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Roles of Urban Agriculture towards Contributing Sustainable Cities: A scoping review

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Abstract

This study explores the roles of UA in creating sustainable urban environments. Employing a scoping review based on Arksey and O'Malley's five-stage framework, the research utilizes NVIVO for thematic analysis to develop a conceptual model. This study emphasizes key UA roles, such as addressing food insecurity and promoting recreation, aesthetics, biodiversity, health, and overall well-being. While acknowledging UA benefits, the findings highlight a significant knowledge gap regarding multidimensional attributes essential for urban sustainability. This research helps achieve diverse, sustainable development goals such as SDGs 2, 11, and 13, contributing to more informed and effective urban planning practices.

Keywords: Urban Agriculture; Sustainable Cities; Role of Urban Agriculture; Scoping Review

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1.0 Introduction

Making sustainable cities is the main essence of the whole world in the urban development agenda in line with the United Nations sustainable development goals. It is key blueprint to achieve a better and more sustainable for all. However, due to the process of urbanization in the city and the uncertain environmental conditions, the function of the city disrupted and leads to the urban problems such as food, social, and environmental challenges (Ding et.al, 2020). The United Nations (UN) predicts that by 2050, as much as 70% of the global population will reside in urban areas (Teran-Yepez et.al, 2020). Thus, urban areas play a crucial role in transitioning towards more sustainable approaches (Armanda et.al, 2019). The imperative to establish sustainable cities is addressed through Sustainable Development Goal (SDG) number 11, 'Sustainable Cities and Communities' (Nicholls et.al, 2020), number 2, 'Zero Hunger' and number 13, 'Climate Action'. UA recognized as a significant contributor to realizing the objectives of this SDG and others. Hence, UA has gained the attention scholars and practitioners to integrate this as a strategies in urban planning to respond urban issues caused by rapid urbanization. To be note, social, environmental and food problems caused by urban developments are stimulating the worldwide UA.

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Plenty of UA have been launched in many countries in the world such as US, UK, Canada, Germany, Australia, France and Netherlands (Petts, 2005). UA also commonly recognized for its role in bolstering the economic, social, and environmental sustainability of cities through the provision of local food, employment opportunities, educational functions, and active involvement in waste and water management, for instances, the substantial growth of UA in France, it is viewed as a potential means to enhance urban sustainability (Clerino and Lelievre, 2020). Historically, UA has emerged as an alternative farming method aimed at addressing food prices, mitigating environmental impacts, and fostering a self-sufficient economy (Gaynor, 2006; Kafle et al, 2023). As it evolved, in developed countries, there has been a shift towards emphasizing social and environmental motives (Petts, 2005; Kafle et al, 2023). However, in developing nations, UA remains a significant source of income and employment (Nugent, 2000, Kafle et al, 2023). In previous studies, research on UA has addressed economic aspects, mental health and well-being, incorporating employment capacity, and environmental impacts. However, these investigations have fallen short in providing a comprehensive identification of attributes that encompass economic, social, and environmental dimensions, along with governance considerations, all contributing to the development of a sustainable city. Generally, the benefits of UA for city are admitted but how the roles of UA contributing sustainable cities is questioned. Therefore, it seeks to identify the roles and contribution of UA to cities sustainability, this will take into account multidimensional attributes essential for urban sustainability.

2.0 Literature Review

UA include farming operations and activities. It includes all activities pertaining to the production, processing, and marketing of food and agricultural goods in urban and peri-urban areas. A variety of crops are cultivated there by taking advantage of natural resources and urban waste, as well as intensive production methods (Hou, Wang, and Murayama, 2019). UA encompasses a variety of different approaches, such as in practice are community gardens, home gardens, individual gardens, commercial farms, institutional gardens, guerilla gardens, controlled environmental farms, and urban parks (Dona et.al, 2021).

2.1 Overview of UA

Globally, UA transformations influenced by various factors, including war, challenging economic conditions, and escalating environmental concerns in urban settings. For example, the growth of UA during the 1960s and 1970s was driven by factors such as rising food prices, increasing environmental awareness, and a growing desire for self-sufficiency (Kafle et al, 2023). Thus, during 19th century, UA roles more towards urban landscape. In the 20th century, UA purposes to address economic challenges due to war and urban decline. Thus, in post-1980s, developed countries like Australia, New Zealand, the USA, the UK, Canada, and European nations like France, the Netherlands, and Germany shifted their focus on promoting UA for social and mental well-being rather than solely for food production (Kafle et.al, 2023). Due to urban challenges, moving forward 21st century, UA more on tackling food insecurity and urban environmental challenges.

