Institutions and Economies
Vol. 18, No. 2, April 2026, pp. 29-55 https://doi.org/10.22452/IJIE.vol18no2.2

A SWOT Analysis of the Potential of Developing Urban Farming in Malaysia

Khalil Fathurrachman[a], Noor Azina Ismail[b], and Muhammad Mehedi Masud[c]

Abstract: *Although current urban farming projects in Malaysia meet the government's cost of living goals, these are still in the early stages, relying on governmental support and requiring sustainable strategies. Analysing these issues can guide recommendations and actions to increase the potential of urban farming in Malaysia. Hence, this study aims to assess the development of urban farming in the country and identify the strategies and potential of urban farming development for policymakers. This study highlights urban farming development in low-cost housing (Program Perumahan Rakyat, PPR) because the government has focused on urban farming policies. Qualitative interviews were used as the main data collection method, and SWOT analysis the main approach for assessing the development of urban farming in low-cost housing and for making strategic recommendations. Strategic recommendations that are focused on policy changes and improvements are outlined to mitigate weaknesses, avoid threats, increase strengths, and capitalise on opportunities to increase the potential of developing urban farming in Malaysia.*

Keywords: Food; Urban farming; SWOT analysis; Sustainable development; Public housing
JEL Classification: O18, O13, Q18

[a] Institute for Advanced Studies, Universiti Malaya, 50603 Kuala Lumpur, Malaysia. *Email: khalif@um.edu.my*
[b] Corresponding author. Department of Decision Science, Faculty of Business and Economics, Universiti Malaya, 50603 Kuala Lumpur, Malaysia. *Email: nazina@um.edu.my*. ORCID ID: 0000-0001-8032-2162
[c] Department of Political Science, Public Administration and Development Studies, Faculty of Business and Economics, Universiti Malaya, 50603 Kuala Lumpur, Malaysia. *Email: mehedi@um.edu.my*. ORCID ID: 0000-0003-0476-4481

1. Introduction

Over 55% of the world's population live in cities, with urban residents consuming up to 70% of the world's food supply (UN DESA, 2019; FAO, 2017). Urban populations are growing faster than rural populations (UN DESA 2019), increasing the challenge of feeding urban dwellers. Nonetheless, technological advancements in recent decades have produced techniques that provide more prospects for urban food production, such as vertical farming, fertigation, horticulture, and hydroponics (Raj, 2021; Rabu & Muhammad, 2015). FAO et al. (2022) define urban farming as the production of food and other outputs and related processes on land and other spaces within cities. In Malaysia, such policies date back to the 1974 Rancangan Buku Hijau, which promoted community farming in response to the economic crisis at the time. Similar policies were also implemented in the 1990s and 2000s, such as Program Semai Indah and Program Bumi Hijau.

Urban farming was initially recognised in the 11th Malaysia Plan, which aimed to provide food, employment, and social integration, focusing on lower-income households. The Department of Agriculture (DoA) established the Urban Farming Division in 2014, initiating the Community Farming Development Programme to reduce living costs by providing farm setup, advisory, monitoring, and knowledge practices. The 12th Malaysia Plan recognises urban farming for additional income and biodiversity. The National Agrofood Policy 2.0 (2021), meanwhile, integrates urban farming into two action plans: increasing urban farming to promote community participation in producing food, and accelerating the development of farming in controlled environments, such as farming factories. In 2021, the Ministry of Housing and Local Government (KPKT) launched the first specialised urban farming policy, the Urban Community Farming Policy (DKKB), to streamline the setup process, enhance farm surveillance, and facilitate product commercialisation. Other smaller authorities and organisations have also conducted policies and programmes. Under Local Agenda 21 Kuala Lumpur, the Kuala Lumpur City Hall (DBKL) launched the Community Garden initiative to promote urban farming among local communities and low-income earners, including low-cost public housing. The initiatives offer technical advisory and commercial assistance, including markets organised by local governments or private entities for farmers to sell their products.

Public universities also support urban farming initiatives as part of their social engagement.

Although urban farming in Malaysia has achieved its initial objective of reducing living costs, it remains at a basic stage, resembling an "infant industry," as described by O'Sullivan and Sheffirin (2007). Farms rely heavily on government financial and technical support, which can hinder their efficiency and competitiveness, raising concerns about long-term sustainability. An analysis of urban farming is needed to better understand issues of sustainability and other underlying factors, and to subsequently formulate strategies for stakeholders to realise the potential of urban farming in Malaysia. Accordingly, this study assesses the development of urban farming in Malaysia, and identifies strategies and potentials for policymakers. The internal and external factors of urban farming will be explored through SWOT analysis, where internal factors will be categorised as strengths or weaknesses and external factors as opportunities or threats. This study focuses on public housing programmes (Program Perumahan Rakyat, PPR) due to the prevalence of urban farming projects at these sites (Omar, 2016; Kamaruddin, 2021).

2. Literature Review

The earliest analysis of urban farming development in Malaysia was conducted by Islam and Siwar (2012), who report that urban farming was an unpopular activity due to a lack of support from relevant stakeholders. This was no longer the case in the following decade, with Murdad et al. (2022) observing that urban farms had developed significantly. In 2018, Ramaloo et al. reported that despite receiving national recognition, there was still a lack of official policies on urban farming, with most community-run farms not being registered. The government later provided a specific urban farming policy, known as DKKB. Nevertheless, Murdad et al. (2022) point out that DKKB does not include certain important aspects of urban farming, such as the management of urban farms and the methods of profit distribution among members. Md Ibharim and Salim (2020) propose a framework to enhance urban farming among low-income groups, focusing on three levels: individual (farmers' intention, capital, and knowledge), internal (plant type, ecosystem, technology, and methods), and external (market, resources, funding, and government support). Although there have been many findings

about urban farms in recent years, few studies examine how urban farmers in Malaysia engage and implement such farms in their respective areas, as noted by Murdad et al. (2022). Recent studies also lack comprehensive research on identifying actions to help establish a policymaking platform for urban farmers (Ishak et al., 2022).

SWOT analysis examines four areas in two dimensions: internal factors (strengths and weaknesses) and external factors (opportunities and threats) (Gürel, 2017). The origin of SWOT analysis is debated, as some scholars attribute it to George Albert Smith Jr. and C. Roland Christensen of Harvard Business School in the 1950s, whereas others credit Albert Humphrey of Stanford Research Institute in the 1960s (Benzaghta et al., 2021; Teoli et al., 2022). In business research, the SWOT framework is traditionally applied to decision-making, policies and sustainability evaluations in multiple fields, including agriculture (Ramaloo et al., 2018; Benzaghta et al., 2021). SWOT analysis has been used in multiple studies involving urban farming evaluation and strategic development planning (Atreya et al., 2020; Forleo & Palmieri, 2019; Ramaloo et al., 2018). Strengths are identified as current positive forces associated with urban farming, opportunities as potential actions to enhance development, weaknesses as existing problems, and threats as potential future problems (Ramaloo et al. 2018). SWOT analysis is the most common technique in strategic planning (Abdel-Basset et al., 2018) and is considered an effective tool for strategic planning (Benzaghta et al., 2021). SWOT analysis information helps extract strategies that could improve the development of urban farming (Forleo & Palmeri, 2019).

