

Review

# Promoting Urban Agriculture and Its Opportunities and Challenges—A Global Review

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**Abstract:** Multifunctionality of urban agriculture can support the resolve of many urban challenges. Therefore, it is vital to understand the contribution of academic studies on urban agriculture practices as scientific information. The present study followed a systematic literature review based on the PRISMA method. Finally, 54 identified articles were analyzed. The review study mainly examined the contribution of academic literature on urban agriculture under four dimensions: the socio-economic context of the country, type of agriculture model, opportunities, and challenges. The results revealed the focus of academic literature on urban agriculture to show favoritism toward developed countries' community gardens. Moreover, the leading academic focus on this discipline identifies multifunctionality. People's motivations in developed countries tend to favor social, health-related, and educational benefits of urban agriculture; however, in developing countries, urban agriculture is more related to economic and ecological needs. Challenges for urban agriculture are also different among developed and developing countries. Nevertheless, existing academic studies have given comparatively less attention to identifying challenges, benefit groups of urban agriculture, and government support. Since urban agriculture is highly reliant on local factors, studying more about opportunities and challenges for urban agriculture under different socio-economic contexts and different agriculture models could be more beneficial to connect farming practices in cities with urban planning. Therefore, to make an adequate academic contribution to urban sustainability, future urban agriculture studies need to be more holistic.

**Keywords:** urban agriculture; multifunctionality; opportunities; challenges; global review



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## 1. Introduction

Urban Agriculture (UA) is “a permanent and dynamic part of the urban socio-economic and ecological system, using typical urban resources, competing for land and water with other urban functions, influenced by urban policies and plans, and contributing to urban social and economic development” [1]. Agriculture has four main functions in cities: subsistence, economics, recreation, and community building [2]. Therefore, more than growing food in the city, urban agriculture is linked with economic, social, ecological, and physical infrastructure components of the urban environment [3]. The multifunctionality of urban agriculture can make cities sustainable [4]; hence, there is a trend in urban planning to introduce agriculture into cities to mitigate urban challenges [5]. The multifunctionality of agriculture is the additional function of agriculture other than food and fiber production [6], which has been widely used by sustainable agricultural research and policymaking [7]. Therefore, there is a growing body of academic literature on urban agriculture and urban sustainability [8].

However, even urban planners are keen on using urban agriculture for urban planning [9]. Still, it has been limitedly integrated into policy and planning due to many reasons including most of the urban agriculture initiatives often being disconnected and

isolated [10], inconsistencies between actual usage and planning intentions [6], often not being considered as urban green space [11] as well as lack of connection between urban agriculture and ecology of the city [12]. Therefore, holistic approaches are essential to promote urban agriculture to create urban sustainability efficiently.

The general awareness of multifunctionality or multiple benefits of urban agriculture is essential to promote farming in cities [13]. Further, as urban agriculture is linked with multiple factors and highly depends on socio-economic contexts and personal motivations [13,14], it is also important to consider the constraints to promote it realistically [15]. But the factors that impede the development of urban agriculture have been under-researched [14]. In addition, urban agriculture practices in developed countries show differences from practices in developing countries concerning its functions in cities [16].

In reality, to promote urban agriculture in cities, the understanding of opportunities and challenges under different socio-economic environments is vital. Therefore, we expect the present review to allow us to understand the contribution of academic studies on urban agriculture through holistic approaches. This review assessed the academic focus on urban agriculture under four dimensions: agriculture model, country socio-economic context, opportunities, and challenges. To achieve our major aim, the present review is built upon three objectives: (1) to understand the academic focus of urban agriculture on different types of agriculture models and practices under different socio-economic contexts; (2) to identify the opportunities and challenges of urban agriculture in developed and developing nations; and (3) to determine the gaps that hinder fostering urban agriculture in urban areas.

The broad range of urban agriculture typologies, such as home gardens, urban gardens, community gardens, educational and institutional gardens, vertical and indoor farming systems, aquaponics, and hydroponics [17], are considered different agriculture models in the review. In addition, the World Bank's development categorization was used to assess the socio-economic context [18]. We evaluate opportunities that help promote urban agriculture in cities. In the present review, they have been assessed through multiple factors: land ownership, multiple benefits of urban agriculture, special benefited groups, and support given by the government (local or national). The challenges of urban agriculture are considered as barriers or limitations to practice agriculture in cities. We conducted a comprehensive review of 54 journal articles in the academic literature on urban agriculture to achieve the objectives.

## 2. Materials and Methods

The study is based on existing academic studies published as journal articles. We used PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) to run the systematic literature review, guided by the PRISMA statement [19,20]. The methodology applied includes resources (Scopus and Google customized search), eligibility and exclusion criteria, steps of the review process (identification, screening, and eligibility), data abstraction, and analysis.

### 2.1. Resources

The review is mainly based on the Scopus database, one of the largest databases for peer-reviewed journals. In addition, we also conducted a Google customized search and considered some of the non-peer-reviewed articles which are highly relevant to our objectives.

### 2.2. Eligibility and Exclusion Criteria

Firstly, regarding document type, only "Articles" were considered, hence, review, conference paper, book chapters, review, book, editorial, note, data paper, and letters were excluded. Second, only articles published in English were considered, and non-English articles were excluded. Thirdly, regarding the timeline, a period of 2010–2020 was selected.

Finally, subject areas of environmental science, social science, agriculture, and biological science were selected, and other than these, these subject areas were excluded (Table 1).

