Value Creation of Urban Agriculture in Bangkok, Thailand

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Abstract

Urban agriculture (UA) has been used as “an innovation driver” within the agricultural sector to deal with the global crisis in urban areas. This study aims to investigate activities and opinions toward the value creation of UA among Bangkok residents. Data was collected through questionnaires with 385 respondents and analyzed using descriptive statistics, t-test, and F-test. Results showed that more than one-third of the respondents (39.7%) had experience in UA practices, with 3 main activities including 1) food growing, 2) ornamental plants, and 3) livestock and fisheries. Additionally, the respondents expressed high opinions regarding the value creation of UA across various aspects. Emotional value ($\bar{X}$=4.20) received the highest mean score, followed by functional value ($\bar{X}$= 4.08), life-changing value ($\bar{X}$=3.96), and social impact value ($\bar{X}$=3.87). According to hypothesis testing, age and marital status were factors affecting opinion level on the value creation of UA at a significantly different level of 0.01. This revealed that older respondents and those who were married tended to appreciate the health benefits and food security more than younger and unmarried respondents. Moreover, the findings indicated that UA has the potential to create various positive outcomes, from fostering emotional well-being and providing functional benefits like access to fresh produce, facilitating life-changing experiences, and promoting social connection within communities. Eventually, the study provides valuable insights for policymakers and stakeholders to formulate laws, policies, development plans, and activities that promote and support UA initiatives. A focus on raising citizens' awareness and appreciation for the value creation of UA, policymakers can be able to encourage sustainable UA practices that contribute to the well-being of Bangkok residents and the resilience of urban future communities.

Keywords: Urban agriculture, value creation, innovation driver, Bangkok

Introduction

According to the Food and Agriculture Organization of the United Nations (FAO) report, approximately 55 percent of the world's population lives in urban areas, and this estimate is expected to increase to 68 percent by 2050. This major growth is expected to occur in Africa and Southeast Asia (Food and Agriculture Organization of the United Nations, 2019). The rapid urban population growth in developing countries has a significant impact across various dimensions, including heightened demands for essential resources such as food, water, and energy. Managing the expansion of urban areas becomes a global critical challenge, particularly in addressing food security, enhancing waste management, ensuring

environmental sustainability, and providing sufficient social services. Bangkok, the capital of Thailand, is an area with enormous potential for year-round crop cultivation (Land Development Department, 2021). The terrain of Bangkok is mostly lowland, making it suitable for agricultural activities (Department of Environment, BMA, 2023). However, due to urbanization and the development of Bangkok as the economic center of the country, there has been a continuous decline in the amount of agricultural land. At the same time, Bangkok is facing various challenges, including environmental issues, social challenges, and the necessity for effective urban planning (Chancharoen, 2017; Menakanit, 2019). To overcome these challenges, it should be reconsidered how Bangkok's urban development strategy interacts with agriculture, food production, and the environment to address these concerns in a more efficient and sustainable approach.

Urban agriculture (UA) refers to the practices that produce food and other outcomes through agricultural production and related processes such as transformation, distribution, marketing, and recycling. These activities occur within cities and nearby regions, engaging several urban actors, communities, methods, places, policies, institutions, systems, ecologies, and economies to reach the changing needs of local residents while simultaneously achieving various objectives and functions (FAO *et al*., 2022). Additionally, UA holds significant potential in offering solutions to address urban challenges, including food security, climate change, the rise of urbanization, and social inequalities (EFUA, 2021).

In recent times, UA has been increasingly recognized as a leisure and recreational activity, while a few urban farms serve educational purposes by providing training to schoolchildren, young professionals, or individuals participating in re-entry programs. Some urban farms aim either to enhance access to nutritious food within specific communities or sustain the cultivation of traditional culinary practices. Moreover, other urban farming was established to generate economic advantages for low-income communities, contribute to environmental justice, and enhance overall health benefits (Paschapur and Bhat, 2020). This has made UA a crucial option for fostering sustainability and resilience in urban areas. However, the synchronization of urban development and agriculture leads to numerous constraints, mainly associated with the accessibility of land, water availability, legal and policy frameworks, and food safety (Orsini, 2020). UA has been considered an innovative way to address current urban problems, which encourages the development of new practices adapted to the urban context, such as novelties or innovations (Sanyé-Mengual *et al*., 2019). Additionally, UA has the potential to drive innovation in the wider agricultural sector and has already provided the catalyst for new farming methods, such as the trend towards organic production, sustainable farming practices, smart farming systems, edible landscaping, and regenerative agriculture (EFUA, 2021; Van der Schans *et al*., 2014). There are also innovative techniques such as vertical farming, hydroponics, aquaponics, precision farming technologies, robotics, and automation that can offer potential to transform growing methods and distributing food in urban areas (Orsini, 2020). Consequently, UA concepts are integrated into urban development across various dimensions. It is crucial to emphasize that

