

ENHANCING HOUSEHOLD ECONOMIC EMPOWERMENT THROUGH ENTREPRENEURSHIP-ORIENTED HYDROPONIC TRAINING

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Abstract. *The rapid development of urban areas has reduced productive land availability and increased food demands among urban communities. This condition also occurs in Menur Pumpungan Subdistrict, Surabaya, where limited green open spaces and underutilised household land reduce opportunities for household-based food production and productive economic activities. This community service program aimed to improve the knowledge and skills of residents, particularly PKK women groups, in household-scale hydroponic cultivation based on entrepreneurship. The program employed a participatory empowerment approach through preparation, implementation, evaluation, and reflection stages. Activities were conducted through lectures, demonstrations, hands-on practice, discussions, and mentoring related to simple hydroponic cultivation, the production of liquid organic fertilizer (LOF) from household organic waste, and entrepreneurship development. Program evaluation was carried out using observation, documentation, and participant response questionnaires with a Likert scale ranging from 1–5. The results showed that participants responded very positively to the program, with evaluation scores ranging from 4.0 to 4.9. The training also generated tangible impacts, including improved participant skills in implementing simple hydroponic systems at home, utilizing kitchen waste as liquid organic fertilizer, and increasing motivation to develop household-based businesses from hydroponic products. This program contributed not only to improving community knowledge and practical skills but also to strengthening women's empowerment, household food security, and sustainable urban household economic resilience.*

Keywords: *entrepreneurship, household food security, hydroponics, urban farming*

Abstrak. Perkembangan kawasan perkotaan yang semakin padat menyebabkan berkurangnya lahan produktif dan meningkatnya kebutuhan pangan masyarakat perkotaan. Kondisi tersebut juga terjadi di Kelurahan Menur Pumpungan, Kota Surabaya, yang memiliki keterbatasan ruang terbuka hijau serta minimnya pemanfaatan lahan rumah tangga sebagai sumber pangan dan peluang usaha produktif. Kegiatan pengabdian kepada masyarakat ini bertujuan untuk meningkatkan pengetahuan dan keterampilan masyarakat, khususnya ibu-ibu PKK, dalam budidaya tanaman hidroponik berbasis entrepreneurship skala rumah tangga. Metode pelaksanaan menggunakan pendekatan participatory empowerment melalui tahapan persiapan, pelaksanaan, evaluasi, dan refleksi program. Kegiatan dilakukan melalui ceramah, demonstrasi, praktik langsung, diskusi, dan pendampingan terkait budidaya hidroponik sederhana, pembuatan pupuk organik cair (POC) dari limbah rumah tangga, serta penguatan konsep entrepreneurship. Evaluasi kegiatan dilakukan menggunakan observasi, dokumentasi, dan angket respons peserta dengan skala Likert 1–5. Hasil kegiatan menunjukkan bahwa peserta memiliki respons yang sangat baik terhadap pelaksanaan program dengan skor rerata evaluasi berkisar antara 4,0–4,9. Pelatihan juga memberikan dampak nyata berupa meningkatnya keterampilan peserta dalam menerapkan sistem hidroponik sederhana di rumah, memanfaatkan limbah dapur menjadi POC, serta tumbuhnya motivasi peserta untuk mengembangkan usaha berbasis hasil budidaya tanaman. Program ini tidak hanya berkontribusi terhadap peningkatan pengetahuan masyarakat, tetapi juga mendukung pemberdayaan perempuan, ketahanan pangan rumah tangga, dan penguatan ekonomi masyarakat perkotaan secara berkelanjutan.

Kata Kunci: entrepreneurship, hidroponik, ketahanan pangan rumah tangga, urban farming

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INTRODUCTION

The rapid expansion of urban areas has significantly transformed community lifestyles, particularly in relation to environmental sustainability, food security, and household economic resilience (Gea et al., 2026; Zainuddin et al., 2026). The continuous growth of urban populations



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has indirectly contributed to the reduction of productive land available for household-scale agricultural activities (Hayati & Rahayu, 2026; Januardi et al., 2025; Mutiara Ayuningtias et al., 2025). According to data from the Surabaya City Statistics Agency (BPS), the population of Surabaya exceeded 3 million inhabitants in 2024, with several districts experiencing exceptionally high population densities. This demographic pressure has resulted in a substantial decline in green open spaces and productive land that could otherwise be utilized for household-based agricultural practices.

