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Urban Home Gardens Enhance Plant Diversity and Food Security in South Tangerang

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Abstract. *Achieving food security goals in urban settings has emerged as a major concern, as it is both essential and crucial to their ecological standing. To achieve food security through plant diversity, one approach is to actively and expertly use yards by growing a range of plants. This is one of the essential stages for supplying the fundamental needs of urban communities, both now and in the future. The purpose of this study is to describe the function of home gardens, their contribution to food availability and security, and strategies for diversifying them. With a quadrat sample size of 4×4 meters for trees and 1×1 meters for vascular understory vegetation, purposeful sampling is used to collect data. Vegetation analysis computes the diversity index (H') using the Shannon-Weiner method. Four (4) plant types are used in South Tangerang's yards: fruit (54%), vegetables (20%), medicinal (24%), and carbs (2%), according to the first research result. Thus, with H' values ranging from 3.015 to 3.028, the types of (food) crops in the Tangerang City region are categorized as high, with Pamulang District having the lowest value and Pondok Aren District having the highest. Therefore, growing a home garden contributes to the growth and preservation of urban plant species diversity within the community, as well as an alternative and innovative way to increase or expand food availability in a sustainable and ongoing manner.*

Keywords: *food security, home garden, plant diversity, social resilience, urban environment*

INTRODUCTION

At least 250 million people in Indonesia lack access to food (Van Dijk et al., 2021; Miladinov, 2023), a need that the country's abundant natural resources could help address. However, because of population growth, changes in land use and climate have an impact on food supply (Molotoks et al., 2021; Boakes et al., 2024; Azdagaz et al., 2025), so it is crucial to pay attention to all factors, especially in urban areas where food availability is more vulnerable. Rahman et al. (2024) and Gunapala et al. (2025) state that one of the central government's initiatives to improve food availability and access is to maximize home gardens. This poses a challenge in urban contexts, too, as there is almost no place for planting, making it difficult to achieve independent food availability, let alone.

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In addition to boosting the output of home gardens and guaranteeing that food is easily accessible, fresh, and nutritious. The Tangerang City Government's program, which has been supporting the "Tangerang Berkebun" initiative since 2014 to transform idle land into productive areas, is one example of a regional project that is beginning to gain traction, according to this argument. This comment puts pressure on the house's remaining acreage to be as beneficial as feasible. To optimize land potential in early 2026, the Tangerang City Food Security Service has scheduled 22 actions and 10 initiatives. However, despite the Ministry of Marine Affairs and Fisheries' backing and commencement of the urban farming initiative, there are still technical and participation issues with its execution. To maximize urban farming in Tangerang City, a more organized strategy, continuous education, and increased community engagement are needed.

The growth of agricultural land is very beneficial to food supply programs; however, this is not the case in urban areas, where land is being used for development. As said before, maximizing one's garden or backyard is a good urban development approach. As previously noted, the living barn has played a significant role in increasing food availability at the local or household level (Gerardo-Méndez et al., 2025). The yard at least contributes to the government's food independence program, but the question is how well-optimized it has been. The majority of food supplies now come from rural regions, which are at risk of food crises if food productivity declines due to climate change, as discussed in the preceding paragraph. This is because the expansion of towns and industry has destroyed productive land. Consequently, it is crucial to emphasize the value of home yards, particularly in urban areas, as fertile spaces for growing fruits, vegetables, and other crops.

In an effort to achieve food independence within the family and to promote local water and land conservation, yard land has become a symbol of food production (Saputra et al., 2025; Gerardo-Méndez et al., 2025). Therefore, in addition to being beneficial for the expansion of green spaces, a house garden also serves as a conservation area and a productive piece of land, which enhances sustainability in life quality (Suwardi et al., 2023; Osei Boateng et al., 2025). House yards serve a variety of purposes and have evolved into new habitats, particularly for the plants and animals that promote ecological balance, biodiversity, food access, safety, and stability, and kindness (Collard et al., 2026; Korpelainen, 2023). As previously stated, a mixed garden can be a source of life, providing oxygen, reducing $CO2$ (air pollution) and improving environmental quality, serving as a catchment area, performing other ecosystem functions, and supporting sustainable development objectives (Kasprzyk et al., 2022; Santos et al., 2022). These are elements of ecosystem services that have enabled us to obtain food, energy, and water sustainably, even if only locally or within a family. Therefore, to develop it, consideration must be given to its possibilities and potential. In the context of food supply and security, urban house gardens have developed into initiatives that promote social and familial resilience (Korpelainen, 2023; Collard et al., 2026).