UA served as an “innovation driver” to deal with future crises that may arise in urban areas (Ngetleh *et al*., 2023). UA is not only the production of food in limited spaces but also a pathway connected to agricultural innovation that gives rise to a variety of value creation of values through four categories of the element of value: functional, emotional, life-changing, and social impact (Almquist *et al*., 2016).

Supporting by numerous studies have focused on the factors affecting perception and awareness of UA among urban residents, which investigated demographics, socio-economic factors, and practices of UA for the development of policies to promote UA in urban areas. According to diverse of people who live in Bangkok, this approach was undertaken to offer insightful understanding of the dynamics and differ perceptions about the value creation of UA among residents which consistent with Ngahdiman *et al.* (2017) noted that positive attitude toward UA and some demographics factors (gender, age, education level, household size) were identified as the factors that influence the adoption of UA in Malaysia. Suwanmaneepong and Mankeb (2017) studied the economic factors of urban vegetable gardening in Bangkok, which suggested that related organizations promote urban vegetable growing with economic values. Therefore, this study has recognized the importance of exploring factors affecting urban agriculture's value creation to create awareness and understanding of the potential and capabilities of UA for Bangkok residents.

In this study, we investigated the demographic characteristics of the respondents and experiences of UA, which employed quantitative methods to analyze the opinions of urban residents regarding the value creation of UA. This is crucial for the overall development of the economy, society, and environment in the Bangkok urban area. The findings will serve as a guideline for formulating laws, policies, development plans, and activities to promote appropriate UA practices. This benefit of the study extends not only to Bangkok but also to other urban areas throughout Thailand in the future.

Materials and methods

Population and Sampling Design

This study was conducted to interview opinions toward value creation of urban agriculture in the Bangkok metropolitan area during July 1 - September 30, 2023, by online and offline interviews (through the city farm project network, personal contact, and the Bangkok agricultural extension office). So, the population of this research was residents in Bangkok, encompassing both registered and unregistered residents accessing public spaces and services in Bangkok. This includes embedded populations, foreigners, and tourists (Department of City Planning and Urban Development, BMA, 2022). Due to the unavailability of the exact population size, the sample size was calculated using Cochran's formula (Cochran, 1977) with a 95% confidence level, resulting in a sample size of 384.16 individuals. For this study, data were collected from a sample of 385 individuals, divided equally into 6 zones of the Bangkok planning district groups. After that, it was selected through an accidental sampling method without relying on probability, ensuring the representation of individuals was commonly found.

Research Tools

A questionnaire was utilized as a data collection tool, comprising both closed-ended and open-ended questions divided into 4 parts with 23 items: 1) demographic characteristics, 2) urban agriculture activities among urban residents in Bangkok, 3) opinions on the value of creation of urban agriculture, and 4) problems and recommendations. To assess the content validity of the research tool, a preliminary questionnaire was presented to 3 specialists on UA for their review. Their feedback with the index of item objective congruence (IOC) was used to revise the questions, ensuring appropriateness, clarity of language, and alignment with the research objectives. Subsequently, the revised questionnaire was tried out with 30 non-participants in the study, randomly selected from the population in Bangkok. The obtained Cronbach's alpha coefficient (Cronbach, 1951), as a measurement of reliability, was 0.92, signifying sufficient reliability for the data collection.

To obtain opinions toward the value creation of UA, the questionnaire covers four dimensions of elements of values: 1) functional value, 2) emotional value, 3) life-changing value, and 4) social impact value (Almquist *et al*., 2016). The opinion level was rated on a 5-point scale, as follows: 1=lowest, 2=low, 3=moderate, 4=high, and 5=highest. The interpretation of opinion levels is a 3-interval scale according to weight mean score range, defined as: Low (1.00 - 2.33) , Moderate (2.34 - 3.66), and High (3.67 - 5.00).

