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Community-Based Urban Farming as a Sustainable Food Security Strategy: Transforming Vacant Land into Productive Green Spaces in Rural Indonesia

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Abstract

Food security remains a pressing challenge in rural Indonesia, driven by climate uncertainty, fluctuating food prices, and the underutilization of local resources. This study examines the transformation of vacant land into productive green spaces through community-based urban farming and explores its contribution to sustainable food security. Employing a Community-Based Participatory Research (CBPR) approach integrated with Participatory Action Research (PAR), the study was conducted in Katapang Hamlet, West Seram Regency, Indonesia. Data were collected through participatory observation, in-depth interviews, focus group discussions, and documentation involving local residents, community leaders, and university students. Thematic analysis was used to identify relationships among social, environmental, and food-security dimensions. The findings reveal that community-based urban farming generated multiple benefits, including increased access to fresh vegetables, reduced household food expenditures, improved environmental conditions, strengthened social cohesion, and enhanced collective learning. Community participation emerged as the primary driver of program effectiveness and long-term sustainability. Based on these findings, the study develops the Community-Based Urban Farming Sustainability Model, which conceptualizes the interconnected roles of vacant land utilization, community participation, collective learning, food production, environmental sustainability, household food security, and community resilience within an integrated social–ecological system. The study contributes a novel framework that repositions urban farming from a production-oriented practice to a community-driven strategy for sustainable food security in rural and island settings. The proposed model offers practical implications for community engagement programs and local food system development in developing regions.

Keywords: *Community Participation, Community Resilience, Food Security, Rural Development, Social-Ecological Systems, Sustainable Agriculture*

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INTRODUCTION

Food security has become one of the most pressing global challenges of the twenty-first century. Rapid population growth, climate change, environmental degradation, and disruptions in food supply chains have intensified concerns regarding the ability of communities to access sufficient, nutritious, and affordable food on a sustainable basis(Alifa

Semendawai et al., 2024; Borelli et al., 2024). Although food security is often discussed in relation to agricultural productivity and national food policies, increasing evidence suggests that local community capacity and the effective utilization of available resources are equally important determinants of sustainable food systems (Azkiya & Irawati, 2024; Johari et al., 2025). In many developing countries, particularly in rural and island regions, food insecurity is not solely the result of limited production capacity but also stems from inefficient resource management, dependence on external markets, and inadequate community engagement in local food initiatives.

Indonesia presents a particularly important context for examining these challenges. Despite being recognized as an agrarian nation with abundant natural resources, many rural communities continue to face vulnerabilities related to food availability, accessibility, and affordability. These vulnerabilities are often exacerbated by fluctuating food prices, transportation constraints, and increasing climate-related risks that affect agricultural production (Natawiguna et al., 2025; Samir et al., 2025; Yusriadi, 2025). Such conditions are especially visible in remote and island-based regions, where geographical isolation frequently limits access to stable food supplies. At the same time, many villages possess considerable land resources that remain underutilized. Vacant plots within residential areas are commonly left unmanaged, becoming environmentally neglected spaces rather than productive assets capable of supporting household food needs and community welfare.

The growing concern over sustainable food systems has encouraged governments, universities, and civil society organizations to promote urban farming as an alternative strategy for enhancing local food production. Although originally associated with metropolitan environments, urban farming has evolved into a broader concept encompassing small-scale agricultural activities conducted within or around human settlements to improve food access, environmental quality, and social well-being (Apriyelita & Marviano, 2025; Hafsari et al., 2025; Hardiyanto, 2025). The relevance of urban farming has become increasingly evident in recent years as communities seek adaptive responses to food insecurity and environmental challenges. Beyond food production, urban farming has demonstrated potential for strengthening social interactions, promoting ecological awareness, and creating multifunctional green spaces within densely populated environments (Junaidi et al., 2022; Rusdiani et al., 2025; Saputra, Abdoellah, & Utama, 2025).

A growing body of literature has examined the contribution of urban agriculture to food security and sustainable development. Research conducted in North America and Europe has shown that community gardens and neighborhood farming initiatives can improve access to fresh food while fostering stronger social ties among residents (Delfiyanti, 2023; Wijaya et al., 2023; Yeny et al., 2022). Urban agriculture has also been associated with positive environmental outcomes, including biodiversity enhancement, urban greening, and reduced ecological footprints resulting from shorter food distribution chains (Bagio et al., 2025; Hasan & Daryanto, 2024; Solihati & Dayanti, 2025). These findings highlight the multidimensional value of urban farming beyond its conventional role as a food production system.

Subsequent studies have expanded the discussion by examining urban farming as an instrument for resilience-building and sustainable urban governance. Research by Anatasia (2024) and Imil et al. (2025) demonstrated that community-based food initiatives contribute significantly to local resilience by strengthening collective action and resource-sharing mechanisms. Similarly, Astriani et al. (2025) and Mukhammad (2026) argued that urban agriculture can function as a climate adaptation strategy capable of mitigating environmental vulnerabilities while improving community preparedness. Such perspectives have shifted scholarly attention from productivity-centered approaches toward broader social-ecological frameworks that recognize the interconnectedness of food, environment, and community development.