**Table 1.** The inclusion and exclusion criteria.

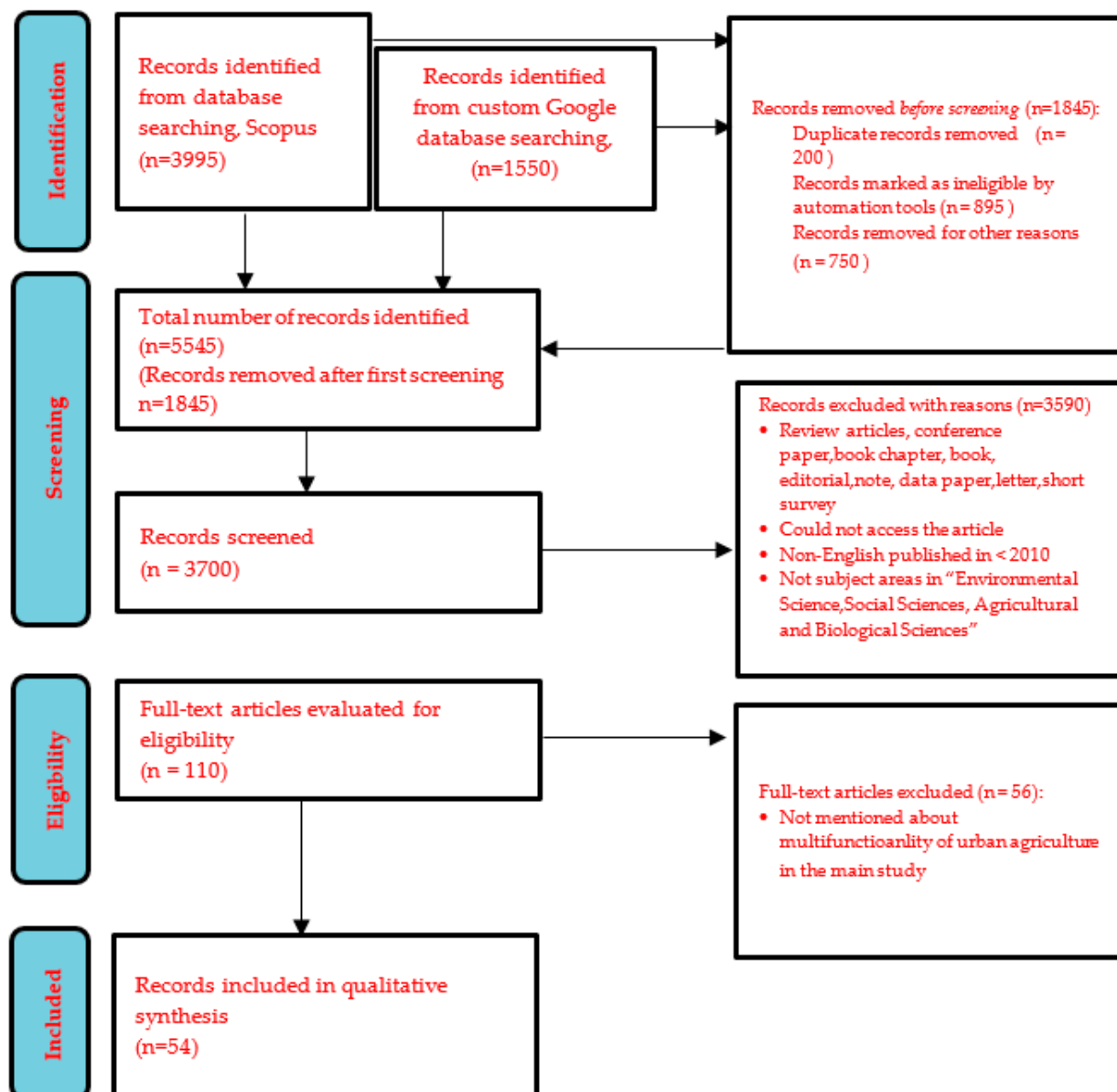
Criterion	Eligibility	Exclusion
Document type	Articles	conference paper, book chapter, review, book, editorial, conference review
	All Open Access (Gold open, Hybrid gold, Bronze and Green)	Could not access the article (Full-text articles)
Language	English	Non-English
Timeline	Between 2010–2020	Before 2010
Subject area	Environmental science, Social science, and Agriculture, and biological science	Other than the three eligible subject areas

### 2.3. Systematic Review Process

The review process involved four steps (Figure 1). The first phase was the identification of records in databases. Using selected keywords, a search process was performed, and the keywords are “urban agriculture” OR “urban farming” OR “urban gardening” AND “case studies.” To be coherent with the review’s objectives, we considered case studies of urban agriculture to gain a better understanding of the subject. Through the database search, 5545 of total articles were identified from both Scopus and Google customized search. But 1845 records were removed before screening due to duplicate records ( $n = 200$ ), marked as ineligible by automation tools ( $n = 895$ ), and due to other reasons ( $n = 750$ ). The second phase was screening. Out of 3700 articles eligible to be reviewed during the screening, 3590 articles were removed, and 110 papers were evaluated for the next stage, eligibility. The eligibility criteria were whether the article had addressed the multifunctionality of the main urban agriculture study. After careful screening, 56 articles were removed as they have not studied the multifunctionality of urban agriculture practice. Therefore, the last stage of review resulted in 54 articles for the final analysis (Figure 1). Out of these 54 articles, 52 were from Scopus and two from the Google database [21,22].

### 2.4. Data Abstraction and Analysis

Fifty-four articles were reviewed and analyzed. The following factors were recorded in each article: agriculture model, land ownership, multiple benefits, special benefited groups, government support, and challenges (Table A1). The development status of the country was identified according to the World Bank classification by income level in 2019–2020. As per the World Bank classification in 2019–2020, countries classified as high income were considered as developed countries in the review and countries classified as upper middle income, lower middle income, and low income countries were considered as developing countries [18]. We analyzed the academic focus on urban agriculture in journal articles under four dimensions: urban agriculture model, socio-economic context of the country, opportunities, and challenges. Opportunities for urban agriculture were measured under four parameters: multifunctionality (multiple benefits), special benefited groups, land ownership, and government support. The multiple benefits were categorized into six categories: health and emotional, social relationships, educational, economic, ecological, and climate resilience. Challenges were also categorized into six categories: land-related, financial-related, human-related, laws and institutional-related, irrigation-related, and others (which cannot be categorized under other categories).



**Figure 1.** The flow diagram of the systematic review process.

Finally, each benefit category was further divided into six sub-categories according to the results. The benefits and challenges found under each category are mentioned in Tables A2 and A3.

The categorization for opportunities and challenges was performed based on the expert judgment of authors. However, expert judgments are mainly built on their framework of understanding experts. Therefore, they are highly subjective, which can lead to bias, misleading and non-reproducible results; hence, accurate statistical and scientific analysis are undoubtedly needed [23]. Though this bias cannot be eliminated, we tried to introduce a new simple methodology of presenting the inherent bias of expert judgment correctly through the present review. We used few other external experts to perform the same task carried out by the authors in categorizing benefits and challenges and used their judgment as a reference to compare with the authors' judgment to minimize the inherent bias in expert judgment. Six external reviewers who are in urban agriculture or urban planning were selected to perform this task. The authors decided the number of external reviewers and the persons selected based on the convenience and availability of resources. These external reviewers include academics and researchers in the relevant fields. Fifty-four articles were randomly divided into each external reviewer. However,

general criteria used by authors to identify each benefit and challenge were distributed among the external reviewers. These criteria were developed based on available literature on urban agriculture (Table A1). However, we did not compare the results of identification of benefits and challenges by the external reviewers as our main intention was to compare the categorization results only. Hence, we performed similarity categorization [24] by comparing the common benefits and challenges identified by both authors and the external reviewers in each article and assigning weights.

The methodology was performed for the similarity categorization as follows:

Step I: Selecting the common benefits and challenges identified by both authors and external experts.

Step II: Calculating the similarity categorization for the commonly identified benefits and challenges and weights were assigned according to simple binary truth values (e.g., identify versus non-identify) [24]. However, according to our purpose, we modified the simple binary truth values adding another value between two binaries. The weights assigned were as follows:

100% similar—1.0

>0% to <100% similar—0.5

0% similar—0

If more than one external reviewer reviewed an article, the final similarity weight was calculated by dividing the total weight by several external experts reviewed.