Studies in urban farming, such as those conducted by Castellarini (2022), Garcia (2020), Mazumder et al. (2019), and Schneider et al. (2020), have employed SWOT analysis to assess internal and external factors without making any strategic recommendations. For example, Garcia (2020) investigates the impact of new tools, plans, and laws related to urban farming in Horta of Valencia, emphasising understanding the contextual factors rather than formulating specific strategies or recommendations on the basis of the analysis. The same approach was also applied by Mazumder et al. (2019), who use SWOT analysis to assess the economic viability and ecologic sustainability of urban farming in Kolkata.

Atreya et al. (2020), Forleo and Palmieri (2019) and Ramaloo et al. (2018) add strategies or recommendations on the basis of their SWOT analysis, although how they depict the strategies or recommendations

vary. For example, Ramaloo et al. (2018) propose a strategic plan for the development of urban farming in Penang, with the plan divided into multiple categories, such as financial and legal frameworks. In comparison, Forleo and Palmieri (2019) use a more straightforward approach by not categorising strategies on the basis of SWOT analysis. In the present study, strategy development based on SWOT follows the analysis technique used by Forleo and Palmieri (2019) and Ramaloo et al. (2018), which recommends unrestricted strategies without any particular framework, because the study is intended to create strategies that can be used in entirety.

3. Materials and Methods

This study uses output from semi-structured interviews with PPR representatives in four states in Peninsular Malaysia between 2021 and 2022, namely the Federal Territory of Kuala Lumpur, Terengganu, Johor, and Penang. The states are selected on the basis of the availability of PPRs in urban areas. In addition, experts—including ministries, departments, academicians, and non-governmental organisations (NGOs)—involved in urban farming in PPRs were also interviewed. The representatives and experts were identified on the basis of their involvement in urban farming. The interview questionnaire contains 12 open-ended questions on the support, impact, challenges, and sustainability of the urban farming market. Respondents were also asked for their recommendations to increase the development potential of urban farming. Table 1 below shows the number of interview participants by category.

Table 1: Number of participants for interviews

Category of participant	Number of participants
Representatives of PPRs	7
Local government officers	3
Ministries and department officers	6
Academicians	1
NGO	2

A total of 19 participants were interviewed, which is a sufficient number for a qualitative study. Guest et al. (2006) report that inhomogeneous studies using purposeful sampling, such as qualitative studies, should

have a minimum of 12 respondents to achieve data saturation. This study uses thematic content analysis (TCA) to analyse qualitative data. In TCA, common themes identified in the text are provided for analysis (Anderson, 2007).

As this study was funded by a grant from the Ministry of High Education (MOHE), it also utilises secondary data collected for other studies under the grant programme involving urban farming in PPRs. The secondary data is composed of structured questionnaires and qualitative interviews completed by 830 residents of PPRs in the four states. Several questions in these structured questionnaires are related to the SWOT points that have been listed. As such, the present study uses this data as support points, in addition to the qualitative interviews. Observation is also used in the present study, as the researchers were involved in the data collection process in the PPRs. The researchers observed the farm conditions, the structure of the PPR housing, and the involvement of the community in urban farming, which were also used as support points in the SWOT analysis. The collected data were organised according to the components of the SWOT analysis—strengths, weaknesses, opportunities, and threats. On the basis of the SWOT analysis, multiple strategies were identified to remedy, mitigate, or reduce the negative components highlighted.

4. Analysis and Discussion

4.1 SWOT analysis

On the basis of observations and data from interviews, the SWOT factors were mapped individually. Table 2 lists the strengths, weaknesses, opportunities, and threats identified in the SWOT analysis. The matrix was developed by categorising key issues within each cell.

4.1.1 Strengths

Twelve interviewees believed that urban farming positively impacts food security, making it a key strength. A local government officer noted that urban farming helped farmers in Penang provide food for their own usage during the Covid-19 pandemic. The survey reveals that 84% of the farmers relied on urban farming to help provide food during the pandemic. This

Table 2: SWOT analysis of the current development of urban farming in PPRs

Strengths	**Weaknesses**

• Increasing food security
  • Providing additional food supply
  • Reducing dependency on imported foods
  • Ensuring adequate nourishment
• Urban farming projects getting support from the government
• Reducing food miles
• Promoting relationships among PPR communities
• Minimal land requirements for farming
	• Limited space in PPR housing
	  • Housing plan
	  • Management regulation and restrictions
	• Small-scale production
	• Implementation of support
	  • Lack of monitoring
	  • Failure of urban farming-related e-government services
	• Lack of farming knowledge
	• Limited participants

Opportunities	**Threats**
• High urban population, many potential customers • Rising demands for fresh food • Urban farming methods are sustainable and resource-efficient • Large-scale urban farming creates employment opportunities • Providing opportunities for new urban farming-related business ventures	• Cheaper prices in hypermarkets • Flash floods • Urban pollution • Dependency on imported inputs

strength can be viewed in terms of individual supply, as urban farming provides food for the farmers' own consumption, whereas market supply increases if the farmers obtain a surplus and sell their products. A similar contribution was observed in Cuba during the food crisis in the late 1980s, as the government introduced initiatives to encourage urban farming, such as unproductive urban farm conversion (Leitgeb et al., 2015). In 2012, urban farming produced approximately 70% of the demand for fresh vegetables and fruits in cities such as Havana and Villa Clara (Altieri & Funes-Monzote, 2012). Both individual and market perspectives contribute to increased food availability and affordability, strengthening food security among residents (Taylor & Lovell, 2014).

In contrast, an officer from the Urban Farming Division of the DoA stated that urban farming contributed less than 5% to national vegetable production during the pandemic and had a limited impact on food security. However, she emphasised that the pandemic highlighted the importance of the urban farming in terms of increasing local food production to reduce reliance on imports. This would help mitigate imported inflation, which affects low-income groups (Black et al., 2009), such as PPR residents. The

adverse impact of import reliance can be seen in Singapore in 2019, as local food prices in 2022 increased significantly due to global events such as the pandemic and the Ukraine war (SFA, 2020; Ong, 2022). Moreover, food prices in sub-Saharan Africa surged by an average of 23.9% from 2022 due to reliance on food imports (Okou et al., 2022). Reducing import reliance can also protect against import bans, as seen in Singapore, where a ban on chicken from Malaysia affected 34% of its imports (Andres, 2022). Urban farms mitigate these risks by providing local food sources, reducing the impact of import bans and inflation, especially for low-income groups.

