Effects of an Urban Home Gardening Program on Plant Diversity and Home Garden Structure in Malang City, Indonesia

Erona Wafaretta[1*], Riyan Riyadlun Najih [2], Amaliah Amriani Amran Saru[3], Muh. Syaiful Akbar[4]

[1,3,4]Departemen Biologi, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Negeri Makassar, Indonesia
[2]Universitas Islam Negeri Sultan Aji Muhammad Idris Samarinda, Samarinda, Indonesia
[*] Corresponding author:
Email: erona.wafaretta@unm.ac.id

Abstract.
Residential home gardens are important components of urban green spaces that contribute to biodiversity conservation, food security, and public health. This study examined the effects of an Urban Home Gardening Program on home garden structure and plant diversity in Malang City, Indonesia. A total of 95 households were surveyed, comprising participants in the government program (JGP) and non-participants (NJGP). Data on home garden typology, plant composition, abundance, and plant diversity were analyzed using descriptive statistics, chi-square tests, and independent-samples t-tests. Three home garden types were identified: ground, mixed, and vertical/rooftop. Mixed gardens predominated among JGP households (48%), whereas ground gardens were more common in NJGP households (56%). Ornamental plants were the dominant plant group, followed by vegetables, fruits, medicinal plants, tubers, and staple food crops. JGP households maintained significantly higher plant diversity (13 vs. 8.4 varieties; $p < 0.05$) and a greater proportion of medicinal plants (59% vs. 32%; $p = 0.013$) than NJGP households. These findings indicate that the Urban Home Gardening Program primarily enhances plant diversity and promotes multifunctional home gardens rather than simply increasing plant abundance. The program therefore has considerable potential to strengthen urban biodiversity conservation, household food security, and the sustainable use of medicinal plants.

Keywords: *Home gardens; medicinal plants; urban biodiversity; urban green spaces; urban home gardening.*

I. INTRODUCTION

Rapid urbanization in various developing countries has led to increasing pressure on green open spaces and urban ecosystems. Land conversion for housing, infrastructure, and economic activities has resulted in the loss of natural habitats and a decline in biodiversity in urban areas [1]. On the other hand, urban green spaces are increasingly recognized as playing a vital role in maintaining environmental quality, mitigating the impacts of climate change, and providing various ecosystem services to urban communities [2]. Therefore, efforts to preserve and enhance vegetation in urban environments have become a key strategy in supporting sustainable and environmentally conscious urban development [3].

Home gardens are a form of small-scale green space that plays a vital role in preserving biodiversity in urban areas. Various studies have shown that home gardens can serve as habitats for a wide variety of food crops, fruit trees, medicinal plants, and ornamental plants, thereby acting as reservoirs of biodiversity within an increasingly fragmented urban landscape [4]. In addition to increasing vegetation diversity, home gardens also support the provision of various ecosystem services, such as the conservation of plant genetic resources, microclimate regulation, improved environmental quality, and the provision of habitats for other organisms in urban environments [5]. Therefore, the sustainable management and use of home gardens are increasingly viewed as an effective strategy to support biodiversity conservation while enhancing the resilience of socio-ecological systems in urban areas [6].

In the city of Malang, population growth and urban development have given rise to various environmental problems, such as a reduction in green open spaces, an increase in household waste, and the occurrence of waterlogging and flooding in several areas of the city [7]. To address these issues, the Malang City Government has launched a community-based greening initiative through the Malang Ijo Royo-Royo (MIRR) program, supported by various training sessions, mentoring, and

environmental competitions at the community level [8]. One of the programs that emerged from this movement is Kampung Bersinar (Clean, Healthy, Beautiful, and Tidy), which encourages communities to improve the quality of their residential environments through spatial management, greening, and the utilization of home gardens. In implementing the program, the government evaluates aspects of environmental management—including plant diversity and the arrangement of green spaces—and awards recognition to communities that demonstrate the best performance [8]. This program has the potential to influence the characteristics of community-managed home gardens, including the composition and structure of the vegetation within them.

