Examining the Trend of Social Science Research on Urban Agriculture: A Bibliometric Review

Munifah Siti Amira
Norsida Man
Nur Bahiah Haris
Ismi Arif Ismail
Aidi Ahmi
Amar Maruf
Winoryanti Sulaiman

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Munifah Siti Amira, *Department of Agriculture Technology, Faculty of Agriculture, Universiti Putra Malaysia,43400 Serdang Selangor*
Email: munifahyusuf@gmail.com

Norsida Man , *Department of Agriculture Technology, Faculty of Agriculture, Universiti Putra Malaysia,43400 Serdang Selangor*
E-mail: norsida@upm.edu.my

Nur Bahiah Haris, *Department of Agriculture Technology, Faculty of Agriculture, Universiti Putra Malaysia,43400 Serdang Selangor*

Ismi Arif Ismail, *Department of Professional Development and Continuing Education, Faculty of Educational Studies, Universiti Putra Malaysia, Serdang, 43400 Serdang Selangor*

Aidi Ahmi, *Tunku Puteri Intan Safinaz School of Accountancy,Universiti Utara Malaysia,06010 UUM Sintok, Kedah, Malaysia.*

Amar Maruf, *Department of Environmental Science, Faculty of Forestry and Environmental Science, Universitas Halu Oleo Kendari, Indonesia*

Winoryanti Sulaiman[1], *Department of Agriculture Technology, Faculty of Agriculture, Universiti Putra Malaysia,43400 Serdang Selangor*

Abstract

This paper aims to examine the current state of urban agriculture research under social science. This study used bibliometric analysis based on 424 documents obtained from the Scopus online database as of March 2021. Harzing's Publish or Perish and VOSviewer software have been used to analyze and visualize the results. This article presents the findings based on the standard bibliometric indicators, with a focus on the rate of publication growth, citation analysis, and research productivity, documents and source type, the language of publications, subject area, most active source title, distributions of publications by countries, most dynamic institutions, authorship, keywords, title, and abstract analysis. The results indicate that urban agriculture literature has grown exponentially from 1984 until 2020. Simultaneously, the USA is ranked first in productivity, with 90 documents published (21.23%) by

country analysis. Concerning citation frequency, with an average of 15 citations per year, the article published by [1] is the most quoted. Various studies on urban agriculture have been conducted using multi-authors and published in multiple languages by 21 authors from 41 different countries and 21 institutions.

Keywords: *urban agriculture; bibliometric analysis; social science*

INTRODUCTION

Urban agriculture, also known as urban farming or gardening, is cultivating, processing, and distributing food in or near cities. [2]) defined *urban agriculture* as all types of agricultural production (food and non-food products) within or near cities. In the meantime, agricultural production near towns is referred to as 'peri-urban agriculture' [3-5]. Generally, individuals and organizations are working on urban agriculture to achieve several lofty private and public aims: improved health and economic conditions for themselves and the communities; increased access to food, the creation of incomes and employment, the enhancement of community development, gardening, and agriculture education; the creation of a sense of community and ecosystem support [6].

In particular, urban agriculture (UA) can contribute to the development of greener cities and enhance the urban climate [7]. In general, urban agriculture performs a range of functions, including production, energy conservation, waste management, biodiversity, micro-climate control, urban greening, economic recovery, community socialization, human health, cultural heritage, and educational activities [8]. Most countries have addressed the importance of urban agriculture on numerous occasions. Various studies have shown and acknowledged that there could be sufficient food, proper nutrition, a cost-effective food supply, and reduced food bills derived from urban agriculture [9].

The urbanization process is expanding as the world's population grows and towns' settlements increased. In 2025, 60 to 85% of the world's population is estimated to be urban residents. The pandemic COVID 2019 recently shocked the entire country. A wave of fears over Malaysia's food supply was sent by the Movement Control Order (MCO). Currently, there have been a large number of urban dwellers whose lockouts and threats have turned the global pandemic into gardens and want farmers who have previously relied only on supermarkets for their food. As a result of the worldwide pandemic, lockouts, and subsequent shortages, there needed to be a better food supply near home and gardens, not just places for essence but also future nutritious food supplies.

Problems of food safety sometimes occurred. There are direct health effects of lack of access to fresh food. The Food Research and Action Center in the US has found that low-income families with no access to high-quality fruits and vegetables are 30 percent overweight or obese. On the other hand, urban agriculture can contribute to global food security. On a global scale, urban farms can generate up to 180 million tons of food each year, perhaps 10 percent of the worldwide output of legumes, roots and tubers, and vegetables if fully implemented in cities worldwide.

Despite the undeniable importance of urban agriculture in the supply of food, the study on urban agriculture has also progressed through time from the agronomy and economic side of urban agriculture into the impact of urban agriculture on the communities and societies. A study by [10] was conducted on 1365 city dwellers as respondents in Klang Valley, Malaysia, which focused the survey on identifying factors influencing the intention of city residents to implement urban agriculture. The other studies from [11, 12] investigate the community enrollment in urban agriculture in their neighborhood. [11] had conducted a quantitative study focused on the community perception and participation in urban farming activities in their residential areas.

Meanwhile, qualitative research by [12] has shown that urban community agriculture has become critical in attaining and addressing the full potential of the residential population. The urban community has recommended that the stakeholders provide financial help to allow community farming and ensure household food security. In addition, several studies examined the implementation of urban agriculture in terms of intention factors, policy and socio-economic impacts, the performance of UA extension agents, predicting youth participation [10, 12-15]. More studies are expected to help the urban communities improve their understanding of urban agriculture, particularly in community perceptions and participation, intention factors, socio-economic impacts, extension agents competency, and replacing traditional paper-based products by providing a better quality of urban agriculture reporting.

Regardless of the broad interest in urban agriculture research, the trends in literature, particularly those which employed a bibliometric approach, have been reported relatively limited. However, a study conducted by [16] has reported the trend of the research on urban agriculture in China. The study showed that urban agriculture had received increasing attention in China. The major forces of urban agriculture research are researchers from agricultural universities and agricultural government departments. Besides, agricultural journals have become the leading platforms for the publication of research outcomes. The present research by [16] focuses primarily on four main topics, which are sustainable development and modern agriculture, peri-urban agriculture and agricultural modernization, agricultural production and agricultural construction, recreational and rural integration. The article was mainly about investigating the general situation of the research on urban agriculture in China. According to the findings of the study, urban agriculture research in China is gaining more attention. The following attributes were examined in the bibliometric analysis by [16], such as leading journals published research on urban agriculture, high-frequency authors, high profile institutions, high-frequency keywords, and keyword co-occurrence frequency.

