

# Urban Agriculture Development: Global Insights and Lessons for Ho Chi Minh City

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## **Abstract:**

**T**he article focuses on the research of urban agriculture development and international experiences that can be applied to Ho Chi Minh City. In the context of urbanization and increasing food demand, urban agriculture has attracted attention as a potential solution. By analyzing the experiences of countries such as Indonesia, Singapore, and Japan, the article identifies important lessons. Successful strategies include rooftop farming, vertical farming methods, and advanced technologies. The article also highlights the role of urban agriculture in ensuring food security, protecting the environment, and promoting socio-economic development. Furthermore, it discusses challenges such as limited natural resources, effective urban management, and resource scarcity. Proposed solutions to overcome these challenges include improving urban agriculture planning and infrastructure, strengthening communication and technology transfer, utilizing community resources, and increasing access to finance and resources.

**Keywords:** *Agricultural production, farming, urban agriculture, urbanization.*

## 1. Introduction

Rapid urbanization and urban growth have led to increased pressure on urban food supply systems, as well as the decline of green spaces and the emergence of heat island effects in many cities worldwide. In response to these challenges, urban agriculture or farming is being promoted as a potential solution (Smit, Nasr & Ratta, 1996).

Urban agriculture, or farming within urban areas, has gained significant attention as a potential solution to the challenges posed by rapid urbanization and the increasing demand for food in cities. Many countries have explored and implemented various approaches to develop urban agriculture, aiming to address food security, environmental sustainability, and social and economic well-being in urban areas. This article will provide an overview of international experiences in urban agriculture development and extract key lessons for the city of Ho Chi Minh. It will highlight the benefits of urban agriculture, such as enhancing food security, promoting environmental sustainability, and fostering social and economic development. Additionally, it will discuss the challenges faced and the strategies employed by different countries to overcome them. By examining these international experiences, policymakers, urban planners, and stakeholders in Ho Chi Minh City can gain insights into successful approaches, policies, and best practices in urban agriculture. These lessons can inform the development of sustainable urban agriculture strategies and contribute to the city's efforts to ensure food security, improve environmental conditions, and enhance the quality of life for its residents.

The following sections will delve into the specific experiences of different countries, including Indonesia, Singapore, Japan, and other successful cases worldwide. By analyzing their approaches and outcomes, we can draw valuable lessons that are relevant to the unique context of Ho Chi Minh City.

## 2. Research Content

### 2.1 Literature review

During the 1990s, the idea of urban agriculture gained momentum, thanks in part to the pioneering efforts of the Urban Agriculture Network, which

received support from the United Nations Development Programme (UNDP). According to Smit et al. (1996), urban agriculture can be described as an industry that focuses on producing, processing, and marketing food and fuel in response to the daily needs of urban consumers. It operates within the urban and peri-urban areas, utilizing both land and water resources dispersed throughout the city. UA employs intensive production methods and incorporates the use and recycling of natural resources and urban waste to cultivate a wide range of crops and livestock. This approach is seen as a sustainable alternative to conventional agricultural practices that often require substantial amounts of scarce resources, such as water. The term “urban agriculture” refers to the practice of cultivating crops and rearing livestock for food and other purposes within cities and towns (Van Veenhuizen, 2014).

The role of urban agriculture is multifaceted and encompasses several important aspects (Van Veenhuizen, 2014; Dubbeling et al., 2019): (i) Economic contribution: Agriculture has historically been a significant contributor to GDP, particularly in pre-industrial development stages. It has played a crucial role in driving economic growth and development; (ii) Employment opportunities: urban agriculture serves as a major source of livelihood for rural communities, helping to alleviate unemployment and poverty; (iii) Food security: It plays a fundamental role in ensuring food security and meeting the nutritional needs of populations; (iv) Infrastructure development: The development of agriculture requires the establishment of transportation networks, markets, storage facilities, postal services, and other related infrastructure. These contribute not only to the functioning of the agricultural sector but also create demand for industrial products and support the growth of the commercial sector; (v) Inequality reduction and rural welfare improvement: Urban agriculture has the potential to reduce inequality by providing income opportunities and improving the well-being of rural communities. It can enhance socio-economic conditions, increase access to resources and markets, and contribute to poverty reduction; and (vi) Climate change mitigation: By promoting