Step III: Final similarity categorization weight was calculated as percentage values for benefits and challenges separately, dividing the total points by the number of articles that recorded commonly identified benefits or challenges by both the authors and external reviewers.

50% or above weight was considered the standard weight to accept or reject authors' expert judgment in the categorization of benefits and challenges.

### 3. Results

#### 3.1. Geographical Distribution of Studies

Out of all articles selected for the review, 36 articles were recorded from developed countries, and seventeen were from developing countries. Each of those articles mentioned agriculture practices related to a single country. One article included urban agriculture practices from developed and developing countries (one country from each) (Table S1). There is a significant difference in the geographical distribution of the studies, in which the highest number of articles were recorded from Europe and the least from Australia (Figure 2). However, as a single country, the USA recorded the highest number of articles ( $n = 7$ ), followed by Italy and the UK (four in each).

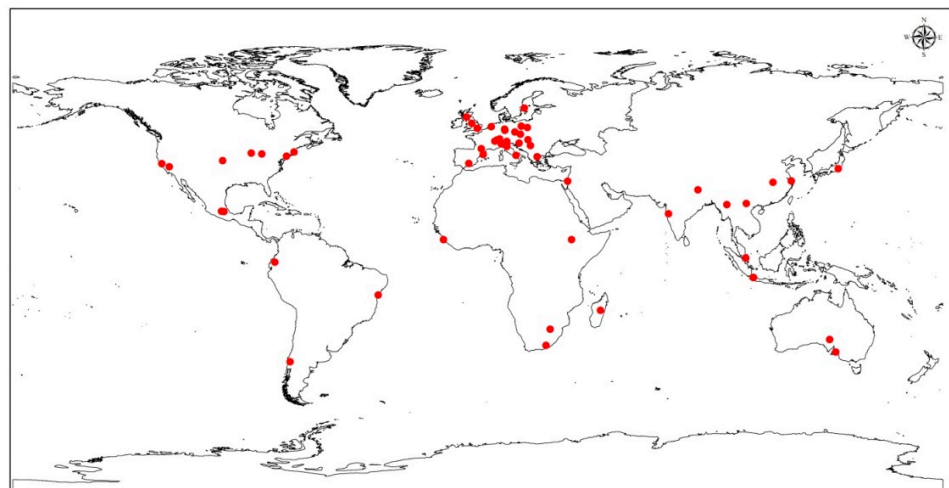
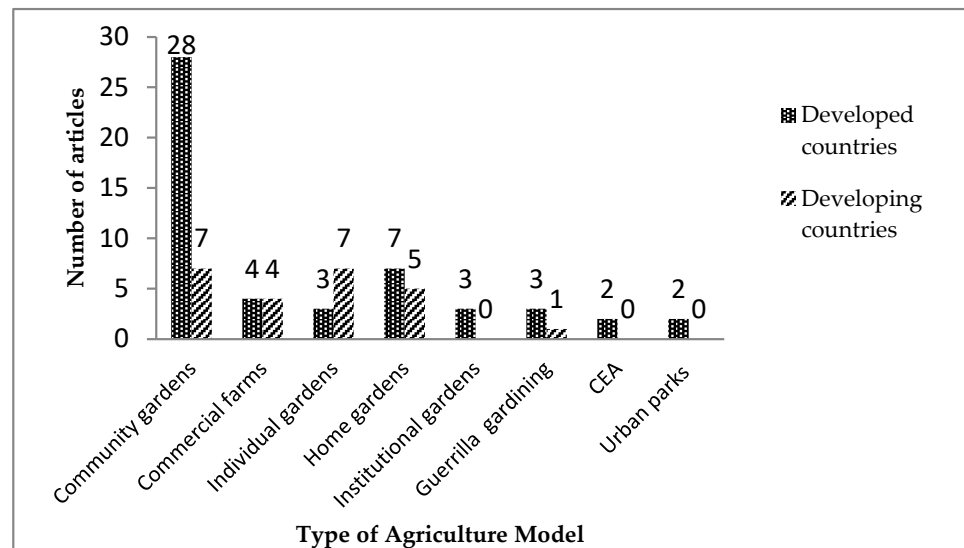


Figure 2. Geographical distribution of the number of articles published by the country.

### 3.2. The Types of Urban Agriculture Models

The different types of agriculture models recorded in articles were: community gardens, home gardens, individual gardens, commercial farms, institutional gardens, guerrilla gardens, controlled environment farms, and urban parks. The highest recorded model was community gardens, followed by home gardens (Figure 3).



**Figure 3.** Diversity of Agricultural Models.

The community garden is a piece of common land gardened collectively by people who grow their produce on multiple individual plots [25,26]. The allotment garden is its sub-category, in which the plots of land are tended individually by plot holders [27]. A home garden is “a garden managed by a single household on owned, rented or borrowed land, either on the same property as the residence or on adjacent land such as a vacant lot, tree lawn or right of way” [28]. The individual gardening activities specifically not mentioned as home gardens, were categorized as individual gardens. An individual garden can be defined as a garden plot physically separated by trees or fences or stand-alone [29] and small–medium farms held by individual farmers [30]. Commercial farms include agrotechnology farms, plant nurseries [5], semi-commercial farms (not solely focused on profit, but a high proportion is for selling), fully commercial farms (fully utilized for profit) [31], market gardening [7], horticulture [21] and micro-farms [32]. Institutional farms include agriculture activities associated with religious places, schools, prisons, hospitals, senior centers, and public housing developments [33,34]. Guerrilla gardening is using spaces for growing crops without having permission [35]. Urban farms, which use soilless systems (hydroponics, aeroponics, and aquaponics) are referred to as controlled environment agriculture (CEA) [33]. Finally, agriculture activities practiced in urban parks or city gardens were considered as a separate category [36,37].

### 3.3. Opportunities for Urban Agriculture

#### 3.3.1. Multiple Benefits of Urban Agriculture

The similarity categorization of multiple benefits between the judgments of the authors and the external reviewers is 77%. Since it is more than the standard weight (50%), the authors’ expert judgment for categorizing benefits was considered in the analysis.

The highest recorded benefit in the review is social relationships with 43 articles, followed by economic benefits as the second highest (38), health and emotional (27), ecological (24), education (23), and the least recorded use is climate resilience (5) (Figure 4).

