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Sustainable urban farming management: a comparison study in Thailand and Indonesia

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ABSTRACT
Introduction: Urban farming is the process of producing food and other products on urban land that provides social and environmental benefits and reduces negative environmental, social and health impacts associated with urban production and consumption patterns. This article identifies the key characteristics of urban agriculture in Thailand and Indonesia, focusing on the approaches and administration of production and distribution procedures. **Methods**: The approach employed in this article involves descriptive analysis, utilizing data sources derived from literature reviews of diverse scientific articles associated with urban farming management in Thailand and Indonesia in the 2015-2023 timeframe and then comparative analysis. **Findings**: Urban farming management in Thailand, especially in the Bangkok Metro Regions (BMR), and in Indonesia, especially in Jakarta, faces various challenges. The BMR in Thailand has been trying to improve food self-sufficiency since 2010, utilizing canals as a source of irrigation and transportation, and has the constraint of the lack of connection of urban agricultural actors to traditional markets. High population density and conversion of agricultural land in Jakarta are serious problems, especially after the 1998 economic crisis, urban agriculture developed with residents using land for agriculture, but uncertainty over land rights increased due to industrialization. **Conclusion:** A challenge in urban agriculture management in Thailand and Indonesia is the lack of coordination in urban agriculture regulations and infrastructure and stakeholders can address this through better communication between urban agricultural actors, retailers, and non-farming households.

KEYWORDS: urban farming; urban development; sustainable development; Thailand; Indonesia.

1. Introduction

The expansion of urban populations contributes to environmental challenges. Sustainable development serves as a balanced approach, endorsing progress that aligns with the ecological sustainability of the environment. Future urban planners will confront the challenge of deciding between preserving green spaces, fostering urban economic growth, and ensuring social justice (Setiowati et al., 2019). Inadequate resource management in urban areas results in reduced benefits of living in cities. The absence of poverty-reducing tools and strategies may be a contributing factor to the increase in urban poverty. Urban farming, recognized as a fundamental strategy, is being embraced in developing nations to tackle urban poverty and enhance the welfare of city residents. (Orsini et al., 2013). Urban farming can be defined as the process of producing food and other end products on land and other types of spaces located in urban areas (FAO & RUAF,

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2022). Urban farming practices carried out with environment friendly methods have many benefits (Fauzi et al., 2016). Urban farming, serving as a instrument for sustainable urban and agri-food development, offers numerous social and environmental advantages for city residents. It addresses adverse environmental, social, and health impacts linked to the production and consumption patterns associated with urban living (Tapia et al., 2021).

Good management of urban agriculture ensures the sustainable utilization of urban resources, augments the proportion of green open spaces, enhances the overall quality of people's lives, streamlines economically viable value and supply chains, and functions as a livelihood strategy during crises while bolstering the adaptive capacity of cities. (Gorna & Gorny, 2021). Urban farming can be implemented to build sustainability in cities and needs to implement policies that make urban farming less resource intensive in urban environments (Puppim de Oliveira & Ahmed, 2021). Society's involvement is constrained, given that urban farming significantly contributes to establishing a political framework that eases access to land, finance, and information. Enhancing urban resilience necessitates collaborative efforts and cooperation among government, academia, and communities. Additionally, it calls for innovative and contextually suitable solutions derived from a thorough evaluation of local conditions (Gulyas & Edmondson, 2021). The capacity of urban farming to contribute to achieving sustainability benchmarks has been acknowledged, emphasizing the importance of understanding the specific requirements and beneficiaries involved. (Bennedetti et al., 2023).

Thai people who lives in urban areas is about 52.16% in 2021, which is an increase from 2011 of 41.7% (O'Neill, 2023). Urban areas generate less than 10% of their food supply, underscoring the significance for Thailand's Ministry of Agriculture and Cooperatives to expedite the progress of urban agriculture. This becomes particularly crucial amid the COVID-19 pandemic, emphasizing a focus on urban ecosystems to safeguard public health and enhance the overall quality of the city (Prachachat, 2022). Indonesia is one of the developing countries in the world with the capital city of Jakarta Province. In contrast to developed nations, the expansion of urban populations in developing countries, like Jakarta, is notably pronounced, primarily driven by rural-to-urban migration. Consequently, certain migrants resort to engaging in urban agriculture as a means of generating their own food and securing income. (Chandra & Diehl, 2019). Urban farming in Jakarta is not included in current city master plans and spatial planning documents, lacks funding and incentives from the government, and gaps in facility provision. Policies specifically addressing urban farming lack clarity and may be subject to diverse interpretations among stakeholders. (Indraprahasta, 2013). This article identifies the primary characteristics of urban agriculture in Thailand and Indonesia, focusing on the approaches and administration of production and distribution processes.