Although various studies have demonstrated the importance of home gardens in supporting urban biodiversity conservation and the provision of ecosystem services [4–6], information regarding the effectiveness of community-based greening programs on the characteristics of garden vegetation remains relatively limited. Most urban environmental programs are more often evaluated based on community participation, environmental cleanliness, or the aesthetics of the area, while changes in plant diversity and the structure of home gardens have not been extensively studied quantitatively [8]. Furthermore, studies that specifically compare the characteristics of home garden between households participating in government programs and those not participating in such programs are still rarely reported. Yet this information is crucial for assessing the extent to which government interventions can promote increased biodiversity at the household level as part of sustainable urban development.

Based on the above description, this study aims to analyze the effect of participation in the the government greening program on plant diversity and the structure of home gardens in Malang City. The analysis was conducted by comparing the number of plant species, the composition of plant groups, and the patterns of home garden space utilization between households participating in the government program (Join Government Program/JGP) and non-participating households (Not Join Government Program/NJGP). The results of this study are expected to serve as a basis for developing more effective urban greening strategies to support biodiversity conservation at the household level.

II. METHODS

Research Location

The study was conducted in Malang City, East Java Province, Indonesia (Figure 1). Geographically, Malang City is located at 112°06'–112°07' E and 7°06'–8°02' S [9]. Malang is one of the largest cities in East Java Province, experiencing relatively high rates of urban development and population growth, which has led to various environmental challenges, such as a reduction in green open spaces, an increase in household waste volume, and changes in land use [7], [9].

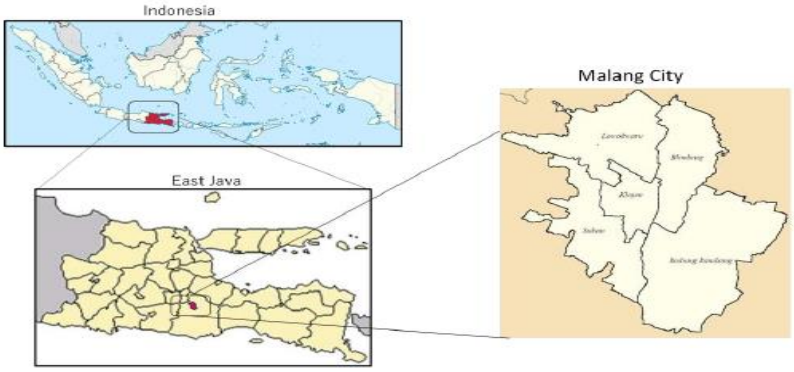

Fig. 1. Map of the study location in Malang City.

Sampling was conducted in five subdistricts in Malang City, namely Klojen, Blimbing, Lowokwaru, Kedungkandang, and Sukun. Respondents were grouped into two categories: households participating in the the government greening program (Join Government Program/JGP) and households not participating in the program (Not Join Government Program/NJGP). These research locations were selected because they are areas where community-based greening and environmental

management programs developed by the Malang City Government are being implemented, including the Kampung Bersinar program, which encourages the use of home gardens as household-scale green spaces [8]. Group identification was conducted through field surveys and initial interviews with homeowners regarding their involvement in environmental greening programs organized by the Malang City Government, including outreach activities, training, mentoring, and community-based environmental competitions. Households that had previously participated in or been involved with these programs were categorized as JGP, while households that had never participated were categorized as NJGP. The distribution of sampling locations in each subdistrict is presented in Figure 2. The distribution of samples across various areas of the city is expected to provide a more comprehensive picture of the characteristics of home gardens and the diversity of plants managed by the residents of Malang City.