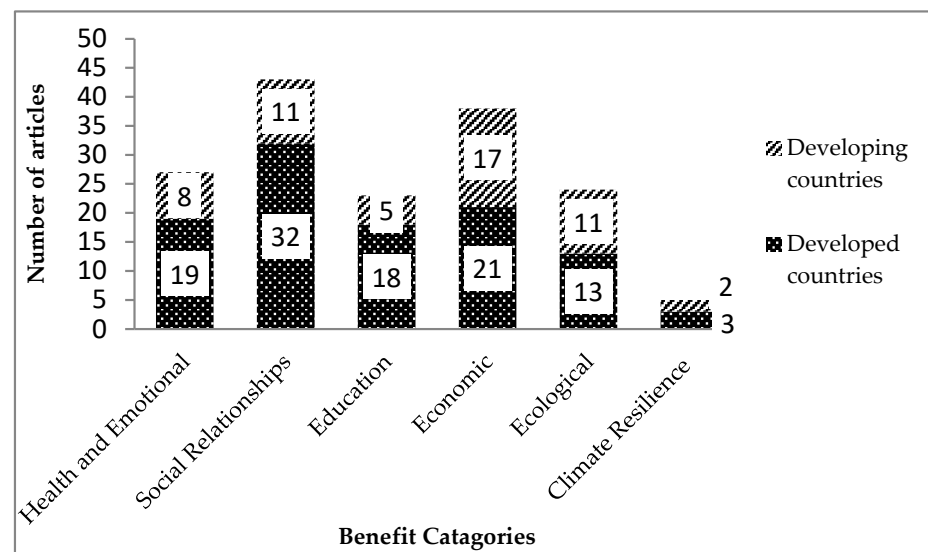


Figure 4. Categorization of benefits.

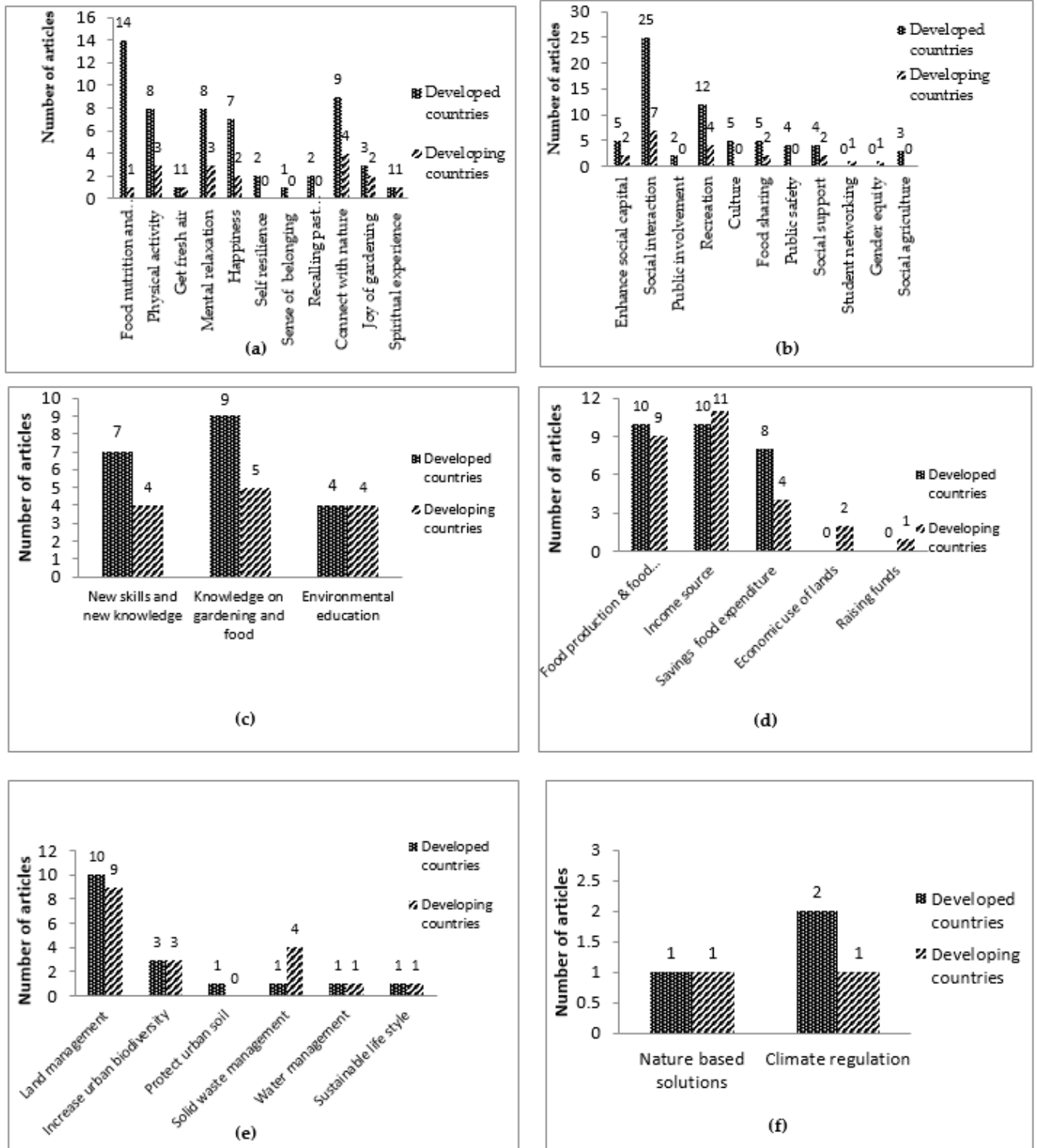
Each benefit category recorded a different number of sub-categories: health and emotional (11 sub-categories), social relationships (11 sub-categories), education (3 sub-categories), economic (5 sub-categories), ecological (6 sub-categories), and climate resilience (2 sub-categories) (Figure 5).

### 3.3.2. Special Benefited Groups, Land Ownership, and Government Support

Regarding the special benefited groups, only 16 articles [27,28,31,33,34,36,38–47] have recorded such specific benefited groups from particular urban agriculture practices, which include older adults, migrants, low-income people, disabled people, people with mental disorders, school children, cancer patients, and women (Table S1). However, the most abundant recorded special groups are elderly people, low-income people, and migrants. Only 16 articles have mentioned land ownership for the recording of ownership of the lands used for the agriculture activity (Table S1). In most cases, community gardens have been conducted in government and private lands, and in certain cases, either only in government lands or private lands. Government support for urban agriculture practices was recorded in only 16 articles (Table S1). These supports include institutional support (e.g., interagency collaboration and linking with municipal council projects) [5,37,48], integrating urban agriculture into urban planning [26,49,50], creating legislation for urban agriculture [33,51], providing irrigation facilities [52,53], providing suitable lands [47,50,53], providing gardening material [50], providing training [52], informal political support [34,47], market creation [43], providing grants [54], and support for guerilla gardening [55]. This support had given through municipal councils or relevant government agencies.

### 3.3.3. Opportunities under Different Socio-Economic Contexts

To understand the opportunities for urban agriculture under different socio-economic contexts, we compared the recordings of options (multiple benefits, benefited groups, and government support) between developed countries and developing countries. The results summarize some similarities and differences between the two groups of countries. Regarding the frequency of recording each benefit category, developed countries depict a higher frequency in all types compared to developing countries (Table 2). However, the benefits of “health and emotional”, “social relationships, and education” are significantly prominent in developed countries, whereas in developing countries, economic benefits and ecological benefits are comparatively more noticeable (Table 2).



