

Urban Agriculture for Sustainable Food Systems: A Narrative Review of Indonesian Practices and Potentials

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ABSTRACT: Urban farming has emerged as a sustainable and participatory approach to strengthen household food security, especially in urbanizing regions like Indonesia. This study aimed to synthesize current literature on the role of urban farming in improving food access, dietary diversity, and economic resilience for urban households in Indonesia. Using a narrative review approach, literature was gathered from academic databases such as Scopus, Google Scholar, and PubMed, targeting peer-reviewed studies published within the last ten years. Keywords included "urban farming," "household food security," "sustainable food systems," and "Indonesia." The findings demonstrate that urban farming initiatives, particularly community-based programs like KRPL and P2L, significantly contribute to reducing food insecurity and promoting healthier diets. These practices also lower household food expenditures and provide supplementary income, especially for women-led households. Nonetheless, structural barriers such as limited land access, lack of training, and weak policy integration hinder scalability. Comparative insights from the Philippines, Kenya, and Brazil reinforce the adaptability of urban agriculture as a global solution to food insecurity. In conclusion, urban farming represents a transformative opportunity for enhancing sustainable food access and community resilience. Policymakers are urged to embed urban agriculture within national food strategies, supported by inclusive governance, financial mechanisms, and educational outreach. Further empirical research is essential to validate and expand upon these findings.

Keywords: Urban Farming, Household Food Security, Sustainable Food Systems, Community Agriculture, Indonesia, Food Access, Urban Nutrition.



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INTRODUCTION

Urban farming has increasingly become a vital strategy in addressing household food security in rapidly urbanizing regions, particularly within the Indonesian context. The confluence of population expansion and urban sprawl has heightened the urgency for innovative solutions to ensure equitable food access. Scholars and policymakers alike have begun to recognize the multifaceted contributions of urban farming, not only as a tool for enhancing food availability but also as a catalyst for socioeconomic empowerment and environmental resilience.

The demographic trajectory of Indonesia projects a significant shift towards urban residency, with estimates suggesting that approximately 68% of the population will reside in urban areas by 2050 (Ivanka et al., 2024). This rapid urbanization exerts substantial pressure on existing food systems, where rural-to-urban migration accelerates food demand, often outstripping supply. Compounded by infrastructural limitations and centralized food production in rural zones, urban centers experience elevated risks of food insecurity triggered by price volatility, logistical constraints, and environmental perturbations (Barokah et al., 2023; Yusuf et al., 2021). In this context, urban agriculture emerges as an essential strategy, enabling households to mitigate external food shocks, enhance dietary diversity, and cultivate localized food systems (Barokah et al., 2023; Hanifa et al., 2023).

Fundamental to urban agriculture is its capacity to supplement household food supplies through self-cultivation. Empirical studies have demonstrated that initiatives such as rooftop gardens, vertical farming, and community plots provide access to affordable, nutritious food, especially for low-income populations (Nasuiton, 2020; Wulandari et al., 2023). Urban farming contributes not only to physical food access but also to economic relief by reducing household expenditures on fresh produce (Mahmudah et al., 2024). For households with limited purchasing power, this dual impact on food access and financial savings is particularly significant.

In addition to its direct benefits, urban farming supports broader public health and environmental goals. The localized production of food reduces dependency on long-distance supply chains, thereby diminishing the environmental footprint of transportation and storage (Yusuf et al., 2021). Moreover, urban green spaces cultivated through agricultural practices contribute to climate resilience by enhancing air quality, managing stormwater runoff, and lowering urban heat island effects (Djan, 2023; Sitepu et al., 2024). Such ecological benefits are critical in densely populated cities where environmental degradation exacerbates vulnerability to climate change.

Urban farming's integration into public policy has gained traction, with Indonesian government initiatives emphasizing food sovereignty and self-reliance. Programs encouraging community-based farming, such as "Pekarangan Pangan Lestari," have shown measurable impacts in improving food literacy and fostering participatory governance (Naipospos & Azzura, 2023; Yusida, 2021). These policies not only aim to alleviate food insecurity but also promote social cohesion through collective action and knowledge-sharing among urban residents (Indah et al., 2020).