Although there was a study done by [16] about research trends on urban agriculture in China, research on this topic still needs to continue in different perspectives because there is still an area that has not been covered in the previous study. In response to little work exploring the trend of urban agriculture broadly, this paper provides a bibliographical analysis of the publication of '*urban agriculture'* published in the Scopus online database as of March 2021. This paper will provide a clear picture of what is taking place in this field.

This bibliometric analysis on urban agriculture looked at the following attributes based on the research questions: most active source title, document language, number of published articles per year, keywords analysis, title, abstract analysis, and countries contributed, most active institutions, authorship, and citation analysis. The author can envision a recent study of this study area, specifically Malaysia, while working on this paper. This paper will expand on the findings using current resources and instruments. As a result, research questions (RQs) were proposed, and various aspects of the urban agriculture literature were considered in order to address those questions:

RQ1: What is the current publication trend in urban agriculture publications?

RQ2: What are the most popular topics in urban agriculture among scholars?RQ3: Who are the most active and influential contributors in urban agriculture studies?

RQ4: What are the state of collaboration in urban agriculture studies?

METHODS

This paper aims in the context of bibliometric analysis to examine trends of urban agriculture in social science research. This paper will feature some of the bibliometric indicators and network visualization. The process taken to gathered the data is by using Scopus online journal academic database. Scopus is known as the world's

largest abstract and citation database of scholarly works compared to Science Direct, Pubmed, and Web of Science. Curated by independent subject matter experts, Scopus is a neutral source-based abstract and citation database. Scopus places powerful discovery and analysis tools in the hands of researchers, librarians, intuitive research managers, and funders. Scopus provides all metadata provided by 5000 publishers, including the following: author(s), affiliation(s), document title, year, electronic identification (EID), source title, volume/issue/pages, citation count(s), source,document type, and digital object identifier (DOI).

This paper restricted the search of urban agriculture studies based on the title to specify relevant literature on the research domain under consideration. As a result, in the search process, the specific query as per Figure 1 was conducted. In this study, the document type analysis search was limited only to journal articles where it represents 424 articles published on urban agriculture. In addition, several tools have been used to examine the data in the bibliometric analysis. This paper used (1) Microsoft Excel for the calculation of the frequencies of the published materials and design the relevant chart and graph; (2) VOSviewer (www.vosviewer.com) to construct and visualize the bibliometric networks; and (3) Harzing's Publish and Perish software for the calculation of the citation metrics and other frequencies.

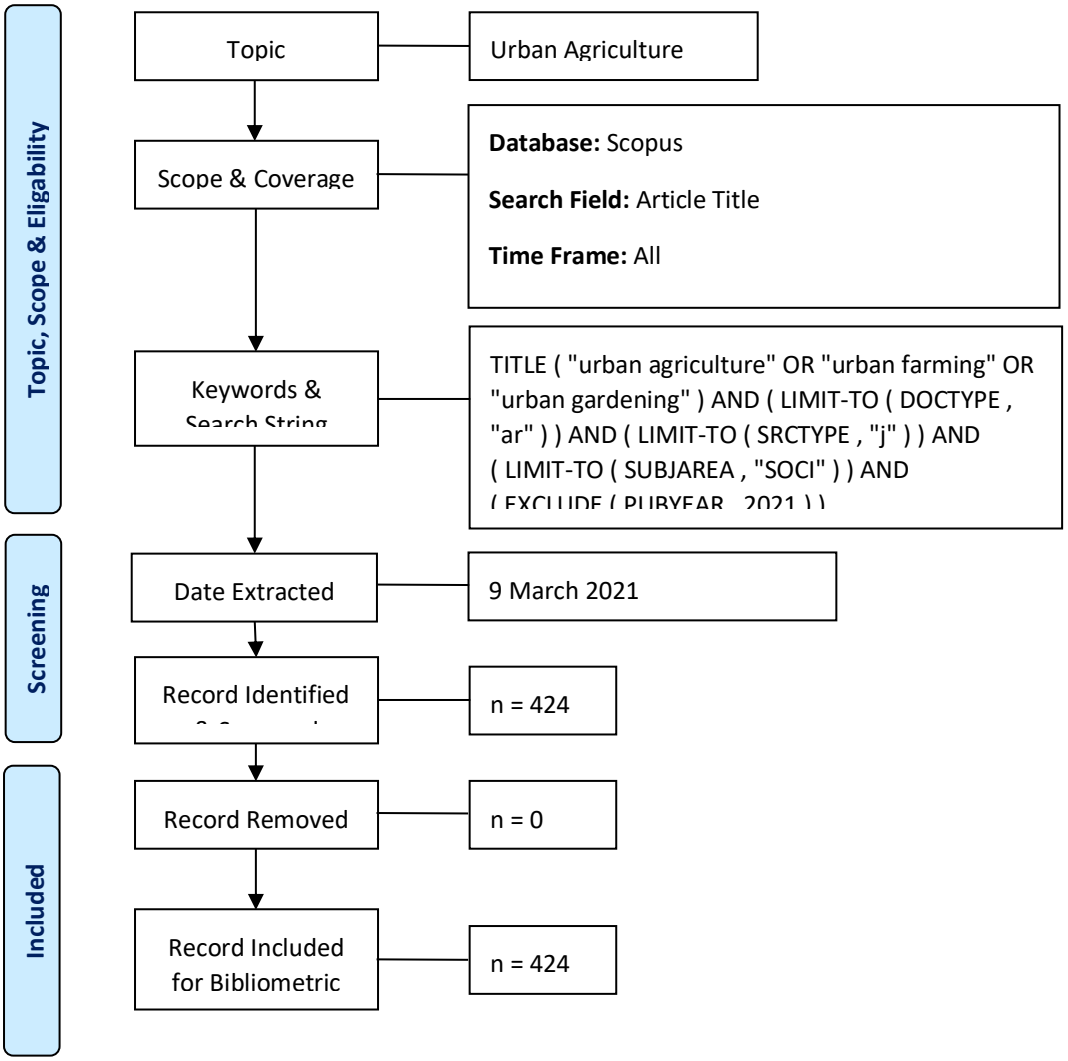

Figure 1. Flow diagram of the search strategy.
Source: [17, 18]

RESULTS

To answer RQ1 (What is the current publication trend in urban agriculture publications?), the study analysis includes the most active source title, document language, and number of published article per year. Most results are shown as frequency and percentage. The data for this analysis is calculated by using the bibliographic data collected from Scopus database.