2. Methods

This research uses a descriptive analysis method with data sources from literature studies of various scientific articles. The author selected data from the latest published articles on the basis of scientific novelty in making relevant discussions and conclusions, and according to research by Yan et al. (2022) from 2015 to 2021 there was a rapid development in the number of published articles related to urban agriculture, for example in 2020 there were 79 articles and increased in 2022 to 102 articles (Abdillah et al., 2023).

The articles reviewed in this study were retrieved using keyword-based searches related to urban agriculture management in Thailand and Indonesia and then subjected to comparative analysis. The indicators that the authors used from the collected articles were the institutional and policy framework for urban agriculture development (including land tenure and land use policies), institutions governing urban agriculture, planning documents, production systems, and major crops.

The gathered articles underwent a review to determine eligibility and were independently evaluated using Bano & Zowghi (2015) quality criteria, which encompass

various aspects. These include the precision of clearly stated research objectives, thorough descriptions of data collection methods, the presence of references supporting crucial statements, coherence between the research design and objectives, successful addressing of research questions or achievement of research objectives, and the comprehensiveness of the research approach detailed in the article.

3. Result and Discussion

The depiction of urban farming in scientific publications exhibits differing levels of consistency across countries and authors (Royer et al., 2023). Gisclard & Richard (2023) observed different methods of implementation of urban agriculture in urban areas. The notable variety in the observed forms is contingent upon factors such as the context (urban, territorial, political, economic, and social), the participants engaged in this endeavor (professionals, non-professionals, individuals, or families), the available land, the technical tools used (high-tech or easily replicable), the production goals (food, economic, and social), and the methods of distribution (self-consumption, giving, sharing, and selling). The scholarly articles reviewed on urban agriculture management in Thailand and Indonesia were compiled, and a comparative analysis is presented in the following section.

3.1 Urban farming management in Thailand

Thailand is composed of 2,472 municipalities categorized into three tiers: cities, towns, and sub-district towns, totaling 30, 195, and 2,477 units, respectively. Regions beyond the municipal boundaries are regarded as rural areas and fall under the jurisdiction of sub-district administrative organizations (Department of Local Government of Thailand, 2020). In 2010, the momentum for promoting the concept and execution of urban vegetable gardens or urban farming in Thailand increased through a cooperative endeavor led by the Sustainable Agriculture Foundation Thailand, the Urban Agriculture Training Center, the Foundation for the Media Center for Development, and the Urban Vegetable Garden Network. Supported by the Thai Health Promotion Foundation, this initiative is grounded in a collective acknowledgment of food security, health, community, and environmental issues in urban areas. The common goal of these organizations is to improve the food self-sufficiency of urban communities (Sereenonchai & Arunrat, 2023).

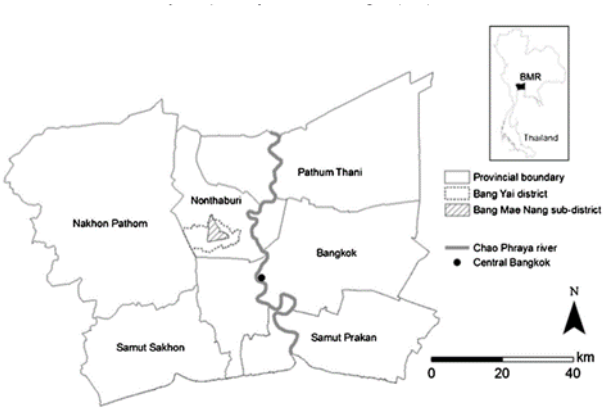

Fig. 1. Administrative map of the Bangkok Metropolitan Regions
(Tsuchiya et al., 2015)