In addition to producing food, the yard fulfills a variety of ecological functions that support the development and functioning of green areas, as described above (Marques et al., 2021; Hanson et al., 2021; Addas, 2023). As stated in the preceding paragraph, a yard or house garden is essential to urban dwellers' lives because of its numerous uses and benefits for ecosystem services. Thus, the goal of this study is to investigate plant diversity in urban environments, a research priority that has been demonstrated to provide food, energy, money, and other resources. As a result, the kitchen garden is a rich area and a source of life that has to be thoroughly studied and documented.

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MATERIALS AND METHODS

Study Site

A few research sites were located in the South Tangerang urban region. This study examined and documented the yard in each urban house garden, as well as a few plant varieties regularly planted and used. South Tangerang is administratively and territorially divided into seven sub-districts, fifty-four sub-districts, and five villages, with a total area of 147.19 km2. Additionally, it shares strategic borders with Tangerang Regency, Depok City, and DKI Jakarta Province. Seven (7) subdistricts in South Tangerang City were observed, as seen in Figure 1: Ciputat, East Ciputat, Pamulang, Setu, Pondok Aren, Serpong, and North Serpong. The types of plants in the yard served as the seven research locations, and the stages are explained in the paragraph that follows. Interviews were also conducted at each yard visited to verify the documented plant types.

Sampling Design, Data Collection, and Analysis

A few efforts were made to collect data on plant species and diversity in home gardens as part of urban farming. As mentioned earlier, this study will examine the plant species in their home garden, as well as the estimated and determined plant diversity. According to the description, this procedure involves multiple steps.

Using a methodical random selection procedure, one home was selected from each community. As a result, the study's sample size was 4 × 2 × 7 = 56 yards, distributed across 7 subdistricts in South Tangerang City. Yard samples were selected based on the subdistrict using a cluster random sampling technique, and four villages were selected from each subdistrict using purposeful sampling. Following the determination of the house's location, information on the different types of yard plants is gathered using a quadrat sample of 4x4 meters for trees and 1x1 meters for vascular understory plants. Use the Flora of Java plant identification key book to identify a variety of yard plants.