Data Analysis

This research employs quantitative data analysis by collecting data through questionnaire responses, and processing the data using statistical software, which is divided into 1) Descriptive statistics to describe demographic characteristics, experiences in UA, and opinions on the value creation of UA, which include percentage, frequency, mean, and standard deviation 2) Inferential statistics to analyze and compare opinion levels on value creation of UA. The hypothesis testing of this study is based on comparing independent variables (demographic characteristics and UA experiences) with dependent variables (opinion toward value creation of UA) by independent sample t-test and one-way ANOVA. Therefore, the proposed hypothesis is as follows:

H1: The difference in certain demographic factors significantly influences the opinion of value creation of UA.

H2: The difference in having UA experiences significantly influences the opinion of value creation of UA.

Results and Discussion

Demographic characteristics of the respondents

The demographic characteristics of urban residents are important for evaluating the value creation of UA. 385 respondents were recorded as urban Bangkok residents, including both registered and unregistered populations who were able to access UA areas, public spaces, and services in the city. The result revealed that the respondents were female more than male (accounting for 61.0% and 39.0% respectively). Regarding age, 62.6% and 37.4% of respondents were less than 30 years old and more than 30 years old, respectively. Most of the respondents were unmarried (72.7%). In terms of family size, more than half of the respondents had family members between 3 and 4 people (55.3%). More than one-third of them had a monthly income between 15,001 and 25,000 Baht per month. Details of the demographic characteristics of the respondents are shown in Table 1.

Table 1 Demographic characteristics of the respondents

(n=385)

Item	n (%)
Gender	
male	150 (39.0)
female	235 (61.0)
Age	
less than 30 years old	241 (62.6)
more than 30 years old	144 (37.4)
Marital status	
married	105 (27.3)
unmarried	280 (72.7)
Family members	
1 - 2	68 (17.7)
3 - 4	213 (55.3)
more than 5	104 (27.0)
Monthly Income	
less than 15,000 Baht	81 (21.0)
15,001 - 25,000 Baht	142 (36.9)
25,001 - 35,000 Baht	69 (17.9)
more than 35,000 Baht	93 (24.2)

Urban agriculture's activities of the respondents

This study showed that almost two-thirds (60.30%) of the respondents had not performed agricultural activities. This might be because there were many factors that hampered the urban residents from performing urban agriculture, such as living conditions, limited space, high costs, and the environment etc. Likitswat (2021), who studied the opportunities and challenges of developing urban farming businesses in Bangkok, indicated that urban agriculture was challenging in cities, faced with several factors, such as limited resources, pollution, scarcity of water and land, high land pressure, and environmental contamination. Nevertheless, there is a certain number of 39.70% respondents in urban areas that consistently involved in agricultural practices. This is because these people desire to improve the quality of their life in urban areas, such as being able to access food diversity and having a green space. For the respondents who are involved in UA, it was found that food growing (49.02%), ornamental plants (43.14%), and livestock and fisheries (7.84%) were the three main activities of urban agricultural activities (Figure 1). These residents might either have dietary needs or require emotional relaxation. This result indicated that the respondents have different goals for UA.

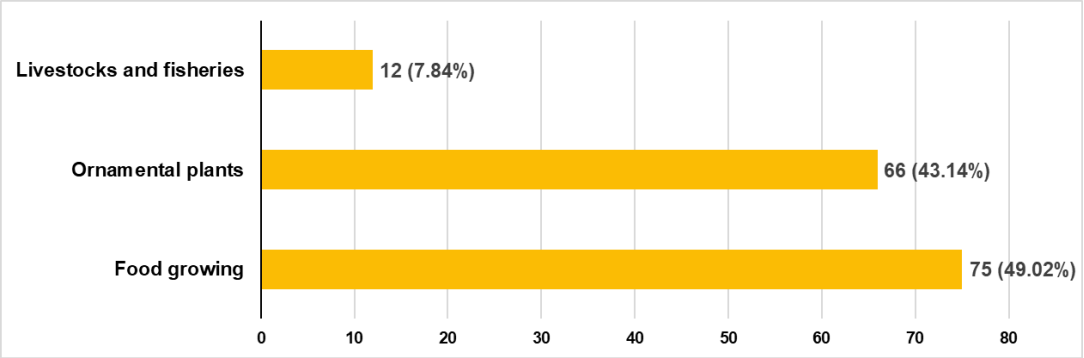

Figure 1 UA activities of urban residents in Bangkok (n=153)