Indonesia The majority of the Bangkok Metropolitan Regions (BMR) is situated in the fertile lowlands of the Chao Phraya delta, characterized by predominantly flat terrain, with elevations ranging only 1-2 meters above sea level, as depicted in the administrative map of the BMR in Figure 1. The BMR features an extensively developed canal network, utilized for irrigating paddy fields, vegetable plots, and gardens. These canals also traditionally

served as transportation routes, though this is undergoing changes due to the rapid development of a road network for land transportation. Vegetable fields and orchards typically exhibit polder and bed structures, tailored to the specific conditions of the local climate, soil, and water environment (Tsuchiya *et al*., 2015). Amid urbanization, traditional food sales systems remain highly significant, with traditional markets playing a crucial role as both a primary source of vegetables and fruits for consumers and a key sales outlet for producers (Sereenonchai & Arunrat, 2023).

Some of the products considered as important food sources for BMR residents such as major vegetable and fruit products include bananas, kale, kailan, coconuts, durian, lettuce, and mangoes (Statistics Thailand, 2022). The significance of traditional markets as providers of vegetables and fruits for local households is increasing due to urbanization in the Bangkok Metropolitan Regions (BMR). This emphasizes the capacity of wet markets in Thailand to serve as central points for local food systems, promoting a mutually advantageous connection between consumers and producers in the Bangkok Metropolitan Region (BMR) and, in turn, backing urban agriculture. A notable hindrance lies in the absence of links between urban farming participants in peri-urban areas and nearby wet markets in the same city for sales, presenting a considerable obstacle to fostering positive interactions between consumers and local producers (Tsuchiya et al., 2015).

Plans for the development and management of the BMR are under the control of the central government, through the Ministry of Agriculture and Cooperatives. One example in Thailand's management of urban infrastructure such as canals and sluices is the ineffective collaboration between the BMR and the surrounding provinces. The lack of coordination among government agencies and stakeholders is evident in the disjointed development of urban structures, hindering the creation and sharing of resilience plans and policies aimed at sustainable development (Likitswat & Sahavacharin, 2022). The central government of Thailand, through the Ministry of Agriculture and Cooperatives, developed the 2017-2036 long-term plan and agricultural cooperative strategy, which regulates the development of urban agriculture and is further guided by the 5-year short-term plan (FFTC-AP, 2019). The Bangkok Metropolitan Administration (BMA) and other stakeholders can potentially surmount this obstacle by fostering communication among participants in urban agriculture, retailers in traditional markets, and non-farming households (Amekawa, 2010; Phromsin & Suksawang, 2023; Tsuchiya *et al*., 2015).

3.2 Urban farming management in Indonesia

Karakteristik Indonesia has 38 provinces, 416 regencies, and 98 cities. The population density in Jakarta reaches 15,978 people per Km^2, making Jakarta the most densely populated province in Indonesia and will continue to increase every year (Statistics Indonesia, 2021). The provision of food in Jakarta, traditionally sourced from the nearby regions as depicted in Figure 2 of Jakarta's administrative map, undergoes continual fluctuations. The capacity of Bodetabek (Bogor, Depok, Tangerang, and Bekasi) and Cianjur to supply food to Jakarta has diminished due to escalating changes in land use, notably the conversion of agricultural land for food production. This shift is expected to escalate transportation expenses and consequently impact food prices in Jakarta, thereby affecting the economically disadvantaged population in the city (Indraprahasta, 2013). The inception of urban farming in Jakarta took place in the aftermath of the 1998 economic crisis in Indonesia, providing seasonal employment opportunities. During this period, numerous residents utilized state-owned land and parcels owned by Soeharto, the former President of Indonesia, for engaging in urban farming activities (Zeeuw, 2004).