Most Active Source Title

Urban agriculture studies were published in journal articles under the scope of social science. Table 1 shows that the most active source title on Urban agriculture which have been published based on six or more publications. *Sustainability Switzerland* contributed the most significant number of publications on urban agriculture (*n=33*), followed by *Land Use Policy* (*n=23*) and *Field Actions Science Report* (*n=13).* The publisher information is also reported in Table 1, and Elsevier is among the leading publisher of urban agriculture. More publications in the journal of Sustainability Switzerland could be caused by several factors such as covered study areas, reputation, rapid publication, and wider targeted academic communities. Generally, its publisher has about 85 journals in various fields that have been deemed to be the most influential journals. From the official website, it can be seen that the sustainability's current impact factor, for instance, reaches 3.251 with a 3.9 cite score of Scopus.

Moreover, manuscripts are reviewed by other authors, and a first decision is given to authors 15.4 days after submitting; decisions about whether their work will be accepted for publication are made in 3.9 days. Free access is likely to explain the highest number of published articles on urban agriculture in the journal. While the authors or their respective institutions pay the charges of article processing, the readers can access the article for free. Some authors might want to get a financial advantage from the publication reader, but the rest prefer wider accessibility, thus increasing the impact on science and communities. According to [19], the selection of open access journals appears to be motivated by both publication quality and free access and visibility.

Table 1

Most Active Source Title

Source Title	TP	TC	Publisher	Cite Score	SJR 2020	SNIP 2020
Sustainability Switzerland	33	196	Multidisciplinary Digital Publishing Institute (MDPI)	3.2	0.581	1.165
Land Use Policy	23	587	Elsevier	6.2	1.479	1.717
Field Actions Science Report	13	10	Institut Veolia Environnement	0.4	0.152	0.072
Local Environment	11	367	Taylor & Francis	3.6	0.747	0.978
Development Southern Africa	10	196	Taylor & Francis	1.3	0.384	0.986
Cities	7	207	Elsevier	6.9	1.606	2.454
Moravian Geographical Reports	7	60	Akademie Ved Ceske Republiky	3.9	0.693	1.076
Urban Forum	7	214	Springer Nature	2.3	0.509	0.902
Environment And Urbanisation	6	176	SAGE	5.4	1.409	2.239
Geoforum	6	186	Elsevier	4.7	1.616	1.714

Notes: TP=total number of publications; TC=total citations;

Languages of the Documents

According to Table 2, English is used in most publications in this research domain (392;92.24%). Ten (2.35%) articles have been published in French, eight (1.88%) in Spanish, six in Italian (1.41%), three (0.71%) in Japanese, and two (0.47) in German language. The remaining three are published in Croatian, Portuguese, and Catalan, respectively. In contrast, only one document is presented to be undefined from what language.

Table 2

Languages

Language	Total Publications (TP)*	Percentage (%)
English	392	92.24
French	10	2.35
Spanish	8	1.88
Italian	6	1.41
Japanese	3	0.71
German	2	0.47
Croatian	1	0.24
Portuguese	1	0.24
Catalan	1	0.24
Undefined	1	0.24
Total	425	102.05

*one document has been prepared in dual languages

Research Trends

The research trend was analyzed based on the number of documents published per year. This analysis was based on the year of publication. In 1884, one journal publication was published on urban farming for developed countries by the Australian Planner. The publication was concerned about the scarcity of farmland and largely middle-class desire for cheap organically grown vegetables and fruits of good quality in the US, Japan, and Norway. It also discussed Australia's high-tech farmlands and rural community development. The publication was then followed by [1, 20, 21] for the next two years. A case study on urban agriculture in [22] reported a survey of 250 low-income housing regions showing that almost 60% of the residents grow gardens. Innovative for urban farming as a reaction to a lack of real income and a form of long-term investment. Argue against the harassment and encouragement of cultivators by giving the land used legal title and contributing to productivity increase.

Meanwhile, a study from [23] on Grenoble's peri-urban agriculture had review changes in policy towards agriculture in the rural-urban fringe. The ongoing urban expansion of Grenoble was reflected in a shift from neglect to an essential position in current planning. Since then, the publishing growth has been increased consistently until 2014 and slightly decrease in 2015 and 2016. After that, the number of publications on urban agriculture increased drastically year after year from 2017 till 2020 (see Figure 2). However, the number of publications on urban agriculture showed the highest number in 2019. The analysis of year publication on urban agriculture since 1984 is summarised in Table 3. Based on the research trends examined on the number of urban agriculture publications, the number is expected to rise in 2020, as food security is globally debated due to Covid 19 pandemic outbreak which has a significant impact on the agriculture industry.

The highest number of social science articles has been cited in the years 2014 (973) and 2010 (852). A study by [24]reported three distinct stages in developing the concept of urban agriculture. Urban agriculture is the fundamental principle for urban planning, changing urban agricultural functions, and urban agriculture renaissance. Political, economic, and social factors affect the separation of urban farming stages, as the role of urban agriculture and the spread of urban practices change. From the result in Table 3, 2010 and 2014 are considered the second half of the 20th century-now. The tendencies in urban agriculture are primarily influenced by research in the science field classified system articles in environmental sciences, agriculture, social sciences, and ecology dominates. At the same time, most articles have been published in Europe and North America geographically[24].

Papers published in 2010 and 2014 were cited highly because, in the timespan, urban agriculture plays a profound role in addressing urban food insecurity problems that become increasingly important with a secular trend towards the urbanization of poverty and the population in developing countries. The article with the highest citation is Urban agriculture, poverty, and food security: Empirical evidence from a sample of developing countries by [25]. The second highest citation goes to an article titled radical, reformist, and garden-variety neoliberal: coming to terms with urban agriculture's contradictions by [26]. The article in 2010 got the highest citations because the paper present nationally household survey data for 15 developing countries. Besides, the paper analyzed the importance of urban agriculture for the urban poor and food insecure in a comparative international perspective. The paper also discovers evidence of a statistically significant beneficial relationship between urban agriculture participation and nutritional adequacy indices. The paper by [25] is helpful for the other authors to be referred.

