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CHANGING PRIORITIES
IN URBAN FOOD
SECURITY RESEARCH: A
BIBLIOMETRIC ANALYSIS

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Abstract

The study of urban food security has evolved dramatically over the past few decades. This evolution has been punctuated, and catalyzed, by insights into the dynamic transformation of food systems in cities across the Global South. The evolution of this field provides an important vantage point for understanding both the dynamic transformation of urban food systems as well as the lens through which that transformation has been understood. This investigation of the field adopted a bibliometric methodology, blending quantitative and qualitative analytical techniques, to assess the dynamic evolution of the literature over time. The methodology included a quantitative analysis of metadata for 162 publications on urban food security. The results of the analysis provide an overview of research progress, historical and evolutionary trends, geographic disparities, keyword distribution, networks of collaboration, and key thematic foci. The quantitative analysis is complemented with a qualitative examination of top publications in the field. The results present a historical narrative of the evolution of urban food security research. In particular, they indicate that the field has diversified its foci along key distinctions in food access and supply. Within these dimensions, much of the research has centred on discussions on alternative food systems, interpreted through a North-South geographic lens. The findings also identify common strategies and challenges inherent to the governance of urban food systems. In summary, the paper provides a unique vantage point for discovering the evolution of urban food security and the perspectives that have defined that evolution.

Keywords

urban food security, bibliometric analysis, urban food systems, urbanization, alternative food systems

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This is the 53rd discussion paper in a series published by the Hungry Cities Partnership (HCP), an international research project examining food security and inclusive growth in cities in the Global South. The multi-year collaborative project aims to understand how cities in the Global South will manage the food security challenges arising from rapid urbanization and the transformation of urban food systems. The Partnership is funded by the Social Sciences and Humanities Research Council of Canada (SSHRC) and the International Development Research Centre (IDRC) through the International Partnerships for Sustainable Societies (IPaSS) Program.



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Introduction

The concept of food security was birthed primarily within a national security framework with a focus on national self-sufficiency and agricultural productivity (Clapp 2015). Within this paradigm, food insecurity was caused by disrupted food supply, resulting in a risk to national security interests (Barrett 2002, Jenkins and Scanlan 2001). As a result, the main tools used to assess food security in this paradigm were derived from macro-economic assessments of national food supply (Barrett 2010). Amartya Sen's (1980) seminal work on the causes of famine radically altered this paradigm. Sen (1981) proposed that food insecurity was not necessarily the result of disrupted supply but of disrupted access. In particular, he noted through case studies of historical famines that insufficient entitlements were the ultimate root cause of food insecurity. Furthermore, Sen argued that the loci of the food security debate should not be established via nationally aggregated statistics but by individually disaggregated characteristics. Sen's arguments opened the door to a diversity of approaches and conceptualizations of food insecurity.

Food security, defined by the FAO (2006) as the stable access to enough safe and nutritious food to live a healthy life, has evolved with the complexity of modern global food systems. Since the work of Sen, novel approaches to food security research have begun to integrate broader themes from complex systems dynamics (Barrett 2002, Ecker and Breisinger 2012). These approaches have integrated the notions of risk, multi-scalar interactions, and system resiliency in the discussion of food security. As conceptualizations of food insecurity increasingly embraced ideas generated from complex adaptive systems (Holland 1992, Meadows 2008), innovative approaches to understanding the risks, hazards and opportunities of food systems emerged (Ericksen 2008, Fraser 2006). These approaches have broadened understanding of how food security is maintained in an evolving global food system.

One emerging area of research has focused on food security in the context of cities. This urban food

security approach was initially driven by the need to address issues of rising urban poverty and malnutrition accompanying the rapid urbanization of the Global South (Haddad et al 1999, Maxwell 1999, Satterthwaite and Mitlin 2012, United Nations 2014, 2015). This process was demonstrably driving urban livelihoods towards dependence on novel and precarious avenues of income generation (Amis 1995, Godschalk 2003). The rapid urbanization of the Global South also has the potential to exacerbate high population densities and strained infrastructure networks (Frantzeskaki et al 2018, Godschalk 2003). The transition is occurring in a global food system where up to 30% of food is never consumed (and diets have increasingly transitioned to the unsustainable consumption of meat and dairy under the strain of climate change (Brown and Funk 2008, Crush and Frayne 2011a, Godfray et al 2010).