In the past economic downturn, the Governor of Jakarta permitted the underprivileged to cultivate food on public land, with the stipulation that they must secure approval from the Governor of Jakarta before utilizing the land. The Jakarta Metropolitan Area and its satellite cities Bodetabek have prioritized industrialization, increasing the uncertainty of land rights permits for future urban farming practices as a result from few urban farming actors in Jakarta own their own farmland, instead farming on land owned by individuals,

companies or the government (Chandra & Diehl, 2019). In spatial regulations, urban farming is not officially recognized as a formal activity with regard to ecological or economic functions. The status of urban agriculture in Indonesia is characterized by ambiguity, as reflected in decisions from two distinct ministries, primarily the Ministry of Public Works and Housing and the Ministry of Home Affairs (Indraprahasta, 2013). According to the Minister of Public Works Regulation No. 05/2008 outlining guidelines for the provision and use of green open space in urban areas, urban agriculture is not classified as a type of green open space. In contrast, Minister of Home Affairs Regulation No. 01/2007 on the arrangement of green open spaces in urban areas designates urban agriculture as a form of green open space. At the local regulation level, notably in the DKI Jakarta 2010-2030 Regional Spatial Plan (RTRW) document, several articles highlight the potential of land for the development of urban agriculture.

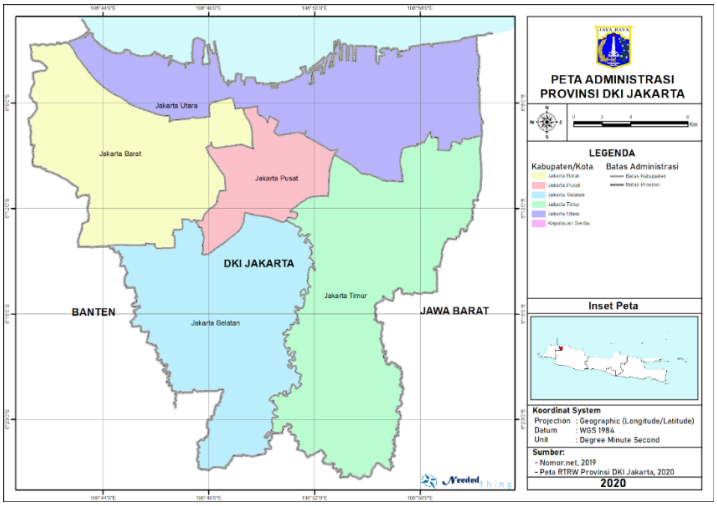

Fig. 2. Administrative map of Jakarta Province
(Regional Spatial Plan Document (RTRW) maps of Jakarta Province., 2020)

The Ministry of Agriculture in Indonesia has sought appropriate urban land for agricultural purposes. Nonetheless, the term "suitable" lacks a precise definition, requiring clarification (La Rosa et al., 2014). An instance of such suitable land includes privately owned vacant or unused land, which could be utilized for temporary or semi-permanent farming. According to Pribadi et al. (2017), the perpetuation of agricultural practices currently rests entirely on the landowner's decision. New regulations could be introduced to incentivize landowners to sustain these practices by offering tax relief. Compensation might also be offered for acquiring land, with a stipulation that a specific portion is dedicated to urban agriculture, such as in parking lots or around service areas. The Deputy Governor of DKI Jakarta for Spatial Planning and Environment (2018) through the grand design of Jakarta's urban farming in 2018-2030 encourages the use of land along riverbanks and railway lines as agricultural land, as riverside farming generates benefits such as preventing riverbank erosion, and utilization of vacant space for food production.

Most urban farmers predominantly grow leafy vegetables due to its short cycles. These vegetables are utilized in major local dishes, exhibit high demand, are well-known, and are easily cultivated, minimizing the risk of crop failure. Bed cultivation is typically carried out manually or with tools by urban farmers. Irrigation is typically performed twice a day (in the morning and evening), which sourced from self-dug channels (groundwater) or occasionally pumped from nearby canals (Chandra & Diehl, 2019). Apart from their primary vegetable produce, the majority of farmers also cultivate a restricted variety of crops with longer growth cycles, such as cassava, a widely consumed staple food, and seasonal crops like banana and papaya, known for their ease of cultivation (Fauzi *et al.*, 2016). The products produced are market-oriented with most urban farmers selling at the same price. The most common crops grown by urban farmers in Jakarta are kale, spinach and caisim (Chandra & Diehl, 2019; Fauzi *et al*., 2016; Kencana *et al*., 2022).