Table 3

Publication per year

Year	TP	NCP	TC	C/P	C/CP	*h*	*g*
1984	1	0	0	00.00	0.00	0	0
1985	1	1	40	40.00	40.00	1	1
1986	1	1	1	01.00	1.00	1	1
1987	3	3	31	10.33	10.33	3	3
1988	1	1	73	73.00	73.00	1	1
1989	1	1	14	14.00	14.00	1	1
1990	1	1	17	17.00	17.00	1	1
1991	2	2	6	03.00	3.00	2	2
1992	1	1	191	191.00	191.00	1	1
1993	4	4	112	28.00	28.00	4	4
1995	3	3	164	54.67	54.67	3	3
1996	2	2	31	15.50	15.50	2	2
1997	3	1	13	04.33	04.33	1	3
1998	6	6	247	41.17	41.17	6	6
1999	2	2	19	09.50	09.50	2	2
2000	3	3	80	26.67	26.67	3	3
2001	4	4	166	41.50	41.50	4	4
2002	5	4	75	15.00	18.75	3	5
2003	2	2	5	02.50	02.50	2	2
2004	2	2	28	14.00	14.00	2	2
2005	2	2	63	31.50	31.50	2	2
2006	6	6	131	21.83	21.83	4	6
2007	6	6	104	17.33	17.33	6	6

2008	8	8	313	39.13	39.13	5	8
2009	13	11	95	07.31	08.64	6	9
2010	13	13	852	65.54	65.54	9	13
2011	14	12	298	21.29	24.83	9	14
2012	20	18	339	16.95	18.83	10	18
2013	19	18	384	20.21	21.33	10	19
2014	30	26	973	32.43	37.42	15	30
2015	28	25	444	15.86	17.76	11	20
2016	28	25	392	14.00	15.68	11	19
2017	47	41	404	08.60	09.85	11	17
2018	45	41	402	08.93	09.80	10	18
2019	49	32	159	03.24	04.97	8	10
2020	48	14	42	00.88	03.00	4	5
Total	**424**	**342**	**6708**	**927.19**	**953.36**	**174**	**261**

Notes: TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; and g=g-index.

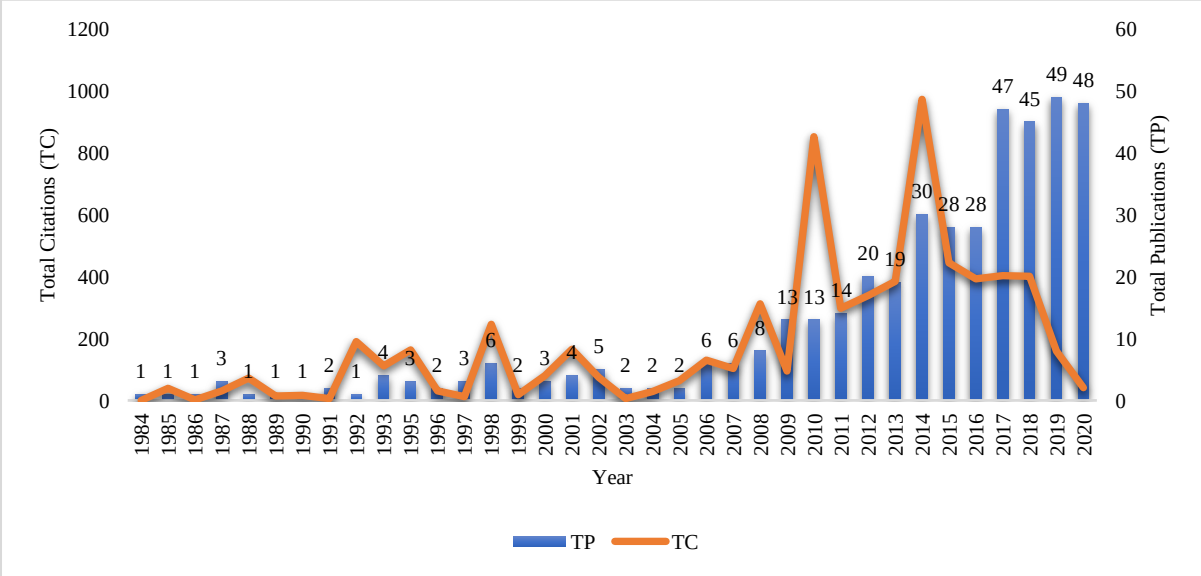

Figure 2. Total Publications and Citations by Year

From 1884 to 2020, publications related to urban agriculture have increased gradually and reached the peak in 2017, 2019 and are expected to rise at the end of 2020. It can be argued that the publication trend follows the situational issues and challenges of global society and its relations to food security and safety. Nowadays, we have encountered an era of disruption. Covid 19 outbreak, as an instance, has challenged the availability and accessibility of food, thus attracting more needs on empirical findings both for better policies and actions. Meanwhile, more articles have been cited in 2014 and 2010 because the years were considered as a part of the second half of the 20th century in terms of stages in the urban agriculture's concept development. In this era, there was a tendency that the concept was largely influenced by research focus in the science field where articles in environmental sciences, agriculture, social sciences, and ecology have dominated. In other words, urban agriculture is no longer perceived as belonging to basic science exclusively, such as soil science or agronomy but also has started to gain recognition from multi-disciplines.

Keywords

To answer RQ2 (What are the most popular topics in urban agriculture among scholars?), this study analyzed the frequency of keywords, title analysis, title and abstract analysis. In terms of keywords analysis, Table 4 summarises the most frequently used words in urban agricultural studies. The result showed that urban agriculture was the most keyword that has been used in publications (*n=282*). After excluding the core keywords connected to the search query, the most often found author's keywords included urban planning, food security, sustainability, urban area, food production, united states, urban farming, and urban development (refer to Table 4).

Table 4

Top Keywords

Author Keywords	Total Publications (TP)	Percentage (%)
urban agriculture	282	66.51
urban planning	59	13.92
food security	52	12.26
sustainability	51	12.03
urban area	40	9.43
food production	35	8.25
united states	34	8.02
urban farming	34	8.02
urban development	32	7.55
sustainable development	25	5.90
periurban area	24	5.66
urban economy	23	5.42
Africa	22	5.19
urbanisation	21	5.19
farming system	19	4.95
South Africa	19	4.95
food supply	18	4.48
land use planning	17	4.48
metropolitan area	17	4.25
agricultural land	17	4.01
agricultural production	16	4.01

The trending words used in conjunction with urban agriculture research are all the words generated by the WordSift program in Figure 3. We can thus predict that these keywords can be concentrated on future urban agriculture research. The figure below indicates that the keyword of urban become the most commonly mentioned word, followed by agricultural, food, policy, and development.