A similar situation is evident in Menur Pumpungan Village, Surabaya City, a densely populated urban neighbourhood predominantly inhabited by middle-income households. The limited availability of green spaces and the restricted size of residential yards have constrained residents' ability to utilize their home environments as sources of household food production or as opportunities for income-generating activities. This challenge is further exacerbated by the increasing demand for healthy food and the rising cost of living in urban areas. Concurrently, urban farming has emerged as a growing trend in Indonesia. The 2023 Agricultural Census reported approximately 13,019 urban farming enterprises nationwide, the majority of which are concentrated on Java Island. These findings indicate that urban farming is increasingly recognized as a strategic approach to strengthening food security and enhancing the economic well-being of urban communities.

Food price volatility also represents a critical challenge for urban households. Statistics Indonesia reported that the national annual inflation rate reached 1.84% in September 2024, with fluctuations in staple food prices identified as one of the primary contributing factors. This condition has intensified the need for household-based food self-sufficiency strategies among urban residents. The growing demand for healthy, fresh, and affordable food products presents a significant challenge within increasingly congested urban environments. Moreover, dependence on food supplies originating from external regions increases community vulnerability to food price escalation and disruptions in food distribution systems.

These circumstances underscore the urgent need for alternative solutions capable of strengthening household food security while simultaneously enhancing community productivity at the household level (Bunga et al., 2025; Dewangga et al., 2025; Islami et al., 2025; Meilani et al., 2024). Among the various approaches available, the utilization of limited urban spaces through urban farming has been widely recognized as an effective strategy for addressing these challenges (Akbar et al., 2026; Giyarsih et al., 2024). In addition, the continuous decline in agricultural land resulting from land-use conversion for residential and industrial development has further threatened urban food security systems (Martika et al., 2026; Ima Aryani et al., 2026; Kiribou et al., 2024). Available data indicate that Indonesia's agricultural land area has decreased by approximately 8.5% compared to 2015, primarily due to the conversion of productive agricultural land into development zones. This trend highlights the growing importance of urban farming as a sustainable and adaptive strategy for enhancing food security and promoting resilient food systems within urban communities.

Urban farming serves not only as a strategy for meeting household food requirements but also as a platform for community empowerment through environmentally sustainable practices and creative economic development (Das et al., 2026; Säumel et al., 2026). Urban farming refers to food production activities conducted within urban environments, encompassing the entire process from cultivation and production to the consumption of agricultural products (Musthofa et al., 2026; Zepeda et al., 2026). In recent years, urban farming has gained increasing prominence as an innovative and sustainable approach to enabling communities to achieve greater food self-sufficiency while simultaneously contributing to the improvement of urban environmental quality. Its multifaceted benefits have positioned urban farming as a viable solution for addressing food security challenges and promoting sustainable urban development.

Plant cultivation through hydroponic systems has emerged as one of the most rapidly expanding urban farming models in metropolitan areas. Hydroponics is a soilless cultivation method that utilizes nutrient-enriched water as the primary medium for plant growth (En et al., 2026; Kader et al., 2026). Compared with conventional agricultural practices, this system is considered more practical, land-efficient, and adaptable for household-scale implementation.