**Figure 5.** Number of articles recorded for multiple benefits of urban agriculture: (a) health and emotional benefits; (b) social relationship benefits; (c) educational benefits; (d) economic benefits; (e) ecological benefits; and (f) climate resilience benefits.



**Table 2.** Recording percentage of different benefit categories.

Benefit Category	Percentage of Recording	
	Developed Countries	Developing Countries
Health and Emotional	70	30
Social Relationships	74	26
Education	78	22
Economic	55	45
Ecological	54	46
Climate Resilience	60	40

Health and emotional benefits were recorded more than twice as much in developed countries [17,26,27,36,38–40,46,47,49,50,52,53,56–61] compared to developing countries [29,59,62–66] (Table 2). The top three health and emotional sub-categories recorded in developed countries are food nutrition and quality, connection with nature, physical activity, and mental relaxation. In contrast, in developing countries, the top three relate to nature, physical activity, and mental relaxation (Figure 5a). However, subcategories such as self-resilience, sense of belonging, and recalling memories were only recorded in developed countries but not in developing countries.

The social relationship category also depicts a significant difference between developed and developing country studies (Table 2). However, in both groups, social interaction is the highest recorded benefit sub-category followed by recreation (Figure 5b). But some benefit sub-categories such as student networking and gender equity were only found in developing countries [67,68]. In contrast, some were found only in developed countries (public involvement, culture, public safety, social agriculture) [36,41,58,61]. Education benefits show the highest rate of difference of recording between developed and developing countries (which is four times higher in developed countries than developing countries) (Table 2). However, like social relations, the highest recorded sub-category in educational benefits is the same in developed and developing contexts, which is the knowledge on agriculture and food (Figure 5c). Recording of environmental education sub-categories has similar frequencies in both developed and developing countries (Figure 5c). There is no significant difference in recording economic benefits between developed [5,28,30,32–34,36,38,39,47–49,53,54,56,57,61,69–71] and developing countries [9,12,21,22,31,42–44,59,62–68,72] (Table 2). However, a distinction can be observed among recordings of different sub-categories. In developed countries, the highest recorded sub-categories are food production and food security, and income source, whereas in developing countries, it is the income source (Figure 5d). However, this sub-category (income source) recorded a higher percentage in developing countries than developed countries. Further sub-categories of economic use of lands and fundraising didn't record developed countries (Figure 5d). The ecological benefit category also doesn't depict a significant difference in recording among developed and developing country studies and sub-categories (Table 2). Thirteen articles from developed countries [18,34,36,40,47,49–51,53–55,59,73] and 11 from developing countries [9,21,22,29,59,63–65,67,68] recorded ecological benefits. However, both groups record a significantly higher frequency in the land management sub-category (Figure 5d).

Recording the least number of articles, climate resilience benefits were recorded from three developed countries and two developing countries (Table 2). Developed country studies recorded two climate regulation related benefits, including climate actions [47], food mile reduction [5], and one nature-based solution [36] related benefit, whereas developing countries recorded one climate regulation benefit (micro-climate regulation) [64] and nature-based solution related benefit [9] (Figure 5f).

Regarding special benefited groups, there is a clear distinction of several recordings according to the socio-economic context. Twelve articles from developed countries [27,28,33,34,36,38–41,45–47] have recorded special benefited groups, whereas in developing countries, it is only four [31,42–44] (Table S2). Similarly, recording government support also shows a significant difference; 14 articles from developed countries have mentioned

the government support for urban agriculture. Still, only two from developing countries have recorded such benefits (Table S2).

### 3.4. Challenges of Urban Agriculture under Different Socio-Economic Contexts

The similarity categorization of challenges between the authors and the external reviewers is 64%. Since it is more than the standard weight (50%), the authors' expert judgment for categorizing challenges was considered in the analysis. The challenges for urban agriculture were recorded only in 29 articles, with 18 in developed countries and 11 in developing countries (Figure 6). Most challenges fall under land-related and "other" categories. The category "others" includes many different types of challenges that we could not categorize under the other five types of challenges (Table 3). The most frequently recorded challenge in the developed world is land-related [5,30,33,34,37,47,50,54,57,60,71] and in developing countries, they are human-related [21,22,29,44,62,63,67,74] and "others" [9,21,29,44,62,63,67,74]. However, there is little significant difference among challenge categories between developed and developing countries.

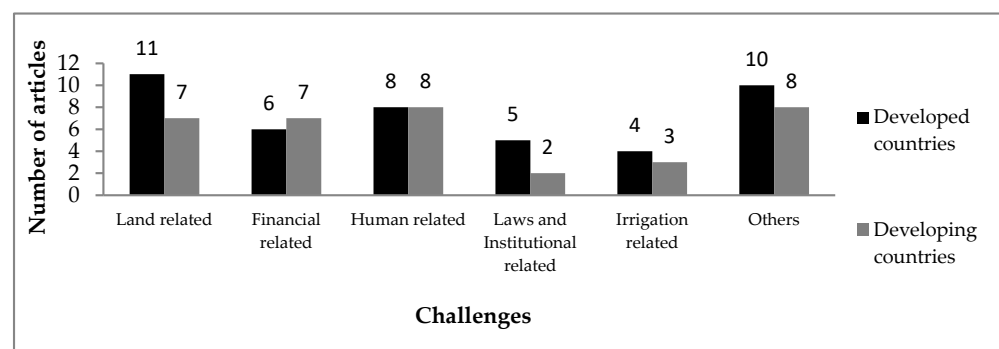


Figure 6. Challenges of urban agriculture.

Table 3. Challenges under "Other" category.

Subcategory	Number of Articles		
	Developed Countries	Developing Countries	Total
Vandalism/Stealing	5	1	6
Unsuitable conditions (sunlight, soil, humidity, pests, wildlife)	2	3	5
Misuse the place	1	0	1
Food processing difficulties including storing	1	1	2
Health risks (polluted water, use of agrochemicals)	1	2	3
Solid waste and wastewater management	1	1	2
Issues from non-farmers/neighbors	2	0	2

## 4. Discussion

### 4.1. Several Agriculture Models and Urban Agriculture under Different Socio-Economic Contexts

Academic focus on urban agriculture is primarily inconsistent among the developed and developing world and different farming models. Having fewer than twice the scholarly journal articles in developed countries reveals that the academic attention on urban agriculture in developing countries is still limited, despite having favorable agriculture activities. Regardless of the potential importance of urban agriculture in developing countries, the

practice has still not been synthesized sufficiently in the global academic literature [75]. However, the extensive literature on urban agriculture in developing countries can be found in nonscientific sources, such as technical documents, technical bulletins, and project reports [13]. Published academic information is considered highly reliable as they are subjected to be mandatorily reviewed by other scholars in the same academic discipline. Therefore, producing more scientific data on urban agriculture in developing countries is essential to encourage urban agriculture to create sustainable urban environments. There is also a significant difference among urban agriculture models recorded in the reviewed articles. The majority of articles recorded community gardens and few numbers with other models. In developed countries, the highest registered agriculture model was community gardens or allotment gardens; this academic favoritism had been recorded in former studies [26,76,77]. There is a significant void in the empirical studies on home food gardens; even academic literature on urban agriculture in the developed world is rapidly expanding [28]. However, some studies emphasize that more attention and studies on home gardens are required, such as the specific potential and contribution of home gardens, the influence of the urban environment and socio-demographic characteristics, and gardeners' motivation [78]. Therefore, more academic knowledge on the opportunities and challenges of different urban agriculture models is needed to identify suitable farming models under different contexts.