Figure 3. Words generated by WordSift Program

Title and Abstract Analysis

The title and abstract from the documents retrieved based on the number of occurrences and co-occurrences using VOSviewer are examined in this study. Figure 4 shows the co-occurrence network analysis based on title and abstract fields with a minimum of 10 occurrences of a term. [27] stated that the thickness of the joining lines reflects the strength of the association between the terms, while the size of the nodes shows the weight of the terms' occurrence. The corresponding words are often co-occurring together, as indicated by the same colour. The graphic, for example, illustrates that community, process, space, project, nature, interest, and all other green-coloured terms are strongly related and frequently co-occur. VOSviewer has created three different colours to symbolise three clusters containing keywords from the publications' titles.

Based on figure 4, the current themes of urban agriculture are linked to issues of food justice and system, community garden, and sustainable development. Urban dwellers have expressed concern about where and how food is produced and how prices are determined, whether they consider farmers' rights or are primarily set to benefit traders. Moreover, as land in urban areas has become limited while the need for healthy food increases and improves social cohesion among the dwellers, community garden offers a socio-environmental solution. Last, sustainable development has three main pillars; economically sound, socially accepted, and environmentally friendly. Urban agriculture theoretically and practically meets all these. Since global warming and climate change have become an international and regional concern, studies about urban agriculture, climate change, and green infrastructure will be a ripe area for future research. Although climate change mitigation has been implemented everywhere, the likelihood of future weather seems still unpredictable. In other words, we need to lift our current adaptation to cope with any potential impacts and risks of climate change. Combining urban agriculture with apartment structure as an instance will provide the urban people with nutritious food and, to some extent, regulate the local climate system and reduce potential stress for the residents as it generated green views and improved local biodiversity.

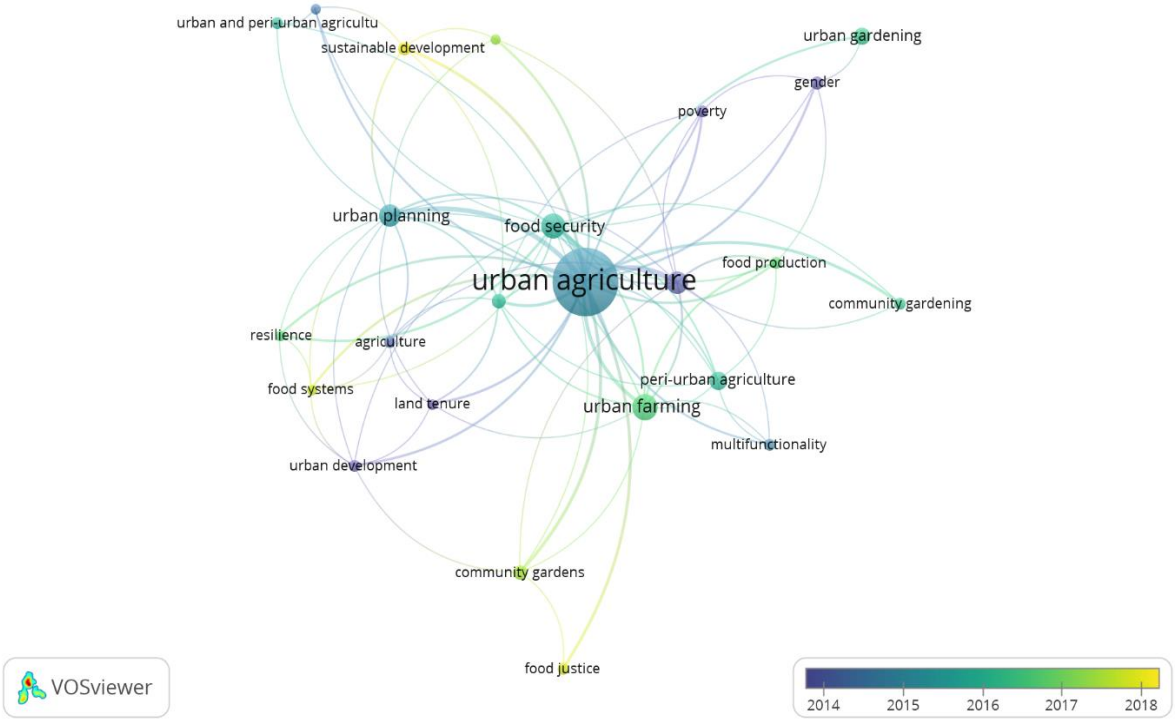

Figure 4. VOSviewer visualisation of a term co-occurrence network based on title and abstract fields (Full Counting)

Geographical Distribution of Publications

To answer RQ3 and RQ4 (Who are the most active and influential contributors in urban agriculture studies and what are the state of collaboration in urban agriculture studies?), we analyzed the top countries contributed to the publications, most active instituitions, most productive authors and identify most cited articles on Urban Agriculture. This paper assesses the number of publications from Scopus produced by countries based on the author's affiliation institution. Thus, 41 countries contributed to the urban agriculture papers in total. According to the results, United States shows the highest publishing country with 90 publications, followed by the United Kingdom, South Africa, Germany, Italy, Canada, France, Australia, Japan, and the Netherlands. All top 10 countries that contribute to the productivity of publications in this research are listed in Table 5. This result is supported by a study from [24]. The study analyzing publishing countries of articles from Scopus and Web of Science database has shown that Europe and North America are leading countries in urban agriculture, while Japan is a leading country in Asia. The majority of the early research on urban agriculture focused on nations in the Global South, where urban food insecurity and poverty are more prevalent than in countries in the Global North ([24]. Future trends in urbanization and food security also point to increased concerns in the Global South; it was estimated in 2016 that by 2020, 85 percent of inhabitants in Latin American cities would be low-income, and 40-45 percent in African and Asian cities [2]. Africa is a location where many studies have been conducted, assessing the function of urban agriculture in poverty reduction and identifying the significant trends in the global south's use of the concept of urban agriculture.

Researchers in developed countries have actively published studies about urban agriculture compared to their counterparts in developing economics due to several reasons related to the general awareness level on health and environmental issues and land availability. As widely known that the perceived issues and problems partly determine the different levels of public awareness. WHO argued that environmental factors, including hazards, become a significant contributor to the burden of death, disease, and disability in developing countries. By contrast, a citizen of developed ones is generally concerned about lifestyle-environmental-related issues such as unhealthy diets. Junk food has become popular among society as people often work on a tight schedule, leaving less time to prepare their food. Aside from the quality issue, most of the food consumed by the people in developed economies, especially in big cities, has been transported from other regions due to less fertile and lack of suitable areas for agriculture. Such phenomenon has attracted attention from academic communities in developed countries to keep promoting urban agriculture that provides healthy food, maintains local climate to the dwellers, and does not require extensive land.

Table 5.