Urban farming ensures adequate nourishment. A representative from a PPR in Kuala Lumpur observed that urban farming provides easier access to "fresh and organic" food, as they farmed the food themselves. Additionally, 60% of the farmers in the survey said that producing healthy food was one of the reasons for their involvement. With urban farming, farmers can access nutritious fruits and vegetables, which is crucial for low-income households such as PPR residents, who tend to purchase less healthy food than higher-income households (French et al., 2019, Cheah et. al., 2024), despite their preference for fruits and vegetables (64% of the respondents' families like to eat vegetables, whereas 87.6% like to eat fruits). Urban farming allows communities to grow healthy food near their homes (Dardak & Muhammad, 2021). A case study in Dar-es-Salaam reported significant improvements in nutrient-rich food consumption among households involved in vegetable farming (Masashua et al., 2009). Access to healthy foods from the urban farming enables low earners to reduce their intake of processed and less healthy foods.

The strength of urban farming is also associated with government support through ministries, departments, agencies, local governments, and public universities. Five of the six interviewed representatives mentioned receiving government support, particularly in the early stages of their farming. Their aid comprises in-kind support, such as agricultural supplies, education and training programmes (Dewan Negeri Selangor, 2020). In 2021, the federal government allocated more than RM63 million to the KEBUNITI community farming programme (Rahman, 2021). Government support provides farmers with knowledge through courses and eliminates startup costs, allowing them to start farming without capital constraints. An officer from government agriculture research noted that urban farmers manage to save an average of RM110 monthly on groceries.

Urban farming reduces food miles, that is the distance between where food is produced and where it is consumed (McIntosh, 2013). According to Bosschaert (2012), urban farming brings producers and consumers closer, reducing transportation distances, harmful emissions, and transportation costs. In PPRs, local farmers practice urban farming near their residences, such as on vacant lots or within apartment complexes, eliminating transportation needs. This benefits the environment by minimising carbon emissions from short-distance transportation and energy-intensive activities, such as cooling, storing, and packaging during food transportation (De Zeeuw, 2011). Additionally, the Urban Farming Division officer noted that having urban farming in residential areas can help communities access food during situations when supplies are limited, such as lockdowns.

Urban farming also strengthens community relationships. Community-based urban farming in PPRs often requires collective effort, as people need to work together to maintain the farm. This cooperative approach fosters teamwork, knowledge exchange, and resource sharing, and enhances social connections and community building (Weil, 1996). An officer from an economic unit of the government noted that urban farming increased cohesion and fostered greater relationships among the community. This is because urban farming brings people together in a specific location, most frequently outdoors, and generates interaction. Community-based urban farms often form bonding and bridging networks that did not exist before their initiation (Smit & Bailkey, 2006). While measuring community relationships lacks specific metrics, 89.7% of survey respondents agreed that farming activities in PPRs promote social interactions between communities, highlighting their role in building relationships.

Another strength of urban farming is its minimal land requirements. An officer from the economic unit and a local academic noted that urban farming uses systems such as vertical farming and fertigation, which differ from traditional farming. Vertical farming stacks plants to save space, and fertigation is applicable on flat surfaces and comprises automated controls, thus eliminating the need for traditional agricultural land and reducing labour (Dixon & Liu, 2022). Moreover, hydroponics requires less land and recycles water, resulting in higher productivity than soil-based systems (Sharma et al., 2018). The minimal land requirements of these urban farming systems indicate that urban farming is suitable for constrained areas such as PPRs. On the basis of the DKKB (2021), five space categories are

suitable for urban farming, including residential areas, unused green areas, utility reserved areas, community facility areas and river reserved areas. In PPRs, vacant lands around residential areas are commonly utilised for urban farming, and are managed by the PPRs themselves. Residents also use balconies and sidewalks, subject to the rules and regulations of PPRs. PPR communities should also be allowed to utilise other nearby categories of space and land.

4.1.2 Weaknesses

Despite the minimal land requirements of urban farms, residents face space issues. The survey reveals that 53% of non-farmers cited space issues as preventing them from being farmers. PPR housing developments often have limited space, restricting the scale and output of urban farms. The interviews and visits in the PPRs revealed two main causes, one being the housing plan. Urban farming is relatively new in Malaysia; the Urban Farming Division was only established in 2014, whereas most PPRs in Kuala Lumpur were built before that (DBKL, 2018). On the basis of these findings, older PPRs do not allocate space for urban farming. For example, a PPR in Setapak, Kuala Lumpur has only one dedicated urban farming space. The space is smaller than a futsal court, which is insufficient for its 1,580 residents, as other areas are occupied by car parks and sports fields. A representative from this PPR acknowledged space scarcity, but appreciated the local government's flexibility in allowing farming outside designated areas, such as sidewalks, if cleanliness and order are maintained.

Another cause of limited space in PPRs is management regulation and various restrictions, such as for maintaining cleanliness, driven by concerns about how residents manage their farms. During a visit to a PPR in Kuala Terengganu in 2022, ample space was observed, but a representative revealed that the joint management body (JMB) of the residence restricted farm expansion to ensure cleanliness. Five residents mentioned JMB restrictions as preventing them from farming, which may underrepresent the issue since this reason was not included in the survey options. This limitation frustrates farmers, who note that government agencies are genrally supportive and willing to provide assistance for the expansion of farm spaces, given the success of their current operations.

The limited space for urban farming in PPRs leads to small-scale production, as farmers can only raise crops in volumes sufficient for personal consumption and limited sales within their communities. The survey reveals that 27% of farmers sell their products, but only 12% earn more than RM500 per month, while 54% earn less than RM200. In terms of profit, only 8% make over RM500, whereas the majority (68%) make less than RM100. The scale of the urban farming in PPRs is so small that community demand often exceeds supply, as noted by the Urban Farming Division officer. A representative from a PPR in Terengganu notes that crops sell out quickly in the morning, as only one of four blocks is dedicated to urban farming. This low volume hinders commercialisation in larger markets, limiting urban farming to reducing living costs rather than providing a significant income for farmers.