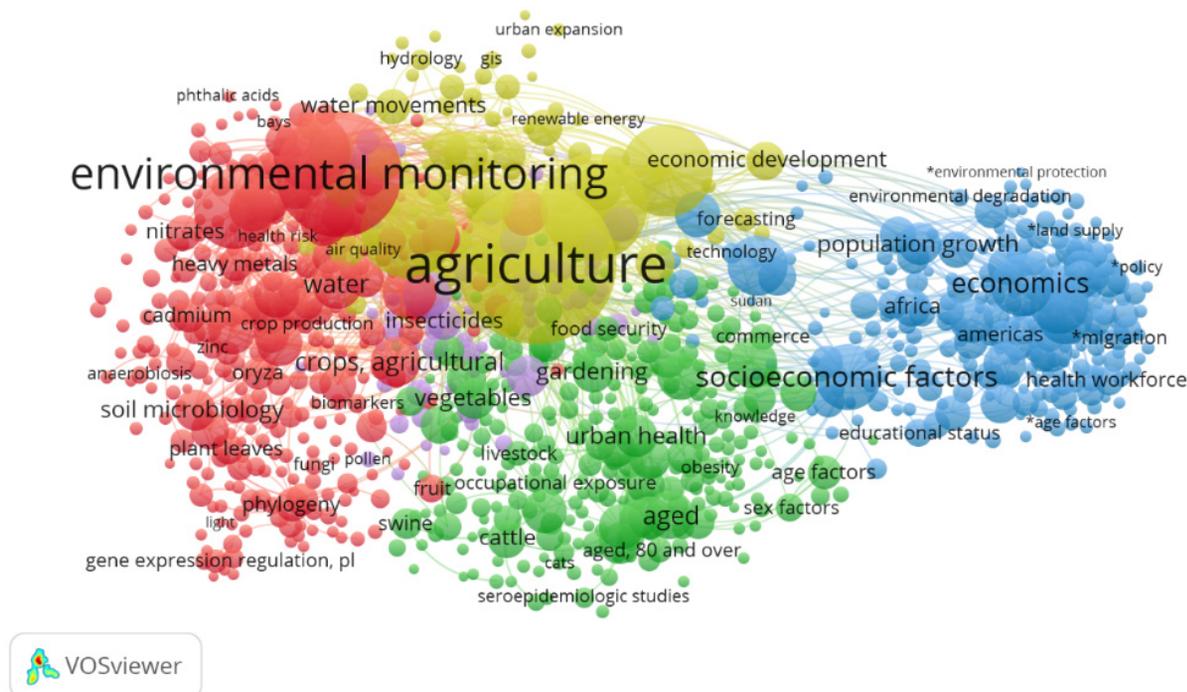


Figure 1. Structure map of research on urban agricultural development

sustainable agricultural practices, it can help reduce greenhouse gas emissions and create a more environmentally friendly food system.

Urban agriculture, a contemporary form of agriculture closely integrated with urban areas, especially metropolitan regions, has been extensively studied using different research approaches, particularly in relation to cultivation practices in urban and peri-urban areas (Lynch et al., 2013). Despite international recognition of the numerous advantages of urban agriculture in terms of livelihood support, food security, and environmental protection, these benefits are not always acknowledged at the local level (Drechsel & Dongus, 2010). Consequently, there is a need for additional case studies to further analyze and understand the intricate relationship between the diverse benefits of urban agriculture.

## 2.2 Methods

The article methodically employed a research approach to synthesize documents, aiming to provide a comprehensive evaluation of the progression of urban agricultural development.

This method was broken down into distinct steps to ensure coherence and scalability. Here's a more detailed analysis of each step within this approach: (i) Defining criteria and research scope: Before initiating the research, the author group specified explicit criteria for selecting relevant documents. These criteria could encompass factors such as geographical location, specific topics related to urban agricultural development, document types, languages, and other relevant elements. Clearly defining these criteria helped narrow down the search scope and select documents accurately; (ii) Document selection: To find suitable materials, the authors employed keywords and Boolean operators (AND, OR, NOT) within document databases to select documents with titles, abstracts, topics, or keywords related to urban agricultural development. Using keywords and Boolean operators allowed them to focus on documents containing essential information while filtering out irrelevant ones; (iii) Quality control of documents: Before utilizing documents for research, the authors ensured their quality by

exclusively using publications from peer-reviewed journals or reliable sources. This step guaranteed that the data used in the study was reliable and valuable; (iv) Data processing method: After collecting documents, the author group utilized a synthesis analysis method to process the data. This method involved consolidating information from the collected documents based on key topic keywords. By conducting synthesis analysis, the author group elucidated diverse facets of urban agriculture in various countries worldwide, thereby deriving lessons for the urban agricultural development in Ho Chi Minh City.

