



## Homegardens: A Model of Sustainable Agroforestry and Biodiversity

(\*Gayathri P.M.)

Assistant Professor, School of Agriculture, RNB Global University, Bikaner, Rajasthan

\*Corresponding Author's email: [gayathri1904@gmail.com](mailto:gayathri1904@gmail.com)

Agroforestry is a sustainable land-use system that integrates arable crops, tree crops, and/or livestock within the same land management unit, either in a spatial or temporal arrangement. In the context of agroforestry, homegardens and similar multistrata, multispecies associations occupy a distinct niche. They represent some of the most intricate manmade systems that integrate trees, crops, and animals, closely resembling natural ecosystems while delivering important ecosystem services under human management. In nearly all tropical and subtropical ecozones, agroforestry is commonly practiced as homestead farming, which involves the mixed cultivation of annual and perennial crops surrounding the farmer's home. Homegardens are globally acknowledged as a prime example of a sustainable agroforestry system. Tropical homegardens, in particular, are unique land-use systems that involve the intentional management of multipurpose trees and shrubs alongside herbaceous species (including annual, perennial, and seasonal crops) and livestock, all within the confines of individual households. This practice is traditionally centered around the homestead, where various plant species are managed by the family, with their products mainly aimed at fulfilling household consumption. ), they provide a diverse and stable supply of socioeconomic products and benefits to the families that maintain them. Depending on the nature and composition of their components, many homegardens in the tropics are considered agro-silvopastoral systems, with herbaceous crops, woody perennials, and animals. Some homegardens, in contrast, are classified as agri-silvicultural systems, featuring only herbaceous crops and woody perennials. Homegardens are dynamic and have evolved over centuries, owing to the adaptive skills of farmers in responding to changing rural and livelihood conditions. In tropical and subtropical regions, home gardens are generally much smaller than a hectare, indicating that this practice is primarily subsistence-oriented. The diversity of herbaceous species, including medicinal plants, in homegardens primarily depends on climate, altitude, socioeconomic and cultural influences, and proximity to markets. Typically, both diversity and density increase with higher rainfall and elevation. Homegardens are outstanding examples of species diversity in cultivated and managed plant communities. In tropical regions, these gardens are vital for their high levels of plant diversity and may act as reservoirs of crop germplasm. A typical tropical Asian home garden, approximately 0.25 acres in size, can feature around 200 kinds of useful plants, including vegetables (particularly root vegetables), herbs, spices, fruit trees, and fiber crops. In a home garden, both cultivated and naturally growing plants are present, but the naturally occurring plants are generally not under active management.

### The Significance of Species Diversity in Homegardens

Homegardens are diverse micro-environments that offer a wide range of species, varieties, and genetic resources, providing crucial resources like food, fodder, fuel, medicinal plants, spices, and materials for construction. According to a classification of production systems

and species diversity, homegardens are ranked highest for their biological diversity among all man-made agroecosystems. The structure, composition, and diversity of homegardens are shaped by both socioeconomic factors and the surrounding geographical and ecological conditions. Homegardens play a crucial role in conserving rare and threatened species and varieties. They act as a 'genetic backstop,' maintaining species and varieties that may not be economically viable for large-scale production but are grown on a small scale due to taste preferences, tradition, or the availability of planting materials.