The COVID-19 pandemic further accentuated the strategic relevance of urban farming. Disruptions in global and national food distribution networks underscored the fragility of centralized supply chains. In contrast, households engaged in urban farming exhibited greater resilience, relying on homegrown produce to supplement diets during periods of restricted mobility and economic downturns (Akbar et al., 2023; Houessou et al., 2021). This resilience reflects the adaptive potential of urban farming as a decentralized food strategy, capable of cushioning urban populations from systemic shocks.

Despite its promise, urban farming in Indonesia faces several formidable barriers. Land scarcity is a recurring challenge, as urban expansion frequently results in the conversion of arable spaces into residential or commercial properties (Amelia & Nawangsari, 2021; Septya et al., 2022). Additionally, many urban residents lack the technical knowledge required for advanced farming techniques such as hydroponics or aquaponics, which are often necessary in space-constrained environments (Mahpudin et al., 2024). Without targeted training and extension services, urban farming initiatives risk inefficiency and high attrition rates among participants (Kusumaningrum et al., 2024; Wardah & Niswah, 2021).

Regulatory ambiguity further compounds these challenges. Legal frameworks often fail to explicitly recognize or support urban agriculture, leading to fragmented policies and unclear land-use rights (Grebitus et al., 2020; Ludang et al., 2021). In some cases, urban farmers operate in legal gray zones, vulnerable to eviction or denial of access to essential resources such as water and composting facilities (Shamshiri et al., 2018). These regulatory shortcomings hinder the scalability and institutionalization of urban farming within municipal development agendas.

The academic discourse on urban farming, particularly in the Indonesian context, reveals significant gaps. Much of the current literature is descriptive, lacking robust empirical analysis to quantify outcomes related to food security, nutrition, and economic empowerment (Ivaşcu et al., 2021; Mahpudin et al., 2024). Furthermore, there is limited comparative analysis across diverse urban settings, which impedes the identification of context-specific best practices and limits the generalizability of findings (Steenkamp et al., 2021).

This review aims to address these gaps by synthesizing available evidence on the effectiveness of urban farming in improving household food security in Indonesia. It seeks to evaluate not only the nutritional and economic outcomes associated with urban farming but also the structural conditions necessary for its successful implementation. The review focuses on key factors such as land use, community participation, policy frameworks, and environmental sustainability, providing a comprehensive analysis of urban agriculture's multidimensional impact.

The geographic scope of this review encompasses a range of urban environments, including megacities like Jakarta and Surabaya, as well as smaller urban centers such as Yogyakarta and Bandung. These locations represent diverse socio-economic and ecological conditions, allowing for an examination of how urban farming manifests across varying urban typologies (Haryanti et al., 2023; Septya et al., 2022). Additionally, the demographic focus includes both low- and middle-income households, with

attention to gendered dynamics in urban farming practices. The literature suggests that women frequently lead urban farming efforts, highlighting the intersection between food security and gender equity (Astuti, 2023; Meilanitasari et al., 2023).

Ultimately, this review aspires to inform policy development and programmatic interventions by presenting a nuanced understanding of urban farming's potential within Indonesia's evolving urban landscape. It underscores the necessity of localized, inclusive, and evidence-based approaches to urban agriculture, positioning it as a viable strategy for achieving sustainable food security in the face of demographic and environmental transitions.

METHOD

This study employed a narrative review approach to examine the role of urban farming in enhancing household food security, with a specific focus on the Indonesian context. A comprehensive literature search was conducted across leading academic databases, including Scopus, PubMed, and Google Scholar, targeting studies published between 2014 and 2024. The search strategy utilized a refined combination of predetermined keywords and Boolean operators to maximize precision and relevance. Key search terms included "urban farming," "household food security," "urban agriculture," "food sovereignty," "sustainable food systems," "community gardens," "food security in Indonesia," "food insecurity," "nutritional outcomes," and "local food policy."