Top 10 Countries contributed to the publications

Country	TP	NCP	TC	C/P	C/CP	h	g
United States	90	77	2138	23.76	27.77	24	44
United Kingdom	41	35	1021	24.90	29.17	19	31
South Africa	36	29	418	11.61	14.41	12	19
Germany	32	27	448	14.00	16.59	11	20
Italy	32	27	754	23.56	27.93	12	27
Canada	30	27	721	24.03	26.70	17	26
France	27	18	320	11.85	17.78	8	17
Australia	16	16	115	7.19	7.19	7	9
Japan	14	11	179	12.79	16.27	6	13
Netherlands	14	10	153	10.93	15.30	7	12

Notes: TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; and g=g-index.

Most Active Institutions

In this paper, the most active institutions also have been analyzed based on research related to urban agriculture with a minimum of six publications. Based on the result counted in Table 6, it shows that The University of Tokyo, Japan has the most publications on urban agriculture. The second highest is the University of Witwatersrand, followed by the University of Otago, the University of Cape Town, and Niigata, Japan. The rest of the most influential institutions are listed as per in Table 6 below.

Table 6

Most active institutions with a minimum of six publications

Institution	Country	TP	NCP	TC	C/P	C/CP	h	g
The University of Tokyo	Japan	11	9	49	4.45	5.44	5	6
University of Witwatersrand	South Africa	9	9	133	14.78	14.78	7	9
University of Otago	New Zealand	8	8	229	28.63	28.63	8	8

University of Cape Town	South Africa	7	5	153	21.86	30.60	5	7
Niigata University	Japan	7	5	18	2.57	3.60	3	4
University of Guelph	Canada	6	6	261	43.50	43.50	6	6
South Westphalia University of Applied Science	Germany	6	6	100	16.67	16.67	5	6
University College London	London	6	6	93	15.50	15.50	4	6
Polytechnic University of Milan	Italy	6	3	18	3.00	6.00	2	4
Portland State University	United States	6	6	378	63.00	63.00	6	6
University Gent	Belgium	6	6	50	8.33	8.33	3	6

Notes: TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; and g=g-index.

Authorship Analysis

In this study, the most productive authors of urban agriculture articles are also presented in Table 7. The most productive authors were listed with at least four publications. The most active authors in this field of research who publish more than five publications on urban agriculture are [1, 12, 13, 17, 20, 26, 28-31] Based on the table below, affiliation and country most of the time connected with the authors. It refers to the authors' affiliations and not to the country in which the research was conducted [27].

Table 7

Most Productive Authors

Author's Name	Affiliation	Country	TP	NCP	TC	C/P	C/CP	*h*	*g*
Kiminami, A.	The University of Tokyo	Japan	9	7	31	3.44	4.43	3	5
Binns, T.	University of Otago	New Zealand	8	8	289	36.13	36.13	8	8
McClintock, N.	Centre Urbanisation Culture Societe	Canada	7	7	566	80.86	80.86	7	7
Pölling, B.	South Westphalia University of Applied Science	Germany	6	6	100	16.67	16.67	5	6
Kiminami, L.	Niigata University	Japan	5	3	10	2.00	3.33	2	3
Rogerson, C.M.	University of Johannesburg	South Africa	5	5	104	20.80	20.80	5	5
Aubry, C.	University Paris-Saclay	France	4	4	119	29.75	29.75	3	4
Delgado, C.	Universidade Nova de Lisboa	Portugal	4	2	15	3.75	7.50	2	3
Furuzawa, S.	Niigata University	Japan	4	3	10	2.50	3.33	2	3
Hovorka, A.J.	Queen's University, Kingston	Canada	4	4	162	40.50	40.50	4	4

Notes: TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; and g=g-index.

Meanwhile, the number of the author(s) per document is shown in Table 8. The table is about the number of authors per article. Based on 424 documents (total publications), there is 135 (31.84%) document that has been written by a single author, and the rest were written by multiple authors with the number of writers ranging from two to eight. There were two documents for which the author's name is were not known and cannot be found in the Scopus database.

Table 8

Number of Author(s) per document

Author Count	Total Publications (TP)	Percentage (%)
1	135	31.84
2	116	27.36
3	94	22.17
4	35	8.25
5	19	4.48
6	14	3.30
7	2	0.47
8	7	1.65
0*	2	0.47
Total	424	**100.00**

*Conference review document. No author is listed.

This study analyses the co-authorship analysis with VOSviewer further in the collaboration of the writers. The analysis is based on authors with a minimum number of three citations and is calculated using the fractional counting approach. The degree of the relationship between the writers is shown by the colour, circle size, text size, and thickness of connecting lines. Connected authors are frequently grouped, as indicated by the same colour. Figure 5 shows the analysis of influential authors with the minimum number of five citations of an author. The analysis also is based on one minimum number of documents and authors and calculated using the fractional counting method. For example, in the diagram, the blue line Orsini F., Gianquito G., Grapsa E., and Sanye-mengual E. cooperated closely and usually conducted research together. The figure also shows that Specht k. and Piovene c. have a group of authors collaborating (colored green and red).

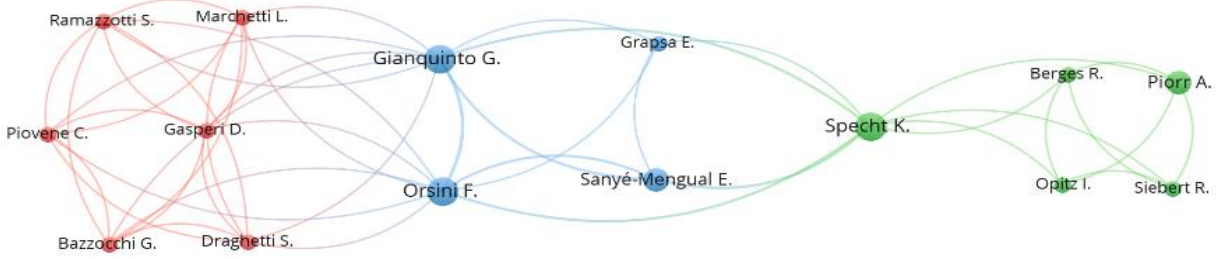

Figure 5. Network visualisation map of the co-authorship based on authors that have a minimum number of five citations and three number of documents (fractional counting)

In addition, Figure 6 also shows the authors' network visualisation map based on their countries. This analysis took into consideration only countries with over three articles and more than five citations. The results show that the United States (US) plays a significant role in collaboration with other countries based on the fractional counting method. For example, the US has collaborated closely with Italy, Uganda, Belgium, and Malaysia. However, United Kingdom appears to collaborate with Nigeria, New Zealand, Portugal, and India.