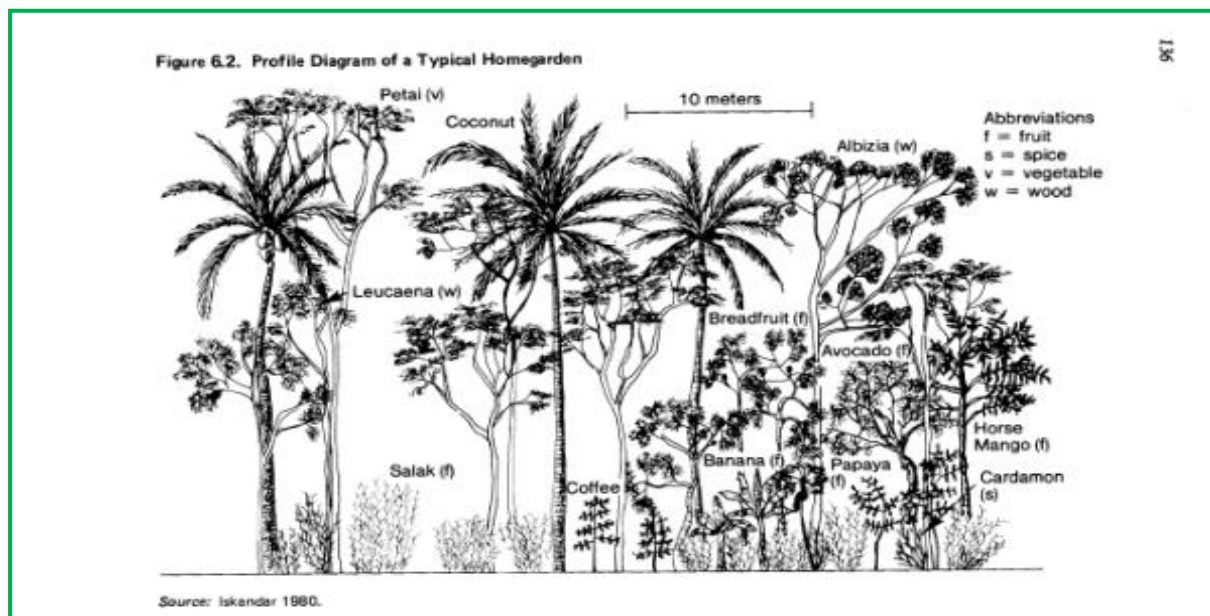


Species Diversity in Homegardens

### The Role of Structure and Composition in Homegardens

Homegardens are often recognized for their biodiversity and sustainable land use. They might initially seem to lack structure due to the complex mix of trees, shrubs, and herbaceous plants. However, upon closer inspection, it becomes evident that the vegetation is arranged in distinct patterns or layers. Therefore, homegardens are also known as "multi-tier systems" or "multi-tier cropping" due to their diverse canopy layers. In Kerala, five distinct canopy strata have been observed in local homegardens. For instance, five canopy strata have been identified in the Homegardens of Kerala. The first layer lies within 2 m high from the ground and is constituted by vegetables (*Cajanus cajan* (pigeon pea), *Arachis hypogaea* (peanuts), *Phaseolus*, *Psophocarpus* and *Vigna* species (beans and other legumes)), tuber crops (*Colocasia esculenta* (taro), *Dioscorea alata* (greater yam), *Dioscorea esculenta* (sweet yam), *Ipomoea batata* (sweet potato), *Manihot esculenta* (cassava), *Xanthosoma* species (tannia or cocoyam)), grasses (*Cymbopogon citratus* (lemon grass)), spices (*Zingiber officinale* (ginger), *Kasthuri manjal* (kasthuri), *Piper methysticum* (kava), *Curcuma longa* (turmeric), *Cinnamomum zeylanicum* (cinnamon), *Areca catechu* (betel nut), *Piper betle* (betel vine)) and other herbaceous plants (*Ananas comosus* (pineapple), *Passiflora edulis* (passion fruit), *Saccharum officinarum* (sugarcane), *Zea mays* (corn or maize)). The second and third layers (within 2m to 10m high from the ground) are almost continuous and overlapping each other. Some of the common constituents of these layers in Kerala Homegardens are banana, nutmeg, papaya, mango, cocoa, young coconut palms and saplings of trees. The upper most canopy layer is formed by *Anacardium occidentale* (cashew nut), *Artocarpus heterophyllus* (jackfruit), *Citrus* species (lemon, lime, orange and tangerin), *Annona* species (soursop and sweetsop), *Swietenia macrophylla* (mahogany), *Ailanthus*

*triphyssa* (tree of heaven), *Averrhoa carambola* (carambola), *A. altilis* (breadfruit), *Carica papaya* (papaya), *Psidium guajava* (guava), *Mangifera indica* (mango), *Azadirachta indica* (neem), *Musa* species (bananas and plantains), *Persea americana* (avocado), *Cocos nucifera* (coconut), *Spondias dulcis*, *Syzygium malaccense* (malay apple), *Tamarindus indica* (tamarind), *Hevea brasiliensis* (rubber), and other tall trees at about 10m to 25m height (Figure 1). However, the choice of species is governed by both agroclimatic factors and the socio-economic conditions of the farmers.



**Tropical Homegardens: Multistrata composition of various components**

### Ensuring Food and Nutritional Security through Homegardens

Homegardens in agroforestry systems play a crucial role in food production by providing edible products such as fruits directly, and by enhancing soil health to support agriculture indirectly. Many developing countries feature traditional homesteads and agroforestry systems where a diverse range of fruit-producing trees, with their distinctive multistrata canopies, play a central role. Despite the lack of scientific study and limited recognition outside their native regions, many of these fruit trees play a crucial role in enhancing food and nutritional security.

### Conclusion

In conclusion, homegardens exemplify a sustainable and biodiverse approach to agroforestry, offering a wealth of benefits that extend beyond simple food production. These intricate systems, characterized by their multi-tiered canopies and diverse plant species, play a vital role in ensuring food and nutritional security. By integrating a variety of edible plants and trees within a single land management unit, homegardens not only provide a stable and diverse food supply but also enhance soil fertility, supporting broader agricultural productivity. The significance of homegardens is further underscored by their ability to conserve rare and threatened species, acting as critical 'genetic backstops' for plants that may not be economically viable for large-scale cultivation but are crucial for local diets and traditions. Despite their underexplored potential and limited scientific research, homegardens remain essential in many developing regions, offering a model for integrating ecological sustainability with practical agricultural practices. Their dynamic and adaptive nature, shaped by socio-economic and environmental factors, underscores their resilience and importance in both traditional and modern agroforestry systems.