3.0 Research Methodology

The scoping review complying to the Arksey and O'Malley's (2005) framework, encompassing the initial five stages of the six-stage process. These stages include: 1) formulating the research question, 2) identifying pertinent studies, 3) selecting studies, 4) charting data, and 5) collating, summarizing, and reporting data. The sixth stage, involving stakeholder consultation, was considered optional and was omitted from this study. The analysis is presented in accordance with the Preferred Reporting Items for Systematic Reviews guidelines and the Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR). Furthermore, recent publications within the last five years (from 2019 to 2023) were specifically chosen to provide an up-to-date overview of the literature. The methodological steps for conducting this scoping review are outlined as follows:

3.1 Identification of the Research Question

This study aimed to identify UA's role in creating sustainable cities. Thus, the scoping study aimed to determine the role of UA based on its benefits and other characteristics and analyze its contributions to sustainable cities. As a result, the main research question was: How do the roles of UA contribute towards sustainable cities? Moreover, the other guiding research questions included the following: What are the roles of UA?

3.2 Identification of relevant studies

Two electronic journal databases were used for the articles: Scopus and Web of Science (WoS). WoS is a comprehensive database that produces high-quality publications and articles on various subjects. Scopus is one of the most extensive databases of peer-reviewed literature abstracts and citations. The articles have searched using the following query string in Table 1.

Table 1. Search String

Databases	Search String
Web of Science (WoS)	"urban agriculture" OR "urban and peri-urban agriculture" OR "peri-urban agriculture" OR "urban farms" OR "urban farming" OR "community garden" OR "community gardens" AND "sustainable cities"
Scopus	"urban agriculture" OR "urban and peri-urban agriculture" OR "peri-urban agriculture" OR "urban farms" OR "urban farming" OR "community garden" OR "community gardens" AND "sustainable cities"

(Source:) Author

3.3 Selection of Studies for Review

Table 2 outlines vital inclusion and exclusion criteria for the literature review. The chosen publication time frame is within the last five years, from 2019 to 2023, ensuring the most recent insights into the role of urban agriculture. Various types of publications, including articles, proceeding papers, book chapters, book reviews, review articles and books, are included to capture a wide range of information related to sustainability in environmental studies, urban studies, regional urban planning, ecology, sociology, and business.

Publications with titles specifically related to sustainability, global sustainability, global environment, urban studies, and agriculture ecosystems environment are selected to align with sustainability pillars. To minimize ambiguity and translation challenges, only English-language articles are considered for evaluation. The selection is further narrowed down by focusing on countries/regions where UA is widely recognized in urban planning practices, including Italy, People's Republic of China, USA, Australia, England, Germany, Japan, Netherlands, South Africa, France, Malaysia, Thailand, Spain, United States, Italy, Australia, United Kingdom, Portugal, South Africa, Germany, Canada, Netherlands, Japan, Thailand, Malaysia.

To align with Sustainable Development Goals (SDGs), the articles are filtered by SDGs related to SDG 2 (Zero Hunger), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action). The remaining articles undergo a qualifying process to enhance the quality of the reviews. The author reviews each article by hand to ensure it meets the requirements.

Table 2. Inclusion and Exclusion Criteria

Criterion	Eligibility	Exclusion
Literature Type	Journal Article, proceeding paper and book chapters, book review, review article, book	Editorial documents and others
Categories Study	Environmental studies, urban studies, regional urban planning, ecology, sociology, business, social science, management and accounting	Others than stated.
Publication Title	Sustainability, global sustainability, global environment, urban studies, agriculture ecosystems environment	Others than stated
Language	English	Non English
Countries/region	Italy, peoples R China, USA, Australia, England, Germany, Japan, Netherlands, South Africa, France, Malaysia, Thailand, Spain, United States, Italy, Australia, United Kingdom, Portugal, South Africa, Germany, Canada, Netherlands, Japan, Thailand, Malaysia	Others than stated
SDG Goals	SDG 2 Zero Hunger, SDG 11 Sustainable Cities and Communities, SDG 13 Climate Action	
Time Line	2019-2023	<2019

(Source:) Author

3.4 Data Charting

In order to identify the related roles of UA, the data was extracted by first reading the abstract and then carefully reading the complete articles. Lastly, information about the roles of UA and how it contributes towards sustainable cities was retrieved and correlated according to the topics (social, economic, and environmental).