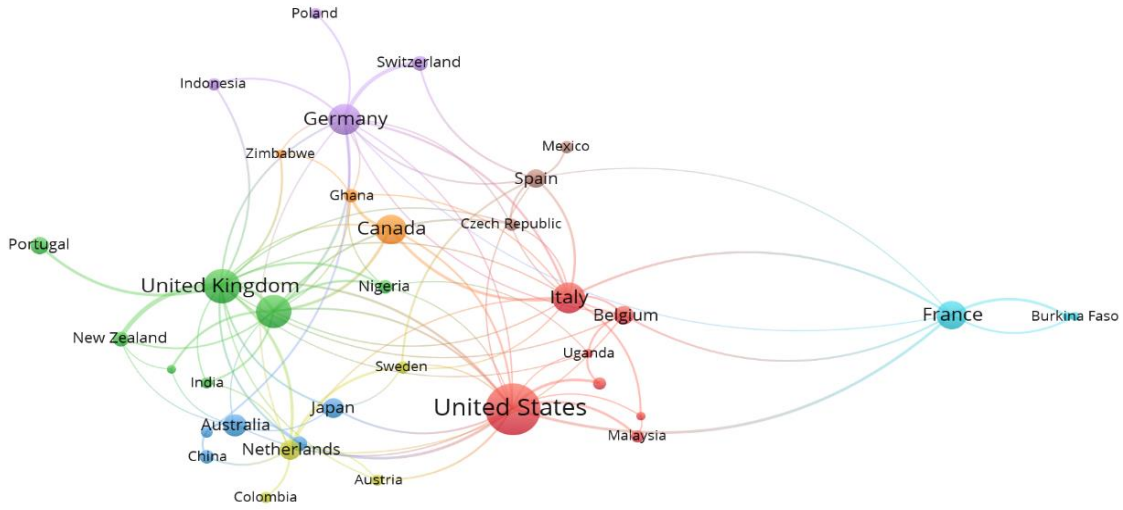

Figure 6. Network visualisation map of the co-authorship based on authors that have minimum number of five citations and three number of documents (fractional counting)

Citation Analysis

The citations for the documents retrieved as of 19 March 2021 are summarised in Table 9. As reported, there are 6708 citations from urban agriculture publications that have been reported in 36 years (1984-2020) for 424 papers retrieved articles with an average of 181.30 citations/year. The citation metrics have been produced by importing the raw citation metrics with - RIS formatted file from the Scopus database to Harzing's Publish and Perish software.

Table 9

Citations Metrics

Metrics	Data
Publication years	1984-2020
Citation years	37 (1984-2021)
Papers	424
Citations	6708
Citations/year	181.30
Citations/paper	15.82
Citations/author	4156.81
Papers/author	240.37
h-index	40
g-index	66

Concurrently, according to the Scopus database, Table 10 below presented the top 20 highly cited publications on urban agriculture (based on the number of times been mentioned). [25] have received the most quotations from the document entitled "Urban agriculture, poverty, and food security: Empirical evidence from a sample of developing countries" with citations 299 or an average of 27.18 citations per year. An article has a high impact factor because it has a high rating in a citation. The article will get many citations as many authors read the paper. [25] paper get the highest cites as the paper has empirical evidence of a positive statistical association between engagement in urban agriculture and dietary adequacy indicators, which the findings might have supported the other authors' findings. The second and third papers also have the highest cites. The same author writes these two papers; [26]. The paper published in 2010 by [29]is about the 'Metabolic rift' as a practical framework in differentiating urban agriculture's multiple origins and functions across the Global North and South. He investigates how UA develops from three interconnected dimensions of the metabolic rift: ecological, social, and individual. UA also attempts to overcome these rift forms by rescaling production, reclaiming vacant land, and 'de-alienating' urban dwellers from their food. Considering all three dimensions is beneficial for both theory and practice. This paper was then continued in 2014 with an explanation of how urban agriculture emerges from a protective countermovement while also entrenching the neoliberal organization of contemporary urban political economies through its entanglement with multiple neoliberalisation processes.

Table 10

Top 20 Highly cited articles on Urban Agriculture

No.	Authors	Title	Cites	Cites per Year
1	[25]	Urban agriculture, poverty, and food security: Empirical evidence from a sample of developing countries	299	27.18
2	[26]	Radical, reformist, and garden-variety neoliberal: coming to terms with urban agriculture's contradictions	246	35.14
3	[29]	Why farm the city? Theorising urban agriculture through a lens of metabolic rift	206	18.73
4	[32]	Urban agriculture for sustainable cities: Using wastes and idle land and water bodies as resources	191	6.59
5	[33]	Critical geography of urban agriculture	159	22.71
6	[34]	Land evaluation for peri-urban agriculture using analytical hierarchical process and geographic information system techniques: A case study of Hanoi	124	9.54
7	[3]	Pictures from the other side of the fringe: Urban growth and peri-urban agriculture in a post-industrial city (Toulouse, France)	120	40
8	[35]	Alternative food security strategy: A household analysis of urban agriculture in Kampala	116	4.46
9	[36]	Exploring the production capacity of rooftop gardens (RTGs) in urban agriculture: the potential impact on food and nutrition security, biodiversity and other ecosystem services in the city of Bologna	110	15.71
10	[37]	Food security in Southern African cities: The place of urban agriculture	90	9

11	[28]	Urban agriculture and land use in cities: An approach with the multi-functionality and sustainability concepts in the case of Antananarivo (Madagascar)	88	9.78
12	[38]	Disparity despite diversity: Social injustice in New York City's urban agriculture system	87	14.5
13	[22]	Cities feeding people: An update on urban agriculture in equatorial Africa	85	7.73
14	[39]	Dynamics and sustainability of urban agriculture: Examples from sub-Saharan Africa	82	7.45
15	[40]	The dynamics of peri-urban agriculture during rapid urbanisation of Jabodetabek Metropolitan Area	80	13.33
16	[20]	Feeding africas growing cities into the 21st century: The potential of urban agriculture	74	3.22
17	[41]	Urban Agriculture: Research Questions and Zambian Evidence	73	2.21
18	[21]	Does urban agriculture help prevent malnutrition? Evidence from Kampala	70	3.04
19	[42]	The Intersection of Planning, Urban Agriculture, and Food Justice: A Review of the Literature	69	17.25
20	[43]	Agro-tourism enterprises as a form of multi-functional urban agriculture for peri-urban development in China	69	6.27

Figure 7 shows the network visualization map of the citations by countries of origin in further detail. Only countries with one minimum number of documents of an author and five citations of an author were considered in this analysis. Based on the fractional counting method, the findings revealed that the most influential countries appeared to be the United States, United Kingdom, Germany, and South Africa. These were the nations where the urban agriculture study authors were most frequently mentioned.

