-	+	-	+	-	-	-	30
104	Tecoma capensis	-	-	-	-	-	-	+	-	-	-	10
105	Tibouchina mutabilis	-	-	-	-	-	-	-	+	+	-	20
106	Tinospora cordifolia	-	+	-	-	-	-	-	-	-	-	10
107	Trichosanthes anguina	+	-	-	-	-	-	-	-	-	-	10

108	<u>Vitex negundo</u>	-	-	-	-	-	-	-	+	-	-	10
109	<u>Woodfordia fruticosa</u>	+	-	-	-	-	-	-	-	-	-	10
	Herbs											
110	Abutilon theophrasti	-	-	-	-	-	-	-	+	-	-	10
111	Adenaum multiflorum	-	-	-	+	-	-	-	-	-	-	10
112	Adenium arabisum	-	-	-	-	-	-	+	-	-	-	10
113	Adenium obesum	-	-	+	-	-	-	-	-	-	-	10
114	Aerides lawrenceae	-	+	-	-	-	-	-	-	-	-	10
115	Alocasia amazonica	-	-	-	-	-	-	+	-	+	-	20
116	Aloe vera	-	+	+	+	+	-	-	+	-	+	60
117	Amaranthus bilitum	-	-	-	+	-	-	-	-	-	-	10
118	Amaranthus dubis	+	-	+	-	-	-	-	+	-	-	30
119	Ananas nanus	-	-	-	-	-	-	-	+	-	-	10
120	Ananas sativus	-	-	+	-	-	-	-	-	-	-	10
121	Anthurium pallidiflorum	+	-	-	-	-	-	-	-	-	-	10
122	Anthurium andreanum	+	-	-	-	-	-	-	-	-	-	10
123	Anthurium andreanum	+	-	-	-	-	+	+	-	-	-	30
124	Anthurium crystallium	-	-	-	-	-	-	+	-	-	-	10
125	Anthurium cutucuense	+	-	-	-	-	-	-	-	-	-	10
126	Anthurium obovatum	+	-	-	-	-	-	-	-	-	-	10
127	Asparagus seataceus	+	-	-	-	-	-	-	-	-	-	10
128	Aspidistra elatior	-	-	+	-	-	-	-	-	-	-	10

129	Aspidistra elatior	-	-	-	-	-	-	+	-	-	-	10
130	Bacopa monnieri	-	+	-	-	-	+	+	-	-	-	30
131	Barlareia cristata	+	-	-	-	-	-	-	-	-	-	10
132	Barleria lupulina	-	-	+	-	-	-	-	-	-	-	10
133	Begonia cuculata	-	-	-	+	-	-	-	-	-	-	10
134	Begonia obliqua	-	-	+	-	-	-	-	-	-	-	10
135	Bletilla striata	+	-	-	-	-	-	-	-	-	-	10
136	Brassica oleracea	-	-	-	-	-	-	-	+	-	-	10
137	Calathea spp	-	-	-	-	-	-	-	+	-	-	10
138	Calathea Zebrina	-	-	-	-	-	-	+	-	-	-	10
139	Callisia fragrans	-	-	-	-	-	-	+	-	-	-	10
140	Capsicum annum	+	+	+	-	-	-	-	-	-	-	30
141	Capsicum fruitenscens	+	+	-	-	-	-	-	-	-	-	20
142	Catharanthus roseus	+	+	+	-	-	-	-	-	-	-	30
143	Catleya spp	+	-	-	-	-	-	-	-	-	-	10
144	Celosia cristata	-	+	+	-	-	-	-	-	-	-	20
145	Centella asiatica	-	+	+	-	-	-	-	+	+	-	40
146	Cestrum laevigatum	-	-	-	-	-	-	+	-	-	-	10
147	Chlorophytum cosmosum	-	-	-	+	-	-	-	-	-	-	10
148	Chloropythum comosum	+	-	-	-	-	-	-	+	-	-	20
149	Clematis terniflora	+	-	-	-	-	-	-	-	-	-	10
150	Cnidoscolus aconittifolius	-	+	-	-	-	-	-	-	-	-	10
151	Codiaeum punctuatum	-	-	-	-	-	-	+	-	-	-	10