### 2.3 Results and Discussion

#### - Types of urban agriculture

Urban agriculture can be categorized into various types based on different perspectives and characteristics (Van Veenhuizen, 2014; Duží et al., 2014):

+ Intra-urban and peri-urban: Urban agriculture can take place within the urban structure of a city (intra-urban) or at the urban periphery (peri-urban).

+ Scale: Urban agriculture can vary in size, ranging from small-scale to middle-scale and large-scale. “Rural-like farming” typically covers 20-200 hectares, while “urban farming” is relatively smaller, ranging from 2 to 20 hectares but more intensive. “Gardening” is performed at a significantly smaller scale, up to 2 hectares.

+ Stakeholders: Urban agriculture involves various forms of individual or collective/community farming. It is not limited to specific demographics, as urban gardeners come from diverse backgrounds regardless of education, gender, income, or age.

+ Purpose: Urban agriculture can serve different purposes, including commercial-market orientation, surplus trading, non-profit or self-provision/subsistence. It can focus on intensive food production or have more diverse purposes such as ornamental, hobby, or natural gardening. The content of gardens can vary, including vegetables, fruit, cereals, vineyards, orchard, flowers, herbs, livestock, or energetic plants.

+ Based on these characteristics, the main types of urban agriculture include: (i) Traditional household gardens: Small-scale

gardens maintained by individual households for personal consumption or small-scale trading; (ii) Community or allotment gardens: Shared spaces where individuals or groups cultivate crops collectively, promoting community engagement and food sharing; (iii) Productive farms: Larger-scale farms within urban areas that focus on commercial production and contribute to local food supply chains; (iv) Institutional gardens: Gardens established within institutions such as hospitals, schools, or environmental education centers for therapeutic purposes, educational programs, or to support specific initiatives.

- Developing urban agriculture in Indonesia encompasses the following types (Moustier & Danso 2006): (i) Subsistence urban farmers: Urban residents engage in farming around their homes or nearby areas, producing agricultural goods for household consumption and occasionally selling them in the market; (ii) Family-based commercial farmers: These farmers primarily cultivate vegetables, contributing to the urban food supply. They farm to earn economic income to support various urban needs; (iii) Urban and peri-urban agricultural entrepreneurs: The distinction lies in the scale of agriculture and consistent labor utilization. Participants include entrepreneurs or expatriates investing in medium to intensive vegetable production; (iv) Multi-cropping peri-urban farmers: These farmers adopt rural practices despite urban influences, involving market engagement, income sources, high levels of intensification, and specialization.

The Indonesian government has implemented various policies to diversify food sources by encouraging the use of garden spaces to enhance food security and strengthen food sovereignty at the household level. During the Covid-19 pandemic, community engagement in agricultural activities has significantly increased, such as urban residents planting vegetables and raising fish in vacant areas around their homes, using containers with vegetables on top, combining the cultivation of catfish with water spinach in ponds, or raising tilapia fish in apartment complex ditches. Rooftop farming, a particularly viable option in cities like Jakarta, makes use of available flat roof structures. This method can incorporate both soil-based

cultivation and hydroponics. Rooftop farming involves the cultivation of crops like vegetables, along with intensive aquaculture and poultry farming. This is achieved through the creative use of pots, containers, and the establishment of soil layers on rooftop surfaces. The reduction of agricultural land due to urban development, coupled with the growing demand for food in urban areas and environmental pollution from contaminants in Indonesian cities, presents an urgent need for urban agriculture development. This is expected to become a source of available food supply and ensure crucial food security in urban areas. Urban agriculture has the potential to create favorable and healthy environments for various cultivation methods like rooftop gardens, hydroponics, and aquaculture, especially in limited spaces. Urban agriculture is emerging as a significant solution to address the land scarcity challenge in Indonesia's urban areas. Suburban cultivation and the participation of individual urban farmers play a vital role in this process. Overcoming the weaknesses in urban agriculture development is essential to ensure urban resilience in Indonesia. The processes of urbanization and dense population have made land use for urban agriculture difficult, impacting food security significantly. Land ownership rights for farmers are also crucial in this context. Promoting urban agriculture in Indonesian cities will contribute significantly to their resilience, especially in food production, food security assurance, and addressing urban land scarcity. However, the implementation of urban agriculture faces challenges posed by urbanization and population density, which limit land use for cultivation. Among the key challenges of urban agriculture, land ownership rights play a pivotal role for farmers. Therefore, encouraging the development of urban agriculture in Indonesian cities will be a crucial factor in enhancing their resilience, particularly in food production, ensuring food security, and addressing urban land scarcity (Abdillah et al., 2023).