#### 4.2. Contribution of Studies on Urban Agriculture

The most popular academic attention is the identification of the benefits of urban agriculture. However, the academic attention of both developed and developing countries has considered the multifunctionality of urban agriculture. In the meantime, these multiple benefits showed differences among the country's socio-economic context and type of agriculture model. People's motivations in developed countries tend to favor social, health-related, and educational benefits of urban agriculture; however, urban agriculture is more related to economic and ecological needs in developing countries. This preference has been proven by many other scholars as well [79,80]. Among farming intentions in urban agriculture practices in developed countries, social and educational farming are more frequent in Europe, Oceania, and North America. At the same time, few cases of commercial projects are significant in Japan [13]. Another general observation is the diversity of benefits provided by community gardens compared to other models. It was also seen that even large-scale commercial farms could provide multiple non-cash benefits [64]. Therefore, different agricultural models need to be studied thoroughly on their multifunctionality.

According to the review results, the topmost recorded social relation benefits are "social interactions" and "recreation." This implies an excellent opportunity to link urban agriculture with urban planning as spaces that provide opportunities for social interactions and recreation within urban contexts. Community-generated social spaces have become key places in urban areas for gatherings and enhance social interactions between communities [81]. It is commonly believed that developing countries focus more on the economic benefits of urban agriculture than the developed countries. But in the present review, we found that both developing and developed countries have given similar weight to the economic benefits, even though there are some slight differences. The Food and Agriculture Organization of United Nations points out that sustainable urban agriculture models should be profitable and economically viable [1]. Hence, the economic perspective is critical for the long-term sustainability of urban agriculture despite the socio-economic context. However, the most cited economic benefits of urban agriculture are food production and food security, providing income sources, and reducing household food expenditure. Therefore, it is important to consider these economic motivations when agriculture practices are encouraged in urban environments.

It was also noticed that developed and developing countries have different intentions regarding the production of urban agriculture. Developed countries mainly intended to gain nutrition and quality food, whereas developing countries were more concerned with

food production and food security. Understanding these differences in personal motives and intentions is important to integrate urban agriculture with urban planning in cities with different socio-economic contexts. It is widely understood that urban agriculture plays a critical role as a survival strategy for the urban poor in improving food security and healthy nutrition for urban society [80,82,83]. Practicing as a land management strategy in urban areas is one of the main ecological benefits of urban agriculture in many situations. In cities, agriculture can be used for landscape beautification [21,22,76], to enhance greenery [26,49,68], for urban restoration [59] and regeneration [55,77], to maintain public spaces [73] as well as to utilize urban vacant lands [12,53,84]. However, other ecological benefits also need to be studied in more detail, especially in developed countries, to integrate agriculture with urban planning in a sustainable manner.

Climate resilience is the least recorded benefit regarding urban agriculture. Only five papers recorded this benefit by way of flood control, micro-climate regulation, climate action, and reduction of food miles [5,9,47,64,80]. Having a limited academic focus on climatic benefits, perhaps due to climate resilience in cities, is considered more general and not thoroughly considering urban agriculture. Previous studies have proven that urban agriculture helps urban flood control through water retention by vegetation and unpaved surfaces, and reduces the urban heat island effect, increasing the air humidity through evapotranspiration [85]. Some scholars imagine the city of the future as resilient and self-sufficient, which reaches the “ecosystem stage” via urban agriculture [79]. Therefore, to achieve a resilient urban future, studying the role of urban agriculture in climate resilience in a comprehensive manner might be useful.

Urban agriculture can support vulnerable groups in the city, such as elderly people, migrants, minorities, low-income people, and people with mental disorders. In the present review, elderly people have been recognized as the leading benefited group, especially in developed countries. Identifying actual beneficiaries in each urban agriculture practice is crucial to efficiently integrate urban agriculture into urban planning because inconsistency between actual usage and planning intention has been identified as one of the significant reasons that urban agriculture has been limitedly used in policy and planning [86]. Identification of land ownership of agriculture practices in cities is important for the long-term sustainability of urban agriculture. According to the results, government lands play an important role in urban agriculture activities; they can be utilized two ways in urban farming: use with formal agreements [12,38,69] and use without any formal agreements, which includes using sidewalks and median strips for farming [12]. However, sometimes, utilizing government lands can make agriculture activities less sustainable, as there is no security of permanence due to other urban development pressures [63]. To support urban agriculture, some countries develop land-use policies to integrate natural urban ecosystems, such as wetlands with urban agriculture [10]. However, public–private collaborations might be helpful to improve the efficiency and sustainability of urban agriculture, especially in situations when sizeable public expenditure for operations can be a barrier to use state lands for agriculture [69].

Government support is vital for the sustainability of urban agriculture practices in cities. The reviewed articles depict this support as mainly including support given by municipal councils or local governments and policies to integrate agriculture into urban planning. High financial and institutional support can make urban agriculture activities more secure in cities [87]. However, the attention on government initiatives in academic literature is limited and significantly less in developing countries. More academic attention on government support in developed countries reveals their interest in urban agriculture to create urban sustainability.

Land security is the most frequently recorded challenge that can directly influence the long-term sustainability of urban agriculture, which has been proven by many previous studies [87–89]. Land insecurity can incentivize rent-seeking behavior, and therefore, urban agriculture is at risk of highest and best use developments [90]. In addition, lack of time and consistent interest are two common human-related challenges recorded in both developed

and developing countries. Buying inputs, mainly seeds and fertilizer, is the main common financial challenge registered in developed and developing countries [12,28,42]. Irrigation can be a challenge in cities, as urban water is expensive, and this can cause insecurities in urban agriculture [87]. Therefore, urban agriculture should move towards innovative sustainable irrigation solutions, such as the re-use of wastewater [91,92]. Identification of challenges for each case through proper scientific investigations is important as they are highly dependent on local factors.

#### *4.3. Lessons to Be Learned from Each Other*

The results demonstrated that a country's socio-economic context influences the types of benefits yielded from urban agriculture practices, which have been proven by many studies. Our comparison between developed and developing countries is not only useful to understand the influence of socio-economic context on urban agriculture activities but also to learn best practices in the application of urban agriculture in urban planning to improve the well-being of urban citizens. With the growing trend of introducing urban agriculture into urban planning in both developed and developing regions, this learning could efficiently integrate urban agriculture into urban planning.