152	Codiaeum variegatum	-	+	-	-	-	-	-	-	-	-	10
153	Codiaeum variegatum	-	-	-	-	-	-	+	-	-	-	10
154	Coleus hybridus	-	-	+	-	-	-	-	-	-	-	10
155	Cordyline astralis	-	-	+	-	-	-	-	-	-	-	10
156	Cordyline fruticosa	+	-	-	-	-	-	-	-	-	-	10
157	Cordyline Terminalis	-	-	-	-	-	-	+	-	-	-	10
158	Ctenanthe oppenheimiana	-	-	-	-	-	-	+	-	-	-	10
159	Cuphae hyssopifolia	+	-	-	-	-	-	-	-	-	-	10
160	Curcuma aromatica	-	+	-	+	-	-	-	-	-	-	20
161	Curcuma caeisa	-	-	-	-	-	-	+	-	-	-	10
162	Curcuma longa	-	+	-	-	+	-	+	-	-	-	30
163	Cymbidium spp	+	-	-	-	-	-	-	-	-	-	10
164	Cymbopogon citratus	-	-	-	-	-	-	+	-	-	-	10
165	Daucus carota	-	-	-	-	-	-	-	+	-	-	10
166	Dendrobium moniliforme	-	+	-	-	-	-	-	-	-	-	10
167	Dendrobium noble	+	+	+	-	-	-	-	-	-	-	30
168	Dianthus barbatus	-	+	-	-	-	-	-	-	-	-	10
169	Dieffenbachia amoena	-	-	-	-	-	-	+	-	-	-	10
170	Dieffenbachia seguine	-	-	+	-	-	+	-	-	-	-	20
171	Dracena trifusciata	+	-	-	-	-	-	-	-	-	-	10
172	Dracula simia	+	-	-	-	-	-	-	-	-	-	10

173	Eclipta prostrata	-	+	-	-	-	-	-	-	+	+	30
174	Epidendrum radicans	-	+	-	-	-	-	-	-	-	-	10
175	Epipremnum aureum	+	-	-	-	-	-	-	-	-	-	10
176	Eruca vesicaria	-	-	-	-	-	-	-	+	-	-	10
177	Eryngium foetidum	-	+	-	-	-	-	-	-	-	-	10
178	Euphorbia milli	+	+	-	-	-	-	-	-	-	-	20
179	Evolvulus alsinoides	-	+	-	-	-	-	-	-	-	-	10
180	Fittonia albevenis	+	-	-	-	-	-	-	-	-	-	10
181	Gebera jamesonii	+	-	-	-	-	-	-	-	-	-	10
182	Gingiber officinalis	-	-	-	+	-	-	-	+	-	-	20
183	Gomesa bifolia	+	-	-	-	-	-	-	-	-	-	10
184	Gomphrena globosa	+	-	+	-	-	-	-	+	-	-	30
185	Gossipium hirsutum	+	-	-	-	-	-	-	-	-	-	10
186	Graptophyllum pictum	-	-	+	-	-	-	-	-	-	-	10
187	Hedychium coronarium	-	+	-	-	-	-	-	-	+	-	20
189	Hydrangia macrophylla	-	+	-	-	-	-	-	-	-	-	10
190	Impatiens balsamina	-	+	-	-	-	-	-	-	+	-	20
191	Impatiens wallerians	-	-	+	-	-	-	-	-	-	-	10
192	Ipomoea batatas	-	-	-	-	-	-	-	+	-	-	10
193	Kaempferia galanga	-	-	-	+	-	-	-	-	-	-	10