As a result of these pressures, and the new conceptual flexibility afforded by an evolving understanding of food security, the research field of urban food security has been growing steadily over the last decade (Battersby 2013, Crush and Frayne 2011b). The field has bifurcated in two directions: one focused on supply-side dynamics (focusing in particular on issues of urban agriculture, supermarketization, and the informal food system) and one on household food access (under the strains of household poverty, public health issues, rising food prices, and infrastructure access). First, the focus on the supply-side dynamics of urban food security has produced conflicting empirical evidence on the importance of urban agriculture in the maintenance of food security (De Bon et al 2010, Frayne et al 2014, Orsini et al 2013, Zezza and Tasciotti 2010). Studies on the growing dominance of supermarkets in urban food systems have highlighted their implications for household food access, food sourcing, and dietary diversity (Battersby and Peyton 2014, Crush and Frayne 2011, Reardon and Hopkins 2006). At the same time, there has been a growing interest in the contributions of the informal economy to the maintenance of household food security in terms of food supply and employment generation (Battersby and Marshak 2017, Skinner 2008).

Second, studies focusing on urban household food access have taken diverse approaches to the topic. Many of these studies have explored the link between household food security and household poverty (Maxwell 1999, Tawodzera and Crush 2016). Other studies have focused on the urban food security impacts of infectious diseases (Crush et al 2011) and the relationship between urban food security and non-communicable diseases (Demmler et al 2017, NCD-RisC 2019, Smit et al 2016). The 2008-2010 food price crisis prompted several studies on the impact of food prices on urban food security (Cohen and Garrett 2010, Sonnino 2016). In addition to these diverse approaches and foci, there have also been studies linking urban food security more broadly to urban planning and infrastructure access (Frayne and McCordic 2015, Morgan 2013, Pothukuchi and Kaufman 1999).

Recent research has also coalesced around, and challenged, the evolution of the urban food desert concept (forcing it to come to terms with non-western characteristics of urban food security). Since its inception in the 1990s in the United Kingdom, the food desert concept has attempted to formalize the observation that healthy food may be more difficult to access in some urban areas and more in some parts of cities than others (Beaumont et al 1995, Wrigley et al 2003). This concept originally focused on measuring the distance between households and supermarkets (D’Rozario and Williams 2005), but soon focused on the types of food accessed by households and food consumption behaviours in general (Beaulac et al 2009, Bridle-Fitzpatrick 2015). More recently, the concept has evolved to consider the economic, social, and political factors that influence food access (Hosrt et al 2016, Sadler et al 2016, Shannon 2016). This evolution has been forced, in part, by emerging urban food security research from the Global South, which has questioned the aggregated spatial measures of food availability and the limited diversity of food sources originally outlined by Northern notions of urban food deserts (Battersby and Crush 2014).

Despite this body of work, there has been little overall documentation of the evolution of the urban food security field or projection of the likely next

steps in the field’s evolution. The purpose of this paper is to provide such an analysis, identifying the key concepts and paradigms that have defined our understanding of urban food security and systematically documenting the evolution of the sub-field to date. The bibliometric method is particularly well suited for this purpose as an objective measure to rigorously evaluate the scientific literature in a manner that mitigates research bias (Sweileh 2020, Zupic and Čater 2015).

The purpose of this research was to examine how the urban food security field has evolved over the past 30 years. The paper addresses three research questions: (a) which authors, journals, and institutions have most influenced urban food security research? (Research Progress); (b) how have the influential publications in the field shaped understanding of urban food security? (Influential Publications); and (c) how have the conceptual building blocks of the urban food security field evolved over time? (Content Analysis). We use the bibliometrics methodology to answer these questions.

Methodology

Bibliometrics has a long history as a method for objectively analyzing a body of literature (Pritchard 1969). Research adopting the bibliometric methodology has undergone rapid uptake in recent years, with over 55% of all bibliometric studies published since 2015. This has been enabled by the Web of Science, which indexes over 12,000 sources spanning a wide range of disciplinary boundaries. Advancements in computing capabilities and the development of software tools have also facilitated faster and more comprehensive analyses of increasingly large datasets (Aria and Cuccurullo 2017, McLevey and McIlroy-Young 2017, van Eck and Waltman 2010).