Value creation of urban agriculture

It was shown that the overall opinion on value creation of UA among Bangkok urban residents was at a high level ($\bar{X}$=4.03). It was also found that the mean score of each opinion aspect was emotional value ($\bar{X}$=4.20), followed by functional value ($\bar{X}$=4.08), life-changing value ($\bar{X}$=3.96) and social impact value ($\bar{X}$=3.87), respectively. Considering the opinion of each aspect, most items were at a high level, whereas the opinion on UA solves the urban society problems was at a moderate opinion level ($\bar{X}$= 3.36) (Table 2). This is due to UA's promotion policy in Bangkok still having limitations, which hinder widespread acceptance regarding the potential of UA to address societal issues. This is consistent with Chuvongs (2020), who studied legal measures of promoting UA in Bangkok and found that the Bangkok metropolitan administration lacked specific legal frameworks at the municipal level in promoting UA. Additionally, Menakanit (2019) proposed that implementing policies and action plans to promote UA in Bangkok would help raise awareness about the importance of UA within different segments of society.

Table 2 Mean, standard deviation, and opinion level on value creation of urban agriculture

Value creation of urban agriculture	$\bar{X}$	S.D.	Opinion level
Functional value			
UA generates income	4.10	0.822	High
UA increases the variety of food in urban areas	4.07	0.791	High
UA increases the quality and value of agricultural products	4.06	0.844	High
UA saves time for accessing food	4.10	0.831	High
Mean	**4.08**	**0.704**	**High**
Emotional value			
UA facilitates relaxation and recreation activities	4.26	0.771	High
UA encourages mental calmness	4.15	0.807	High
UA enhances aesthetics and stimulates creativity	4.19	0.815	High
UA contributes to maintaining good health	4.21	0.821	High
Mean	**4.20**	**0.702**	**High**

Table 2 Mean, standard deviation, and opinion level on value creation of urban agriculture (Cont.)

Value creation of urban agriculture	$\bar{X}$	S.D.	Opinion level
Life-changing value			
UA improves the quality of life	3.91	0.831	High
UA can raise social status (wealth, occupation, and education level)	3.69	0.939	High
UA increases employment and provides jobs	4.11	0.792	High
UA increases the skills and competency of life	4.13	0.808	High
Mean	**3.96**	**0.717**	**High**
Social impact value			
UA encourages social innovation	3.91	0.839	High
UA solves urban society problems	3.36	1.186	Moderate
UA makes a livable urban society	4.25	0.722	High
UA drives urban development in various dimensions	3.95	0.860	High
Mean	**3.87**	**0.741**	**High**
Overall mean	**4.03**	**0.632**	**High**

Remark: 5-point scale was used to rate opinion levels of value creation Low =1.00 – 2.33, Moderate = 2.34 – 3.66, High = 3.67 - 5.00

The finding can be explained that UA in Bangkok can be connected to value creation in various ways, especially emotional value that can provide therapeutic benefit by leading positive emotion and sense of accomplishment from UA activities such as gardening and farming, improving the urban environment by adding greenery and natural elements to urban landscapes, and foster creativity and innovation. By enhancing the visual quality of urban space and providing innovative ideas, these will reflect the cultural, social, and aesthetic preferences of the urban community. The finding is consistent with the study carried out by Lee and Matarrita-Cascante (2019), who studied the relationship between emotional motivations and gardeners' participation in UA and found that emotional motivations, such as feelings of enjoyment and psychological healing from stress, have been identified as important factors in garden participation.

In case of functional value, it contributes the value creation by addressing basic needs of urban populations in terms of food security, making more valuable agricultural products, and reducing time for accessing fresh and locally grown products, which will save storage and transportation costs. For life-changing value, it has the potential to make a life change by supporting self-sufficiency, fostering education and skill development, and promoting economic opportunities through local markets, small businesses, and job creation in the agricultural sector. Furthermore, social impact value emphasizes the innovative role of UA in addressing systemic challenges. UA becomes a catalyst for positive social change by supporting community engagement and building social capital within urban communities through UA activities, encouraging the development of innovative solutions or social innovation to address urban issues, and integrating aspects of community, nature, and cultural elements to make

a livable urban society. This result is related to the study of Thanh Vu and Minh (2023) and Mensah (2023), who argued that UA has significant value in socio-economic and environmental dimensions. It improves the quality of life, creates employment, boosts income, reduces poverty, relaxes, creates fun, provides clean food, and stimulates local economic activities that contribute to climate change mitigation by reducing emissions, improving air quality, and creating a resilient urban environment.

Factors affecting opinion on the value creation of urban agriculture

Factors affecting opinion on the value creation of UA were classified by demographic characteristics and experiences in UA by comparing the mean score in each aspect of the value creation (Table 3). It was found that overall, factors affecting opinion on the value creation of UA by age and marital status were significantly different ($p \leq 0.01$). But the other factors (gender, monthly income, and experiences in UA) do not affect the overall opinion.