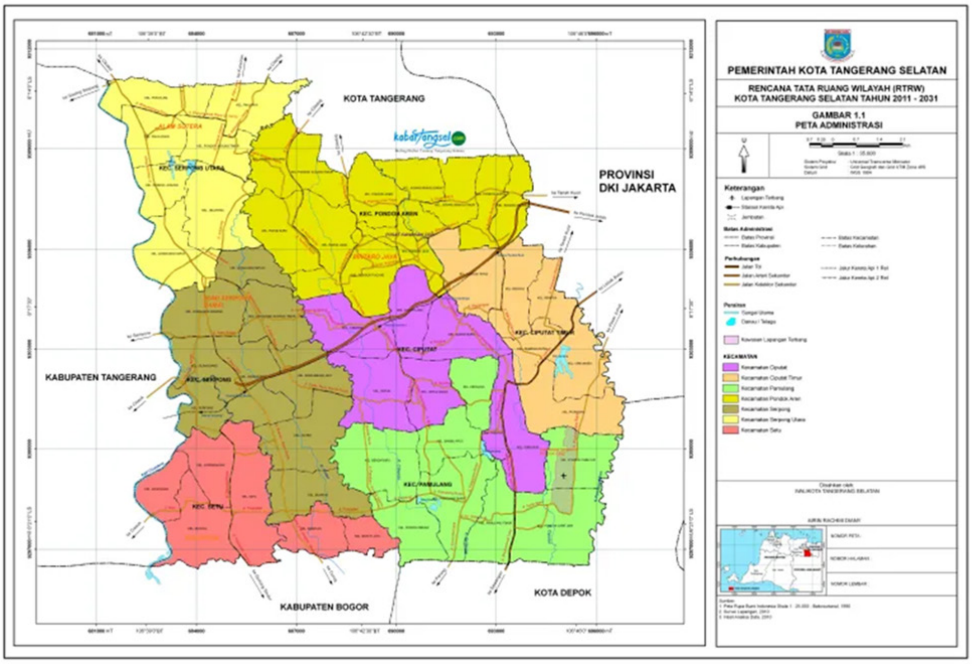

Figure 1: Study area map showing urban home garden locations in South Tangerang

A semi-structured interview or participatory ethnobotanical evaluation was conducted in addition to direct observation and discussions with yard owners about the plants in their yards. The data was subjected to both descriptive and analytical evaluations. When analyzing vegetation, results are quantitatively examined using the Shannon-Weiner diversity index (H'), which is defined as $H' = -\sum pi \ln pi$ (Magurran, 2004). This study uses quantitative vegetative analysis alongside qualitative (mixed-methods) approaches (Taylor & Lovell, 2015; García-Antúnez et al., 2023; Ritter et al., 2024). To improve the qualitative understanding of the relationship between the yard's activities, quantitative data is combined with journal review studies, observational data, and interviews.

RESULTS AND DISCUSSION

According to the Indonesian Minister of Public Works Regulation No. 05/PRT/M/2008 and Law No. 26 of 2007 concerning Spatial Planning, cities are required to have 30% green open space, which is divided into 10% private green open space in the yards of residences, businesses, or private property and 20% public green open space. This includes the yard; thus, for the Private Green Open Space category, the ideal yard space is at least 10% of the city area. However, the expansion of business zones and the conversion of land into residential neighborhoods are among the many changes that occur constantly in the South Tangerang area. Between 2010 and 2020, 1,847 hectares of green open space were lost, and 2,212 hectares (23.33%) of land were converted.

In 2018, residential areas made up 61.35% of the total area. As a result, fertile land is lost, and the production of food, energy, and water is gradually impacted. Thus, even if it is done locally, maximizing the yard as a home garden is one of the alternatives and methods for ensuring food availability and security, while also enhancing ecosystem services, particularly for family welfare (Liu et al., 2023; Adeloye & Oke, 2025). As mentioned earlier, it truly accomplishes several goals, one of which is to support biodiversity, or a range of plant sources, which helps to enhance and increase the quality of the environment (Tresch et al., 2018; Li & Du, 2024). Because a home garden may reestablish its ecological function—the more diverse the plants, the more diverse the home garden is—it is therefore a source of food, energy, and water that sustains life (Nowysz et al., 2022; Toboso-Chavero et al., 2023).

The Home Garden as a Diverse Source of Plants

Based on field data gathered throughout time, the yard is home to a wide variety of plant species. 86 distinct food plant species, divided into 86 groups (Table 1), were identified through observation, illustrating the variety of plants in South Tangerang home gardens. This home garden is essentially a part of the green space function in addition to the previously described food and non-food crops. As a result, home gardens can serve as a variety of plant sources (Yinebeb et al., 2022; Korpelainen, 2023), thereby promoting ecosystem development in urban areas (Figure 2). Home gardens have increased land productivity, affecting ecosystem stability and enhancing food availability and security in urban areas (Asante et al., 2024), particularly in South Tangerang, which has land with development potential, as stated above.

Table 1. Diversity of home garden plants in South Tangerang

No.	Family	Species
1.	*Amaranthaceae*	*Amaranthus hybridus* L.
2.	*Anacardiaceae*	*Spondias dulcis Forst.*
3.	*Anacardiaceae*	*Mangifera indica*
4.	*Annonaceae*	*Annona muricata* L.