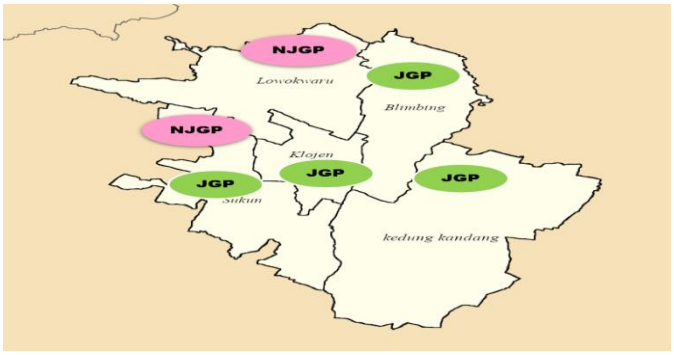

Fig. 2. Distribution of study locations (participants in the government program (Join Government Program/JGP) and non-participants (Not Join Government Program/NJGP)).

Research Design and Sampling

This study employed a survey approach using field observation and vegetation inventory methods in residential home gardens in Malang City. Data collection was conducted in five subdistricts: Klojen, Blimbing, Lowokwaru, Kedungkandang, and Sukun. The study focused on comparing the characteristics of plant diversity and home garden structure between households participating in the the government greening program (Join Government Program/JGP) and those not participating in the program (Not Join Government Program/NJGP).

The sample was selected using convenience sampling from households that had home gardens and were willing to participate in the study. Based on the results of the field survey, a total of 95 households were found to meet the study criteria, consisting of 61 JGP households and 34 NJGP households. Respondents were classified through an initial interview regarding their participation in greening programs organized by the Malang City Government, including outreach activities, training, mentoring, and community-based environmental competitions. Households that had participated in these activities were categorized as JGP, while those that had never participated were categorized as NJGP.

Eligible households were those that had a home garden or planting area around their residence, whether at ground level or in other forms of space utilization, such as vertical systems, hanging systems, and rooftops. Each household was observed as a single sample unit to collect data on the number of plant species, the number of individual plants, plant groups, and the structure of the managed home garden.

Research Methodology

Data collection was conducted through direct observation and vegetation inventory using a pre-designed floristic survey form. In each household, all plants found in the home garden were recorded by species and number of individuals. The plants were then grouped into several functional categories: medicinal plants, tubers, food crops, fruit trees, vegetables, and ornamental plants. For each category, the number of varieties and the total number of plants were recorded.

In addition to cataloging plant species, the structure of the home garden was documented based on the location of the plants. Home garden structures are classified into five categories: ground level, vertical, fences, hanging, and rooftops. If more than one planting system is found in a single home garden, that home garden is categorized as a mixed type. All data from the floristic survey were compiled to obtain information on the number of plant species, the number of plant individuals, the composition of plant groups, and the structure of the home gardens in each household. This data was then used to compare the characteristics of the home gardens between households participating in the government program (Join Government Program/JGP) and those not participating in the program (Not Join Government Program/NJGP).

Data Analysis

Data obtained from the floristic survey were analyzed using descriptive and inferential statistics. Descriptive statistics were used to describe the characteristics of home gardens, including the number of plant species, the number of plant individuals, the composition of plant groups, and the structure of the gardens. The results of the descriptive analysis are presented in the form of mean values, percentages, tables, and graphs.

Differences in home garden characteristics between households participating in the government program (Join Government Program/JGP) and those not participating (Not Join Government Program/NJGP) were analyzed using an independent samples t-test at a 95% confidence level ($\alpha = 0.05$). The analysis was conducted to compare the number of plant species, the number of individual plants, and plant groups between the two respondent groups. In addition, a chi-square (χ^2) test was used to test for differences in the proportions of households growing specific plant groups (medicinal plants, tubers, fruits, vegetables, and ornamental plants) between the JGP and NJGP groups. All statistical analyses were performed using IBM SPSS Statistics software.

III. RESULT AND DISCUSSION

Effects of the Urban Home Gardening Program on Home Garden Typology and Structure

Based on field observations, home gardens in Malang City can be grouped into three main types: ground type, mixed type (a combination of ground and vertical/rooftop), and vertical/rooftop type (Figure 3). The ground type is a form of garden that directly utilizes the ground as a growing medium, while the mixed type combines the ground with vertical or rooftop planting systems. The vertical/rooftop type is a form of space utilization that places plants on walls, fences, vertical racks, or building roofs as the primary planting locations. These three types demonstrate the variety of strategies used by the community to manage green spaces in urban residential environments with limited space.