While government support is acknowledged as a strength for urban farming in PPRs, there are implementation issues. Initial startup support is often followed by inadequate follow-up, with communication limited to messaging applications such as WhatsApp, as revealed in the interviews. The survey revealed that only 33.5% of the farmers reported local government monitoring of their urban farming activities. This lack of ongoing support leads to decreased interest among farmers. For example, when crops fail, follow-up messages in a WhatsApp group are insufficient; farmers need in-person visits and further training. An officer for the Ministry of Agriculture and Food Security (KPKM) notes challenges in monitoring the farms due to the limited staff covering large areas. In a PPR in Setapak, support from a public university helped restart the farming project that had been abandoned due to the pandemic. However, a visit in March 2023 revealed that the project failed within a year because of insufficient follow-up support. This situation is not unique; among the ten PPRs attempting urban farming, three projects had failed.

Additionally, in the digitalisation effort, government agencies launched two e-commerce platforms to sell urban farming products: Pasarkita.my and AgroBazaar Online. As of May 2023, Pasarkita.my is inaccessible. Although AgroBazaar Online is active, it can be considered a failure because numerous products have zero sales, indicating low visitor traffic. Anthopoulos et al. (2016) notes that unrealistic planning often leads to e-government service failures, as successful e-commerce sites require substantial resources to attract customers. For example, Shopee, Southeast Asia's largest e-commerce

platform, spends hundreds of millions on marketing (Kaur, 2020). Thus, launching a new site with a low budget and a niche market appears unrealistic.

A lack of knowledge has caused farmers to lose interest in their urban farming projects, as seen in various PPRs. A local government officer said that one key reason for the failure of the urban farming project in Iskandar Puteri, Johor was the farmers' lack of expertise in farming techniques, which, in their case, was fertigation, causing them to lose interest when their farms encountered problems. Multiple interviewees agreed that low-income individuals tend to have limited urban farming knowledge, contributing to their disengagement. The survey also revealed that many PPR residents lack urban farming knowledge, with only approximately 53% familiar with planting media, 55% familiar with fertilisers, 35% familiar with pesticides, 40% familiar with lighting, and 48% familiar with watering. Almost 20% of nonfarmers cited a lack of knowledge of farming techniques as the reason for their inability to do so.

According to the interviews and visits, farmers in PPRs tend to be retirees and housewives. The survey shows that retirees (27%) and housewives (26%) constitute the second and third highest proportions of farmers, respectively, after self-employed individuals, which is understandable because of their more flexible schedules or because they are commercial farmers. An KPKM officer pointed to the challenge of securing commitment in meetings and farm monitoring from residents, as they are not full-time farmers. Urban farming projects also tend to involve similar faces because all interviewed representative except one mentioned receiving support, which was shown otherwise by the survey, as only 41% of the farmers received guidance from the resident's association, local government or KPKM. Time constraints also hinder participation in urban farming projects, as 32% of the residents cited being too busy with other work as the main reason, second only to space issues. Jobs for low-income groups usually provide only one day off per week, and some residents hold multiple jobs, leaving little time for urban farming. Additionally, it is difficult to commercialise small-scale urban farming, as the labour costs are high (the urban median wage is RM2,438, whereas the rural median wage is RM1,520) (DOSM, 2022a). Urban farming is unpopular among youth, with only 16.2% of farmers under 30, according to the survey. Farming is viewed as a physically demanding job, especially among youth (Ismail, 2019).

4.1.3 Opportunities

One of the opportunities for urban farming in PPRs is the large number of potential customers. Urban areas have experienced significant population growth, with the urbanisation rate rising from 70.9% in 2010 to 75.1% in 2021 (DOSM, 2022b). Despite low fertility rates (DOSM 2021, Fox et al., 2018), urban areas attract people from other areas due to job opportunities, thus increasing the population (Selod & Shilpi, 2021). Although current urban farming projects in PPRs do not provide large-scale food production, the sales of fruits remain high, showing that the market exists and requires an increase in production. Higher production allows farmers to achieve economies of scale, as food prices can be affordable with more efficient production due to decreased cost per unit.

According to Hadi et al. (2010), freshness in vegetables is a key attribute that Malaysian consumers value. A survey by Herbalife Nutrition (2020) revealed that more than 50% of Malaysians have made positive changes to their dietary habits, such as increasing their consumption of fruits and vegetables, reducing meat intake, and incorporating more plant-based foods. Given the rising demand for freshness, locally sourced food presents significant opportunities for urban farming in PPRs. By minimising food miles, urban farming enables a direct supply of food to consumers in shorter timeframes, resulting in fresher produce than conventional farming methods. Urban farming encompasses sustainable and resource-efficient practices such as vertical farming, hydroponics, aquaponics and aeroponics, which require less land, water, and energy than traditional agriculture. With the increasing importance of environmental considerations, urban farmers can position themselves as providers of eco-friendly, low-impact food options, attracting niche markets, particularly environmentally conscious consumers seeking sustainable, locally sourced produce.

While urban farming in PPRs typically operate on a small scale, successful farm expansion could create valuable employment opportunities for residents. By hiring residents, urban farmers can contribute to community economic development while fostering a sense of ownership and empowerment. These jobs within the urban farming sector can provide income stability and valuable skill development for individuals in PPRs. Urban farming also provides opportunities for new business ventures beyond farm production. Many inputs for urban farming are still imported

due to limited local production. For example, 90% of the seeds for the national vegetable industry are imported (Che Omar, 2018). This presents opportunities for businesses to produce these materials and equipment locally, increasing the supply of inputs. A higher supply can lower market prices and reduce import dependency on farming inputs, thus mitigating the risks associated with imported inflation that threaten the market.

4.1.4 Threats

Multiple interviewees highlighted the threat of physical markets or hypermarkets that sell agricultural products at lower prices due to economies of scale. Larger producers or vendors benefit from cost-efficient production, which creates price disparities that challenge community-based urban farmers, impacting competition and profitability. Currently, successful community-based urban farming initiatives in PPRs remain competitive because of ongoing support from the government. However, if the support ceases, these farmers might struggle to compete. Hence, while physical markets present a pricing threat, continued government support is crucial for sustaining the competitiveness of community-based urban farmers against larger market players.

In urban areas such as Kuala Lumpur, flash floods are common natural disasters. Rapid urbanisation has led to increased migration and consequent spatial changes in land use and cover (Samsuri et al., 2018). Flash floods threaten urban farms in PPRs because most are located at the ground level, potentially damaging plants and infrastructure. According to overseas experiences, urban farming also faces threats from air pollution, which can adversely affect crops (Agrawal et al., 2003; Bell et al., 2011). Urban areas are more polluted due to larger populations, associated with increased vehicle usage and greater tailpipe emissions (Bereitschaft & Debbage, 2013). This air pollution can reduce crop yields, negatively impacting farmers' incomes, while also contributing to an increase in plant pests, which forces farmers to spend more on pesticides. On the other hand, urban farming can also contribute to pollution itself, as farming can introduce unwanted chemicals into the environment. Inorganic fertilisers, manure, and pesticides lead to water pollution and excessive growth of algae and aquatic plants in nutrient-rich waters (Meharg, 2016). An interview with an urban farming NGO in Kuala Lumpur revealed the complaints they faced from nearby

residents due to unpleasant smells and sounds by the animals on the farms.