No.	Family	Species
5.	*Annonaceae*	*Annona squamosal*
6.	*Apiaceae*	*Apium graveolens* L.
7.	*Araceae*	*Alocasia macrorrhiza* Schott.
8.	*Araceae*	*Colocasia* sp.
9.	*Araceae*	*Xanthosoma sagittifolium*
10.	*Arecaceae*	*Cocos nucifera* L.
11.	*Arecaceae*	*Phoenix dactylifera* L.
12.	*Arecaceae*	*Areca catechu* L.
13.	*Arecaceae*	*Salacca zallaca*
14.	*Asphodelaceae*	*Aloe vera* L.
15.	*Asteraceae*	*Gynura procumbens* (Lour.) Merr.
16.	*Asteraceae*	*Lactuca sativa* L.
17.	*Brassicaceae*	*Brassica juncea*
18.	*Bromeliaceae*	*Ananas cuamosa*
19.	*Cactaceae*	*Hylocereus undatus* (Haw.) Britt. Et R.
20.	*Caricaceae*	*Carica papaya*
21.	*Convolvulaceae*	*Ipomoea reptana* Poir.
22.	*Convolvulaceae*	*Ipomoea batatas* Poir.
23.	*Cucurbitaceae*	*Momordica charantia* L.
24.	*Cucurbitaceae*	*Cucumis* sp.
25.	*Dracaenaceae*	*Dracaena angustifolia*
26.	*Euphorbiaceae*	*Phyllanthus acidus* (L.) Skeells
27.	*Euphorbiaceae*	*Jatropha curcas* L.
28.	*Fabaceae*	*Tamarindus indica*
29.	*Fabaceae*	*Cynometra cauliflora*
30.	*Fabaceae*	*Parkia speciosa*
31.	*Fabaceae*	*Adenanthera microsperma*
32.	*Fabaceae*	*Abrus precatorius* L.
33.	*Lamiaceae*	*Ocimum sanctum* L.
34.	*Lamiaceae*	*Orthosiphon stamineus* Benth.
35.	*Lamiaceae*	*Mentha piperita* L.
36.	*Lauraceae*	*Parsea Americana*
37.	*Leguminosae*	*Leucaena leucocephala* (Lam.)
38.	*Liliaceae*	*Allium cepa*
39.	*Liliaceae*	*Allium odorum* L.
40.	*Liliaceae*	*Allium sativum*
41.	*Malvaceae*	*Durio zibethinus*
42.	*Meliaceae*	*Sandoricum koetjape*
43.	*Menispermaceae*	*Cyclea barbata* Miers.
44.	*Moraceae*	*Morus alba*
45.	*Moraceae*	*Arthrocarpus integra*

No.	Family	Species
46.	*Moraceae*	*Artocarpus altilis*
47.	*Multingiaceae*	*Muntingia calabura* L.
48.	*Musacecae*	*Musa paradisiaca*
49.	*Myrtaceae*	*Eugenia uniflora*
50.	*Myrtaceae*	*Eugenia aquea* Burm. F.
51.	*Myrtaceae*	*Psidium guajava*
52.	*Myrtaceae*	*Syzygium malaccense*
53.	*Myrtaceae*	*Syzygium polyanthum*
54.	*Oxalidaceae*	*Averrhoa carambola* L.
55.	*Oxalidaceae*	*Averrhoa bilimbi* L.
56.	*Phyllanthaceae*	*Sauropus androgynous*
57.	*Phyllanthaceae*	*Manihot esculenta*
58.	*Piperaceae*	*Piper* spp.
59.	*Poaceae*	*Cymbopogon citrarus*
60.	*Poaceae*	*Saccharum officinarum* L.
61.	*Punicaceae*	*Punica granatum* L.
62.	*Rubiaceae*	*Morinda citrifolia* L.
63.	*Rutaceae*	*Citrus sinensis*
64.	*Rutaceae*	*Citrus maxima* (Burm.) Merr.
65.	*Rutaceae*	*Citrus amblycarpa* (Hassk.)
66.	*Rutaceae*	*Citrus nobilis*
67.	*Rutaceae*	*Citrus aurantifolia*
68.	*Rutaceae*	*Citrus hystrix* Dc.
69.	*Sapindaceae*	*Litchi chinensis*
70.	*Sapindaceae*	*Nephelium lappaceum*
71.	*Sapotaceae*	*Achras zapota* L.
72.	*Sapotaceae*	*Manilkara cauci*
73.	*Sapotaceae*	*Pouteria campechiana*
74.	*Simaorubaceae*	*Brucea javanica*
75.	*Solanaceae*	*Capsicum annum*
76.	*Solanaceae*	*Solanum melongena* L.
77.	*Solanaceae*	*Lycopersicum esculentum*
78.	*Thymelaeaceae*	*Phaleria macrocarpa*
79.	*Vitaceae*	*Vitis vinifera* L.
80.	*Zingiberaceae*	*Zingiber purpureum* Roxb.
81.	*Zingiberaceae*	*Zingiber officinale* Rosc.
82.	*Zingiberaceae*	*Kaempferia galanga* L.
83.	*Zingiberaceae*	*Curcuma longa* L.
84.	*Zingiberaceae*	*Curcuma rubescens* Roxb.
85.	*Zingiberaceae*	*Alpinia galanga* (L.) Sw.
86.	*Zingiberaceae*	*Curcuma xanthorrhiza* Roxb.