Fig. 3. Home garden types (A: ground level; B: vertical + ground; and C: rooftop)

The distribution of home garden types shows differing patterns between households participating in the government program (JGP) and those not participating (NJGP) (Figure 4). In the JGP group, the mixed type (ground + vertical/rooftop) was the most dominant, accounting for 48%, followed by the ground type at 39% and the vertical/rooftop type at 13%. In contrast, in the NJGP group, the ground type dominates at 56%, while the mixed type and vertical/rooftop type account for only 26% and 18%, respectively (Figure 4). This pattern indicates that households participating in the

the government greening program tend to make greater use of a combination of various planting spaces compared to households not participating in the program.

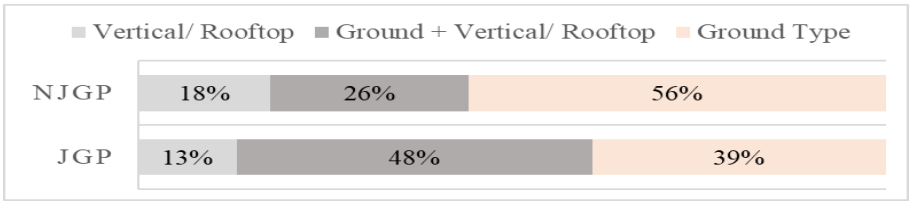

Fig. 4. Types of home gardens by program group.

The predominance of mixed-type gardens in the JGP group indicates a greater effort to optimize space through the simultaneous use of both horizontal and vertical areas. The utilization of various forms of growing spaces is one of the adaptation strategies employed by urban communities to cope with increasingly limited land availability due to urbanization. Recent studies show that home gardens and household-scale green spaces play a crucial role in maintaining urban biodiversity, especially as public green open spaces become increasingly limited [10], [11]. In conditions of limited land, the use of vertical shelves, hanging pots, living fences, and rooftop gardens allows for an increase in growing space capacity without requiring land expansion [11].

Differences in visual characteristics between the home gardens of program participants and non-participants were also evident in the vertical garden systems implemented (Figure 5). Home gardens in the JGP group generally featured more intensive plant arrangements, utilizing tiered shelves, hanging pots, and vertical structures integrated with building elements. In contrast, in the NJGP group, the use of vertical space tends to be simpler and limited to specific areas around the house. Although this study did not directly measure the quality of home garden design, these patterns indicate differences in the level of space utilization that are likely related to access to information, training, and home garden management experience gained through the the government greening program.

Fig. 5. Comparison of vertical garden systems between program participants (A) and non-participants (B).

The interview results show that the main factor underlying the development of home gardens in both groups is the availability of space (Figure 6). All NJGP respondents (100%) stated that the layout of their gardens was entirely determined by the available space around their homes. In the JGP group, the majority of respondents (82%) also cited the availability of space as the main factor; however, 18% of respondents stated that information obtained from the government or nongovernmental organizations (NGOs) also influenced the design and management of their home gardens.

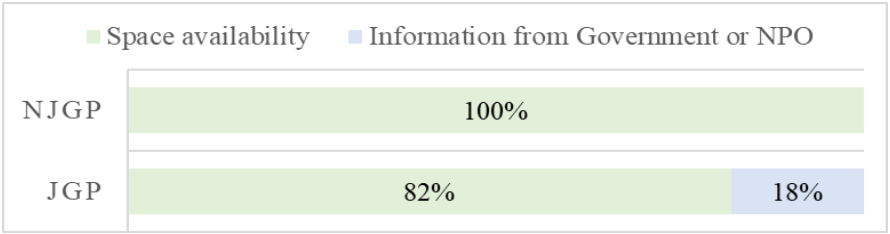

Fig. 6. Reasons for developing home gardens

The findings indicate that although the physical conditions of the land remain a dominant factor in determining home garden layout, greening programs have the potential to expand residents' options for utilizing available space. Community-based programs are known to enhance community capacity through the dissemination of information, technical training, and the exchange of experiences among residents, thereby encouraging the adoption of more diverse urban gardening practices [13], [14]. In addition to serving as spaces for plant cultivation, more intensively managed home gardens also contribute to enhancing urban ecosystem services, such as providing habitats for other organisms, improving the microclimate, and enhancing the visual quality of residential environments [11], [12]. Therefore, greening programs not only have the potential to increase the amount of vegetation planted by the community but also encourage innovation in land use so that home gardens can function more optimally as an important component of urban green spaces.