Multiple interviewees also highlighted the threat of imported inputs used in urban farms, such as seeds and fertilisers. Approximately 90% of the seeds for the national vegetable industry are imported (Che Omar, 2018). This dependency on imported inputs will cause farmers to face the risk of imported inflation. Increasing prices or decreasing foreign exchange will cause farmers to spend more on inputs unless the inputs are subsidised by the government. Currently, seeds and fertilisers are not price-controlled products.

4.2 Strategies

Table 3 shows the recommendation strategies based on the weaknesses or threats identified via SWOT analysis.

Table 3: Strategies to encounter weaknesses and threats

Strategies	Weaknesses/threats
Establishment of urban farming division at district level	Lack of farming knowledge
	Limited participants
	Lack of monitoring
	Urban farming pollution
Utilise government-owned idle and utility land	Limited space in PPR housing
	Small-scale production
Land leasing for urban farming	Limited space in PPR housing
	Small-scale production
Specific urban farming laws	Limited space in PPR housing
	Urban farming pollution
Public-private partnership for urban farming	Failure of urban farming -related e-government services
	Lack of farming knowledge
	Limited participants
Incentive for input providers	Dependency on imported inputs

4.2.1 Establishment of the urban farming division at the district level

The DoA should establish a urban farming division at the district level. Staff shortages to administer urban farming projects can be resolved by hiring more department staff or collaborating with the two main urban farming

authorities, the DoA and local governments, similar to the Ministry of Health (KKM) partnering up with local governments for dengue enforcement. Owing to the limited number of officers from KKM, local governments usually help with dengue preventive enforcement, such as fogging and community surveillance. District urban farming division provides training, and the location of the knowledge transfer must be performed at the PPRs to ensure participation from residents. Support for urban farming projects must also be given during training to maintain farmer engagement, as exemplified by the local government in Iskandar Puteri. A local government officer from Iskandar Puteri revealed how they managed to revive a failing urban farming project (started by other agencies) through annual funding and regular supervision (three farm visits per year). Regular monitoring also ensures adherence to farming guidelines, including the threat of pollution emitted by farm by-products. Multiple interviewees suggested profiling potential community leaders to lead urban farming projects, as successful PPR projects often have committed leaders or government-appointed officers, as observed during PPR visits. If no community leader emerges, the urban farming division can assign an officer to manage the project, ensuring proper leadership and reducing the risk of failure. Establishing a district-level urban farming division would enable direct community engagement, enhancing leadership identification and project sustainability.

4.2.2 Utilising government-owned idle and utility land

The DKKB provides guidelines for using government-owned idle and utility land for urban farming, offering PPR farmers alternatives beyond their housing area. However, visits to PPRs revealed that only one community urban farm uses nearby idle land, and a survey reported that only 28% of farmers use land outside their residential area. This low usage may be due to the complex land use application process, which requires approval from at least three agencies: the landowner, local government, and DoA (optional, for initial support). Hence, DoA should cooperate with other stakeholders, such as local governments and energy companies that own idle land. A centralised platform, similar to the MySejahtera app for MOH's collaboration with private medical practitioners during mass Covid-19 vaccinations, would streamline land and support applications for urban farming activities. This platform could facilitate direct communication

between farmers and landowners, minimising bureaucratic hurdles in initiating urban farming projects.

4.2.3 Land leasing for urban farming

Currently, any land used for urban farming is permission-based, requiring landowner consent. Land leasing would give farmers more security, as it involves formal agreements, preventing sudden land takeovers. Potentially leasable land includes idle land in PPRs, idle land owned by local or state governments, and utility land near electricity substations or rail stations. Although DKKB provides guidelines for urban farming land use on government-owned idle and utility land, these guidelines require permission. This study suggests leasing the land instead. For example, the Cuban government allowed individuals to farm on government-owned urban land through usufruct rights, enabling long-term leases for 25-year renewable terms during its 1990s food crisis (Schultz, 2012; McNamara, 2017). Unused private land can also be utilised for urban farming, as in the case of the Argentinian government providing tax incentives for private landowners that make vacant land temporarily available to the urban poor for urban farming (Ponce & Terrile, 2010).

4.2.4 Specific urban farming laws

In conjunction with suggestions regarding land leasing and a new lower level of division, the government must also create specific urban farming laws. Although many state agriculture departments and local governments provide similar initiatives to promote urban farming, there are important differences in the types of operations allowed in each area, including PPR housing. Earlier SWOT analyses mentioned the issues of limitations regarding urban farming activity, such as PPRs' permission to perform small-scale urban farming in non-specific areas. Some PPRs are lenient towards this situation, whereas others are not. With specific urban farming acts, the government can designate particular zones or areas within a city where urban agriculture is permitted, making it easier for individuals and communities to establish and maintain urban farms. An example of an enacted urban farming law is the Urban Agriculture Ordinance in New Port Richey in Florida, United States. The function of the ordinance is to allow vacant, publicly owned lots to be

used for microfarms, hence increasing the number of residential gardens in the city (Spence et al., 2019). In addition to space security, specific urban farming laws ensure that farmers adhere to the guidelines, which prevents them from using hazardous pesticides or emitting pollutants.

4.2.5 Public–private partnerships for urban farms

Public–private partnerships (PPPs) could boost urban farming projects by enhancing farm produce marketing and generating income for farmers. In terms of marketing, the agriculture ministry could collaborate with major e-commerce platforms in Malaysia, such as Shopee and Lazada, or delivery platforms, such as Foodpanda and Grab, to help urban farmers commercialise their products. These platforms' large market shares would enhance the connectivity between farmers and consumers. This model has proven successful, as seen in the consumer ministry's 2020 partnership with Shopee's 'Buy Malaysian Products' campaign, which generated nearly RM1 billion in sales in 2021 (Zainuddin, 2020; Ho, 2021). Offering incentives such as discount vouchers, rebates and ad credits, similar to the campaign, could help attract consumers to urban farming products. The freshness of products can be maintained with platforms such as Foodpanda, offering same-day delivery. This PPP model benefits farmers through increased sales, private companies through sales commissions, and the government by reducing marketing costs in their urban farming support.

PPPs could be applied to support urban farmers in setting up and managing their farms. For example, cocoa farms in Indonesia receive government support for infrastructure, whereas private entities provide technical training and part of the infrastructure (Natawidjaja et al., 2015). In return, the farmers sold their produce to these private entities. This PPP model could help farmers generate income while reducing the need for extensive government support (start-up funding, technical advice, annual funding). Moreover, with private sector involvement, the focus should be on productivity, ensuring that farmers use the best technology and attracting more participants due to the income potential. However, while this approach benefits farmers economically, it may not directly enhance food security for their communities, as the produce is sold to private entities. On a larger scale, regional food security could still improve by utilising local resources for production.