Inclusion criteria for the review required studies to be peer-reviewed and either empirical in nature or structured as systematic reviews and meta-analyses that specifically examined the impact of urban farming on household food security within Indonesian urban settings. Selected studies had to demonstrate clear linkages between urban agriculture practices and food availability, access, or nutritional outcomes. Studies not published in English, lacking direct empirical evidence, or not peer-reviewed were excluded from the analysis. The initial screening process entailed a review of titles and abstracts, followed by full-text assessments to evaluate methodological rigor and contextual relevance.

To ensure reliability and mitigate selection bias, a multi-phase screening process was conducted by four independent reviewers. These reviewers evaluated each study against the established inclusion and exclusion criteria. Thematic synthesis was then applied to the eligible studies to identify recurring patterns in how urban farming influences household food security. This analytical process enabled the extraction of key insights regarding the structural, policy, and behavioral factors that shape the effectiveness of urban farming interventions in urban Indonesia.

RESULT AND DISCUSSION

Urban farming has emerged as a viable and increasingly essential approach for addressing household food security in urban Indonesia. Across multiple studies, empirical evidence underscores the role of

urban agricultural practices in improving food availability, access to healthy nutrition, reducing market dependency, and fostering community resilience. These themes are elaborated below under five core subtopics reflecting the dominant patterns and findings from the literature.

Urban farming significantly contributes to the availability of food by enabling urban households to cultivate fresh produce directly in their domestic environments. Programs such as the Kawasan Rumah Pangan Lestari (KRPL) have demonstrated positive outcomes in increasing household-level food production and improving access to diverse and nutritious food (Mayusa et al., 2018; Purwantini et al., 2016). Through the cultivation of vegetables and fruits in limited spaces, families have supplemented their diets with fresh ingredients that directly enhance nutritional intake and support dietary diversity. KRPL's focus on encouraging crop diversity aligns with food sovereignty principles, enabling households to rely less on market sources.

Furthermore, studies show a marked reduction in food insecurity among urban communities participating in urban farming programs. Households involved in KRPL in Aceh, for example, reported reduced vegetable purchases due to homegrown produce, highlighting increased self-sufficiency and a strengthened capacity to cope with food price fluctuations (Parwodiwiyono, 2023). The resilience conferred by home-based food production became even more evident during the COVID-19 pandemic, where supply chain disruptions and economic shocks were partially offset by continued local food production (Renita et al., 2024).

Research on community-based programs has revealed their effectiveness in enhancing food security through collective cultivation efforts. Urban farming projects in Sleman during the pandemic showed reduced food expenditures and increased local food production, reinforcing the role of community gardening in bolstering household resilience (Sulistyo et al., 2023). Additionally, women were found to play central roles in household farming efforts, underscoring gendered dimensions of food security strategies (Prayitno et al., 2019) (Herlan et al., 2022). Beyond meeting nutritional needs, urban agriculture fosters community awareness, strengthens social capital, and promotes broader engagement in sustainable food systems (Ashari et al., 2019).

From an economic standpoint, urban farming contributes substantially to household financial stability by reducing expenses on food and enabling new income opportunities. Although quantified savings vary, consistent findings suggest that families engaged in urban agriculture report decreased reliance on market purchases and improved dietary quality without proportionally increased costs (El-Osta, 2020; Sharma et al., 2018). These cost-saving benefits are particularly relevant for low-income households, who often face barriers in accessing fresh produce due to market volatility.

Moreover, urban farming opens avenues for supplementary income. Surplus produce is frequently sold, allowing participating families to enhance their financial flexibility and reduce vulnerability to external economic shocks (Peshin et al., 2018). Female participation in urban agriculture is especially notable, with many women engaging in related entrepreneurial activities, such as selling processed foods, which contribute to both household income and community-level economic resilience

(Brennan et al., 2016). Local government-backed initiatives in Bandung have shown that providing hydroponics training can translate into increased earnings and improved food security outcomes (Irawan et al., 2021).