Hydroponics has been widely recognized as a cultivation approach particularly suited to urban environments characterized by limited land availability. Several advantages have been associated with hydroponic production systems, including higher planting density per unit area, cleaner and higher-quality harvests, and reduced dependence on seasonal planting cycles (Berling & Sternberg, 2026; Faghiri et al., 2026). Furthermore, hydroponic techniques such as the Nutrient Film Technique (NFT) and Deep Flow Technique (DFT) enable communities to optimize the use of restricted spaces, including vertical growing areas, thereby maximizing land-use efficiency (Putri et al., 2026; Raschke et al., 2026). The implementation of hydroponic cultivation in limited urban spaces represents a strategic alternative for strengthening household food security and promoting sustainable food production systems (Nikam & Nikam, 2026; Wu et al., 2026). These characteristics make hydroponic farming particularly relevant for urban neighborhoods such as Menur Pumpungan Village, where the availability of productive land is highly constrained.

Despite the considerable potential of hydroponic cultivation in urban communities, its implementation has not been fully supported by adequate community knowledge and technical competencies. Field assessments revealed that the majority of residents in Menur Pumpungan Village possess limited understanding of hydroponic cultivation practices, including nutrient management, selection of appropriate growing media, and the maintenance of simple hydroponic systems. Furthermore, community members generally lack the knowledge required to convert household organic waste into liquid organic fertilizers that can support sustainable plant production. These limitations have hindered the optimal and long-term utilization of restricted residential spaces for productive agricultural activities. More broadly, urban communities continue to face significant challenges related to the knowledge and skills necessary for developing and managing household-based urban farming systems effectively. Addressing these capacity gaps is essential to maximize the benefits of urban agriculture as a strategy for enhancing food security, environmental sustainability, and community resilience.

Another critical issue identified is the limited understanding of household-based entrepreneurship among community members. Most residents continue to perceive plant cultivation primarily as a subsistence activity aimed at fulfilling personal or household needs rather than as a potential income-generating enterprise with economic value (Achmad et al., 2022; Guampe et al., 2022). In fact, hydroponically cultivated products, including fresh vegetables, medicinal and herbal plants, as well as value-added processed products, possess substantial market potential within urban areas. However, inadequate competencies in product packaging, marketing strategies, branding, and basic business management constitute significant barriers to the development of community-based economic activities derived from plant cultivation. These challenges are further exacerbated by limited access to business capital and the lack of sustainable mentoring and capacity-building programs for local communities (Raza et al., 2024). Consequently, the economic opportunities associated with urban farming remain underutilized despite their considerable potential to contribute to household income generation and community economic resilience.

Community empowerment through an entrepreneurship-based approach represents a strategic pathway for enhancing household economic independence while simultaneously strengthening household food security. Entrepreneurship-oriented interventions extend beyond the capacity to produce goods; they also foster creativity, innovation, and the confidence of community members to identify and develop business opportunities based on local environmental resources and potentials (Dwijayantie et al., 2025; Pratama et al., 2025). Adult learning processes are generally more effective when educational content is aligned with the actual needs of participants and can be directly applied to their daily lives (Kaiwai et al., 2022; Nur Hanifan Maulana et al., 2024). Experiential learning theory emphasizes that practice-oriented and experience-based learning approaches significantly enhance participants' understanding and skill acquisition. Community empowerment programs that actively engage participants throughout the learning process are more likely to generate meaningful and sustainable learning outcomes (Rahmawati et al., 2023). The integration of entrepreneurship education with hands-on urban farming activities provides opportunities to strengthen

entrepreneurial competencies, expand economic potential, and enhance community resilience while supporting sustainable household food security.

The empowerment of women within household settings is particularly important, given the substantial potential of housewives to contribute to family income through household-based productive enterprises. The development of competencies in plant cultivation and post-harvest processing offers a flexible and economically viable alternative that aligns with the characteristics and needs of urban communities (Haryu et al., 2025; Nanda et al., 2023; Safitri et al., 2021). This community service program was designed as an empowerment initiative targeting members of the Family Welfare Movement (PKK) in Menur Pumpungan Village through entrepreneurship-oriented training in household-scale plant cultivation. The program emphasizes the development of practical agricultural skills alongside entrepreneurial capacities to support household economic resilience and sustainable community development.