4.2.6 Incentives for input providers

In addition to providing incentives for urban farmers, attention should be given to input providers, addressing the reliance on imported inputs. The government can stimulate the growth of the local agricultural inputs industry by offering incentives, such as tax exemptions, to encourage investment in this sector. This approach mirrors the strategies employed in promoting Malaysia's electric vehicle (EV) industry. The government's substantial incentives for both producers and consumers of EVs, including road tax and import duty exemptions, demonstrate the potential effectiveness of such measures (Wong, 2023; Tan, 2023). Notably, the establishment and success of an agricultural input industry are contingent upon the growth and demand of the urban farming market, emphasising the need to first enhance the marketability of urban farming products before fully realising the potential of this industry.

4.3 Theoretical implications

To the authors' knowledge, this study is the first to analyse the development of urban farming in Malaysia after the introduction of DKKB in 2021. This study contributes to the literature in two ways. First, strategic recommendations, which function as suggestions for policy action for the development of urban farming in Malaysia, are provided. Second, this study managed to assess urban farming development specifically among low-income groups in urban areas, which may help urban farming policy be more low-income oriented.

4.3 Limitations of the study

The first limitation is the geographical factor, as this study involves no respondents from East Malaysia due to cost constraints. This study also limits the respondents from PPRs, as the housing programme has a high concentration of low-income families in Malaysian urban areas. However, there could be low-income individuals who are involved in urban farming but do not live in PPRs. Although the number of respondents for qualitative interviews is sufficient on the basis of the past literature, this study would have benefitted from interviewing a greater number of farmers to represent

the diverse demographics of PPR residents, thus reducing potential bias. Data collection through qualitative interviews and questionnaires may also introduce subjectivity, as responses are open to interpretation. Finally, time and resource constraints restricted the extent of the investigation, potentially omitting the longer-term impacts of urban farming initiatives.

5. Conclusion

This study identifies the positive and negative aspects of urban farming development in Malaysia, focusing on PPRs, in the nine years since initiated by the government in 2014. Despite identifying various implementation challenges, urban farming has made progress towards its main objectives. Through an in-depth SWOT analysis, this study provides a comprehensive understanding of urban farming dynamics in Malaysia and suggests strategies for further development. The issues and situations vary according to the PPRs or locations; hence, strategies must be implemented according to specific contexts. The strategies are centred on government policies because community urban farms, particularly among low earners in PPR communities, are insufficiently profitable for private entities to be involved. With the current progress in urban farming in PPRs, policymakers must be fully engaged in implementation with more efficient actions, as addressed in this study. The review of the literature identified a gap within the scope of urban farming development in Malaysia. The only prior SWOT analysis of urban farming in Malaysia was conducted by Ramaloo et al. (2018). This emphasises the significance of this study for contributing new insights and filling this critical gap. Moving forwards, the call for more extensive urban farming assessments in Malaysia is decisive. Continued and collective efforts are required to identify the variety of potentialities waiting to be utilised and the issues that may hold up urban farming development. More studies should be performed using SWOT analysis to identify unexploited potential, determine challenges, and, eventually, increase the prospects for urban farming in Malaysia to its maximum extent.

Credit Author Statement

Khalil Fathurrachman: Data curation, Formal analysis, Investigation, Writing – Original draft preparation, Writing – Review and editing; **Noor**

Azina Ismail: Conceptualisation, Funding acquisition, Methodology, Project administration, Resources, Supervision, Writing – Review & editing; **Muhammad Mehedi Masud**: Methodology, Writing – Review and editing.

Acknowledgment

The authors would like to acknowledge the Ministry of Higher Education Malaysia for financial support under the Long-Term Research Grant Scheme (LRGS/1/2019/UKM-UM/5/3). The funder had no role in the study design, data collection and analysis, decision to publish, or preparation of the manuscript.

References

Abdel-Basset, M., Mohamed, M., & Smarandache, F. (2018). An extension of neutrosophic AHP–SWOT analysis for strategic planning and decision-making. *Symmetry*, *10*(4), 116. https://doi.org/10.3390/sym10040116

Agrawal, M., Singh, B., Rajput, M., Marshall, F., & Bell, J. N. B. (2003). Effect of air pollution on peri-urban agriculture: A case study. *Environmental Pollution*, *126*(3), 323–329. https://doi.org/10.1016/S0269-7491(03)00245-8

Altieri, M. A., & Funes-Monzote, F. R. (2012). The paradox of Cuban agriculture. *Monthly Review*, *63*(8), 23. https://monthlyreview.org/2012/01/01/the-paradox-of-cuban-agriculture/

Anderson, R. (2007). Thematic content analysis (TCA): Descriptive presentation of qualitative data. *Rosemarie Anderson*. https://rosemarieanderson.com/wp-content/uploads/2014/08/ThematicContentAnalysis.pdf

Andres, G. (2022, May 24). Malaysia bans chicken exports: What you need to know. CNA. https://www.channelnewsasia.com/singapore/malaysia-bans-chicken-exports-singapore-supply-price-consumers-2703071

Anthopoulos, L., Reddick, C. G., Giannakidou, I., & Mavridis, N. (2016). Why e-government projects fail? An analysis of the Healthcare.gov website. *Government Information Quarterly*, *33*(1), 161–173. https://doi.org/10.1016/j.giq.2015.07.003

Atreya, P. N., Kafle, A., Shrestha, B., & Rayamajhi, R. J. (2020, February 6–7). *Precision and protected horticulture in Nepal: Sustainability and*

future needs [Paper presentation]. 11th National Horticulture Seminar, Kathmandu, Nepal.