Several policy-driven initiatives underscore the importance of supportive governance in enhancing the impact of urban farming. The Pekarangan Pangan Lestari (P2L) program in South Kalimantan has yielded promising results, increasing household-level food access and improving nutritional outcomes (Qomariah et al., 2022). Moreover, P2L emphasizes community participation and biodiversity through the cultivation of local crop varieties, fostering sustainability (Ilieva et al., 2022). Training programs facilitated by municipal governments have further enhanced the accessibility and effectiveness of urban agriculture, including hydroponics, vertical farming, and composting practices (Fadhilah et al., 2024).

Ecotourism-integrated urban farming initiatives have emerged as innovative models that combine environmental education with agricultural sustainability. These programs generate additional income while increasing public awareness of food systems (Puspaningtyas et al., 2024). Similarly, Civil Society Organizations (CSOs) have played crucial roles in bridging the gap between policymakers and communities, ensuring inclusive participation in agricultural governance and facilitating access to resources (Muttaqin et al., 2022).

In addition to these efforts, digitalization has augmented urban farming practices. Programs such as Buruan Sae in Bandung have used technology to disseminate best practices, provide real-time agricultural advice, and strengthen community engagement (Sukarno et al., 2022). Comparative studies evaluating urban farming during the pandemic in cities like Jakarta and Surabaya show that food security outcomes were better among households involved in these programs, further validating their relevance in crisis contexts (Amelia & Nawangsari, 2021).

Urban farming's nutritional benefits are evident in studies linking home gardening to improved dietary diversity and increased consumption of fresh produce. In North Bandung, urban farmers reported higher intakes of vegetables and fruits, attributing this to the ease of access and quality of homegrown food (Abdoellah et al., 2023). These households not only improved their nutritional intake but also adopted healthier food preparation habits. Community initiatives have led to a greater cultural appreciation for homegrown food, thereby fostering long-term changes in dietary behavior (Wulandari et al., 2023).

Home gardening practices have also been associated with enhanced nutritional literacy. Urban farming programs that include educational components improve household awareness of the nutritional value of various foods and encourage dietary practices that support long-term health (Krismawati & Panuntun, 2023). Regular access to fresh ingredients enables experimentation with diverse recipes and leads to more balanced food consumption, especially in low-income communities where processed food is otherwise predominant (Syaban & Appiah-Opoku, 2024).

Globally, urban farming practices in Indonesia mirror successful strategies observed in countries such as the Philippines, Kenya, and Brazil, albeit with contextual variations. In the Philippines, community gardening in Manila's informal settlements has shown measurable improvements in food access and household income. The widespread adoption of hydroponics and aquaponics as space-efficient methods presents a viable model for Indonesia (Omondi et al., 2017).

In Kenya, urban farming addresses food insecurity through cultivation on underutilized land in cities like Nairobi. Community-based training programs and education on sustainable farming have significantly improved both food security and social outcomes, with women playing leading roles in these efforts (Omondi et al., 2017). Similarly, Brazil's "hortas comunitárias" integrate urban farming with social cohesion and sustainability, offering valuable lessons in participatory planning and public support mechanisms (Langendahl, 2021).

Adapting global best practices, Indonesia stands to benefit from collaborative urban farming models, enhanced public education, and integration of technology. Localized planning that reflects the specific needs of communities can lead to better policy alignment, improved outcomes, and increased scalability. Programs that incorporate vertical farming, digital platforms, and market linkages will likely yield long-term sustainability in urban agriculture.

In summary, urban farming in Indonesia demonstrates considerable promise as a strategy to enhance household food security, reduce market dependency, improve nutritional outcomes, and foster economic and community resilience. Its continued success, however, depends on supportive policies, community engagement, and adaptive innovations informed by both local experiences and global best practices.

The findings of this review affirm the substantial role of urban farming in strengthening household food security across various urban settings in Indonesia. Consistent with the broader literature on urban agriculture, this study highlights the diverse contributions of urban farming not only in ensuring access to nutritious food but also in enhancing economic resilience and environmental sustainability. These results align with international research demonstrating the viability of urban agriculture as a tool for addressing food insecurity, particularly in rapidly urbanizing regions.