Another stream of research has focused on the role of participation and social capital in determining the success of urban farming programs. Studies indicate that initiatives characterized by strong community engagement, collaborative decision-making, and shared learning experiences tend to achieve greater sustainability than projects driven solely by external interventions (Alami & Mohammad, 2024; Fadhilah et al., 2024a; Sumartini & Nasrudin, 2024). Community participation not only enhances local ownership but also facilitates the transfer of knowledge, encourages innovation, and strengthens social networks that support long-term program continuity. These findings suggest that the effectiveness of urban farming cannot be understood exclusively through technical indicators such as productivity or yield; rather, it must be analyzed through the social relationships and collective capacities that underpin agricultural practices.

Recent scholarship has further emphasized the importance of integrating food security, environmental sustainability, and community empowerment within a unified analytical framework. Urban agriculture is increasingly viewed as a form of social innovation that enables communities to address complex development challenges through locally driven solutions (Q. M. Astuti et al., 2025; Budiawati et al., 2024; Cahyono & Tokuda, 2024). Such initiatives create opportunities for experiential learning, environmental stewardship, and participatory governance while simultaneously contributing to household food security. The emergence of these perspectives reflects a broader shift toward community-centered approaches that recognize local actors as key agents in sustainable development processes.

Despite these advances, existing literature remains concentrated primarily on urban and metropolitan settings. Much of what is currently known about urban farming derives from studies conducted in large cities where demographic density, infrastructure availability, and institutional support differ significantly from conditions found in rural and island communities. Consequently, less attention has been devoted to understanding how urban farming functions in non-urban contexts where social relations, land-use patterns, and resource constraints follow different dynamics. Furthermore, many studies continue to evaluate urban farming through production-oriented indicators, focusing on crop yields, cultivation techniques, or economic benefits while giving comparatively limited attention to the social processes through which communities collectively transform available resources

into sustainable food systems. As a result, the interconnections among vacant land utilization, community participation, collective learning, food security, and environmental sustainability remain insufficiently explored within a single analytical perspective.

This limitation becomes particularly important in the context of rural Indonesia, where social cohesion and collective action have historically played central roles in local development. In many villages, community members possess valuable knowledge, social networks, and cooperative traditions that can potentially support food security initiatives. However, the mechanisms through which these social resources contribute to sustainable food production remain underexamined. Understanding these mechanisms is increasingly important because contemporary food security challenges require solutions that are not only technically feasible but also socially embedded and environmentally sustainable. Examining urban farming through a community-centered lens therefore offers an opportunity to advance current discussions by highlighting how local participation and collective learning processes shape long-term development outcomes.

Against this background, the present study investigates the transformation of vacant land into productive green spaces through community-based urban farming in Dusun Katapang, West Seram Regency, Maluku. Rather than treating urban farming merely as an agricultural activity, the study approaches it as a social-ecological process through which communities mobilize local resources, strengthen collective capacities, and develop adaptive responses to food insecurity. By examining the interactions among land utilization, community participation, collective learning, food production, and environmental improvement, the study seeks to provide a more integrated understanding of sustainable food security in rural settings. In doing so, it contributes empirical evidence from an underrepresented island context in Eastern Indonesia while offering a broader conceptual perspective on how community-driven food initiatives can support resilience, sustainability, and inclusive local development. The study ultimately aims to analyze the processes that enable the transformation of neglected land into productive community assets, evaluate their contributions to household food security and environmental quality, and generate insights that can inform future research, community engagement programs, and policy interventions aimed at strengthening sustainable food systems in rural regions.

RESEARCH METHOD

This study employed a qualitative research design grounded in the principles of Community-Based Participatory Research (CBPR) and Participatory Action Research (PAR). A qualitative approach was considered the most appropriate because the study sought to understand the social processes, collective experiences, and community meanings underlying the transformation of vacant land into productive green spaces. Rather than measuring agricultural outputs alone, the research aimed to explore how community members interpreted food security challenges, participated in urban farming activities, and collectively developed strategies to sustain local food production. Qualitative inquiry enables researchers

to capture these complex social realities through participants' perspectives and lived experiences, thereby providing a deeper understanding of community-driven development processes (Anggraeni et al., 2025; Febrina et al., 2025; Priani et al., 2023). The integration of CBPR and PAR was particularly relevant because community members were not merely research subjects but active participants involved in identifying problems, implementing farming activities, and reflecting on their outcomes. This participatory orientation allowed the research process to generate knowledge while simultaneously supporting local empowerment and practical action (Amandaria et al., 2025; Silalahi & Silalahi, 2024).

The study was conducted in Dusun Katapang, West Seram Regency, Maluku, Indonesia. This location was selected purposively because it represents a rural island community facing challenges related to food accessibility, limited agricultural land management, and dependence on market-based food supplies. At the same time, the area possesses several underutilized vacant lands located within residential spaces that offer opportunities for community-based food production. The implementation of urban farming initiatives through university community engagement activities provided a valuable context for examining how local residents mobilize social resources and collective action to address food security concerns. Furthermore, the relative scarcity of empirical studies on community-based urban farming in rural and island settings makes Dusun Katapang an important case for generating context-specific insights that may contribute to broader discussions on sustainable food systems in Eastern Indonesia.