3.5 Summarizing and Reporting Results

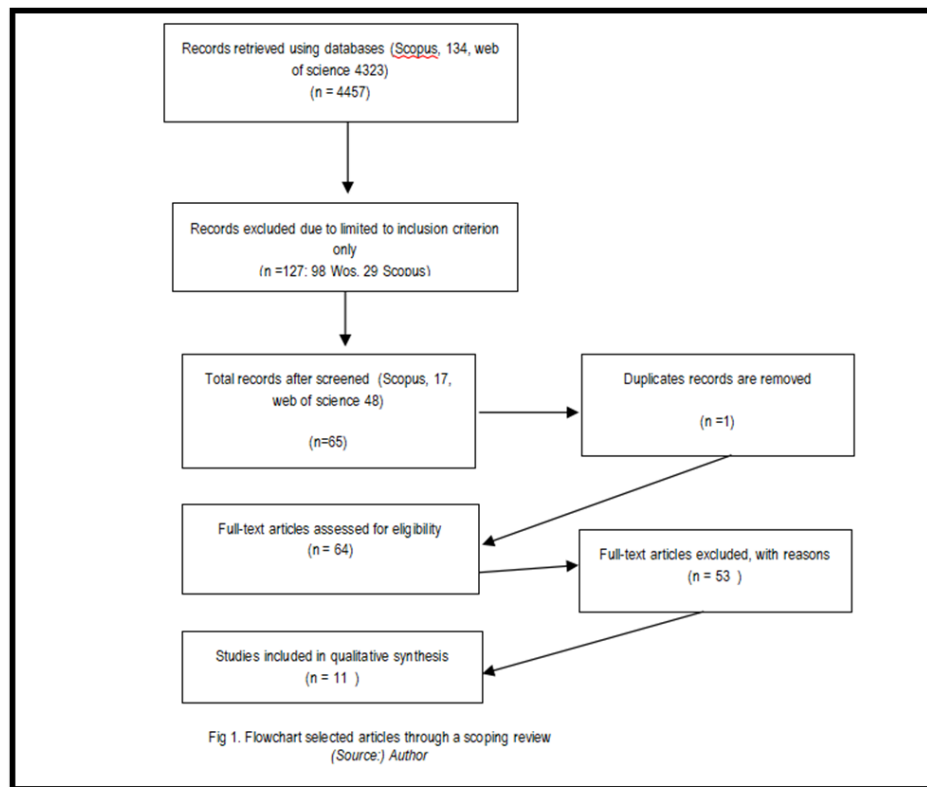
By consolidating the findings from this scoping review, the author scrutinized the diverse studies multiple times. In order to enhance the overall credibility, a thorough reevaluation of the findings was conducted.

3.6 Consultation

As per Arksey and O'Malley's (2005) guidelines, including consultation in a scoping review is optional. Consequently, for this particular scoping review, it was omitted as the implemented steps were deemed satisfactory in achieving the study's objective.

4.0 Findings

The results were illustrated in a systematic framework flow chart as in Fig 1, outlining the steps of the scoping review process. Only eleven studies fulfilled the inclusion criteria of the 64 articles identified based on the eligibility criteria. The exclusion of 53 articles was out of the study's scope, focusing on UA leisure, sustainability science, and water resources.



4.1 Roles UA in Creating Sustainable Cities

Table 3. UA Benefits Based on Sustainability Pillars

UA Benefits based on Sustainability Pillars	Authors										
	Yoshida et al (2019)	Clerino & Lelievre (2020)	Ding et al (2020)	Nazuri et al (2022)	Mengual et al (2019)	Krikser et al (2019)	Kafle et al (2023)	Aceves and Schmidt (2022)	Azunre et al (2019)	Simon (2023)	Kanosvamhira (2023)
Social											
➤ Human health benefits	◆					◆	◆	◆	◆		◆
➤ Community development	◆					◆					
➤ Educational benefits	◆	◆							◆		◆
➤ Providing local foods		◆	◆	◆	◆	◆		◆		◆	
➤ Employment	◆	◆					◆		◆	◆	◆
➤ Social Capital			◆			◆					◆
➤ Improve nutrient efficiency					◆						
➤ Poverty Reduction								◆			
➤ Cultural Preservation								◆			
➤ Civic Engagement									◆		
➤ Safety & security									◆		
➤ Social Equity									◆		
➤ Social Cohesion										◆	