194	Lalblah purpureus	+	-	-	-	-	-	-	-	-	-	10
195	Lathyrus odoratus	+	-	-	-	-	-	-	-	-	-	10
196	Leea rubra	-	-	-	-	-	-	+	-	-	-	10
197	Liriope spicata	-	-	+	-	-	-	-	-	-	-	10
198	Mentha piperita	-	-	-	-	-	-	+	-	-	-	10
199	Mentha pipertia	-	+	-	-	-	-	-	-	-	-	10
200	Mirabalis jalappa	+	-	-	-	-	-	-	-	-	-	10
201	Monstera oblique	-	-	-	-	-	+	-	-	-	-	10
202	Nepenthes belle	-	-	-	-	-	-	+	-	-	-	10
203	Ocimum sanctum	+	+	+	+	+	+	+	+	+	+	100
204	Ocimum tenuiflorum	-	-	-	-	-	-	+	-	-	-	10
205	Oncidium bauerii	+	+	-	-	-	-	-	-	-	-	20
206	Onsidium flexuosus	-	+	-	-	-	-	-	-	-	-	10
207	Opuntia cochenillifera	-	-	-	-	-	-	-	+	-	-	10
208	Oxalis corniculata	-	-	-	-	-	-	+	-	-	-	10
209	Oxalis trianqularis	-	-	-	-	-	-	+	-	-	-	10
210	Pajenalia longifolia	-	-	+	-	-	-	-	-	-	-	10
211	Pandanus amaryllifolius	-	+	-	-	-	-	-	-	-	-	10
212	Pentus lanceolata	+	-	-	-	-	-	-	-	-	-	10
213	Phalaras arundinaceae	-	-	-	+	-	-	-	-	-	-	10
214	Phalenopsis aphrodite	+	+	-	-	-	-	-	-	-	-	20
215	Phaseolus vulgaris	-	-	+	-	-	-	-	-	-	-	10
216	Philodendron	-	-	-	-	-	-	+	-	-	-	10

	bipinnatifidum											
217	Philodendron burle marc	-	-	-	-	+	+	-	-	-	-	20
218	Phormium tenax	-	-	-	-	-	-	+	-	-	-	10
219	Phragmipedium kovachii	-	+	-	-	-	-	-	-	-	-	10
220	Phyllanthus niruri	-	+	-	+	-	-	-	-	-	-	20
221	Pisum sativum	+	+	-	-	-	-	-	-	-	-	20
222	Plectanthus colevides	-	-	-	-	-	-	+	-	-	-	10
223	Plectranthus amboinicus	-	+	-	-	-	-	+	-	-	-	20
224	Plicoblastus viridistriatus	+	-	-	-	-	-	-	-	-	-	10
225	Polyscias baulfouriana	-	-	+	-	-	-	-	-	-	-	10
226	Polyscias fruticosa	-	-	+	-	-	-	-	-	-	-	10
227	Polyscias guifoylei	+	-	-	-	-	-	-	-	-	-	10
228	Portulaca grandiflora	+	-	+	-	-	-	-	-	-	-	20
229	Psychopsis spp	-	+	-	-	-	-	-	-	-	-	10
230	Rhyncostylis gigantae	+	-	-	-	-	-	-	-	-	-	10
231	Rhyncostylis retusa	+	-	-	-	-	-	-	-	-	-	10
232	Rosa gallica	-	+	-	-	-	-	-	-	-	-	10
233	Rosa rubignosa	-	+	+	-	-	-	-	-	-	-	20
234	Russelia equisetiformis	-	-	-	-	-	-	+	-	-	-	10
235	Sansevieria spp	+	-	-	-	-	-	-	+	-	-	20
236	Sapthiphyllum wallisii	-	-	-	-	-	-	-	+	-	-	10

237	Schefflera araboricola	-	-	-	-	-	-	+	-	-	-	10
238	Selaginella pallescens	+	-	-	-	-	-	-	-	-	-	10
239	Sida acuta	-	-	+	-	-	+	-	-	-	-	20
240	Solanaum nigrum	-	-	-	-	-	-	-	-	-	+	10
241	Solanum lycopersicum	+	-	-	+	-	-	-	-	-	-	20
242	Solanum melongena	+	-	-	+	-	-	-	-	-	-	20
243	Spathoglottis plicata	-	+	-	+	-	-	-	-	-	-	20
244	Spinacia oleraca	-	-	-	-	-	-	-	+	-	-	10
245	Synedrellanodifl- ora	-	-	-	-	-	-	+	-	-	-	10
246	Syngonium podophyllum	-	-	-	-	-	-	-	+	-	-	10
247	Talinum fruticosm	+	-	-	-	-	-	-	-	-	-	10
248	Tillandsia usneoides	-	-	-	-	-	-	-	+	-	-	10
249	Tradescantia flumiensis	-	-	+	-	-	-	-	-	-	-	10
250	Tradescantia pallida	-	+	+	-	-	-	-	-	-	-	10
251	Tradescantia spatheceae	-	+	-	-	-	-	+	-	-	-	20
252	Tradescantia zebrina	-	+	+	-	-	-	-	-	-	-	20
523	Vanda ascocenda	-	+	-	-	-	-	-	-	+	-	20
254	Zamioculcas zamifolia	-	-	-	-	-	-	+	-	-	-	10
255	Zephyranthes rosea	-	+	-	-	-	-	-	-	-	-	10