Making the most of a home garden, which produces a range of useful plants and enhances the subtle beauty and usefulness of a green area (Hanson et al., 2021; Aslanoğlu et al., 2025), as demonstrated in Table 1. Therefore, a house garden helps to increase biodiversity and provides urban inhabitants with a source of life (Korpelainen, 2023; Muliyah et al., 2025). Consequently, it fulfills multiple functions and improves ecosystem services and stability. Urban farming, such as home gardening, has become a major concern for food security and availability in urban areas (Fauzia et al., 2024; Shrestha et al., 2025). As previously noted, urban areas face complex problems but also have potential when used properly, as in the case of home gardens.

At a time when urban populations are looking to the future for food supply and ecosystem services, house gardens have emerged as an alternate solution (Fauzia et al., 2024; Saputra, 2025). To achieve food security, it is crucial to continue expanding the contributions made by urban dwellers through their home gardens. Conversely, the variety of plants cultivated in a home garden is known as plant diversity or biodiversity, and it fulfills the home garden's previously mentioned function.

Diversity of Plants in Gardens at Home Type Development

The yard or house garden can be used as a green plot with ecological purposes, as well as a food plot, as mentioned in the previous paragraph. As the aforementioned paragraph and Table 1 demonstrate, it promotes biodiversity (Korpelainen, 2023; Collard et al., 2026). Thus, the home garden has evolved into a local development plan that maximizes the amount of land left around the house, as seen in the South Tangerang region. In addition to planting in the yard (Figure 2C), very hydroculture has one planting model that has become the most popular planting technique in local urban yards and residential areas (A & B), as shown in Figure 2. Using yards or vacant areas with a variety of plants and their uses is at least one way to achieve plant biodiversity.

In contrast to a restricted yard, as shown in Figure 2 (A & B), a significant section of the conserved urban Betawi area is typically included in Figure 2C, where the yard is larger and includes trees. The average lot size in the image is small, at roughly 5 m² to 20 m², but this is part of the city community's efforts to make the most of its limited land. Because of this, Betawi has the conventional home shape, is the same size as the yard, and has a variety of flora. The typical land area is between 100 and 300 square meters. This is because traditional Betawi homes in South Tangerang typically have larger yards, reflecting the philosophical value of openness, in contrast to homes in housing clusters with smaller yards. Although Setu District's variety is still lower than that of Pondok Aren and Ciputat, it has more available, unoccupied land than other districts (Figure 3).

A B C

Figure 2: Planting systems in different types of available land. (A), (B) Hydroponic cultivation in residential areas; (C) Front-yard cultivation in village areas.

To make the most of the remaining land in a small urban area, they sought to use a variety of long-lived plant species at one of the South Tangerang locales. Fruit, vegetables, medicinal plants, and decorative plants are all cultivated as food crops. The variety of yard plants grown is listed in Table 1. Naturally, each plant species has a purpose, but, as previously mentioned, pastimes and leisure activities also play a significant role without the owner being aware of it. As it turns out, yard plants can produce a variety of plant species as well as food and medicinal elements (Pranskuniene et al., 2021).

Even yet, each type of plant serves the same purpose and contributes in the same way to the availability of food, medicinal elements, freshwater, and fresh air, environmental quality, and so forth. As a result, Figure 3 shows a statistically significant difference in plant variety across all South Tangerang regions. The variation in index values indicates the state of the land-environment and the significance of growing particular plant species used in daily life.