The Effect of the Urban Home Gardening Program on Plant Composition and Dominant Species

An inventory of vegetation in all residential home gardens revealed that residents of Malang City grow a diverse range of plant groups, including ornamental plants, vegetables, fruits, medicinal plants, tubers, and staple food crops (Table 1). Overall, the ornamental plant group was the most dominant, with 80 individuals representing various species, followed by vegetables (58), fruits (56), medicinal plants (47), tubers (19), and staple food crops (2). These results indicate that home gardens in urban areas serve as multifunctional spaces that are utilized not only for aesthetic purposes but also to support household food and health needs.

Table 1. Plant species and dominant plants

Plant Species	N	Plant Species	N
Tuber Crops	**19**	**Ornamental Plants**	**80**
Zingiber officinale	6	*Sansevieria trifasciata*	18
Manihot esculenta	5	*Anthurium Plowmanii Croat*	15
Curcuma longa	5	*Phalaenopsis amabilis*	9
Alpinia galanga	2	*Syzygium oleana*	8
Ipomoea batatas	1	*Plumeria rubra*	6
Staple foods	**2**	*Begonia spp.*	3
Zea mays	2	*Anthurium andraeanum*	4
Fruit	**56**	*Helianthus annuus*	3
Mangifera indica	17	*Cyrtostachys renda*	2
Musa acuminata	15	*Hibiscus rosa-sinensis*	2
Averrhoa carambola	9	*Portulaca grandiflora*	2
Psidium guajava	8	Cananga odorata	1
Citrus sinensis	5	*Taxodium distichum*	1
Cocos nucifera	1	Dieffenbachia seguine	1
Fragaria ananassa	1	*Jasminum spp.*	1
Vegetable	**58**	*Chlorophytum comosum*	1
Capsicum frutescens	18	*Codiaeum variegatum*	1
Solanum melongena	10	*Adiantum spp.*	1
Lactuca sativa	9	*Salix spp.*	1
Solanum lycopersicum	7	**Medicinal Plants**	**47**
Eleutherine bulbosa	6	*Aloe vera*	25
Spinacia oleracea	6	*Piper betle*	22
Apium graveolens	1		
Brassica oleracea	1		

The dominance of ornamental plants shows that aesthetic aspects are still one of the main considerations in managing urban home gardens. The most commonly found species include Sansevieria trifasciata, Anthurium plowmanii, Phalaenopsis amabilis, and Syzygium oleana, which are known to have high aesthetic value and are relatively easy to maintain in residential environments. The high proportion of ornamental plants in home gardens has also been widely reported in various cities around the world, where homeowners tend to choose species that can improve the visual quality of the environment while providing psychological comfort for home occupants [17], [19]. In addition to functioning as decorative elements, ornamental plants also contribute to improving the quality of the microenvironment through carbon absorption, reducing air temperature, and providing habitat for various urban organisms [10], [11].

However, the high number of vegetable and fruit plants indicates that home gardens in Malang City also have a fairly important productive function. The vegetable group is dominated by chili (*Capsicum frutescens*), eggplant (*Solanum melongena*), lettuce (*Lactuca sativa*), and tomato (*Solanum lycopersicum*), while the fruit group is dominated by mango (*Mangifera indica*), banana (*Musa acuminata*), starfruit (*Averrhoa carambola*), and guava (*Psidium guajava*). The dominance of these species indicates that people tend to choose plants that have direct benefits for household needs, both as a food source and as a source of fresh fruit that is easily obtained from their own home gardens. This finding is in line with various studies that show that home gardens are a small-scale agroecological system that can support household food security while also being a place to conserve various genetic resources of cultivated plants [16], [18], [20].