Table 3 Comparing the opinion on value creation of urban agriculture by demographic factors and UA experiences

Factors	Functional		Emotional		Life changing		Social impact		Overall		Interpretation
	t/F	p	t/F	p	t/F	p	t/F	p	t/F	p	
Gender	-1.057^{ns}	.291	-1.346^{ns}	.179	-1.568^{ns}	.118	-2.015*	.045	-1.717^{ns}	.087	Non-sig.
Age	-2.428*	.016	-2.922**	.003	-3.079**	.002	-4.171**	.000	-3.621**	.000	Sig.
Marital status	1.726^{ns}	.085	1.872^{ns}	.063	2.919**	.004	3.542**	.000	2.908**	.004	Sig.
Monthly income	1.487^{ns}	.218	0.884^{ns}	.449	1.480^{ns}	.220	2.873*	.036	1.805^{ns}	.146	Non-sig.
UA experiences	1.278^{ns}	.202	3.163**	.002	0.887^{ns}	.376	.024^{ns}	.981	1.487^{ns}	.138	Non-sig.

Remark: ns = Non – significant, * Significance level of 0.05, ** Significance level of 0.01

The analysis on the difference in opinion by age showed that respondents aged more than 30 years old had a higher opinion than those aged less than 30 years old. That may be based on their life experiences, awareness of environmental issues, interest in health and well-being, and long-term vision for the future, which made them more interested in UA. They recognized the potential of UA to provide innovative solutions to other crucial issues, such as food insecurity, environmental sustainability, and community development. This is consistent with Jeong *et al*. (2019), who suggested that older age groups showed higher expectations and a higher necessity for community gardens than other age groups. Moreover, this study stated that they have lived in the community for a long time, which contributed to their increasing expectations and necessity for community gardens. They perceived these spaces as important for community revitalization, health promotion, and environmental purification.

For marital status, respondents with married status had a higher opinion than those with non-married status. This is because married respondents appreciate the health benefits and food security concerning UA activities for themselves and their families. Moreover, they perceived UA as a way to enhance family relationships by engaging in activities such as gardening and meal preparation.

This is consistent with Yusuf *et al*. (2015), who studied effect of urban household farming on food security status in Ibadan metropolis, Oyo state, Nigeria showed that marital status were significant determinants of food security among the households in the study areas as married household's heads showed more food secure than those who were separated, single, divorced, or widowed which are engaged in income generating activities, contributed to household income, and increased their household food security status.

Conclusion

It is concluded that Bangkok residents perceive UA as a valuable solution to enhance their society and quality of life. The opinion toward value creation of UA in every aspect was at a high level, with the highest mean score being emotional value ($\bar{X}$=4.20), followed by functional value ($\bar{X}$= 4.08), life-changing value ($\bar{X}$=3.96) and social impact value ($\bar{X}$=3.87). This recognition highlights that UA had the potential to create a range of positive outcomes, from fostering emotional well-being and providing functional benefits like access to fresh produce, to facilitating life-changing experiences and promoting social cohesion within communities. In determining the factors affecting opinion on the value creation of UA, the results showed that age and marital status were significantly different. This revealed that older respondents and those who were married tended to have different perceptions compared to younger and unmarried respondents. Additionally, more than one-third of the respondents (39.70%) had experience in UA practice on food growing activities, ornamental plants, livestock, and fisheries. This reflects the diversity of UA practices and interests among residents in Bangkok.

The findings from this study can be applied as valuable information for developing UA management plans, by focusing on raising citizens' awareness and appreciation for the value creation of UA, establishing demonstration sites or urban farms throughout the city area, and providing incentive activities for residents to participate in community gardening and farming initiatives. Especially, emotional value from UA activities that can heal and lead to positive emotions and a sense of accomplishment. In order to promote public acceptance of UA as an innovative solution to address urban issues and improve quality of life, it is essential to integrate these benefits into policy-making processes. Eventually, this approach will foster a deeper connection between residents and UA that could empower communities, enhance food security, promote environmental sustainability, and transition Bangkok towards a better, sustainable, and resilient urban future. The limitation of this study was that on-site data collection with respondents in the Bangkok area was difficult due to the large number of people who live in Bangkok and a wide variety of careers with a hectic lifestyle, which makes some problem for face-to-face interviews.

References

Almquist, E., J. Senior and N. Bloch. 2016. The elements of value. Harvard Business Review 94(9): 47-53.