The diversity of food crops in South Tangerang City's yards has a Shannon-Wiener index value between H' = 3.015 and H' = 3.828. This suggests that South Tangerang City's yards have a comparatively large diversity of food crops. This is in line with the standards set forth by Magurran (1988), according to which species diversity is low if H' < 1, moderate if 1 < H' < 3, and high if H' > 3. Pondok Aren District has the greatest diversity of food crops, whereas Pamulang District has the least. The results of the interviews, which showed that only 26 out of 100 respondents agreed with the questioner regarding the possibility of planting food crops in the yard—the remaining responses ranged from disagree to unsure have an impact on variations in the degree of diversity of yard plants.

The diversity index for food crops in each district is displayed in Figure 3. The Pondok Aren area has the highest diversity value, followed by Ciputat and other areas, as mentioned previously. These variations have been influenced by yard size, the types of plants planted for flavor or purpose, the composition of the food crop as shown in Figure 4, and other factors. However, weather, climate, and soil type also affect the growth and development of plant species. Plant diversity is crucial in home gardens, as it contributes to food security and availability, albeit at the household level.

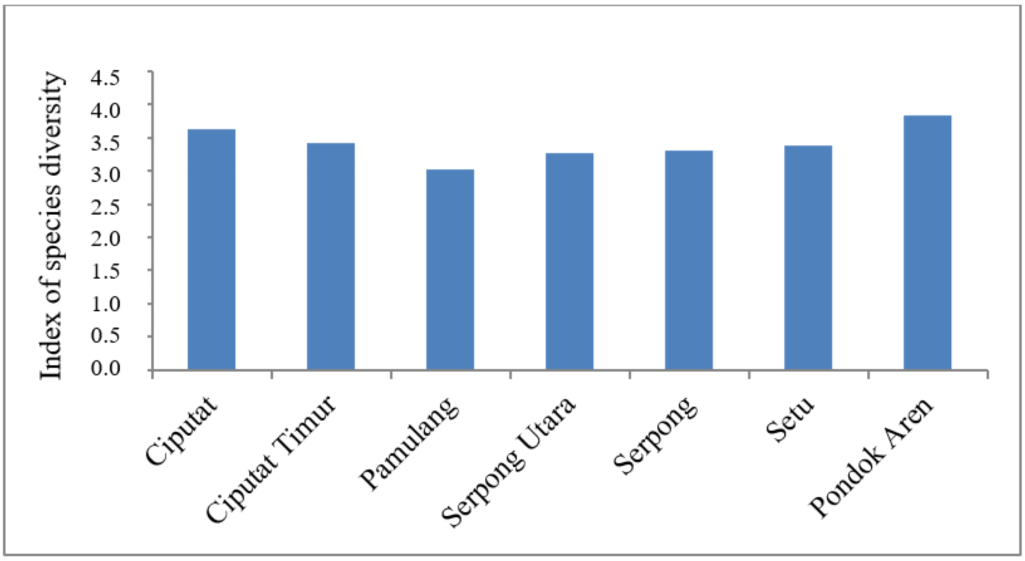

Figure 3: Index of species diversity (Shannon-Wiener)

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The Role of Yards in Urban Farming and Household Food Availability

As previously stated, home gardens are pioneers in shaping biodiversity and land productivity (Collard et al., 2026; Korpelainen, 2023). Although they supply food for households, they also promote security. Because of this, home gardens are among the most effective solutions to the urban food crisis (Baliki et al., 2023), especially in the South Tangerang area, where there is room for small-scale cultivation. Table 1 shows that the South Tangerang region, which indirectly represents urban dwellers, sought to maximize the remaining acreage for planting species that are the predominant food crops in its cultivated area. The majority of the yards in Tangerang City are planted with fruit plants because they are simple and quick to harvest, as can be seen from the presentation in Table 3, which shows which plant species are used in their daily lives and whose fruit is larger than other plant species by 54% or The most common types of food plants found in home gardens in South Tangerang City are fruit plants, namely 36 types of plants, and At least four plant species *Manihot esculenta* Crantz, *Colocasia esculenta* (L.) Schott, *Artocarpus altilis*, and *Xanthosoma sagittifolium* are the least common sources of carbohydrates.