- Developing urban agriculture in Singapore involves the utilization of advanced urban farming technologies and methods, such as vertical farming and rooftop farming, to make the

most of limited urban space. With advancements in hydroponics, aeroponics, and aquaponics, vertical farming has become a more efficient and cost-effective cultivation method in urban areas. For example, vertical farms in Singapore's Lim Chu Kang area produce approximately 1 ton of vegetables per day, ten times more than traditional farms. About 2,500 plants of leafy greens or Chinese cabbage are grown in 9-meter-tall A-shaped towers within each 5.5-square-meter greenhouse. It only requires 12 liters of water to irrigate 1 kilogram of vegetables, saving 95% compared to the water needed for outdoor cultivation. Furthermore, innovative micro-farms combine vertical farming with fish and shrimp aquaculture in a space equivalent to a basketball court, providing urban dwellers with access to a variety of food options. Some farms also employ organic farming methods, cultivating crops on elevated bed systems (Górna & Górný, 2021).

Once the vegetables are ready for consumption, they are transported directly to supermarkets in the city center of Singapore within a few hours. In addition, hydroponics, an inorganic cultivation method, is considered a suitable alternative to conventional soil-based farming, particularly for rooftop farming in public buildings. Implementing rooftop farming in Singapore's public spaces can increase the local vegetable production rate from 5% to 35.5% and reduce Singapore's carbon emissions by approximately 9,052 tons per year. It also offers higher productivity, lower labor requirements, and lightweight systems that can be easily installed on existing rooftops. By embracing advanced urban farming techniques, Singapore can enhance its food security, reduce its carbon footprint, and promote sustainable urban development. Urban agriculture not only contributes to local food production but also serves as a model for other densely populated cities worldwide, demonstrating the potential for self-sufficiency and environmental stewardship in urban environments.

- Developing urban agriculture in Japan presents a unique case where agricultural land use is a common feature in urban landscapes despite being a highly industrialized country. One-third of the country's total agricultural output is

actually generated from urban agriculture. Urban farmers make up 25% of the farming households in Japan. Urban agriculture in Japan takes on various forms of business, including experiential farms, community-supported agriculture, direct sales to the market, and supplying meals to schools. Urban areas also have green spaces and riverside areas that are considered to have positive multifunctional roles. Emerging trends such as plant factories and rooftop farms are also gaining traction in Japan (Kiminami et al., 2022).

The application of vertical farming methods in Japan can minimize the use of limited resources, particularly water and nutrients, compared to traditional agriculture. Vertical farming, where crops are stacked vertically in enclosed environments using artificial lighting and without the need for soil, has seen significant development and is projected to continue growing in the future. Engaging in urban agriculture, urban residents in Japan can also contribute to the conservation of biodiversity and ecosystem services by providing habitats and managing species. Urban agriculture production, such as growing vegetables and fruits, offers environmentally friendly products to consumers while creating local economic opportunities. Additionally, the national government encourages the long-term conservation of agricultural land within efficient green spaces by providing tax reductions for landowners and farmers. To maintain the designation of efficient green spaces, land must remain agricultural for at least 30 years after initial designation, and landowners have the option to sell the land every 10 years after meeting the 30-year requirement.

However, the conservation and promotion of urban agriculture in Japan are still in the early stages of development, and most innovations in this field are driven by farmers, urban communities, and private initiatives. The Japanese government has been promoting urban agricultural land leasing through legal measures, but policies to encourage and protect urban agriculture are still evolving. To enhance competitiveness, especially in promoting value-added agricultural products for export, some agricultural cooperatives in Japan have undergone mergers and diversified

their services from production to transportation and export. They have selected some premium products to promote, such as Japanese beef, melons, and organic vegetables.

### ***2.4 Challenges and Lessons Learned for Urban Agriculture in Ho Chi Minh City***

#### **- Challenges:**

Natural resources, encompassing land, water, and the environment, are undergoing depletion due to a combination of natural processes and human interventions. The challenges are profound, including the fragility and degradation of land, the rising salinity levels in soil and water, the constraint of water availability, and the recurrent impacts of climate change. The confluence of these factors accentuates the difficulties in urban agriculture development. Notably, the scarcity of both resources and labor emerges as a pivotal obstacle. The swift urbanization and conversion of land into urban spaces in numerous developing nations have led to the dwindling availability of cultivable land and restricted water resources. Consequently, this amplifies the potential for a decline in agricultural productivity. Adding to the challenge, the absence of essential support services like agricultural extension, technology dissemination, and limited credit access further compounds the barriers to the growth of urban agriculture (Orsini et al., 2013).