Medicinal plant groups were also found in relatively high numbers, dominated by Aloe vera and Piper betle (Table 1). The presence of medicinal plants indicates that some communities still maintain the practice of using plants for family health needs. In addition to being easy to cultivate, these two species are widely known as medicinal plants that have various traditional and modern benefits, so they are often planted in home gardens. Medicinal plants maintained in the household environment not only serve as a source of simple medicine, but also contribute to the preservation of local knowledge and the conservation of urban biodiversity [20], [21].

The plant composition found in this study indicates that home gardens in Malang City have characteristics as multifunctional home gardens, namely a home garden system that integrates aesthetic functions, food production, plant diversity conservation, and health benefits in one relatively limited space. The existence of various plant groups with different functions indicates that home gardens can be an important component of urban green space while supporting the provision of various ecosystem services at the household scale [10], [12], [16]. Thus, the diversity of plant composition found not only reflects the preferences of homeowners for certain types of plants, but also shows the ability of home gardens to accommodate various social, economic, and ecological needs of urban communities.

The Impact of Urban Home Gardening Programs on Plant Diversity

Although all plant groups were found in both government program participant (JGP) and non-participant (NJGP) households, there were differences in the number of plants and the diversity of varieties managed by the two groups (Table 2). In general, program participant households had a higher average number of plants (52.6 individuals) than non-participant households (42.6 individuals), but this difference did not show statistical significance based on the t-test ($p > 0.05$). In contrast, the average number of plant varieties in the JGP group reached 13 varieties, significantly higher than the NJGP group which only had an average of 8.4 varieties. The t-test results showed that this difference was significant at the 95% confidence level ($p < 0.05$), indicating that participation in the Urban Home Gardening Program is associated with an increase in the diversity of plant types cultivated by the community.

Table 2. Comparison of the number of plants and the number of plant varieties in the home gardens of government program participants (JGP) and non-program participants (NJGP)

Plant Groups	Percentage of Households (%)			Average Number of Plants			Average Number of Plant Varieties		
	JGP N=61	NJGP N=34	(X^2)	JGP	NJGP	t-test	JGP	NJGP	t-test
Total	100%	100%		52.6	42.6	0.594	13	8.4	2.272*
Medicinal plants	59%	32%	0.013*	14.5	7.4	2.201*	3.3	2.3	1.76
Tuber Crops	21%	18%	0.7	13.3	20.8	-0.599	1.8	3.2	-0.889
Fruit	66%	47%	0.1	8.9	20.3	-0.908	3.2	2.7	0.548
Vegetable	67%	50%	1	14.8	21	-0.429	2.7	2.6	0.190
Ornamental Plant	85%	82%	0.7	29.7	19.9	1.537	7.8	5.4	1.777

These findings suggest that greening programs do not necessarily encourage people to plant more plants, but rather play a role in expanding the choice of cultivated plant types. In other words, the program contributes to increasing the diversification of home gardens rather than simply increasing the quantity of plants. A similar pattern has also been reported in various community-based urban gardening programs, where training, outreach, and information exchange activities have a greater impact on the diversity of planted species than the number of individual plants maintained [13], [14]. Diversification of plant types is an important aspect in home garden management because it can increase ecological stability, expand the benefits obtained by households, and strengthen the function of biodiversity conservation at the local scale [10], [16].

A more pronounced difference was seen in the medicinal plants group. Fifty-nine percent of households participating in the program planted medicinal plants, while only 32 percent of households in the non-participant group did so. This difference was significant based on a chi-square test ($p = 0.013$). Furthermore, the average number of medicinal plants grown in JGP home gardens (14.5 individuals) was almost twice as high as that of the NJGP group (7.4 individuals), and this difference was also significant based on a t-test ($p < 0.05$). Conversely, tubers, fruits, vegetables, and ornamental plants did not show any significant differences between the two groups.