The program focused on three main components: training in simple hydroponic cultivation techniques, the production of liquid organic fertilizer (LOF) from household waste, and the strengthening of entrepreneurship concepts based on plant cultivation outputs. Program activities were implemented through a combination of instructional sessions, hands-on practice, group discussions, and continuous mentoring. This approach enabled participants not only to acquire theoretical knowledge but also to develop the practical competencies required for independent implementation within their household environments. The program aimed to enhance community knowledge and skills in hydroponic cultivation, foster entrepreneurial mindsets, and create sustainable household-based business opportunities. These outcomes are expected to contribute to improved economic well-being, increased household resilience, and a higher quality of life among urban communities.

METHOD

Program Implementation Method

The community service program adopted a participatory empowerment approach grounded in experiential learning, emphasizing the active involvement of members of the Family Welfare Movement (PKK) in Menur Pumpungan, Surabaya, throughout all program stages. This approach was designed to facilitate the acquisition of both theoretical knowledge and practical competencies related to household-scale hydroponic cultivation and entrepreneurship. The program targeted women as key agents of household economic resilience and food security, ensuring that learning outcomes could be directly applied within participants' domestic environments.

Program implementation consisted of four sequential phases: preparation, implementation, evaluation, and reflection. During the preparation phase, field observations, informal interviews, and community discussions were conducted to identify local needs, revealing demand for training in hydroponic cultivation, liquid organic fertilizer (LOF) production from household waste, and entrepreneurship development. The implementation phase integrated lectures, demonstrations, hands-on practice, group discussions, and mentoring. Training activities covered hydroponic system establishment, seedling production, nutrient and plant management, LOF preparation, product packaging, marketing strategies, and household business development. Learning was supported through leaflets, handouts, PowerPoint presentations, and practical demonstrations to enhance participant engagement and skill acquisition.

Program effectiveness was assessed through a mixed evaluation framework incorporating observations, documentation, and participant response questionnaires. Evaluation indicators included attendance, engagement levels, practical competencies in hydroponic cultivation and LOF production, and participant satisfaction with the training content and delivery. Responses were measured using a five-point Likert scale and analyzed descriptively through percentage distributions and mean scores. Subsequently, a reflection phase was conducted through collaborative discussions to identify program benefits, implementation challenges, and opportunities for future development. This process provided insights into the sustainability of

household-based urban farming and entrepreneurship initiatives while supporting community self-reliance and long-term economic empowerment.

Evaluation Design

The evaluation of the community service program conducted by the Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Negeri Surabaya (UNESA), focused on two primary aspects: participant engagement and knowledge acquisition. The participant engagement aspect was assessed based on participants' attendance rates and the extent of positive responses demonstrated during the training activities. The knowledge acquisition aspect was evaluated through the successful completion of practical outputs, including the preparation of hydroponic growing media and the construction and installation of hydroponic systems equipped with plants cultivated using the developed growing media. These indicators were used to determine participants' ability to apply the knowledge and skills acquired throughout the training program practically and productively.

Table 1. *Program Evaluation Design*

Evaluation Aspect	Indicator	Description
Participant Engagement	Participants attending the program accounted for at least 50% of the invited individuals.	Based on the preliminary survey, the expected number. The number of participants ranged from 10 to 15 individuals.
Participant Engagement	More than 75% of participants provided positive responses toward the training activities.	Participant responses were measured using a questionnaire completed at the end of the program.

RESULT AND DISCUSSION

At the time of writing, the Community Service Program (PKM) team had completed the preparation phase of the project. Several activities were undertaken during this stage, as described below.