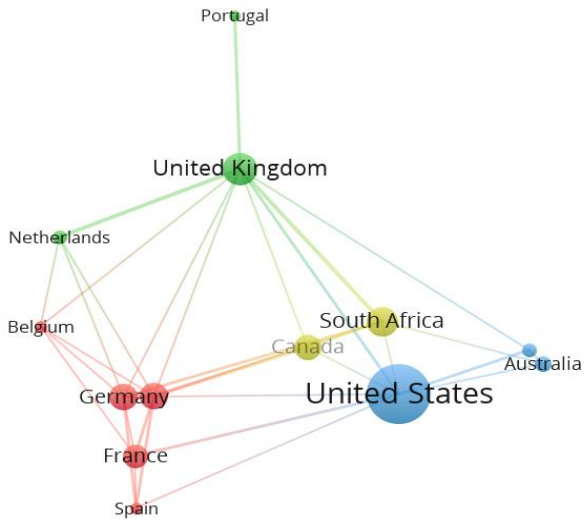

Figure 7. Network visualisation map of the citation by countries that have a minimum of five number of citations and one number of documents (fractional counting)

DISCUSSION AND CONCLUSION

This bibliometric analysis of urban agriculture research improves our understanding of this field of study and has critical advantages for related stakeholders. The previous work review only covered China's perspective, thus providing a narrow picture of the whole urban agricultural aspects. The thorough analyses are, however, beneficial, particularly for researchers both from South and North globes. A researcher, for example, can identify considerable gaps in existing research, plan to collaborate with other authors from anywhere, and suggest possible future research opportunities. Bibliometric analysis can provide insights into the relative influence of studies in a research area and influence the scholars in developing high-impact studies [44]. Moreover, the scholars can assess the quality of a specific research domain and benefit research-related agencies by setting certain policies, especially those about funding availability [45].

Throughout this study, several contributions have been made to the field. Firstly, the research publication trend has been examined in this study area by analyzing yearly publications, most active source title, and authors, country and institutions. Secondly, the most influential studies topic in urban agriculture and productive authors by mapping citation and co-authorship networks could be identified. Thirdly, by using the co-occurrence and co-citation analysis the intellectual structure of the study area has been mapped which could help researchers avoid stagnation and advance the field. Fourthly, this area faces several obstacles that impede its development. Lastly, this paper proposes few recommendations for future potential avenues in this field.

This study recommends that further researchers look at the title of urban agriculture under the scope of pure science research and increasing the number of research on factors that contribute people to execute urban agriculture in their residential. When it comes to food and nutrition security, urban centers are particularly vulnerable because the global population is expected to grow throughout the year. This is due to disruption in the food supply chain, increased physical and economic barriers to accessing food, and the dramatic increase in the amount of food wasted due to labor shortages that have resulted from the COVID-19 pandemic. It means adopting more resilient food systems that reduce waste and boost local agriculture. Home gardening and urban agriculture are essential strategies for increasing availability at the household and community levels. Food and nutritional security during and after the COVD-19 pandemic can be improved through home gardening, and the provision of numerous ecosystem services (i.e., plant biodiversity, microclimate, water runoff, water quality, human health). Thus, there is a need to broaden the scope of research in urban agriculture based on pure science research and social science research, so that any problems and risks regarding urban agriculture could be addressed and overcome.

Additionally, the United Nations has collaborated with countries worldwide to adopt the 2030 agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs). The goals center on eradicating inequality, resolving food scarcity and establishing universally sustainable communities. Thus, following these Sustainable Development Goals, urban agriculture appears to have been used to advance the following objectives: achieving zero hunger (SDG#2), promoting good health and well-being (SDG#3), developing sustainable cities (SDG#11), and promoting responsible consumption & production (SDG#12). Incorporating urban agriculture into communities enables communities to accomplish all of these goals and more. Diversifying urban agriculture research methods and adopting a multidisciplinary approach can strengthen the community's capacity to practice and sustain urban agriculture, thereby eliminating food insecurity.

Bibliometric studies have grown in popularity to show the trend of studies [27]. This study aims to examine the direction of bibliometric analysis in urban agriculture social science research. The productivity of research and publications in specific research fields can be evaluated by employing bibliometric analysis [27]. Thus, this study

focuses on urban agriculture publications collected from the Scopus database. In this study, a search query of 424 documents from the specified database was used. The results show that the Urban Agriculture topic has emerged since 1984 and has increased massively in 2019. The articles were published in the journal of social sciences, and English was adopted as the primary language. While a single author writes 32% of documents, 50% of documents have two to three authors. In terms of contributing authors, the United States had the most, followed by United Kingdom, South Africa, Germany, and Italy.At the same time, the most publications on urban agriculture were by *Sustainability Switzerland,* followed by *Land Use Policy* and *Field Actions Science Report*.

Urban agriculture issues come mainly from social studies and environmental sciences. However, other areas, such as agricultural and biological sciences, earth and planetary sciences, energy, arts, and humanities, also focus on the subject. Meanwhile, the current urban agriculture themes are intertwined with food justice and system issues, community gardens, and sustainable development. This study also shows a higher average number of authors per paper and increased the frequency of publications per annum. In some ways, this trend shows increased cooperation between authors in the field.

Although this article offers valuable insights, the study also has several limitations or constraints that should be addressed to give readers a clear understanding and improve future research. The first findings were based on the title of the document. They are based on the particular keyword, i.e., urban agriculture, which the initial list of scholarly works published as Scopus indexed was used. However, in former bibliometric studies, this practice has been repetitive. Thus, future research probably can broadly use another source of document type it. Besides, although Scopus is one of the largest online databases indexing all scientific works, it does not cover all sources available, and sometimes the search engine is not stable. Some exclusions from this study are therefore highly expected. In addition, no search query can be done 100 percent to capture all the academic activities in this field. As a result, false positive and false adverse outcomes are always expected [46]). Web of Science, Google Scholar, and CABI are just a few of the other databases that could be used in future research. Combining all of these databases will almost certainly result in more interesting and valuable findings [27].

Despite these flaws, this work has added to the body of knowledge by describing the current state of urban agriculture in social science research. This study also adds to and supplements earlier findings on urban agriculture literature by employing a bibliometric method, providing valuable insights into prior material trends. This report offers a bird's eye view of the current urban agriculture research trend around the world.

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