These results indicate that the greening program likely not only affects the physical aspects of home gardens, but also influences people's perspectives on the function of home gardens. Before participating in the program, home garden use tended to focus on aesthetic functions through planting ornamental plants or consumption functions through fruit and vegetable plants. However, after receiving information, training, and assistance from the government program, people began to expand the function of home gardens as a source of plants that support family health. The increase in the planting of medicinal plants indicates a shift in orientation from home gardens as passive green spaces to multifunctional spaces that provide ecological, economic, and health benefits simultaneously [13], [20], [21]. This finding is reinforced by the dominance of Aloe vera and Piper betle in the medicinal plant group (Table 1), two species that have long been known and used by the community as household medicinal plants. The presence of these plants indicates that the greening program has the potential to be a medium for reintroducing the use of medicinal plants in everyday life. In the context of sustainable urban development, increasing the diversity of medicinal plants in home gardens not only supports the conservation of plant genetic resources, but also strengthens public health resilience by providing simple, easily accessible sources of medicine [20], [21].

Overall, the research results show that the main impact of the the government greening program lies not in increasing the number of plants planted by the community, but rather in increasing the diversity of plant varieties and expanding the function of home gardens. The program encourages communities to manage their gardens in a more diverse and multifunctional way, so that the gardens not only serve as an aesthetic element of the environment or a source of household food, but also as a means of biodiversity conservation and the use of medicinal plants at the family scale. These findings

demonstrate that community-based government interventions can be an effective instrument in improving the quality of urban green spaces while strengthening community relationships with the diversity of plants they manage [10], [11], [13], [14].

IV. CONCLUSION

This study shows that home gardens in Malang City are characterized as multifunctional green spaces composed of three main types: ground type, mixed type (ground and vertical/rooftop), and vertical/rooftop type. The vegetation composition is dominated by ornamental plants, followed by vegetables, fruits, medicinal plants, and tubers, reflecting the combination of aesthetic, food production, and health functions in home garden management. Households participating in government greening programs tend to have more diverse home garden structures, a higher number of plant varieties, and a greater proportion of medicinal plants planted than non-participating households. These results indicate that the main contribution of the greening program is not in increasing the number of plants planted, but in diversifying plant types and expanding the function of home gardens. Community-based greening programs have the potential to be an effective instrument for improving the quality of urban green spaces by strengthening the functions of biodiversity conservation, household food security, and the use of medicinal plants. Therefore, the development of future greening programs needs to be more directed at increasing plant diversification and education on the use of food and medicinal plants to optimize the resulting ecological and social benefits.

V. ACKNOWLEDGMENTS

The authors would like to thank all respondents who participated in this research. Appreciation is also extended to Saga University, Japan, for its academic support, research facilities, and financial assistance during the study that formed the basis of this research.

REFERENCES

[1] Aronson, M. F. J., Lepczyk, C. A., Evans, K. L., Goddard, M. A., Lerman, S. B., & MacIvor, J. S. (2023). Biodiversity in the city: key challenges and opportunities for urban conservation. Annual Review of Environment and Resources, 48, 531–557.

[2] Li, X., Zhou, W., Ouyang, Z., Xu, W., & Zheng, H. (2022). Urban green spaces and ecosystem services: a review of current research and future perspectives. Urban Forestry & Urban Greening, 68, 127458.

[3] United Nations. (2023). The Sustainable Development Goals Report 2023. United Nations, New York.

[4] M. A. Buchmann, A. D. Landis, and D. J. Bennett, "Home gardens as biodiversity reservoirs in urban landscapes: A global synthesis," Urban Forestry & Urban Greening, vol. 75, pp. 127698, 2022.

[5] R. C. Cilliers, S. Siebert, and M. J. du Toit, "Urban home gardens and ecosystem services in rapidly urbanizing regions: A review," Sustainability, vol. 14, no. 18, pp. 11452, 2022.