Research participants were selected through purposive sampling based on their direct involvement in urban farming activities and their knowledge of local community dynamics. A total of 20 informants participated in the study, consisting of the hamlet head, community leaders, members of households involved in urban farming, youth representatives, women actively engaged in cultivation and maintenance activities, and university students participating in community service programs. These participants were chosen because they represented diverse perspectives regarding program planning, implementation, participation, and perceived impacts. Such variation was essential for capturing a comprehensive understanding of the social, environmental, and food-security dimensions associated with the initiative (Haikal et al., 2025; Nugroho et al., 2025).

Data were collected through participant observation, in-depth interviews, focus group discussions, and document analysis. Participant observation enabled the researchers to directly observe land preparation, planting activities, maintenance practices, and community interactions throughout the implementation process. This method was important because many aspects of collective participation and informal learning occur through everyday practices that may not be fully articulated during interviews. In-depth interviews were conducted to explore participants' perceptions of food security, motivations for participation, experiences of collaboration, and expectations regarding program sustainability. To complement individual perspectives, focus group discussions were organized to facilitate collective reflection on challenges, opportunities, and future development strategies.

Documentation, including field notes, photographs, meeting records, and activity reports, was used to provide contextual information and support data verification.

Data analysis followed the thematic analysis procedures proposed by Lindgren et al. (2020). The process began with data familiarization through repeated reading of interview transcripts and field notes, followed by initial coding to identify meaningful patterns. Similar codes were subsequently grouped into broader themes reflecting community participation, land transformation, collective learning, food security, and environmental sustainability. The themes were continuously reviewed and refined through iterative interpretation to ensure coherence and analytical depth.

To enhance the trustworthiness of the findings, triangulation was conducted through multiple strategies. Source triangulation involved comparing information obtained from different participant groups, including community leaders, residents, women, youth, and students. Method triangulation was achieved by integrating observations, interviews, focus group discussions, and documentation. In addition, researcher triangulation was applied through collaborative discussions among the research team to minimize subjective interpretation and strengthen analytical consistency. These procedures contributed to the credibility, dependability, and confirmability of the study findings, ensuring that the resulting interpretations accurately reflected the experiences and perspectives of the participating community members (Awan, 2025; Bancin et al., 2024; Piring et al., 2025).

RESULTS AND DISCUSSION

Transforming Vacant Land into Productive Green Spaces: Reclaiming Community Resources

One of the most significant findings of this study was the successful transformation of previously neglected vacant land into productive green spaces managed collectively by community members. Prior to the implementation of the urban farming initiative, the selected land in Dusun Katapang was largely abandoned and underutilized. Field observations revealed that the area was characterized by unmanaged vegetation, scattered waste, and a lack of productive activities. Although physically located within a residential environment and easily accessible to local residents, the land had long been perceived as an ordinary empty space rather than a potential community asset. This condition reflects a broader challenge frequently encountered in rural communities, where available resources often remain dormant due to limited collective initiatives and the absence of mechanisms for mobilizing local capacities.

The transformation process began with a participatory identification and mapping exercise involving local residents, community leaders, and university students participating in community service activities. Rather than imposing an externally designed intervention, the initiative was developed through discussions regarding local food needs, available resources, and community aspirations for improving the surrounding environment. During focus group discussions, participants collectively assessed the suitability of the land, identified potential constraints, and formulated a shared vision for its utilization. This process was important

because it encouraged local ownership from the earliest stages of implementation. As one community leader (informant AS) explained, “For years this land was simply there, unused and forgotten. When we started discussing its potential together, people began to see it differently—not as empty land, but as something that could benefit everyone.”

Following the identification stage, community members engaged in a series of collective activities including land clearing, waste removal, soil preparation, and the construction of simple planting beds. These activities were conducted through mutual cooperation, reflecting long-standing traditions of collective action within the village. Participant observation indicated that community involvement extended beyond physical labor. Residents contributed local knowledge regarding soil conditions, planting schedules, and suitable crop varieties, while students facilitated technical discussions related to cultivation methods. The collaborative nature of these activities enabled the integration of local experience and external knowledge, creating a practical learning environment that supported both agricultural production and community engagement.

The physical transformation of the area became increasingly visible throughout the implementation process. Spaces that had previously appeared neglected gradually evolved into organized cultivation plots containing various vegetables and food crops. The emergence of green vegetation altered the visual landscape of the settlement, contributing to a cleaner and more aesthetically pleasing environment. Several participants noted that the presence of cultivated gardens generated a renewed sense of pride in the neighborhood. According to informant RM, “Before, people walked past this area without paying attention. Now it has become something that we care about and maintain together.” Such observations suggest that environmental improvements were accompanied by changes in community attitudes toward local resource management.