Initial Coordination

Initial coordination with neighbourhood representatives in Manyar Rejo Village, Surabaya City, was conducted as an essential preliminary step in the implementation of the community service program entitled "Entrepreneurship-Based Household-Scale Plant Cultivation Training." The implementation team carried out coordination activities with representatives of the neighbourhood administration in Manyar Rejo Village, Surabaya City. This coordination meeting was held on 23 June 2025 at the Manyar Rejo Community Hall. During the meeting, members of the community service team presented the objectives and scope of the program, including the planned training activities, implementation stages, and expected forms of community participation. The neighbourhood representative, Mr Drs. Didik Arghyantoro Putro, expressed strong support for the initiative and welcomed the proposed program. The discussion also facilitated mutual understanding regarding the needs of the local community and the collaborative mechanisms required to ensure the successful implementation of the planned activities. The documentation of this activity captured a collaborative meeting between representatives of the community service team and neighbourhood officials in the meeting hall, which was designated as one of the venues for the forthcoming training sessions. The coordination process constituted an important step in establishing effective collaboration and strengthening partnerships with the local community. Such engagement was essential for ensuring the successful implementation, effectiveness, and long-term sustainability of the community service program.

Identified Training Needs

The assessment findings indicated several priority needs among community members: 1) enhancement of practical and accessible plant cultivation skills for limited residential spaces

through hydroponic farming techniques; 2) acquisition of fundamental knowledge regarding the selection of economically valuable and low-maintenance plant species suitable for hydroponic cultivation systems; 3) development of household-scale organic fertilizer management skills through the production of liquid organic fertilizer (LOF) derived from kitchen and household organic waste; and 4) introduction to basic entrepreneurship concepts, including strategies for marketing and distributing cultivation products within local community networks.

Local Conditions and Community Potential

The assessment of local conditions and community potential revealed several factors that could support the successful implementation of the training program. The findings indicated that: 1) the majority of women participants had available free time during the morning and late afternoon, providing opportunities to engage in household-based cultivation activities; 2) several community members had already demonstrated interest in or possessed preliminary experience with vegetable cultivation using hydroponic systems; 3) knowledge limitations remained evident in key areas, including cultivation techniques, product marketing, and entrepreneurship development; and 4) participants expressed a high level of enthusiasm toward home-based activities that offer opportunities to generate additional household income. These findings suggest favorable conditions for the implementation of entrepreneurship-oriented urban farming initiatives within the community.

Specific Training Needs

During the assessment process for the hydroponic cultivation training program, several specific training needs were identified among participant groups. The findings indicated that participants required targeted capacity development in various aspects related to hydroponic cultivation, organic fertilizer production, and entrepreneurship-based household business development. These specific training needs served as the basis for designing the training materials and practical activities implemented throughout the program.

The training program required a range of materials and equipment to support hydroponic cultivation activities. Essential resources included 50–100 net pots, which could be substituted with recycled plastic cups, one block of rockwool or sponge as a germination medium, and vegetable seeds such as lettuce, water spinach, and pakcoy selected for their rapid growth. Nutrient requirements were fulfilled using 1–2 liters of AB Mix nutrient solution per group, while hydroponic systems were supported by five nutrient reservoirs, approximately five meters of flannel wick material, and 10–20 hydroponic containers made from recycled bottles, basins, or styrofoam boxes. Additional equipment included pH meters or litmus paper to monitor nutrient solution acidity, optional TDS/EC meters for measuring nutrient concentration, plant labels and markers for identification, and 2–3 hand sprayers for irrigation and nutrient application.

To support the production of liquid organic fertilizer (LOF) from household waste, participants were provided with 10 plastic buckets, basins, or fermentation bottles with capacities of 1.5–2 liters, along with bucket lids or cloth covers to facilitate semi-closed fermentation processes. Storage of the finished fertilizer utilized 10 empty five-liter jerry cans and recycled 1.5-liter mineral water bottles for distribution. Supporting equipment included five plastic funnels for transferring fertilizer into storage containers, 10 pairs of plastic or rubber gloves to maintain hygiene during processing, five stirring tools made of wood or plastic for mixing materials, and one to two digital or manual scales for measuring organic waste inputs when precise quantities were required. In addition, two to three sieves or fine plastic filters were prepared to separate solid residues from the liquid fertilizer before packaging.