Environmental										
➤ Create greening	◆		◆		◆					
➤ Boosting biodiversity	◆									
➤ Improving natural resource efficiency	◆									
➤ Urbanization										
➤ Environmental health				◆						
➤ Avoid toxic environmental					◆		◆			
➤ Environmental resilience						◆				
➤ Environmental Education							◆			
➤ Recreation									◆	
➤ Development									◆	
➤ Technology									◆	
➤ Management emission									◆	
➤ Water management									◆	
➤ Waste management									◆	
➤ Energy efficiency									◆	
Economic										
➤ Offers lower transportation cost	◆									
➤ Create opportunity cost				◆						
➤ Improve economy cost-benefit					◆					
➤ Create self sufficient economy							◆			
➤ Cope food price							◆		◆	
➤ Income generating							◆		◆	
➤ Economic Inclusion								◆		
➤ Tax revenue									◆	

(Source:) Author

The threefold pillars of sustainable development include economic, social, and environmental aspects (Azunre et al., 2019). UA significantly contributes to the sustainability of urban areas. The benefits of UA for cities are widely acknowledged, but there is ongoing scrutiny regarding how UA contributes to the sustainability of cities. This inquiry aims to pinpoint and understand the roles and contributions of UA to urban sustainability pillars, as tabulated in Table 3. Based on Table 3, from the literature drawn, UA offers significant roles towards achieving sustainability goals, which benefits the whole society, economy, and environment.

5.0 Discussions

From UA benefits based on sustainability pillars and various literature conducted, the conceptual framework on roles of UA towards sustainable city has been developed as in Fig. 2:

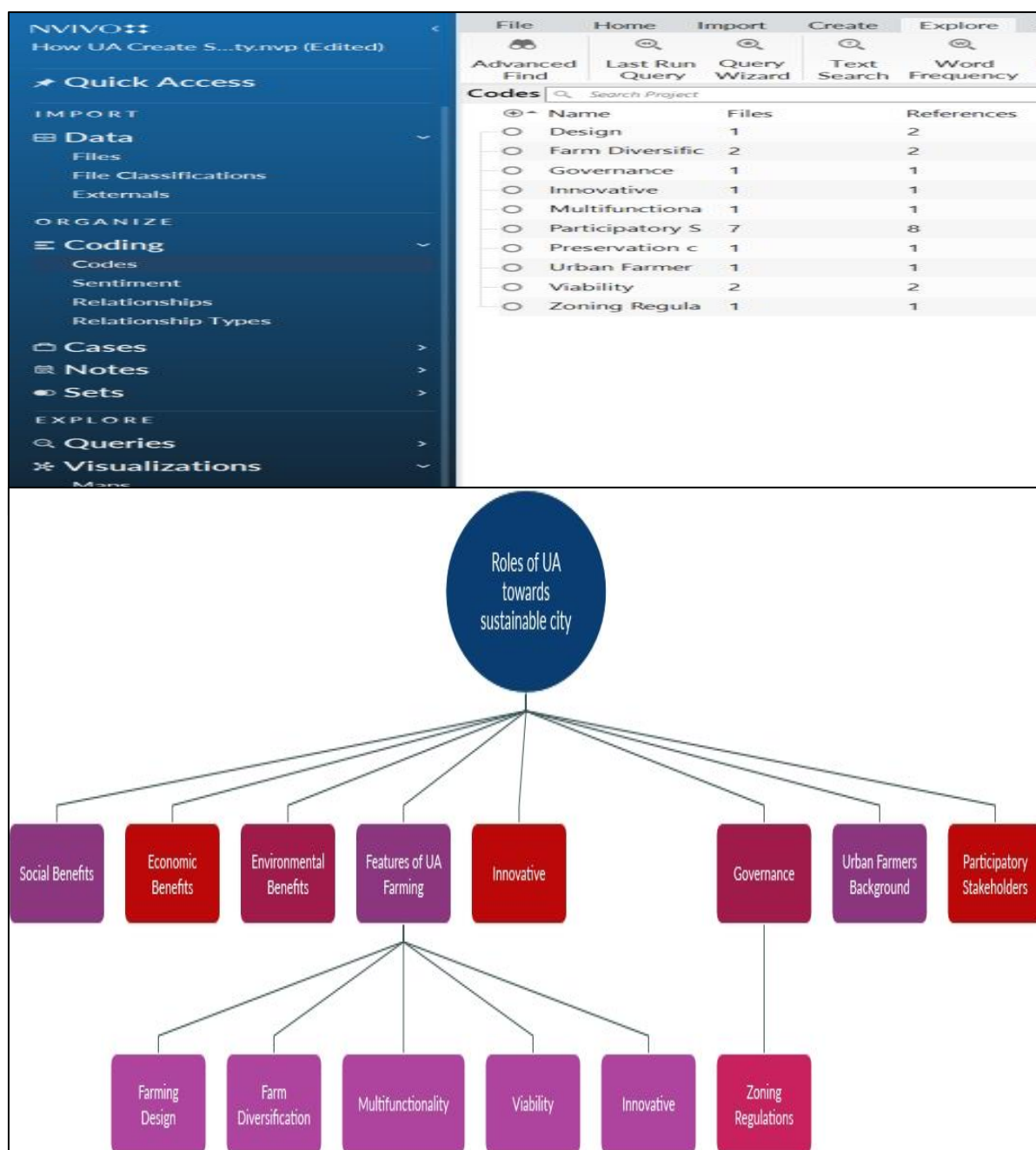


Fig 2. Conceptual Framework Based on Roles of UA towards sustainable city
(Source:) Author

5.1 Social, Economic, Environmental Benefits

As indicated in Table 3, there is widespread acknowledgment that Urban Agriculture (UA) plays a significant role in advancing sustainability goals by delivering overall social, economic, and environmental benefits. UA is renowned for its contributions to bolstering the economic, social, and environmental sustainability of cities. This is achieved through activities such as providing local food, generating employment opportunities, fulfilling educational functions, promoting social inclusion, adding aesthetic value, fostering a healthy lifestyle and well-being, and actively participating in waste and water management, among other aspects. However, to effectively contribute to the establishment of a sustainable city, additional holistic characteristics of the role of UA are essential for achieving success in city sustainability. It is imperative to scrutinize the distinctive features of UA, as this is vital for identifying successful strategies to ensure UA practices' enduring sustainability and viability.

5.2 Features of UA Farming

To ensure the sustainability of cities, it is crucial to comprehensively understand the features of UA in terms of design, farm diversification, multifunctionality, socio-economic viability, and innovation. The multifunctionality of UA plays a pivotal role in ensuring the sustainability

of both cities and urban farms, as noted by Yoshida et al. (2019). To optimize this multifunctionality, incorporating entrepreneurial or innovative strategies for farm diversification is essential, as highlighted by Yoshida et al. (2019) and Mengual et al. (2019). Entrepreneurial practices represent the managerial decisions of farmers and entrepreneurial behavior, which can encourage diversification in farming activities. Encouraging the development of innovative and entrepreneurial farmers is essential for contributing significantly to providing social benefits related to sustainability.

Farms that achieve high levels of diversification are recognized for their elevated economic and social sustainability. Diversification strategies can be implemented by enhancing the sales of agricultural products through effective strategies like offering memberships, creating product baskets, and providing food packages. In Japan, utilizing short supply chains for marketing, such as direct sales to supermarkets or school meal centers, is emphasized as a critical diversification strategy.

According to Hopeward and Myer (2023), the economic viability of UA is heavily influenced by methods of gardening and commercial approaches, which are dependent on factors of land and labor costs, which are significant challenges. Therefore, introducing appropriate policy interventions, such as subsidizing land or labor tailored to the specific development context, is imperative to ensure the economic viability of UA. For social viability, the types of food cultivated and the degree of mechanization play crucial roles. Endorsing market mechanisms that facilitate the direct distribution of UA produce to local consumers close to the production point is essential to optimize environmental advantages. This not only contributes to sustainability but also helps reduce CO2 emissions. UA is also recognized as a source of social capital among communities, contributing to overall sustainability. Factors such as integration with green infrastructure, accessibility, size, visual openness, planting form, agricultural infrastructure, and intelligent infrastructure significantly enhance social capital (Ding et al., 2020).