Figure 1 Soil Preparation and Seed Planting in Polybags
Source: Authors' Field Documentation, 2026

Beyond its physical dimensions, the transformation of vacant land represented a deeper social process through which previously overlooked resources were redefined as collective assets. This finding aligns with contemporary developments in Social-Ecological Systems theory, which emphasize that resources acquire value not merely through their material characteristics but through social institutions, collective action, and community governance arrangements (Daulay & Arka, 2025; Verdian et al., 2025). From this perspective, the land itself was not inherently productive; rather, its productive capacity emerged through the interactions, knowledge, and collaborative efforts of local actors. The process therefore illustrates how community-based initiatives can activate latent resources that have long remained underutilized within local environments.

The findings also resonate with recent discussions within Resilience Thinking, which view local resource mobilization as a critical mechanism through which communities strengthen their adaptive capacity in response to social and environmental uncertainties (Afriati et al., 2025; Saputra, Abdoellah, Utama, et al., 2025; Sutardi et al., 2022). In the context of Dusun Katapang, the conversion of vacant land into productive green space increased not only food production opportunities but also the community's ability to respond to challenges associated with food accessibility and fluctuating market conditions. The initiative demonstrated that resilience can emerge from relatively small-scale interventions when communities collectively organize around locally available resources.

Community Participation as the Driving Force of Urban Farming Sustainability

A central finding of this study is that the sustainability of community-based urban farming in Dusun Katapang was determined less by technical agricultural interventions than by the quality and depth of community participation that emerged throughout the process. While the availability of land, seeds, and cultivation techniques contributed to the implementation of the program, these factors alone were insufficient to ensure continuity. What distinguished the initiative was the active involvement of local residents in planning, implementing, maintaining, and evaluating farming activities. Participation was not limited to attendance or physical labor but evolved into a collective process through which community members negotiated responsibilities, shared knowledge, and developed a common commitment toward the utilization of local resources.

The findings revealed that participation began during the initial stages of problem identification and decision-making. Residents were involved in discussions concerning the selection of cultivation sites, the types of crops to be planted, and the organization of work schedules. This early engagement created opportunities for community members to express their views and contribute local knowledge regarding environmental conditions and agricultural practices. As one participant (informant HR) explained, “People were willing to join because they felt the idea came from all of us, not from outsiders alone.” This statement illustrates that participation was closely linked to perceptions of ownership and legitimacy. Community members were more willing to invest time and effort when they perceived themselves as active contributors rather than passive recipients of assistance.

Collective action became particularly visible during the land preparation phase. Observational data showed that residents voluntarily participated in clearing vegetation, removing waste, preparing planting beds, and organizing cultivation areas through communal work activities. These efforts reflected the enduring relevance of mutual cooperation practices within rural communities. However, the significance of these activities extended beyond labor contributions. The process of working together created opportunities for social interaction, trust-building, and the strengthening of interpersonal relationships among residents. Similar findings have been reported in studies emphasizing that collective participation often generates social capital that supports long-term community development initiatives (Muliadi et al., 2024; Soediro et al., 2024).

An important dimension of participation was the emergence of differentiated yet complementary roles among community members. Rather than relying on a rigid organizational structure, responsibilities evolved organically according to individual capacities and availability. Older residents contributed agricultural knowledge derived from experience, while younger participants assisted with physically demanding tasks and the adoption of new cultivation practices. Women played a particularly important role in daily maintenance activities, including watering, monitoring plant growth, and managing the utilization of harvested vegetables for household consumption. Their involvement reinforced the connection between food production and household food security. Several female participants emphasized that direct access to fresh vegetables reduced their dependence on market purchases and increased awareness of nutritious food consumption within their families.

Youth participation also emerged as a significant factor supporting program sustainability. In many rural areas, young people are often perceived as increasingly detached from agricultural activities. However, the urban farming initiative created a space where youth could engage in practical environmental action while contributing to community welfare. According to informant AR, “This activity made us realize that farming is not only for older people. We can also be involved because it benefits the whole community.” Such experiences suggest that community-based urban farming can function as an intergenerational platform that facilitates knowledge exchange and strengthens local engagement among younger generations.

The role of local leadership was equally important in sustaining participation. The hamlet head acted as a facilitator who encouraged involvement, coordinated activities, and mediated communication among participants. Rather than exercising authority through top-down directives, leadership was characterized by facilitation and consensus-building. This approach helped maintain community trust and encouraged broader participation. Similarly, university students participating in community service programs functioned as facilitators and knowledge brokers rather than project managers. Their contribution was particularly visible in introducing cultivation techniques, organizing discussions, and documenting activities. Nevertheless, the continuity of the initiative depended primarily on local commitment rather

than external support. This distinction became increasingly evident as residents assumed greater responsibility for maintaining the farming areas over time.

These findings resonate with Anugrah et al. (2023) perspective on lived participation, which emphasizes that meaningful community engagement is constructed through everyday practices, social interactions, and shared experiences rather than through formal participation alone. Participation in Dusun Katapang was embedded within routine activities and interpersonal relationships, allowing residents to experience collective action as part of daily community life. The findings also align with contemporary community resilience frameworks, which identify participation, social connectedness, and local agency as critical foundations for sustainable community adaptation and development (Arumdhani, 2025; E. P. Astuti et al., 2024).