In contrast to a traditional literature review, bibliometrics describes the structure of a body of scientific literature using quantitative analysis to study publication patterns based on each article’s metadata (Nakagawa et al 2019). Metadata analysis can

be (a) descriptive, including how many articles have been published and identifying the top authors, journals, institutions, and keywords; or (b) evaluative, examining how authors, articles, journals, or institutions have influenced subsequent research by others. Bibliometrics are thus better suited to documenting and visualizing the evolution of a field of study and consequently, the trends and opportunities for future research. As such, the methodology has benefitted greatly from advances in big data, visualization, text mining, and network analysis.

The analysis was conducted using open-source R software and several packages including Bibliometrix, Tidytext, and ggplot² (Aria and Cuccurullo 2017, Silge and Robinson 2016, Wickham, 2009). We followed Zupic and Čater's (2015) five-step workflow developed by to conduct the bibliometric analysis: determine the research question, compile relevant data, analyze the data, visualize the findings, and interpret the results.

Bibliometric information on journal articles was retrieved from the Web of Science database and Scopus via a systematic search of academic literature relating to iterations of urban food security and various associated keyword queries relating to urban nutrition security, and urban food and nutrition insecurity. The following query was used to sample the journal articles included in the analysis:

TITLE+ABSTRACT+KEYWORD "urban food security" OR "urban nutrition security" OR "urban food and nutrition security" OR "urban household food security" OR "urban household nutrition security" OR "urban household food and nutrition security" OR "urban food insecurity" OR "urban nutrition insecurity" OR "urban food and nutrition insecurity" OR "urban household food insecurity" OR "urban household nutrition insecurity" OR "urban household food and nutrition insecurity"

A total of 362 articles were initially identified for further screening. Three screening measures were applied: the document type was restricted to articles, the language was restricted to English, and the timeline was restricted to pre-2019. Finally, any

duplicates were removed. This resulted in a final sample of 162 journal articles. Metadata, including authorship, journal, and abstract, among others, were exported as a Bibtext file.

To identify the most influential papers in the field, we examined the top manuscripts by citation count and the top cited references in the dataset. By including the top cited references and the reference publication year spectroscopy, the analysis provides more comprehensive and rigorous understanding of the field and its evolution, in contrast to a more traditional literature review. The citation count for the publications used metrics from the Web of Science and Scopus. However, as a cross-check we also include the number of Google Scholar citations for the most influential publications (at the time of writing).

The analysis that follows is limited to these search criteria and to journal articles only. Furthermore, the metrics used in this analysis were exclusively drawn from Web of Science and Scopus. As a result, the generalizability of the findings are necessarily limited by the parameters set by these search criteria. For example, several influential publications including books such as Sen (1981) and published reports were not captured by the search criteria. Additionally, the restricted search queries do not necessarily capture adjacent but relevant fields of study, such as urban supermarkets, urban informal food systems, and urban food deserts.

Research Trends

Literature on urban food security is a niche and nascent sub-field relative to the body of literature on food and nutrition security as a whole (Figure 1). As of December 2019, there were a total of 31,819 journal publications on "food security" indexed to the Web of Science, dating as far back as 1974. Of these, 27,386 (86%) were published between 2010 and 2019, with an average 22% year-over-year growth. This attests to the rapid growth of interest and literature on the general subject of "food security." We also examined the general publication trends associated with the terms "food insecurity",

“nutrition security”, and “nutrition insecurity”. “Food insecurity” is the second most prevalent keyword, with a total of 7,437 journal publications indexed to the Web of Science. This is followed by “nutrition security” with 984 publications and “nutrition insecurity” with 127 publications.

By comparison, “urban food security” and “urban food insecurity” have only 116 and 41 indexed publications respectively on the Web of Science. “Urban food security” thus accounts for less than 0.004% of all publications on food security. Moreover, the very first publication on “urban food security” indexed to the Web of Science is from 1993, 19 years after the first indexed publication on “food security” per se.