Developed countries focus more on how urban agriculture can be used as a strategy in urban planning to enhance citizens' social and health well-being. According to the present review, it is revealed that developed countries significantly consider the potential of using urban agriculture as preventive health care measures in urban setups. It is primarily recognized that regular contact with nature provides many health benefits and enhances psychological well-being [35]. Generally, people living in highly urban areas and more minor natural regions would like to spend more time in urban gardens to get personal satisfaction, mental and physical health, and connect with nature [58,93]. Many cities in developing countries are experiencing several adverse impacts due to rapid urbanization, which has created severe negative effects on urban citizens. The lessons from developed countries on how urban agriculture has been utilized to improve the well-being of people could be beneficial for developing countries.

One of the primary functions of urban agriculture in developed countries is creating social interactions and recreation. According to Alderfer's ERG Theory of Motivation, social motivations are among the three reasons people need for relationships [94]. In addition, integrating urban agriculture and urban recreation can be beneficial synergies. It can provide additional income opportunities for farmers and farming in cities to create cultural ties between urban citizens with the urban hinterlands [95]. Another lesson that can be learned from developed countries is utilizing urban agriculture as education centers in the cities, which provide opportunities to learn about gardening, food, nature, sustainability, and develop skills and knowledge of urban citizens. Urban agriculture supports sustainability objectives and promotes environmental stewardship by urban people [96]. Developing countries can learn more from community garden practices, which is the most popular urban agriculture practice in developed countries to integrate the multifunctionality of urban agriculture to enhance the social well-being of urban citizens. In developed countries, community gardens are not merely places that provide sources for food, they provide other benefits such as social cohesion, community building education, and promoting health [97–99]. Other community gardens can be used as places in cities that create social integrity. In general, community gardens are more heterogeneous in education, age, gender, and financial status, and usually lack previous gardening experience [100].

Many studies from developed countries demonstrated the importance of government support to promote urban agriculture, which could be lessons for developing countries. Local authorities such as municipal councils can play a significant role in the sustainability of urban agriculture practices in cities, as they have the authority to plan and manage the urban lands in most cities [37,48,54]. Integrating urban agriculture into urban planning in Singapore [26] and Barcelona [49], establishing legislation to use public lands for urban agriculture in New York [33], the Workers' Allotment Gardens Act, and the Polish

Association of Allotment Gardens (PZD) in Poland [51] are some of the examples from the developed world how policy interventions are important to promote urban agriculture. Case studies from Glasgow and Toledo explain the importance of getting informal support from politicians for urban agriculture projects to promote urban farming in cities [34,47].

Some important lessons can be learned from urban agriculture practices in developing countries as well. Since developing countries usually concentrate more on the economic benefits of urban agriculture, the others can learn about the multiple economic benefits urban farming can provide for cities. A study conducted in the city of Quito, Ecuador, revealed that home gardening had influenced increased house value [62]. Moreover, many case studies in developing countries explained the multiple benefits that home gardens provide, limitedly studied in developed countries. Some of the developing countries use urban agriculture as a solution for urban solid waste management (e.g., Bedelle in Ethiopia, Johannesburg in South Africa, and Mexico City) as well as depollution of wastewater (e.g., Mexico City and Antananarivo, Madagascar) [9,21,63,67]. This demonstrates the potential of using urban agriculture as a low-cost decentralized technique for urban waste management.

#### *4.4. Urban Agriculture on Policy Implementation*

There is an excellent opportunity for urban planners to enhance city sustainability by incorporating urban agriculture into the planning agenda at all levels, from the master plan to individual plans, such as sites and neighborhoods [4]. There are vivid examples of how urban agriculture has been implemented at the policy level in urban planning. In Dae es Salaam in Tanzania, urban agriculture is mainstreamed in land use planning [79], whereas in Germany, urban agriculture is compulsory in the urban planning process [101]. The American Planning Association has also recognized the importance of integrating urban agriculture into urban planning [102]. Havana, Cuba, has allocated 30,000 hectares within and on the fringe of the city [102]. The city council of Bulawayo, the second-largest city in Zimbabwe, has recognized the importance of urban agriculture to improve access to healthy food for the urban poor, hence have allocated 450 hectares of vacant municipal lands permanently for urban agriculture to disadvantaged urban residents [80].

Nevertheless, even though urban agriculture is essential in urban resilience and global sustainability [96], urban land use planning is still underestimating the potential of the multifunctionality of urban agriculture as a nature-based solution [15]. Further, the potential provision of multifunctionality of urban agriculture is still not adequately accounted for in practice and thus does not positively influence land-use planning in urban areas, and this is considered as one of the great difficulties urban agriculture faces, especially in the global south [96]. Therefore, a deep understanding of urban agriculture practices under different contexts is vital for the successful implementation of urban agriculture in urban planning decisions.

#### *4.5. Suggestions for Future Urban Agriculture Studies*

Through the results of the present review, we identified some gaps in the existing academic knowledge on urban agriculture, which can hinder expanding urban agriculture practices in cities. Therefore, we suggest that future urban agriculture studies need to focus on the following aspects to promote urban agriculture in urban setups while minimizing the inconsistencies between actual usage of urban agriculture and planning intentions.

1. More academic attention for urban agriculture practices in developing countries.
2. More holistic studies on different urban agriculture models in both developed and developing countries.
3. Not limiting urban agriculture studies to identify the multifunctionality and identify the other aspects, such as land ownership, special benefited groups and government support.
4. More in-depth studies to identify the role of urban agriculture in climate resilience in urban areas.

5. More studies to identify challenges and constraints for different urban agriculture models under different socio-economic contexts.

Finally, we suggest practicing the methodology introduced by this study to review literature in future review studies to minimize the inherent bias of expert judgments of authors, as well as to enhance the reproducibility of studies, with further improvements.

## 5. Conclusions

The present review depicts that the academic contribution to urban agriculture could be evaluated based on the focus on urban agriculture types, socio-economic context of the country, identification of opportunities, and challenges. An inequality in the attention given to different kinds of urban agriculture models was revealed, in which community gardens are the most popular studied model, with other practices having been significantly understudied. However, there is also a difference of multiple benefits produced from urban agriculture between developed countries and developing countries. The developed country studies have focused on social relations, health, emotional, and educational benefits, while developing countries focus more on economic benefits. This disparity would help to learn best practices from each other, for example, developing countries can learn from developed countries how urban agriculture can be used to enhance the social, physical, and mental well-being of urban citizens, whereas developed countries can learn from developing countries the ways that agriculture practices in cities can provide economic benefits. The main academic attention on urban agriculture is concentrated on identifying multiple benefits. Still, since urban agriculture is highly dependent on local context, it is critical to apply a holistic approach by considering other factors, such as beneficiaries, land ownership, government support, and challenges that could help to minimize inconsistencies of actual usage of agriculture in cities with planning intentions. However, it is also known that a potential provision of multifunctionality of urban agriculture is still not adequately accounted for in practice. Thus, it does not positively influence urban land-use planning, and the lack of a holistic approach in studies could be a possible reason for this. This holistic approach in academic studies can also provide a good learning opportunity for other cities and countries.