Viewed from this perspective, participation functioned not merely as an implementation strategy but as a mechanism for generating social ownership. Through continuous involvement in decision-making and practical activities, community members gradually developed a sense of responsibility toward the farming initiative and its outcomes. This sense of ownership became a crucial factor supporting long-term sustainability because it encouraged residents to continue maintaining the cultivated spaces even in the absence of external intervention. The experience of Dusun Katapang therefore demonstrates that the enduring success of community-based urban farming depends not only on agricultural productivity but also on the capacity of participation to transform collective action into a shared commitment toward local food security and community well-being.

Collective Learning and Knowledge Sharing in Community-Based Urban Farming

The findings of this study indicate that community-based urban farming in Dusun Katapang functioned not only as a mechanism for food production but also as an important arena for collective learning and knowledge sharing. Throughout the implementation process, residents engaged in continuous exchanges of experiences, practical skills, and local knowledge that gradually shaped their capacity to manage agricultural activities independently. This learning process emerged organically through daily interactions rather than through formal training programs alone. As a result, urban farming became a social space where community members jointly constructed knowledge, reflected on their experiences, and developed adaptive strategies suited to local environmental conditions.

One of the most visible forms of learning occurred through the transfer of knowledge among residents. Individuals who possessed prior experience in small-scale farming shared insights regarding soil preparation, planting schedules, seed selection, and crop maintenance with those who had limited agricultural backgrounds. This exchange was particularly important because participants entered the program with varying levels of knowledge and experience. During interviews, several participants explained that they initially lacked confidence in their ability to cultivate vegetables successfully. However, observing and working alongside more experienced residents gradually increased their understanding and willingness to participate. As informant RM noted, “At first I only helped with cleaning the

land because I did not know much about planting. Over time, I learned from other residents about how to prepare the soil and take care of the crops." Such experiences illustrate that knowledge acquisition occurred through social interaction and practical engagement rather than through one-way instruction.

The role of university students participating in community service activities was also significant in facilitating learning processes. Rather than positioning themselves as external experts, students acted as facilitators who encouraged dialogue and experimentation among community members. They introduced basic cultivation techniques, shared information on vegetable production, and helped organize discussions regarding planting methods. However, field observations revealed that learning was not unidirectional. Students also gained valuable insights from residents regarding local ecological conditions, traditional cultivation practices, and community dynamics. This reciprocal exchange created a collaborative learning environment in which scientific knowledge and local experience complemented one another. Such findings support arguments within participatory development literature that sustainable innovation is more likely to emerge when external knowledge is integrated with local expertise rather than imposed upon communities (Ayungingtyas et al., 2025; Fiza et al., 2025).

A particularly important characteristic of the learning process was its experiential nature. Most participants emphasized that they learned through direct involvement in farming activities rather than through formal instruction. Planting, watering, monitoring crop growth, and addressing cultivation challenges became opportunities for practical experimentation and reflection. This form of learning allowed participants to observe immediate outcomes and adjust their practices accordingly. During field observations, researchers noted how residents frequently discussed plant growth conditions, exchanged suggestions, and collectively evaluated which techniques were producing better results. According to informant AS, "We learned by doing. Sometimes plants grew well, sometimes they did not, but every experience taught us something that we could apply the next time." This pattern reflects the importance of experiential learning in community-based sustainability initiatives, where knowledge is continuously refined through action and reflection.

The findings further demonstrate that collective learning encouraged the adaptation of cultivation techniques to local conditions. While some practices were introduced through external facilitation, community members did not adopt them uncritically. Instead, they modified planting arrangements, watering schedules, and maintenance strategies based on their observations of soil characteristics, rainfall patterns, and available resources. Such adaptations were particularly important in a rural island context where environmental conditions often differ from those described in generic agricultural guidelines. The ability to adjust practices according to local realities reflects an emerging adaptive capacity that strengthens the long-term viability of community initiatives. Recent scholarship on sustainability transitions emphasizes that learning processes play a critical role in enabling communities to respond effectively to environmental uncertainty and changing conditions

(Adzkiyah, 2025; Irjayanti et al., 2026).

Another notable outcome was the emergence of local innovations derived from collaborative experimentation. As participants gained experience, they began proposing new ideas regarding crop arrangements, resource utilization, and maintenance systems. Some residents suggested combining different vegetable species within the same cultivation area to maximize space utilization, while others developed informal schedules for shared maintenance responsibilities. Although these innovations were relatively simple, they demonstrated the community's growing confidence in managing the initiative independently. More importantly, they illustrated that knowledge creation was not confined to external sources but increasingly originated within the community itself.

These findings align closely with Social Learning Theory within sustainability transition research, which views learning as a collective process through which individuals develop shared understandings, build trust, and coordinate actions toward common goals (Sabani & Turhamun, 2025; Wulandari et al., 2026). The experience of Dusun Katapang also reflects the principles of Transformative Learning for Sustainability, where learning extends beyond the acquisition of technical skills to include shifts in perspectives, values, and social relationships (Bangun, 2024; Pambudi & Pramujo, 2025). Through participation in urban farming activities, residents not only learned how to cultivate crops but also developed a stronger appreciation for collective action, environmental stewardship, and local food production.