The topic of urban food security does show a consistent level of growth in publication numbers since 2000, increasing from just 11 publications in 2000 to 162 in 2019 (Figure 2). A full 85% of the articles were published after 2010. On average, the literature saw a 45% increase year over year. The rapid uptick in related publications attests to the

heightened interest the field has garnered in recent years. In addition to publication counts, research progress may be also measured by total citations (Figure 3). Total citations to date surpass 2,900, again indicating an expanding accumulation of knowledge about urban food security.

We identified 345 separate authors who have contributed to the literature. There is also a greater degree of collaboration over time. The collaboration index (Elango and Rajendran 2012, Koseoglu 2016) was used to calculate the average number of co-authors per article across all multi-authored articles, which rose from 2.0 to 4.87 over the period of analysis. By journal, *Urban Forum*, *Food Security*, *Food Policy*, and *Sustainability* are the most prominent sources, together accounting for 40 (25%) of the 162 articles in the dataset.

The analysis also considered the country where authors of the 162 articles were based (the country of their institutional affiliation). In all, we identified authors from 27 countries represented in this body of literature. The most important were the United

FIGURE 1: Number of Publications on Web of Science for Each Topic

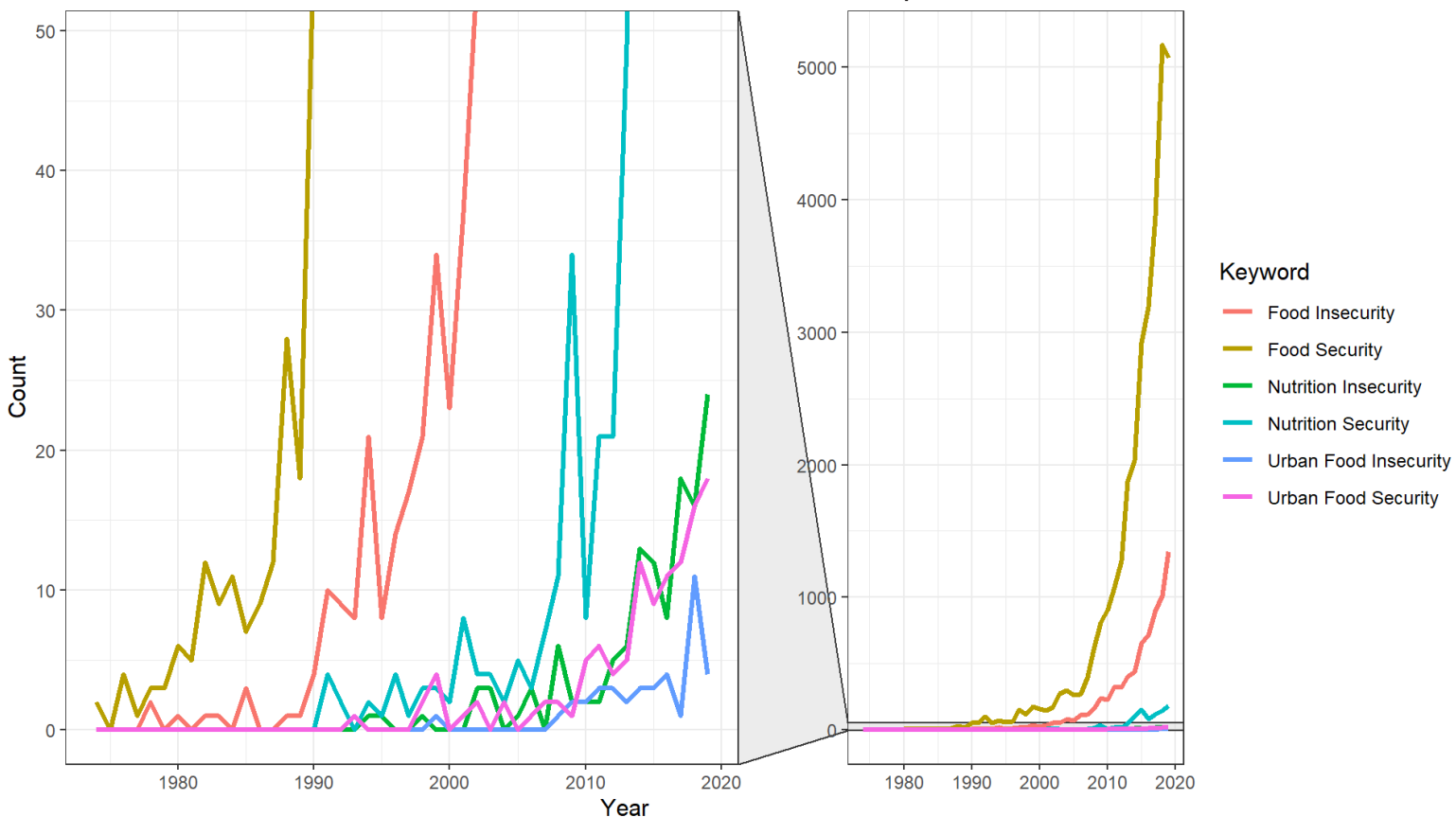