The equipment and materials required for the hydroponic cultivation and liquid organic fertilizer (LOF) production training have been prepared to support the planned implementation of the program, which is scheduled to take place no later than the end of July 2025. The final schedule remains subject to confirmation based on the outcomes of deliberations and coordination meetings conducted by the Manyar Rejo neighborhood administration. The

preparation of training resources at this stage reflects the program team's commitment to ensuring the effective and timely implementation of all planned activities.

Recommended Training Model

The recommended training model consisted of several key components: 1) training activities should be conducted through thematic face-to-face sessions to facilitate direct interaction between facilitators and participants; 2) practical exercises should be incorporated throughout the program, including plant cultivation, liquid organic fertilizer (LOF) production, and post-harvest product packaging activities; 3) informational leaflets should be provided as supplementary learning materials to support participants' independent learning; 4) participant response questionnaires should be administered following the completion of the community service program to collect feedback regarding participants' experiences and perceptions of the training activities; and 5) certificates of participation should be awarded as a form of recognition and motivation for participants who actively engage in and complete the training program. The training on liquid organic fertilizer (LOF) focused on introducing participants to the concept and environmental benefits of converting household organic waste into a sustainable fertilizer product. The materials covered the tools and materials required, step-by-step LOF production procedures using household waste as the primary feedstock, proper application techniques to support plant growth, and practical recommendations to optimize fertilizer quality and utilization.



Figure 1. Leaflet on Liquid Organic Fertilizer (LOF)



Figure 2. Hydroponic cultivation leaflet

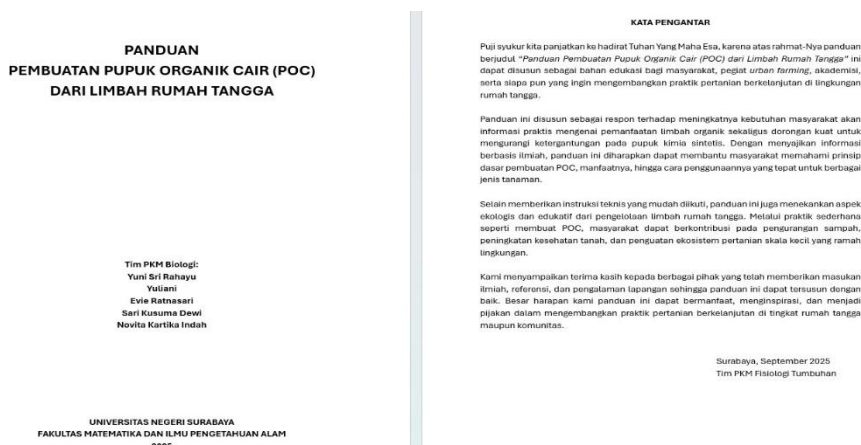


Figure 3. Guidebook for Liquid Organic Fertilizer (LOF) production protected by Intellectual Property Rights (IPR)

The entrepreneurship component was designed to strengthen participants' capacity to transform urban farming activities into household-based economic opportunities. The training addressed fundamental entrepreneurship concepts, pathways for developing businesses from hydroponic products and LOF, business development and sustainability strategies, basic marketing principles, collaboration and task-sharing mechanisms, and practical guidance for establishing and managing successful household-scale enterprises, thereby linking cultivation activities with income-generating opportunities. The training materials described above were developed in the form of leaflets, handouts, and practical guides to facilitate participants in storing and accessing the information whenever needed to support the implementation of their action plans following the completion of the training program. In addition, the materials were prepared in the form of PowerPoint (PPT) presentations and distributed to participants before the practical sessions to provide a foundational understanding of the concepts and procedures to be applied during the hands-on activities.