3.3 Comparative analysis of urban farming in Thailand and Indonesia

The practice of urban farming through good management has been proven to provide benefits to the community and the urban environment from studies conducted in Thailand and Jakarta. The following Table 1 shows a comparison of urban agriculture management in Bangkok Metro Region (BMR), Thailand and Jakarta Province, Indonesia.

Table 1. Urban farming management pattern in Thailand and Indonesia

Indicator	**Urban farming management in Thailand**	**Urban farming management in Indonesia**
Location	Bangkok Metro Region (BMR)	Jakarta Province
History	Rising from 2010 inisiated by the Sustainable Agriculture Foundation Thailand in collaboration with local organizations	After Indonesia's economic crisis in 1998 many people occupied state-owned land and land owned by President Soeharto, then The Governor of Jakarta permitted individuals with limited resources to use public land for cultivating food.
Institutions	Central government (Ministries of agriculture and cooperatives), local government (Bangkok Metropolitan Administrative), non-profit organizations, communities, and individuals	Central government (Ministry of Agriculture), local government (Governor of DKI Jakarta), non-profit organizations, communities, and individuals
Planning documents	Ministry of Agriculture and Cooperatives 2017-2036 long-term plan, agricultural cooperative strategy, and 5-year short-term plan	Jakarta Spatial Plan Document (RTRW) 2010-2030 and Jakarta urban farming grand design 2018-2030
Main crops	vegetable products such as kale, kailan and lettuce, major fruits, such as banana, coconut, durian and mango	vegetable products such as kale, spinach, and caisim, staple foods such as cassava, and fruits such as bananas and papaya
Production system	vegetable fields and orchards usually have a bed structure that is adapted to the climate, soil, and water coming from the Chao praya water canal.	public land is used, such as along rivers and railways and private land uses beds that are tilled by hand or with tools, and irrigation is typically performed twice a day (in the morning and evening), which sourced from self-dug channels (groundwater) or occasionally pumped from nearby canals.
Target market	traditional market retailers and non-farming households	traditional market retailers and non-farming households

(Author's compilation)

4. Conclusion

Thailand, especially in the Bangkok Metro Regions (BMR), has had a collaborative effort to improve the food self-sufficiency of urban communities since 2010, utilizing canals as a source of irrigation and transportation from the Chao Phraya delta. The lack of connection of urban farming actors to traditional markets remains a challenge. The development and

management of the BMR area is carried out by the central government, through the ministry of agriculture and cooperatives which has made a long-term plan to regulate urban agriculture. The condition of urban farming in Indonesia, especially in Jakarta, has major challenges due to high population density and agricultural land conversion. After the 1998 economic crisis, urban agriculture flourished with residents using land for agricultural activities. Industrialization in the Jakarta Metropolitan area and Bodetabek increased land rights uncertainty and regulations on urban agriculture are ambiguous and divergent at the national level, although regulations related to finding suitable land are being carried out by the Indonesian Ministry of Agriculture and the governor of DKI Jakarta, such as developing urban agriculture along rivers and railway lines. The majority of urban farming actors focus on leafy vegetable production using traditional methods, and the products are sold in local markets. A challenge in urban agriculture management in Thailand and Indonesia is the lack of coordination in urban farming regulations and infrastructure and stakeholders can address this through better communication between urban agricultural actors, retailers, and non-farming households.

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Author Contribution

Conceptualization, N.I.D.A. and S.A.A.; Methodology, N.I.D.A. and S.A.A.; Software, N.I.D.A. and S.A.A.; Validation, N.I.D.A. and S.A.A.; Formal Analysis, N.I.D.A. and S.A.A.; Investigation, N.I.D.A. and S.A.A.; Resources, N.I.D.A. and S.A.A.; Data Curation, N.I.D.A. and S.A.A.; Writing – Original Draft Preparation, N.I.D.A. and S.A.A.; Writing – Review & Editing, N.I.D.A. and S.A.A.; Visualization, N.I.D.A. and S.A.A.; Supervision, N.I.D.A. and S.A.A.; Project Administration, N.I.D.A. and S.A.A.; and Funding Acquisition, N.I.D.A. and S.A.A.

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The authors declare no conflict of interest.

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