Further, this review again proves the gaps of knowledge in urban agriculture in developing countries. It indicates the importance of having a more geographically diverse scientific database on this subject as there is a growing trend of using urban agriculture in global urban planning. Scientific data play a crucial role in planning and decision-making. Therefore, we think future studies on urban agriculture should focus more on developing countries and different agriculture models and should apply a more holistic approach for better understanding the influence of local contexts. Further, we also suggest future studies in developing countries to emphasize the following benefits of urban agriculture: health and emotional, social relations, and education, and examining how they can be integrated with urban planning to improve the well-being of urban citizens. One of the main limitations of this review is that we had to limit our search process with several eligibility and exclusion criteria due to time constraints and the availability of many databases. However, we suggest conducting more reviews in the future to develop a deep understanding of this discipline. Finally, we would like to indicate the importance of validating any expert judgments on available literature by comparing the authors' conclusions with external references.

**Supplementary Materials:** The following table is available online at <https://www.mdpi.com/article/10.3390/su13179609/s1>, Table S1: Summary of the reviewed articles.

**Author Contributions:** C.G.W.D. contributed to the study's conceptualization, methodology (data collection and analysis) and took the lead in writing-original draft preparation. G.M. was involved in the methodological framework, formal analysis, review, and editing of the manuscript. K.F. was mainly involved in the supervision of the overall study and manuscript preparation. All authors

provided critical feedback and helped shaped the research analysis and manuscript. All authors have read and agreed to the published version of the manuscript.

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## Appendix A

**Table A1.** Criteria used to categorize benefits and challenges of urban agriculture.

	Category	Criteria
Benefits	Health and Emotional	Benefits related to improving the physical or mental well-being of individuals
	Social Relationships	Benefits related to improving connections and relationships with others (family members, neighbors, community, etc.)
	Educational	Benefits help to improve the knowledge and skills of people related to any given discipline
	Economic	Benefits which related to any short term or long term financial gains, cost reductions, and production-related attributes
	Ecological	Benefits help to improve the quality and quantity of natural ecosystems or actions which can trigger such results
	Climate Resilience	Benefits related to climate mitigation and adaptation
Challenges	Land related	Challenges or limitations related to access to lands or use of lands for farming
	Financial related	Challenges or limitations related to the cost of farming
	Human related	Challenges or limitations related to human-related and relationships between stakeholders
	Laws and Institutional related	Challenges or limitations related to legal and institutional aspects of agriculture and urban planning
	Irrigation related	Challenges or limitations related to irrigation of farming
	Others	Any other challenge or limitation which cannot be categorized under the above categories
	Land related	Challenges or limitations related to access to lands or use of lands for farming



**Table A2.** Benefits of urban agriculture found in reviewed articles.

Main Benefit Category	Sub-Categories	Benefits of Urban Agriculture
Health and Emotional	Food nutrition and quality	Access to organic food, access to healthy food, access to fresh food, access to high quality food, improve eating habits, fresh tasty produce, traceability
	Physical activity	Physical health, physical exercise, psychological benefits
	Get fresh air	Opportunity to get fresh air
	Mental relaxation	Stress reduction, therapeutic benefits, mental health, relaxation
	Happiness	Having fun, joy, aesthetic pleasure, satisfaction
	Self-resilience	Self-esteem, self-confidence, openness, optimism
	Sense of belonging	Sense of belonging to the neighborhood
	Recalling memories	places of memory and recreation of rural past
	Connect with nature	Re-connect with nature, provides a place of "wild" in terms of nature and human
	Joy of gardening	Gardening as a hobby
Spiritual experience	Feelings of spirituality, closeness to God, kind of yoga	
Social Relationships	Enhance social capital	Community empowering, social entrepreneurship, encourage social initiative
	Social interaction	Socializing, community building, as a meeting place, community coalescence, strengthening family bonds, neighborhood harmony, social ties between farmers, place to address social problems
	Public involvement	Civic participation
	Recreation	Leisure, place for kids to play, resting place
	Culture	Provide place for cultural activities and events
	Food sharing	Food donation
	Public safety	Crime reduction, pace allocation during disasters
	Social support	Support for special groups such as older people, migrant community, disabled people, mentally ill people, minors at risk and youth groups
	Student networking	Connecting students
	Gender equity	Gender equity
Social agriculture	Social work for farmers, encourage others for agriculture	

Table A2. Cont.

Main Benefit Category	Sub-Categories	Benefits of Urban Agriculture
Educational	New skills and new knowledge	Development of personal skills, transmit knowledge, act as education centers, service learning and research for students
	Knowledge on gardening and food	Knowledge on agriculture, food, horticulture, food, medicinal plants
	Environmental education	Education on biodiversity, nature, and environmental sustainability
Economic	Food production & food security	Food production, food security, reduce food mileage, reduce food spoilage
	Income source	Livelihoods, businesses, self-sufficiency, income for disadvantaged people, provide self-resilience
	Savings food expenditure	Savings from household food expenditure
	Economic use of lands	Increase hose and land values
	Raising funds	Conduit for funds and resources to serve the community
	Food production & food security	Food production, food security, reduce food mileage, reduce food spoilage
Ecological	Land management	Urban beautification, greenery, restoration, effective land use, landscape, regeneration, use of vacant lands
	Increase urban biodiversity	Enhance biodiversity, habitat for wildlife
	Protect urban soil	Soil conservation
	Solid waste management	Solid waste management, promote organic fertilizer
	Water management	Wastewater management, water de-pollution
	Sustainable lifestyle	Use and promote eco-technologies
	Climate Resilience	Climate actions
Nature based solutions		Nature based solutions, flood mitigation

Table A3. Challenges for urban agriculture found in reviewed articles.

Main Challenge Category	Challenges for Urban Agriculture
Land related	Land insecurity, short term leases, lack of zoning, conflicts with other land uses, access to space, high space rent, land ownership issues, unsuitable lands
Financial related	Long-term lease (start-ups), cost of inputs, less economic sustainability, lack of funds, lack of access to credits, market accessibility
Human related	Time allocation, lack of manpower, lack of consistent interest, conflicts between farmers and farmers, lack of experiencing in gardening and farmer entrepreneurship

Table A3. Cont.

Main Challenge Category	Challenges for Urban Agriculture
Laws and institutional related	Lack of clarity in agencies in land use planning, Issues in policy implementation, Lack of coordination between stakeholders, Lack of institutional support, High involvement of local authorities and less participation of farmers in decision making
Irrigated related	Access to water, lack of water availability, water issues
Others	Vandalism, stealing the produce, misuse as a meeting place, unsuitable conditions (lack of sunlight, soil issues, humidity, pests, wildlife), health risk (polluted water, use of agro-chemicals), food processing difficulties including storing, solid waste and wastewater management, issues from non-farmers and neighbors

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