Regarding accessibility, placing UA near residential areas or within a short walking or biking distance can enhance convenience and encourage greater participation, leading to increased social interaction. Morckel (2015) emphasizes that the arrangement of infrastructure elements in community gardens, such as pavilions, arches, fences, elevated planting beds, and artworks, can influence participants' preferences and impact the development of social networks. Furthermore, effectively managing the balance between the size of the area and the number of allotments can increase participation from low-income groups and unemployed individuals, fostering interaction among diverse social groups.

Additionally, the visual accessibility of UA plays a role in public familiarity and participation. UA in community gardens with open visual features proves advantageous for a broad spectrum of social interactions and exerts a more robust social influence than UA with limited visual accessibility (Škamlová, 2020). The varied spatial aesthetics generated by distinct planting forms also significantly impact the attractiveness of UA. By identifying these characteristics, there is considerable potential for enhancing UA practices, paving the way for more sustainable urban agriculture.

5.3 Innovative

Mengual et al. (2019) highlighted that integrating innovative practices plays a key role in enhancing the overall sustainability of UA. Elements such as limited access to land, reduced community cohesion, challenges related to water resources, and the current urban conditions are significant factors fostering innovation in UA. Consequently, various UA categories have been established, encompassing tactical gardens, backyard gardens, forest gardening, greenhouses, green walls, animal husbandry, street landscaping, vertical farms, beekeeping, and aquaponics. The diversity in UA practices is predominantly influenced by factors such as economic activities, location, tenancy arrangements, types of crops cultivated, scale of operations, and the incorporation of technology.

5.4 Governance

In urban settings, robust urban governance and community engagement are acknowledged as vital components that unite diverse elements within a system, ensuring cohesive functionality (Simon, 2023). Effective governance proves advantageous, providing opportunities for individuals involved in UA at home and in the community, as demonstrated by the urban farming market. To promote sustainable cities, it is crucial to integrate UA into city land use planning and zoning processes (Azunre et al., 2019).

5.5 Urban Farmers Background

Whether prioritizing social, environmental, or economic objectives, the implication is that urban farmers' backgrounds play a crucial role in ensuring the farm's sustainability (Clerino et al., 2020). Thus, the farmer's behavior and motivations could encourage sustainability in farming activities.

5.6 Participatory Stakeholders

Creating sustainable cities necessitates participatory involvement from various stakeholders (Clerino et al., 2020). This approach aids in improving decision-making processes in urban planning, aiming to enhance participation and align with all dimensions of sustainability. Active engagement in the planning, executing, and evaluating UA programs is crucial for their success (Nazuri et al., 2021). Recognizing the contributions of agencies, non-governmental organizations (NGOs), and communities is essential, forming a robust network vital for promoting social empowerment among UA program participants. In Mexico City, the absence of organizational support and advocacy reveals vulnerabilities in operating without a protective mechanism (Aceves and Schmidt, 2022).

6.0 Conclusion & Recommendations

This study explores the roles of UA in contributing sustainable cities. Previous research has mainly focused on economic aspects, mental health, employment, and environmental impacts, lacking a comprehensive understanding of attributes across economic, social, and environmental dimensions, including governance considerations. While acknowledging the benefits of UA for cities, questions arise about how UA contributes to sustainable cities. Thus, this study aims to analyze the roles and contributions of UA to urban sustainability, considering multidimensional attributes essential for building sustainable cities. It bridges knowledge gaps by developing a conceptual framework, focusing on social, economic, and environmental benefits and other distinct features and roles of UA. There needs to be more knowledge regarding features of UA farming, innovation, governance, urban farmer backgrounds, and participatory stakeholders as crucial aspects of urban sustainability. Recognizing distinctive UA features is vital for ensuring UA practices' long-term sustainability and viability in building sustainable cities. While the findings are based on brief reviews, more comprehensive reviews with multidimensional data sources across various urban settings are needed for validation. This study contributes to diverse sustainable development goals (SDGs 2: Zero Hunger, 11: Sustainable Cities and Communities, and 13: Climate Action) and informs effective urban planning practices. It provides valuable insights for government authorities and urban planners, guiding strategies that integrate UA with a focus on multidimensional sustainability, aligning with the pursuit of SDGs.

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Paper Contribution to Related Field of Study

This article aims to address gaps in knowledge by creating a conceptual framework that outlines the roles of UA in contributing to sustainable cities. It emphasizes the importance of recognizing UA roles' unique features, as this is essential for identifying effective strategies to ensure the enduring sustainability and viability of UA practices toward sustainable cities.

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