Strengthening Household Food Security through Local Food Production

The findings of this study demonstrate that community-based urban farming contributed significantly to strengthening household food security in Dusun Katapang. Although the scale of production remained relatively modest, participants consistently reported improvements in their access to fresh vegetables and a reduced dependence on market-based food supplies. These outcomes are particularly important in rural island communities where fluctuations in food prices, transportation constraints, and seasonal disruptions can affect the availability and affordability of agricultural products. Within this context, urban farming functioned as a localized food production strategy that enabled households to exercise greater control over a portion of their daily food needs.

One of the most immediate impacts observed during the study was the increased availability of fresh vegetables at the household level. Prior to the implementation of the farming initiative, most families relied heavily on purchasing vegetables from local markets or mobile traders. Such dependence often created challenges when supplies became limited or prices increased. Following the establishment of community-managed cultivation plots, households gained direct access to various vegetables that could be harvested according to their needs. Participant observations indicated that vegetables such as spinach, mustard greens, chili peppers, and eggplants were regularly harvested and distributed among participating families. As informant NM explained, “Before, we bought vegetables almost every day. Now, when we need vegetables for cooking, we can simply take them from the garden.” This statement reflects a shift from market dependence toward localized food

provisioning, illustrating how small-scale agricultural activities can improve food availability within rural communities.

The increased availability of fresh produce was accompanied by changes in consumption patterns. Several participants reported that vegetables became a more regular component of daily meals because they were readily accessible and did not require additional household expenditure. During interviews, women participants frequently emphasized that the presence of the community garden encouraged families to consume fresh produce more often than before. Informant SR noted that “children are now more accustomed to eating vegetables because they see them growing and being harvested nearby.” This observation suggests that urban farming may contribute not only to food quantity but also to dietary quality by facilitating access to nutritious food sources. Previous studies have similarly found that local food production initiatives can positively influence dietary diversity and healthy eating behaviors by increasing the availability of fresh foods within communities (Firdaus et al., 2025; Istiqomah et al., 2025).

Another important finding relates to the economic dimension of household food security. Although urban farming did not completely replace market purchases, participants consistently reported a reduction in food-related expenditures. The ability to obtain vegetables directly from community cultivation plots allowed households to allocate financial resources to other essential needs. This outcome was particularly meaningful for families with limited incomes, for whom even small reductions in daily expenses represented a valuable contribution to household welfare. Informant AR explained, “The savings may not seem large, but when vegetables are available from the garden, we do not have to spend money every time we cook.” Such experiences illustrate that local food production can strengthen household resilience by reducing vulnerability to price fluctuations and economic uncertainty.

The findings also reveal that urban farming influenced community perceptions of food security and food safety. Many participants expressed greater confidence in consuming vegetables produced within the community because they were directly involved in cultivation and maintenance processes. Knowing how crops were grown, what inputs were used, and how the produce was handled contributed to a stronger sense of trust in the quality of the food consumed. Several residents contrasted this experience with uncertainty regarding vegetables purchased from external sources, where production methods were often unknown. This perception aligns with broader discussions regarding food sovereignty and community control over food systems, which emphasize the importance of local agency in shaping food-related decisions and outcomes (Darma et al., 2025; Nuryana et al., 2024).

Beyond addressing immediate food needs, the initiative also demonstrated potential for diversifying local food sources. As participants gained confidence in cultivation practices, discussions emerged regarding the possibility of expanding crop varieties and integrating additional food-producing plants into available spaces. Such aspirations indicate that urban farming can evolve from a short-term intervention into a broader strategy for strengthening local food systems. Diversification is particularly important in rural and island settings because

it reduces dependence on a limited number of food sources and enhances the capacity of households to respond to environmental or economic disruptions.

These findings can be understood through the Food Security Framework, which conceptualizes food security as comprising four interconnected dimensions: availability, accessibility, utilization, and stability (Damasetio, 2025; Hibatullah et al., 2024). Urban farming increased food availability by generating local agricultural production, enhanced accessibility by reducing reliance on external markets, supported utilization through greater consumption of fresh vegetables, and contributed to stability by providing a more reliable source of food during periods of market uncertainty. Importantly, the findings suggest that food security is not determined solely by the quantity of food produced but also by the degree of community control over food resources and production processes.

Environmental Sustainability Benefits of Community Urban Farming

Beyond its contribution to household food security, the findings reveal that community-based urban farming generated significant environmental benefits for the residents of Dusun Katapang. Although the initiative was initially motivated by concerns regarding food availability and the productive use of vacant land, its implementation produced broader ecological outcomes that were recognized by community members throughout the research process. Field observations, interviews, and focus group discussions consistently indicated that the transformation of neglected spaces into cultivated green areas improved the environmental quality of the settlement while simultaneously fostering greater environmental awareness among residents. These findings suggest that the value of urban farming extends beyond agricultural production and encompasses multiple ecological functions that contribute to sustainable rural development.