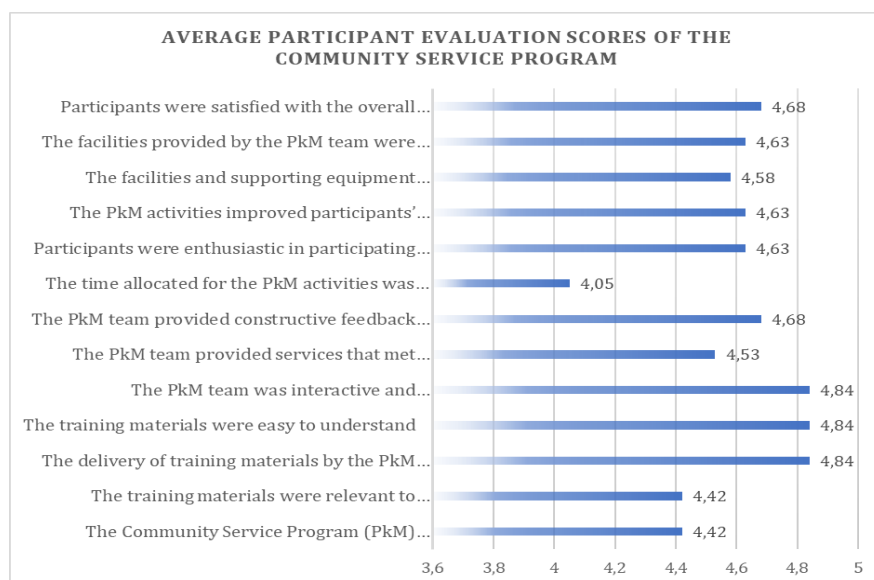


Figure 4. Participant responses and evaluation results of the community service program

The evaluation results of the Community Service Program (PkM) indicated that participants' overall perceptions were categorized as very good, with mean scores ranging from 4.0 to 4.9 on a five-point Likert scale. These findings suggest that the program successfully met participants' expectations across multiple dimensions, including service quality, training content, and interactions between participants and the facilitation team. The empowerment of women within household settings is of considerable importance, as housewives possess substantial potential to contribute to family economic well-being through household-based

productive enterprises (Windiasih et al., 2023). The development of competencies in plant cultivation and post-harvest processing offers a flexible economic alternative that is highly relevant to the characteristics and needs of urban communities (Mardiana et al., 2024). The training program was designed not only to enhance participants' knowledge and technical skills but also to foster household economic self-reliance through the productive utilization of limited land resources and household assets (Yusida et al., 2021). This approach is consistent with community empowerment frameworks that recognize women as key agents in strengthening family economic development and promoting household food security (Husna et al., 2021).



Figure 5. *Implementation of the community service program*

The implementation of the training program demonstrated tangible impacts on participants' behavioral changes and practical skill development following their involvement in the community service activities. Several participants began adopting simple hydroponic systems within their household environments by utilizing recycled bottles, buckets, and other readily available containers as planting media. The cultivated crops primarily consisted of fast-growing vegetables, such as water spinach (*Ipomoea aquatica*), lettuce (*Lactuca sativa*), and mustard greens (*Brassica* spp.), which could be utilized to support daily household food consumption. These outcomes indicate that the training program successfully enhanced community awareness regarding the productive use of limited residential spaces as economically and ecologically valuable resources (Rukmana et al., 2025; Artika & Surahman, 2025).

The training program demonstrated measurable impacts on participants' behavioral changes and skill enhancement following their participation in the community service activities. Several participants began implementing simple hydroponic systems within their household environments by utilizing recycled bottles, buckets, and other low-cost containers as planting media. The cultivated crops included fast-growing vegetables such as water spinach, lettuce, and mustard greens, which could be used to support daily household food needs. These findings indicate that the training activities successfully increased community awareness regarding the productive utilization of limited residential spaces as resources with both economic and ecological value (Rukmana et al., 2025; Artika & Surahman, 2025).

Another notable impact observed following the training program was the increased motivation among participants to develop cultivation outputs into household-based business opportunities. Several participants began marketing and selling hydroponically grown produce to neighbouring households and local community networks on a small scale. Cultivated products, particularly fresh vegetables, were perceived as attractive commodities due to their health benefits, hygienic quality, and community-based production processes. These developments indicate that the training program contributed not only to the enhancement of participants' technical competencies in plant cultivation but also to the strengthening of entrepreneurial mindsets and the confidence required to initiate household-scale business ventures.