[6] C. L. Dobbs, M. D. Kendal, and T. N. Nitschke, "The contribution of residential gardens to urban biodiversity and resilience: Recent advances and future directions," Landscape and Urban Planning, vol. 240, pp. 104894, 2023.

[7] W. Fizriani, "Ruang Terbuka Hijau di Kota Malang Terus Berkurang," Republika, https://news.republika.co.id/berita/p5h5io423/ruang-terbuka-hijau-di-kota-malang-terus-berkurang . 12 Maret 2018. Diakses tanggal 12 Mei 2026.

[8] Humas Kota Malang, "Menuju Kampung Bersinar," Pemerintah Kota Malang, 2019. https://malangkota.go.id/2019/04/12/dlh-gelar-pembinaan-kampung-lingkungan-hidup-menuju-kampung-bersinar/. Diakses tanggal 12 Mei 2026.

[9] Pemerintah Kota Malang, Geografis Kota Malang. Available: https://malangkota.go.id/sekilas-malang/geografis/. Diakses tanggal 12 Mei 2026.

[10] R. J. Delahay, K. J. Gaston, K. L. Evans, and M. A. Goddard, “Biodiversity in residential gardens: a review of the evidence base,” Biodiversity and Conservation, vol. 32, pp. 3231–3261, 2023. doi: 10.1007/s10531-023-02694-9.

[11] R. W. Cameron, “Do we need to see gardens in a new light? Recommendations for policy and practice to improve the ecosystem services derived from domestic gardens,” Urban Forestry & Urban Greening, vol. 80, 127820, 2023. doi: 10.1016/j.ufug.2022.127820.

[12] D. L. Evans, A. M. Santoro, and colleagues, “Ecosystem service delivery by urban agriculture and green infrastructure: A systematic review,” Environmental Science & Policy, vol. 130, pp. 1–15, 2022. doi: 10.1016/j.envsci.2022.01.002.

[13] M. Egerer, P. Bichier, and S. M. Philpott, “Growing gardens into neighborhoods through community-scale biodiversity actions,” Urban Forestry & Urban Greening, vol. 95, 128345, 2024. doi: 10.1016/j.ufug.2024.128345.

[14] M. Egerer, “In defence of urban community gardens,” People and Nature, vol. 6, no. 3, pp. 580–586, 2024. doi: 10.1002/pan3.10612.

[15] X. Zhao, Y. Wang, and H. Li, “Biodiversity in urban green space: A bibliometric review on research status, hotspots, and future trends,” Land, vol. 11, no. 10, 2022. doi: 10.3390/land11101761

[16] M. A. Egerer, P. Bichier, and S. M. Philpott, “Biodiversity and multifunctionality in urban home gardens: current knowledge and future directions,” Urban Ecosystems, vol. 27, no. 1, pp. 1–15, 2024. doi: 10.1007/s11252-023-01463-2

[17] A. Borysiak, J. Mizgajski, and M. Speak, “Floral diversity of domestic gardens and its contribution to urban biodiversity,” Sustainability, vol. 14, no. 21, 2022. doi: 10.3390/su142114312

[18] A. L. Paço, J. Aronson, and M. R. da Silva, “Residential gardens as reservoirs of cultivated plant diversity in urban ecosystems,” Urban Forestry & Urban Greening, vol. 84, 2023. doi: 10.1016/j.ufug.2023.127945

[19] M. C. Calvet-Mir, V. Gómez-Baggethun, and E. Reyes-García, “Beyond food production: ecosystem services and social values of urban home gardens,” People and Nature, vol. 5, no. 4, pp. 1114–1128, 2023. doi: 10.1002/pan3.10496

[20] H. K. Lal and R. P. Singh, “Home gardens as hotspots of agrobiodiversity conservation and livelihood support: a review,” Agriculture, vol. 13, no. 7, 2023. doi: 10.3390/agriculture13071405

[21] S. A. Karki, P. Chaudhary, and R. B. Thapa, “Medicinal plants in urban home gardens: their contribution to household health and biodiversity conservation,” Plants, vol. 12, no. 18, 2023. doi: 10.3390/plants12183241.