Bell, J. N. B., Power, S. A., Jarraud, N., Agrawal, M., & Davies, C. (2011). The effects of air pollution on urban ecosystems and agriculture. *International Journal of Sustainable Development and World Ecology*, *18*(3), 226–235. https://doi.org/10.1080/13504509.2011.570803

Benzaghta, M. A., Elwalda, A., Mousa, M. M., Erkan, I., & Rahman, M. (2021). SWOT analysis applications: An integrative literature review. *Journal of Global Business Insights*, *6*(1), 55–73. https://www.doi.org/10.5038/2640-6489.6.1.1148

Bereitschaft, B., & Debbage, K. (2013). Urban form, air pollution, and CO_2 emissions in large US metropolitan areas. *Professional Geographer*, *65*(4), 612–635. https://doi.org/10.1080/00330124.2013.799991

Bosschaert, T. (2012, July 3). Large scale urban agriculture. *Except Integrated Sustainability*. https://except.eco/knowledge/large-scale-urban-agriculture/

Castellarini, F. (2022). Urban agriculture in Latin America: A green culture beyond growing and feeding. *Frontiers in Sustainable Cities*, *3*, 792616. https://doi.org/10.3389/frsc.2021.792616

Che Omar, I. S. (2018, September 26). Misi hasilkan tanaman berkualiti. *Utusan Malaysia.* https://www.utusan.com.my/nasional/2018/09/misi-hasilkan-tanaman-berkualiti/

Cheah, Y. K., Su, T. T., & Adzis, A. A. (2024). Cross-sectional analysis of expenditure on fruits and vegetables: A comparison between low-income and high-income households. *Institutions and Economies*, *16*(1) , 53–78. https://doi.org/10.22452/IJIE.vol16no1.3

Dardak, R. A., & Muhammad, R. M. (2021). Urban agriculture as an alternative food source. *FFTC Agricultural Policy Platform*. https://ap.fftc.org.tw/article/2886

Department of Statistics Malaysia (DOSM) (2021). *Vital statistics, Malaysia, 2021*. DOSM. https://www.dosm.gov.my/portal-main/release-content/vital-statistics-malaysia-2021

Department of Statistics Malaysia (DOSM) (2022a). *Salaries and wages survey report, Malaysia, 2021*. DOSM. https://www.dosm.gov.my/portal-main/release-content/salaries-&-wages-survey-report-malaysia-2021

Department of Statistics Malaysia (DOSM) (2022b). *Key findings population and housing census of Malaysia, 2020 Version 2.0*. DOSM. https://www.

dosm.gov.my/portal-main/release-content/key-findings-population-and-housing-census-of-malaysia-2020-administrative-district

Dewan Bandaraya Kuala Lumpur (DBKL) (2023). Senarai PPR/PA di bawah seliaan DBKL mengikut parlimen. *Data.gov.my.* https://archive.data.gov.my/data/ms_MY/dataset/senarai-ppr-pa-di-bawah-seliaan-dbkl-mengikut-parlimen

Dewan Negeri Selangor (2020, November 27). Program pertanian bandar. *Portal rasmi Dewan Negeri Selangor*. https://dewan.selangor.gov.my/question/program-pertanian-bandar/

Dixon, M., & Liu, G. (2022). The advantages and disadvantages of fertigation. *EDIS*, *2022*(4). https://doi.org/10.32473/edis-HS1442-2022

Food and Agriculture Organization (FAO), Rikolto, & RUAF (2022) *Urban and peri-urban agriculture sourcebook—From production to food systems*. FAO and Rikolto. https://doi.org/10.4060/cb9722en

Food and Agriculture Organization (FAO) (2017). *The state of food and agriculture 2017: Leveraging food systems for inclusive rural transformation.* FAO. https://openknowledge.fao.org/items/2f47c5f5-0950-4b4f-8d14-ba796e618a49

Forleo, M. B., & Palmieri, N. (2019). The potential for developing educational farms: A SWOT analysis from a case study. *Journal of Agricultural Education and Extension*, *25*(5), 431–442. https://doi.org/10.1080/1389224x.2019.1643747

Fox, J., Klüsener, S., & Myrskylä, M. (2019). Is a positive relationship between fertility and economic development emerging at the sub-national regional level? Theoretical considerations and evidence from Europe. *European Journal of Population*, *35*, 487–518. https://doi.org/10.1007/s10680-018-9485-1

French, S. A., Tangney, C. C., Crane, M. M., Wang, Y., & Appelhans, B. M. (2019). Nutrition quality of food purchases varies by household income: The SHoPPER study. *BMC Public Health*, *19*, 1–7. https://doi.org/10.1186/s12889-019-6546-2

Garcia, J. L. M. I. (2020). New phase in the process of maintenance of the urban agricultural area of 'L'Horta de València', Spain. *Urban Agriculture and City Sustainability II*, *243*, 3. https://doi.org/10.2495/ua200011

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field*

Methods, *18*(1), 59–82. https://doi.org/10.1177/1525822x05279903

Gürel, E. (2017). Swot analysis: A theoretical review. *Journal of International Social Research*, *10*(51), 994–1006. https://doi.org/10.17719/jisr.2017.1832

Hadi, A. H. I. A., Selamat, J., Shamsudin, M. N., & Radam, A. (2010). Demand for food safety attributes for vegetables in Malaysia. *Environment Asia*, *3*(3), 160–167. http://www.tshe.org/ea/pdf/vol3s%20p160-167.pdf

Herbalife Nutrition. (2020, December 11). Diet decisions survey. *Herbalife*. https://www.herbalife.com/en-sg/about-herbalife/press-room/press-releases/diet-decisions-survey

Ishak, N., Abdullah, R., Rosli, N. S. M., Majid, H., Halim, N. S. A. A., & Ariffin, F. (2022). Challenges of urban garden initiatives for food security in Kuala Lumpur, Malaysia. *Quaestiones Geographicae*, *41*(4), 57–72. https://doi.org/10.14746/quageo-2022-0038

Islam, R., & Siwar, C. (2012). The analysis of urban agriculture development in Malaysia. *Advances in Environmental Biology*, *6*(3), 1068–1078.

Ismail, A. R. (2019, August 27). Not many young people involved in agriculture. *Borneo Post Online*. https://www.theborneopost.com/2019/08/28/not-many-young-people-involved-in-agriculture/

Kamaruddin, Z. (2021, August 3). KPKT sasar wujud kebun komuniti di setiap PPR. *Harian Metro*. https://www.hmetro.com.my/mutakhir/2021/08/738072/kpkt-sasar-wujud-kebun-komuniti-di-setiap-ppr

Kaur, D. (2020, November 5). What's behind Southeast Asia's monthly sales hype? *Tech Wire Asia*. https://techwireasia.com/11/2020/whats-behind-southeast-asias-monthly-sales-hype/

Leitgeb, F., Schneider, S., & Vogl, C. R. (2016). Increasing food sovereignty with urban agriculture in Cuba. *Agriculture and Human Values*, *33*, 415–426. https://doi.org/10.1007/s10460-015-9616-9

Masashua, H. E., Dimoso, P. J., & Hawassi, F. G. (2009). *Potentials of urban horticulture for poverty reduction in Dar es Salaam: A case of Kinondoni Municipal*. Eldis Poverty Resource Guide. https://archive.ids.ac.uk/eldis/document/A43098.html

Mazumder, S., Datta, D., Naskar, M., & Ghosh, R. (2019). Urban and peri-urban agriculture in Kolkata metropolitan area: An assessment of status and sustainability. *Contemporary Social Sciences*, *207*, 207–222. https://

iigeo.org/wp-content/uploads/2023/11/Paper_3__Shrabana.pdf

McNamara, T. (2017). *Crisis of urban agriculture: Case studies in Cuba.* Yale Hixon Center for Urban Sustainability. https://hixon.yale.edu/sites/default/files/files/fellows/paper/170124_tess_mcnamara_hixon_report_v2.pdf

Md Ibharim, L.F., & Salim, S.A. (2020). The framework of urban farming towards enhancing quality of life in Malaysia. *International Journal of Supply Chain Management*, *9*(1), 520–526.