4. Summary

The Covid-19 pandemic has aggravated food insecurity in urban centers because of the disruption in the food supply chain, aggravation of the physical and economic barriers that restrict access to food, and the catastrophic increase in food waste because of labor shortages. Thus, there is a need to adopt more resilient food systems, reduce food waste, and strengthen local food production. Enhancing availability at the household and community levels through home gardening and urban agriculture is an important strategy [13]. Thus, home gardens can improve food security, diversity, nutritious value, and the microenvironment around the family home. The present study revealed that Home gardens in Kollam district of Kerala are the depositories of diverse plant resources of both ecological and economic significance. Home gardens may be considered as a vital source of income in the present scenario of Covid-19 pandemic.

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References

1. T.A. Gardener, J. Barlow, R. Chazdon, R. M. Ewers, C. A. Harvey, C. A. Peres, N.S. Sodhi. Prospects for tropical forest biodiversity in a human modified world. *Ecology Letters*. 12 (2009) 561-582.
2. S. Sekaran, Home Gardens: Agrobiodiversity hotspots- A case study. *3rd National Biodiversity Congress Abstract*, (2017) pp 37.
3. G.P. Galluzzi, V. Eyzaguirre and V. Negri, Home gardens: neglected hotspots of agrobiodiversity and cultural diversity. *Biodiversity Conservation*, 19 (2010) 3635-3654.
4. E. L. Webb and M.D.E. Kabir, Home Gardening for tropical Biodiversity conservation. *Conservation Biology*, 23(6) (2009)1641-1644.

5. F. C. M. Fernandes and P.K. Nair, An evaluation of the structure and function of tropical homegardens. *Agricultural systems*, 21 (1986) 279- 310.
6. S. K. Saha, P.K.R. Nair, V. D. Nair and B. M. Kumar, Soil carbon stock in relation to plant diversity of home gardens in Kerala, India. *Agroforestry System*, 76 (2009) 53-65.
7. D. H. Galhena, R. Freed, K.M. Maredia, Home gardens: A promising approach to enhance household food security and wellbeing. *Agriculture and Food Security*, 2:8 (2013) 1-13.
8. U. P. Albuquerque, L.H.C. Andradeb and J. Caballeroc, Structure and floristics of home gardens in Northeastern Brazil. *Journal of Arid Environment*, 62 (2005) 491 – 506.
9. P. Saikia, B.I Choudhury and M. L. Khan, Floristic composition and plant utilization pattern in home gardens of Upper Assam, India. *Tropical Ecology* 53(1) (2012) 105-118.
10. R. McDougall, P. Kristiansen, R. Rader, Small-scale urban agriculture results in high yields but requires judicious management of inputs to achieve sustainability. *Proceedings of the National Academy of Sciences of the United States of America*. 116(1) (2019), 129–134.
11. N. A. Kumar, V. A. Nambi, M. G. Rani, E. D. I. Oliver King, S. S. Chaudhury, S. Mishra, Community agro biodiversity conservation continuum: an integrated approach to achieve food and nutrition security. *Current Science*, 109 (3) (2015), 474-487.
12. W. D. Shuster, S. Dadio, An applied hydrogeological perspective on the rendering of ecosystem services from urban soils. In: Lal R, Stewart BA, editors. *Urban Soils*. Boca Raton: CRC Press, (2018) pp. 261–263.
13. Rattan Lal. Home gardening and urban agriculture for advancing food and nutritional security in response to COVID-19 pandemic. *Food Security*, 23 (2020)1-6.