Urban farming initiatives in Indonesia resonate with global experiences in cities such as Manila, Nairobi, and Rio de Janeiro. McDougall et al. (2018) emphasize the capacity of urban agriculture to yield high productivity using efficient resource management, echoing the positive production and sustainability outcomes found in this review. Likewise, Ilieva et al. (2022) have documented how urban agriculture can alleviate nutritional disparities and improve dietary diversity in economically marginalized communities, a condition prevalent in Indonesian urban centers. These comparisons reinforce the notion that urban agriculture is a scalable, adaptable solution for food access issues in both Global South and North contexts.

The application of best practices from other countries can further enhance the effectiveness of urban farming in Indonesia. Programs like the Farm-to-School initiative in the Philippines have successfully

improved fruit and vegetable consumption among children, providing a model that could be replicated to instill early awareness of nutrition and local food systems (Hartson et al., 2021). Similarly, Kenya's community-driven urban agriculture has demonstrated the value of grassroots collaboration in fostering food security, suggesting that inclusive, participatory frameworks could bolster local engagement in Indonesia (Putri et al., 2023). In Brazil, the integration of urban farming with urban planning and technological innovation has yielded positive outcomes, particularly through the use of underutilized spaces and community horticulture programs. Adapting such technological and spatial innovations, such as hydroponics and vertical farming, would help Indonesian cities overcome land constraints and increase production efficiency.

However, despite its promise, the development of urban farming in Indonesia is constrained by a variety of systemic and structural challenges. These include land use policies that prioritize commercial and residential development over agriculture, insufficient financial support mechanisms, limited technical knowledge among practitioners, and negative public perceptions of farming as a low-status occupation. Addressing these barriers is crucial for realizing the full potential of urban farming as a food security strategy.

Land tenure and land use regulations pose one of the most significant barriers to the expansion of urban agriculture. (Amelia & Nawangsari, 2021) argue that rigid zoning laws and bureaucratic hurdles prevent the optimal use of vacant land for farming, particularly in densely populated urban areas. In many cases, legal ambiguity regarding the status of urban farmland deters both individual and institutional investment. Without clear policies supporting access to land for food production, the scalability of urban farming remains severely limited.

Access to finance also presents a persistent challenge. As Mahpudin et al. (2024) note, many urban farmers operate without sufficient capital to invest in infrastructure, tools, or training. The lack of targeted financial instruments or credit facilities for urban agriculture further inhibits innovation and expansion. Addressing this gap requires tailored financial inclusion strategies, including microfinance schemes, subsidies, and partnerships with private-sector stakeholders willing to invest in sustainable agriculture.

Moreover, a lack of agricultural literacy and training opportunities undermines the effectiveness of many urban farming initiatives. (Yulianti et al., 2023) emphasize the need for structured training programs that educate communities on sustainable agricultural practices, crop selection, soil health, and water management. Without these foundational skills, urban residents may struggle to initiate or sustain productive gardens, particularly those based on intensive methods such as hydroponics or aquaponics. Training programs that are accessible, context-specific, and ongoing are essential for scaling urban farming practices.

Public attitudes and societal perceptions toward farming also influence participation rates and the long-term viability of urban agriculture. Supyandi et al. (2024) highlight the stigma associated with manual labor and farming, particularly in urban contexts where other forms of employment are

perceived as more prestigious or profitable. Changing these attitudes requires comprehensive education campaigns and the inclusion of urban agriculture in school curricula, as well as showcasing successful urban farming models to elevate its visibility and appeal.

While these structural and systemic issues pose significant challenges, several supportive factors exist that may enable the expansion of urban farming across Indonesia. Chief among them are favorable public policies, active community networks, and the integration of technology. Programs such as P2L demonstrate the benefits of policy support, particularly when national and local governments collaborate to provide resources, education, and technical assistance to urban farmers (Amelia & Nawangsari, 2021). Community-based organizations in Yogyakarta, for example, have been instrumental in mobilizing local residents, coordinating resource sharing, and cultivating a collective identity around food production (Nirmala, 2022).