Another emerging outcome was the increased motivation among participants to transform cultivation activities into household-based entrepreneurial opportunities. Several participants began exploring the sale of hydroponically cultivated produce to neighbouring households and local community networks on a small scale. Cultivated products, particularly fresh vegetables, were considered attractive by consumers due to their perceived health benefits, hygienic quality, and locally managed production processes. These developments suggest that the training program not only enhanced participants' technical competencies in plant cultivation but also fostered entrepreneurial attitudes and increased their confidence to initiate household-scale business activities.

Following the training program, participants demonstrated increased motivation to transform cultivation activities into household-based business opportunities. Several participants began marketing hydroponically grown vegetables to neighbouring households and local community networks on a small scale. The freshness, hygienic quality, and community-based production of hydroponic products enhanced their market appeal, indicating that the program contributed not only to the improvement of technical cultivation skills but also to the development of entrepreneurial mindsets and the confidence required to initiate small-scale business ventures. The sustainability of the program was reflected in the emergence of participant-led collaboration in hydroponic cultivation and liquid organic fertilizer (LOF) production. Participants actively exchanged knowledge and experiences related to cultivation techniques, plant maintenance, and product marketing, fostering productive social networks within the community. These interactions provide a strong foundation for the future development of urban farming-based business groups while strengthening social cohesion, collective learning, and the long-term sustainability of community empowerment outcomes.

The utilization of household waste as a primary raw material to produce liquid organic fertilizer (LOF) emerged as another positive outcome of the training program. Participants developed an understanding that kitchen waste, including vegetable residues and fruit peels, could be transformed into products with both economic and ecological value. This practice not only contributed to the reduction of household waste generation but also supported the adoption of environmentally sustainable agricultural practices at the household level. Increased awareness regarding the management of organic waste indicates that the community service program contributed to the development of more environmentally responsible behaviours and strengthened community commitment to the sustainability of urban ecosystems.

The success of the training program was further reinforced by the high level of positive participant responses toward the community service activities. Evaluation results indicated that participants perceived the training as effective in enhancing their knowledge and skills related to hydroponic cultivation and household-based entrepreneurship. The strong enthusiasm demonstrated by participants during practical sessions and group discussions suggests that experiential learning approaches are effective in improving community understanding and skill development (Dushkova & Ivlieva, 2024). These outcomes indicate that the community service program extended beyond the delivery of training activities and contributed to behavioural change, skill enhancement, and the development of sustainable community-based productive business opportunities (Hairunisya et al., 2023).

CONCLUSION

The entrepreneurship-based hydroponic training program implemented in Menur Pumpungan Village, Surabaya City, successfully enhanced community knowledge and skills, particularly among members of the Family Welfare Movement (PKK), in hydroponic plant cultivation, the production of liquid organic fertilizer (LOF), and the development of urban farming-based household enterprises. The program, which was delivered through participatory and hands-on learning approaches, received highly positive responses from participants, with evaluation scores ranging from 4.0 to 4.9 on a five-point scale. The initiative generated tangible outcomes, including increased utilization of limited residential spaces for plant cultivation, the conversion of household organic waste into LOF, and strengthened participant motivation to

develop productive enterprises based on cultivation outputs. These outcomes demonstrate the program's contribution to strengthening household food security and promoting the sustainable economic empowerment of urban communities.

Entrepreneurship-based hydroponic training programs should be sustained through continuous mentoring, strengthening of business management capacities, product marketing assistance, and the development of collaborative networks among higher education institutions, local government agencies, and community members. Support in the form of cultivation infrastructure, advanced entrepreneurship training, and the establishment of community-based business groups is essential to enable participants to further develop urban farming as both a household food source and an economic opportunity. The promotion of environmentally sustainable cultivation innovations and the adoption of digital marketing strategies are also important for enhancing the long-term sustainability, competitiveness, and economic viability of urban community enterprises.

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