Chancharoen, K. 2017. The long and winding road to a healthy space development in an urban area. Research Center for Community Development, Siam University. Bangkok. [in Thai]

Chuvongs, P. 2020. Legal measures of promoting urban agriculture in Bangkok. Romphruek Journal 38(2): 49-61. [in Thai]

Cochran, W. G. 1977. Sampling techniques. 3rd Edition. John Wiley & Sons, New York.

Cronbach, L. J. 1951. Coefficient alpha and the internal structure of tests. Psychometrika 16(3): 297-334.

Department of City Planning and Urban Development, BMA. 2022. Bangkok population study report 2021. Available: https://webportal.bangkok.go.th/public/cpud/page/sub/25197 (November 11, 2023). [in Thai]

Department of Environment, BMA. 2023. Bangkok state of environment 2021-2022. Available: https://online.anyflip.com/berzm/gels/mobile/index.html (March 28, 2024). [in Thai]

EFUA. 2021. Official EFUA Flyer. Available: https://www.efua.eu/public-resources/official-efua-flyer (November 22, 2023).

FAO, Rikolto and RUAF. 2022. Urban and peri-urban agriculture sourcebook: From production to food systems. FAO and Rikolto, Rome.

Food and Agriculture Organization of the United Nations. 2019. City region food system programme-reinforcing rural-urban linkages for climate resilient food systems. Available: https://www.fao.org/3/ca6337en/CA6337EN.pdf (November 22, 2023).

Jeong, N. R., K. J. Kim, H. G. Yun, S. W. Han and S. You. 2019. The perception of urban residents on creation and management of community gardens. Journal of People, Plants, and Environment 22(5): 411-424.

Land Development Department. 2021. Promotion guidelines for Bangkok's appropriate agriculture according to the Agri-map database. Available: https://www.ldd.go.th/Agri-Map/Data/C/bkk.pdf (March 28, 2024). [in Thai]

Lee, J. H. and D. Matarrita-Cascante. 2019. The influence of emotional and conditional motivations on gardeners' participation in community (allotment) gardens. Urban Forestry & Urban Greening 42: 21-30.

Likitswat, F. 2021. Urban farming: Opportunities and challenges of developing greenhouse businesses in Bangkok metropolitan region. Future Cities and Environment 7(1): 1-10.

Menakanit, A. 2019. Urban agriculture: A Void in Bangkok metropolitan management. Veridian E-Journal, Silpakorn University 12(1): 1136-1154. [in Thai]

Mensah, J. K. 2023. Urban agriculture, local economic development and climate change: conceptual linkages. International Journal of Urban Sustainable Development 15(1): 141-151.

Ngahdiman, I., R. Terano, Z. Mohamed and J. Sharifuddin. 2017. Factors affecting urban dwellers to practice urban agriculture. International Journal of Advanced Research 5(7): 1580-1587.

Ngetleh, N.N., M.J. Bime-Egwu and M.D. Tambi. 2023. Drivers of innovative urban and peri-urban agriculture in Bamenda city, Cameroon. Agricultural Sciences 14(9): 1133-1152.

Orsini, F. 2020. Innovation and sustainability in urban agriculture: the path forward. Journal of Consumer Protection and Food Safety 15: 203-204.

Paschapur, A. and C. Bhat. 2020. Urban agriculture: The savior of rapid urbanization. Indian Farmer 7(1): 1-9.

Sanyé-Mengual, E., K. Specht, E. Grapsa, F. Orsini and G. Gianquinto. 2019. How can innovation in urban agriculture contribute to sustainability? A characterization and evaluation study from five Western European cities. Sustainability 11(15): 4221.

Suwanmaneepong, S. and P. Mankeb. 2017. Economic aspects of urban vegetable gardening in Bangkok metropolitan, Thailand. International Journal of Agricultural Technology 13(7.2): 2161-2173.

Thanh Vu, P. and V.Q. Minh. 2023. Suitability assessment and recommendations for urban agricultural development: A case study in Cai Rang district, Can Tho City, Vietnam. Plant Science Today 10(3): 321-327.

Van der Schans, J. W., H. Renting and R. V. Veenhuizen. 2014. Innovations in urban agriculture. Urban Agriculture Magazine 28: 3-12.

Yusuf, A.S., L.O. Balogun and E.O. Falegbe. 2015. Effect of urban household farming on food security status in Ibadan metropolis, Oyo State, Nigeria. Journal of Agricultural Sciences 60(1): 61-75.