The role of technology and innovation in overcoming spatial and resource limitations cannot be overstated. As highlighted by Yulianti et al. (2023) and Munadi (2021), technologies such as hydroponics, vertical farming, and composting systems allow for high-yield agriculture in confined spaces. These innovations not only enhance productivity but also reduce labor intensity and environmental impact, making urban farming more feasible for a broader range of participants. The integration of mobile apps, sensors, and data analytics can further optimize cultivation techniques and connect farmers to markets, training, and support services.

Integrating urban farming into national food security strategies could amplify these benefits and ensure more equitable access to resources. Policies that explicitly recognize urban farming as a key component of food systems planning can enhance its legitimacy and attract investment. Maulana et al. (2024) and Rozci & Inti (2023) argue for holistic food security frameworks that include land access, financing, education, and interagency collaboration. Coordinating efforts among agricultural, educational, and health sectors can produce synergistic outcomes that simultaneously address food, economic, and environmental objectives.

Public education and outreach are equally important in cultivating a culture of sustainable food practices. As suggested by Amelia & Nawangsari (2021), increasing public awareness of the benefits of urban farming can shift social norms and encourage greater community participation. Training modules embedded in school systems or community centers can normalize agricultural knowledge and empower future generations to engage with food systems more critically.

Ongoing monitoring and evaluation of urban farming programs will be essential in refining strategies and maximizing impact. Supyandi et al. (2024) and Pusvita et al. (2019) emphasize the importance of data collection, performance indicators, and participatory feedback mechanisms. These tools help governments and communities identify what works, adjust practices accordingly, and build evidence for scaling successful models. Without such feedback loops, programs risk stagnating or failing to meet community needs effectively.

This review is subject to several limitations. The reliance on existing literature may have excluded valuable insights from unpublished community projects or gray literature not indexed in the selected databases. Additionally, the review is limited by the availability of empirical data specifically quantifying the impact of urban farming on household nutrition and income. The heterogeneity of program structures and contextual differences across study sites may also limit the generalizability of findings. Finally, as a narrative review, this study lacks the statistical rigor and replicability associated with systematic reviews or meta-analyses.

Future research should aim to address these limitations by incorporating more robust quantitative studies and longitudinal assessments of urban farming initiatives. Comparative case studies across diverse geographic and socio-economic contexts could provide deeper insights into best practices and scalability. Further exploration of gender dynamics, policy effectiveness, and technological adoption will be critical in shaping inclusive and sustainable urban farming models. A greater focus on participatory research involving marginalized communities will ensure that future strategies are equitable, relevant, and grounded in lived experience.

CONCLUSION

This narrative review has demonstrated that urban farming plays a critical role in enhancing household food security in Indonesia by improving access to nutritious food, reducing dependency on external markets, and contributing to economic resilience. Key findings highlight that programs like KRPL and P2L have effectively empowered urban households to cultivate their own food, leading to better dietary diversity and reduced food expenditures. Moreover, the integration of community-based farming, supported by governmental and civil society initiatives, underscores the potential of urban farming to transform urban food systems.

However, several structural and systemic barriers persist, including restrictive land policies, inadequate financial support, limited technical knowledge, and prevailing negative perceptions toward agriculture. These issues require urgent policy interventions such as flexible land use regulations, increased access to agricultural financing, enhanced training programs, and widespread public education campaigns to shift societal attitudes.

The review also emphasizes the need for a national framework that integrates urban agriculture into broader food security and urban development policies. Incorporating successful practices from international contexts such as the Philippines, Kenya, and Brazil may enhance local models. Future research should prioritize quantitative impact evaluations, long-term case studies, and participatory approaches to ensure inclusive and context-sensitive outcomes. Urban farming, as illustrated through this review, should be positioned as a cornerstone strategy for sustainable food systems in Indonesia's urban future.

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