One of the most visible environmental changes was the expansion of green space within the community. Prior to the intervention, the selected area consisted largely of unmanaged land characterized by overgrown vegetation, scattered waste, and limited productive use. Following the establishment of urban farming plots, the landscape gradually evolved into a more organized and vegetated environment. Rows of vegetables and cultivated plants replaced previously neglected spaces, creating a greener physical setting that was frequently described by participants as cleaner and more attractive. During field observations, researchers noted that the presence of cultivated vegetation altered the visual character of the area, transforming it from a passive and underutilized space into an active community environment. As informant ML explained, “Before, this place looked abandoned and people rarely paid attention to it. Now it feels more alive because there are plants growing and people taking care of them.” This perception illustrates how environmental improvements were experienced not only in ecological terms but also through everyday interactions with the transformed landscape.

The enhancement of environmental aesthetics emerged as another important outcome. Participants consistently described the farming area as contributing to a more pleasant and orderly living environment. Although aesthetic improvements are often viewed

as secondary benefits, they played an important role in strengthening community attachment to the space and encouraging continued participation in maintenance activities. Previous studies have shown that green spaces contribute positively to residents' perceptions of environmental quality and place attachment, particularly when communities are directly involved in their creation and management (Daulay & Arka, 2025; Verdian et al., 2025). In Dusun Katapang, the visual transformation of the area appeared to reinforce residents' motivation to preserve and improve their surroundings, demonstrating the interconnected nature of environmental and social outcomes.

The initiative also contributed to reducing the presence of abandoned and neglected land within the settlement. Vacant spaces often become sites of waste accumulation, environmental degradation, and declining neighborhood quality when left unmanaged for extended periods. By converting these areas into productive gardens, community members effectively reactivated previously underutilized resources while simultaneously mitigating environmental neglect. This finding aligns with broader sustainability discussions emphasizing the importance of adaptive land management strategies that maximize the ecological and social value of existing resources rather than expanding into new areas (Fadhilah et al., 2024b; Mukhlishin et al., 2025). The experience of Dusun Katapang demonstrates how community action can transform environmental liabilities into assets that support both human well-being and ecological sustainability.

Another significant finding concerns the emergence of environmental awareness among participants. Throughout interviews and focus group discussions, many residents reported that their involvement in urban farming increased their appreciation for environmental stewardship and responsible resource management. Activities such as preparing soil, maintaining crops, managing organic waste, and monitoring plant growth encouraged participants to engage more directly with ecological processes than they had previously. Informant SR explained, "When we started planting, we became more careful about keeping the area clean because we wanted the plants to grow well." This statement reflects how practical involvement in cultivation activities can influence environmental attitudes by creating tangible connections between human behavior and ecological outcomes. Such experiences are consistent with research suggesting that participation in community-based environmental initiatives often strengthens pro-environmental values and encourages long-term stewardship behaviors (Arumdhani, 2025; Ayungingtyas et al., 2025).

The findings further indicate that urban farming created opportunities for supporting local biodiversity, albeit on a modest scale. The introduction of multiple vegetable species and cultivated plants increased vegetation diversity within the area and attracted various insects and pollinators commonly associated with agricultural ecosystems. While biodiversity conservation was not an explicit objective of the initiative, participants observed greater ecological activity within the farming plots compared to the previously neglected land. This suggests that even small-scale community gardens can contribute to enhancing habitat diversity and ecological connectivity at the local level. Recent studies within sustainability

science have emphasized that community-managed green spaces can function as important microhabitats that support biodiversity while simultaneously providing social and economic benefits (Irjayanti et al., 2026; Sabani & Turhamun, 2025).

These findings can be interpreted through the lens of Nature-Based Solutions (NBS), which conceptualizes environmental interventions as actions that address societal challenges while generating benefits for both people and ecosystems (Firdaus et al., 2025; Istiqomah et al., 2025). From this perspective, urban farming in Dusun Katapang represents a locally grounded Nature-Based Solution that simultaneously addresses food security concerns, environmental degradation, and community well-being. Rather than viewing food production and environmental conservation as competing objectives, the initiative demonstrates how both goals can be pursued through integrated land management practices rooted in community participation.

From Food Security to Community Resilience: Emerging Social-Ecological Outcomes

The findings presented in the previous sections demonstrate that the impacts of community-based urban farming in Dusun Katapang extended well beyond the immediate objectives of food production and land utilization. While the initiative successfully increased access to fresh vegetables, improved environmental quality, and strengthened community participation, the most significant outcome emerged in the form of enhanced community resilience. The evidence suggests that urban farming functioned as a social-ecological process through which residents developed stronger social relationships, expanded their adaptive capacities, and increased their collective ability to respond to future uncertainties. In this sense, food security became not merely an end goal but a pathway through which broader forms of community resilience were cultivated.