Meharg, A. A. (2016). Perspective: City farming needs monitoring. *Nature*, *531*(7594), S60. https://doi.org/10.1038/531s60a

Murdad, R., Muhiddin, M., Osman, W. H., Tajidin, N. E., Haida, Z., Awang, A., & Jalloh, M. B. (2022). Ensuring urban food security in Malaysia during the COVID-19 pandemic—Is urban farming the answer? A review. *Sustainability*, *14*(7), 4155. https://doi.org/10.3390/su14074155

Okou, C., Spray, J., & Unsal, D. F. (2022, September 27). Africa Food Prices Are Soaring Amid High Import Reliance. *IMF Blog*. https://www.imf.org/en/Blogs/Articles/2022/09/26/africa-food-prices-are-soaring-amid-high-import-reliance

Omar, N. (2016, December 6). Noh: Urban farming for PPR flats to reduce household bills. *Malaysiakini*. https://www.malaysiakini.com/news/365329

Ong, C. (2022, June 20). Singapore imports more than 90% of its food. Here's how it's dealing with rising food inflation. *CNBC*. https://www.cnbc.com/2022/06/21/singapore-imports-90percent-of-its-food-how-is-it-coping-with-inflation.html

O'Sullivan, A., & Sheffrin, S. M. (2007). *Economics: Principles in Action*. Pearson Prentice Hall.

Ponce, M., & Terrile, R. (2010). An analysis of markets in Rosario, Argentina. *Urban Agriculture Magazine*, *24*, 55–57. http://www.ruaf.org/sites/default/files/UA%20Magazine%2024%20sept2010web%2055-57.pdf

Rabu, M., & Muhammad, R. (2015). The potential of urban farming technology in Malaysia: Policy intervention. *FFTC Agricultural Policy Platform*. https://ap.fftc.org.tw/article/965

Raguraman, A. (2022, October 11). Malaysia lifts export ban on live broiler chicken: What types of chicken are imported into S'pore? *The Straits Times*. https://www.straitstimes.com/singapore/consumer/malaysia-lifts-

export-ban-on-live-broiler-chicken-what-types-of-chicken-are-imported-into-spore

Rahman, H. A. (2021, October 17). MAFI salurkan insentif lebih RM63 juta untuk Program Kebuniti. *Berita Harian*. https://www.bharian.com.my/berita/nasional/2021/10/876976/mafi-salurkan-insentif-lebih-rm63-juta-untuk-program-kebuniti

Raj, A. (2021, August 13). How agritech is creating an urban farming ecosytem. *Tech Wire Asia*. https://techwireasia.com/08/2021/agritech/

Ramaloo, P., Siwar, C., Liong, C. Y., & Isahak, A. (2018). Identification of strategies for urban agriculture development: A SWOT analysis. *Planning Malaysia*, *16*(3), 320–331. https://doi.org/10.21837/pmjournal.v16.i7.521

Samsuri, N., Abu Bakar, R., & Unjah, T. (2018). Flash flood impact in Kuala Lumpur—Approach review and way forward. *International Journal of the Malay World and Civilisation*, *6*(1), 69–76. https://www.ukm.my/jatma/jilid-6terbitan-khas-bil-1/

Schneider, P., Meyer, A., & Plat, K. (2020). Potential of bioeconomy in urban green infrastructure. In C. Keswani (ed.), *Bioeconomy for sustainable development*, 251–276. Springer. https://doi.org/10.1007/978-981-13-9431-7_13

Schultz, R. (2012). Food sovereignty and cooperatives in Cuba's socialism. *Socialism and Democracy*, *26*(3), 117–138. https://doi.org/10.1080/08854300.2012.724904

Selod, H., & Shilpi, F. (2021). Rural-urban migration in developing countries: Lessons from the literature. *Regional Science and Urban Economics*, *91*, 103713. https://doi.org/10.1016/j.regsciurbeco.2021.103713

Shapiro, D., MacDonald, D., & Greenlaw, S. A. (2022). *Principles of microeconomics 3e*. OpenStax. https://openstax.org/books/principles-microeconomics-3e/pages/1-introduction

Sharma, N., Acharya, S., Kumar, K., Singh, N., & Chaurasia, O. P. (2018). Hydroponics as an advanced technique for vegetable production: An overview. *Journal of Soil and Water Conservation*, *17*(4), 364–371. https://doi.org/10.5958/2455-7145.2018.00056.5

Singapore Food Agency (SFA) (2020, May 19). Levelling up Singapore's food supply resilience. *Food for Thought*. https://www.sfa.gov.sg/food-for-thought/article/detail/levelling-up-singapore-s-food-supply-resilience

Smit, J., Bailkey, M., & Van Veenhuizen, R. (2006). Urban agriculture and the building of communities. In R. Van Veenhuizen (ed.), *Cities farming for the future, urban agriculture for green and productive cities*, 146–171. RUAF Foundation.

Spencer, C. A., Campbell, C. G., Prizzia, A., & Felter, L. (2019). How to establish an urban agriculture ordinance. *EDIS*, *2019*(2). https://doi.org/10.32473/edis-hs1327-2019

Teoli, D., Sanvictores, T., & An, J. (2022, September 5). SWOT analysis. National Library of Medicine, *National Center for Biotechnology Information*. https://www.ncbi.nlm.nih.gov/books/NBK537302/

Taylor, J.R., & Lovell, S.T. (2014). Urban home food gardens in the Global North: Research traditions and future directions. *Agriculture and Human Values*, *31*, 285–305. https://doi.org/10.1007/s10460-013-9475-1

United Nations Department of Economic and Social Affairs (UN DESA) (2019). *World urbanization prospects: The 2018 revision*. United Nations. https://www.un.org/en/desa/2018-revision-world-urbanization-prospects

Weil, M. O. (1996). Community building: Building community practice. *Social Work*, *41*(5), 481–499. https://doi.org/10.1093/sw/41.5.481

de Zeeuw, H. (2011). Cities, climate change and urban agriculture. *Urban Agriculture Magazine*, *25*, 39–42. https://www.slurc.org/uploads/1/0/9/7/109761391/cities_climate_change_and_urban_agriculture.pdf