Fruit plant species are the most prevalent, followed by medical plant species at 24%, since at least some garden plant species contain carbohydrates. Fruit, vegetables, and medicinal plants are inexpensive, year-round yard plants that are easy to cultivate from seed to harvest, as mentioned before. Carbohydrate-rich yard plants can be purchased; these plants (Figure 4) show that the outcomes can save costs. The list of residential yard types in Figure 4 at least illustrates how city residents attempt to use their yards to meet their daily needs. so that each yard is utilized for growing plants with many models, as shown in Figure 2 A & B, which shows the yard's influence in addition to producing food goods as mentioned in the previous paragraph. It illustrates how ecologically sensitive development has produced a calm, fresh, green atmosphere, improving the quality of the surrounding environment. House gardens should be maintained since they have many applications and have enhanced the environment, society, and economy. As a result, it encourages planting based on their type and purpose, especially in homes, and can at least satisfy their ecological, nutritional, and health needs (Maredia et al., 2023).

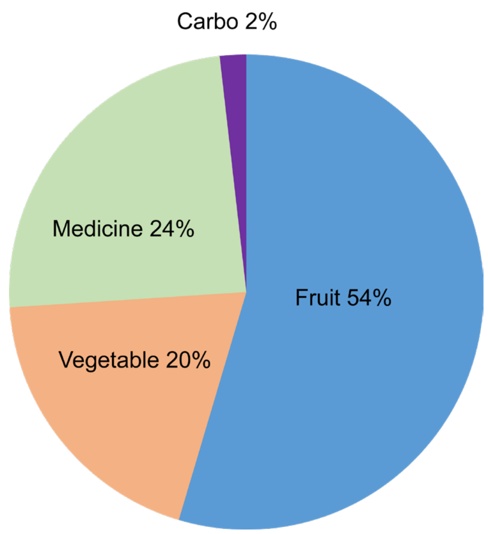

Figure 4: Percentage composition of food crop categories cultivated in the home gardens

Jurnal Biodjati 11(1): 166–178, May 2026

JURNAL BIODJATI

http://journal.uinsgd.ac.id/index.php/biodjati

Overall, the study's findings show that yards have not been optimized in accordance with the regional government's policy on food availability and security in the city; as a result, the majority of yards are merely a side activity, run by those in the retired group. Consequently, it is imperative to conduct additional socialization addressing the role, function, and contribution of the home garden in daily life going forward. In addition to giving retirees greater authority to maximize their yards, Tangerang City has significant yard potential, as discussed above. According to residents of Tangerang City, backyards have several uses, including local economic and ecological restoration (Buchmann, 2009; Komalawati et al., 2022; Dimouli et al., 2024). They are cool and green, and they naturally produce foods that can be harvested (Table 1). Therefore, everyone can actively participate in making their backyards as functional as possible, including seniors and workers in the public and commercial sectors. Although residents of Tangerang City have developed yard houses as urban agricultural projects, it is unclear how the local government or associated organizations can support the community and help their yards become a model for a sustainable city in the future.

Root Growth

Two-way ANOVA revealed that plant density significantly affected root fresh weight and root dry weight per planting bag, whereas biochar application had no significant effect on these parameters. Conversely, biochar application significantly increased root length, while plant density had no significant effect on this trait (Table 4).

CONCLUSION

There are attempts to maximize cultivation yards for food security, at least on a family level, even though each study site has varying degrees of plant diversity, ranging from moderate to high. One strategy to boost land productivity is to establish a variety of plant species in a home garden or on the remaining property. Home gardens help create equilibrium and are a source of biodiversity. Essentially, house gardens enhance ecosystem services and perform a variety of tasks, such as establishing green spaces that provide ecological benefits, including absorbing pollutants, collecting water, and producing oxygen. While those are some of its uses, a home garden can also serve as a substitute for family-scale, locally produced food. Plant species are also a suite of land because each urban yard or home garden has its own land potential.

AUTHOR CONTRIBUTION

K.F. designed the research and supervised the entire process. **K.F.M.** collected and analyzed the data and wrote the manuscript.

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CONFLICT OF INTEREST

The author declared that they have no conflict of interest.

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