#### **- Lessons learned:**

Research on urban agriculture development in countries like Indonesia, Singapore, and Japan provides essential foundations for advancing urban agriculture in Ho Chi Minh City.

+ **Diversifying urban agriculture forms:** Drawing from examples of other nations, HCMC can leverage various urban agriculture forms, including rooftop cultivation, hydroponics, fish, and poultry farming. Diversification optimizes limited urban space and ensures a diverse food supply.

+ **Community engagement promotion:** Community involvement stands as a pivotal factor in urban agriculture development. Ho Chi Minh City can learn from other countries' initiatives that encourage citizens to partake in home-based farming and fish-raising. This approach fosters supportive environments, enhances community

cohesion, and addresses urgent food needs.

+ Integration of agricultural technology: Modern agricultural techniques such as hydroponics, vertical farming, and rooftop cultivation have seen successful application. Ho Chi Minh City can research and apply these technologies to maximize restricted urban areas, boosting production efficiency.

+ Supportive policy framework: Incorporating supportive policies from the government and relevant agencies is crucial. Providing land tax reductions or financial aid to urban agriculture participants can stimulate the sustainable growth of the sector.

+ Environmental management: Ho Chi Minh City should assess its urban environment to design suitable agricultural systems. Ensuring food safety, managing water resources, and controlling pollution are paramount considerations.

+ Value-added agriculture: The city should aim to create value-added products by transitioning towards smart and modern agriculture, utilizing machinery to replace labor-intensive tasks for farmers. While it requires time and financial investment, a specific plan is necessary to achieve this goal.

+ Utilization of limited land: With limited land availability due to urbanization and increasing land demand, finding suitable spaces for urban agriculture is a challenge. Ho Chi Minh City should explore unused spaces such as rooftops, balconies, roadside areas, and parks for growing crops and raising livestock.

## **2.5 Strategies and Solutions for Urban Agriculture Development**

To unlock the potential of urban agriculture for sustainable development, several solutions need to be implemented:

- Improve urban agriculture planning and infrastructure: Enhance urban agriculture planning by identifying suitable areas, allocating land, and developing necessary infrastructure to support urban farming activities.

- Foster research and provide tailored solutions: Link urban agriculture research with practical on-the-ground challenges in urban environments. Develop collaborative partnerships along the value chain to meet local demand and export

requirements.

- Strengthen communication and technology transfer: Enhance awareness through effective communication strategies, provide training programs, and facilitate technology transfer. Promote digital transformation in urban agriculture, integrating sustainable practices and restructuring agricultural activities.

- Develop community resources: Utilize community resources to reduce the agricultural footprint in urban areas, preventing destruction or pollution. Encourage community engagement and participation in urban farming initiatives.

- Increase access to finance and resources: Provide financial support, grants, and low-interest loans for urban agriculture projects. Facilitate access to resources such as seeds, fertilizers, and equipment through cooperatives or community-based initiatives.

- Improve agricultural productivity: Enhance productivity in urban agriculture by improving the efficiency of farming activities and implementing economically sound approaches based on scientific knowledge. Increase yield while reducing costs.

- Improve rural household incomes: Introduce rural-based agricultural occupations that rely on local products to enhance income generation opportunities for rural families in urban areas. This will provide employment opportunities for youth and help reduce unemployment and poverty.

By implementing these solutions, Ho Chi Minh City can promote sustainable development in urban agriculture, contributing to food security, environmental protection, and socioeconomic well-being.

## **3. Conclusions**

In summary, the research on urban agriculture development provides valuable insights for tackling the challenges of rapid urbanization and increasing food demand in cities. The international experiences shared in this study offer important lessons applicable to Ho Chi Minh City and other urban areas. However, successful urban agriculture development requires addressing various challenges. To foster sustainable urban agriculture, it is crucial to enhance urban agriculture planning and infrastructure, facilitate

research and customized solutions, strengthen communication and technology transfer, develop community resources, improve access to finance and resources, and enhance agricultural productivity. Implementation of these strategies and solutions can contribute to achieving food security, environmental sustainability, and socioeconomic well-being in urban settings.

Also, urban agriculture holds promise in addressing the complex issues arising from urbanization and food requirements. By drawing insights from international experiences and adopting appropriate strategies, policymakers, urban planners, and stakeholders in Ho Chi Minh City and other urban areas can advance sustainable urban agriculture and create resilient and prosperous cities for the future.

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