One of the clearest manifestations of this process was the strengthening of social solidarity among residents. Throughout the implementation of urban farming activities, community members regularly engaged in collective work, informal discussions, and shared responsibilities related to land preparation, planting, maintenance, and harvesting. These interactions created opportunities for individuals who might otherwise have limited daily contact to collaborate toward a common objective. Participant observations revealed that cooperation gradually evolved beyond the technical requirements of cultivation and became embedded in everyday social relations. Several informants described how urban farming activities encouraged more frequent communication and mutual support among neighbors. As informant AR explained, “We did not only grow vegetables together; we spent time together, helped each other, and became more connected than before.” Such experiences indicate that the initiative contributed to rebuilding and strengthening social bonds that constitute an essential component of resilient communities.

Closely related to this process was the emergence of stronger patterns of cooperation and collective action. The successful management of community gardens required residents to coordinate schedules, share resources, and address challenges collaboratively. Rather than relying on formal organizational mechanisms, cooperation was largely sustained through

informal agreements and mutual trust developed through repeated interactions. This finding is consistent with previous studies suggesting that community resilience is often grounded in the capacity of local actors to organize collectively and mobilize resources through existing social networks (Anatasia, 2024; Imil et al., 2025). In Dusun Katapang, urban farming provided a practical context in which such capacities could be exercised and strengthened. The process demonstrated that collective action is not merely a means of achieving specific development objectives but also an important resource that communities can draw upon when facing future challenges.

The development of social trust emerged as another important outcome. Interviews revealed that participants increasingly viewed one another as reliable partners in maintaining the farming initiative and contributing to community welfare. Trust was reinforced through visible acts of commitment, including participation in communal work activities, adherence to shared responsibilities, and the equitable distribution of harvested produce. Informant SR noted that "People became more willing to cooperate because everyone could see that others were also contributing." This observation highlights how trust develops through everyday practices rather than through formal declarations or institutional arrangements. Over time, these repeated interactions fostered confidence in collective efforts and reduced barriers to cooperation, thereby strengthening the social foundations necessary for community resilience.

The findings further indicate that urban farming enhanced the community's perceived capacity to cope with food-related disruptions and economic uncertainty. Although the scale of production was insufficient to fully replace market dependence, participants consistently emphasized that having access to locally produced food increased their sense of security. Several residents noted that the farming plots provided a supplementary source of vegetables during periods when food prices increased or supplies became less accessible. As informant ML explained, "We know that the garden cannot provide everything, but it gives us something to rely on when conditions become difficult." This perception is particularly important in rural island contexts where food distribution systems are often vulnerable to transportation disruptions, seasonal variability, and broader economic fluctuations. By diversifying food sources and reducing exclusive reliance on external markets, urban farming contributed to strengthening local adaptive capacity.

Adaptation to environmental and climatic uncertainty also emerged as a significant dimension of resilience. Throughout the cultivation process, community members continuously adjusted planting schedules, maintenance practices, and crop selection in response to changing weather conditions and local environmental constraints. These adaptations were informed by both local experience and collective learning processes developed during the initiative. Rather than applying fixed agricultural techniques, participants demonstrated flexibility and responsiveness in managing emerging challenges. Such adaptive behavior reflects a key characteristic of resilient social-ecological systems, namely the ability to learn from experience and adjust practices in response to changing

circumstances (Anggraeni et al., 2025; Budiawati et al., 2024).

CONCLUSION

This study demonstrates that community-based urban farming can function as an effective and sustainable strategy for strengthening local food security in rural communities by transforming underutilized vacant land into productive green spaces that generate social, environmental, and food-related benefits simultaneously. The findings reveal that the success of urban farming is not primarily determined by agricultural techniques or production outputs, but by the capacity of communities to mobilize participation, foster collective learning, and build shared responsibility in managing local resources. Through the integration of community participation, experiential knowledge exchange, and locally adapted cultivation practices, vacant land was successfully converted into a community asset that improved access to fresh food, reduced household food expenditures, enhanced environmental quality, and strengthened social cohesion. More importantly, the study shows that food security outcomes are closely intertwined with broader processes of environmental stewardship and community resilience, as residents developed stronger adaptive capacities, social trust, and collective action through everyday farming practices. By highlighting the interconnected relationships among land utilization, community participation, collective learning, food production, household food security, environmental sustainability, and community resilience, this study offers an integrated social-ecological perspective that extends existing urban farming scholarship beyond its predominantly production-oriented focus. The proposed conceptual understanding suggests that sustainable food security in rural contexts is most effectively achieved when local resources are activated through community-driven processes that simultaneously address social, environmental, and livelihood dimensions of development.

ETHICAL STATEMENT AND DISCLOSURE

This study was conducted in accordance with established ethical principles, including informed consent, protection of informants' confidentiality, and respect for local cultural values. Special consideration was given to participants from vulnerable groups to ensure their safety, comfort, and equal rights to participate. No external funding was received, and the authors declare no conflict of interest. All data and information presented were collected through valid research methods and have been verified to ensure their accuracy and reliability. The use of artificial intelligence (AI) was limited to technical assistance for writing and language editing, without influencing the scientific substance of the work. The authors express their gratitude to the informants for their valuable insights, and to the anonymous reviewers for their constructive feedback on an earlier version of this manuscript. The authors take full responsibility for the content and conclusions of this article.

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