FIGURE 2: Urban Food Security Article Publications

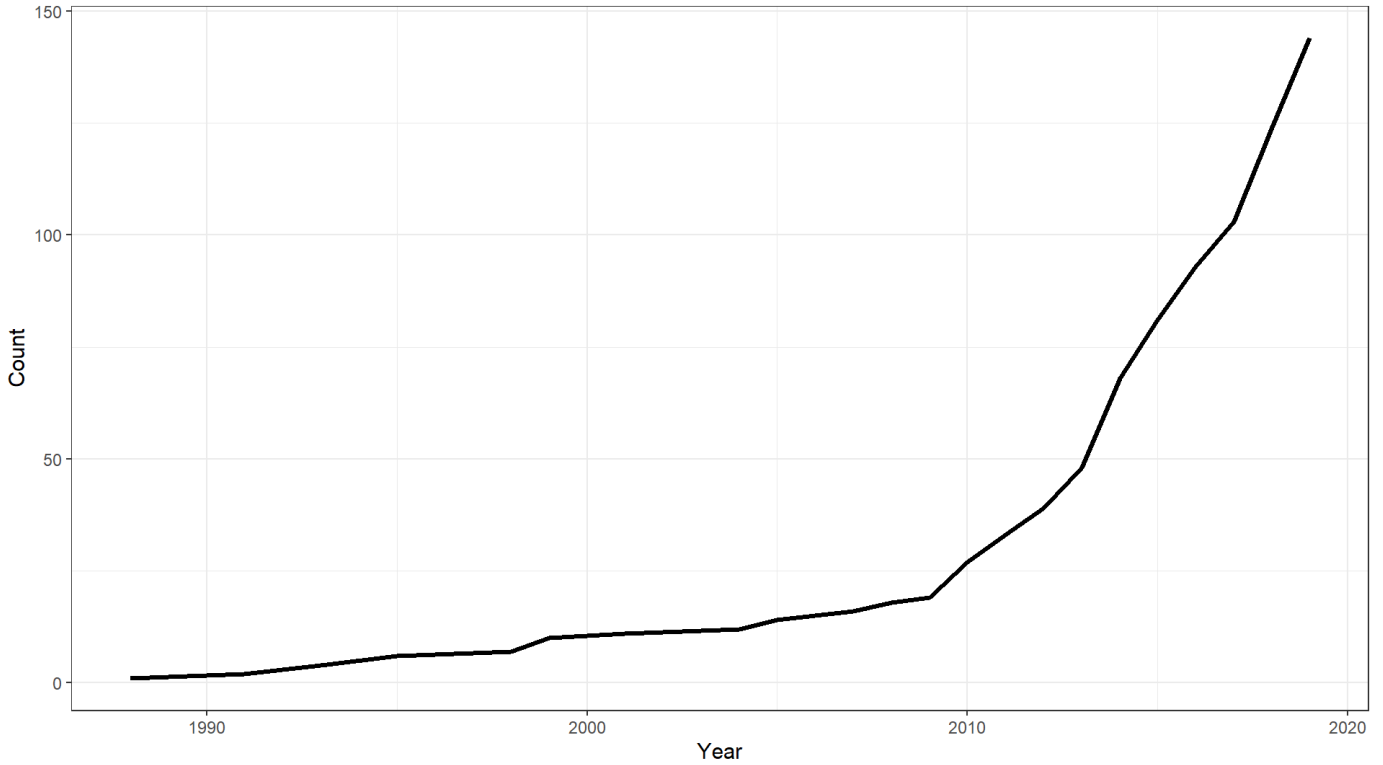
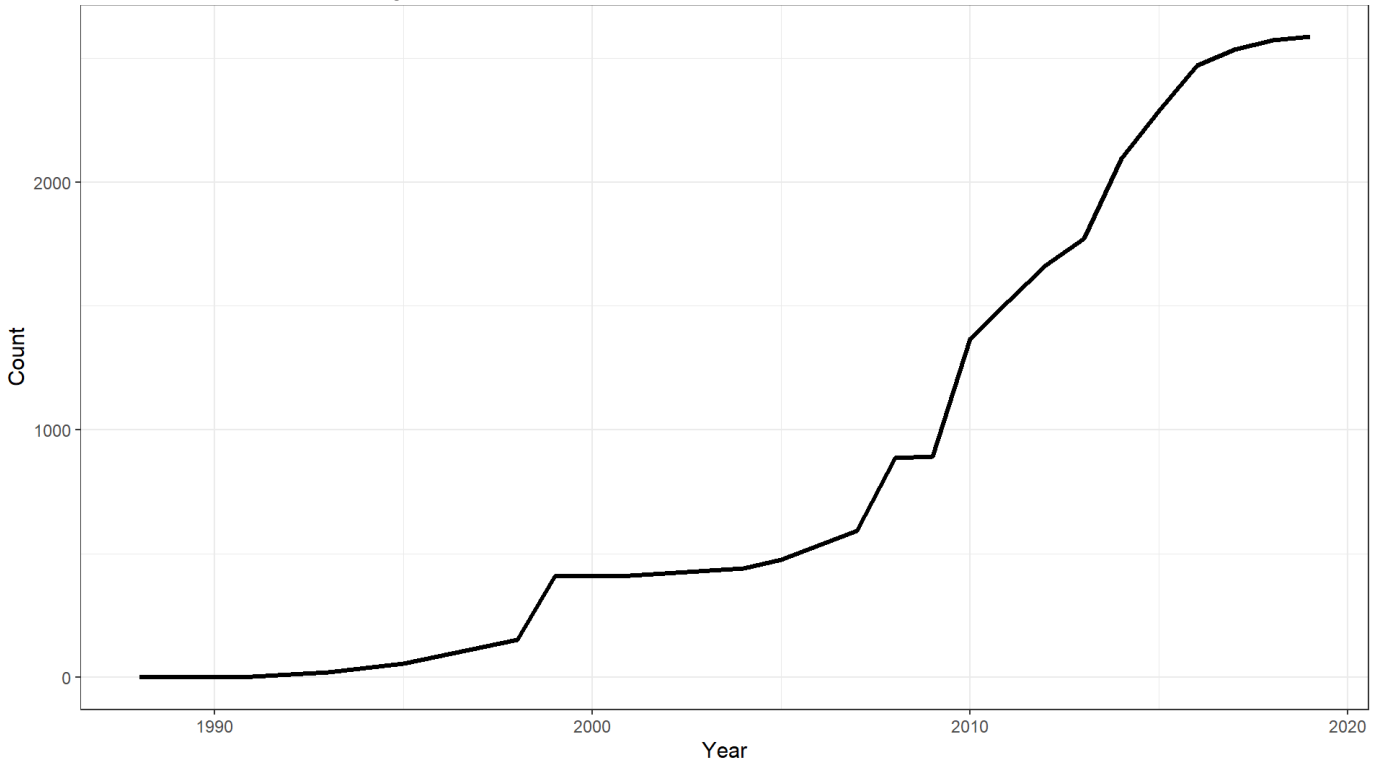


FIGURE 3: Urban Food Security Article Total Citations



States, Canada, and South Africa. However, cross-country collaborations are also on the rise (Figure 4). For example, scholars from Ethiopia, Malawi, Ghana, South Africa, Kenya, and Sierra Leone networked extensively with European and North

American scholars on urban food security publications (Figure 5). The average number of different country authors per article increased from 1 to 2.6 over the period of analysis, indicating more frequent international cooperation in food security research.

FIGURE 4: Articles by Country of Institutional Affiliation of Authors

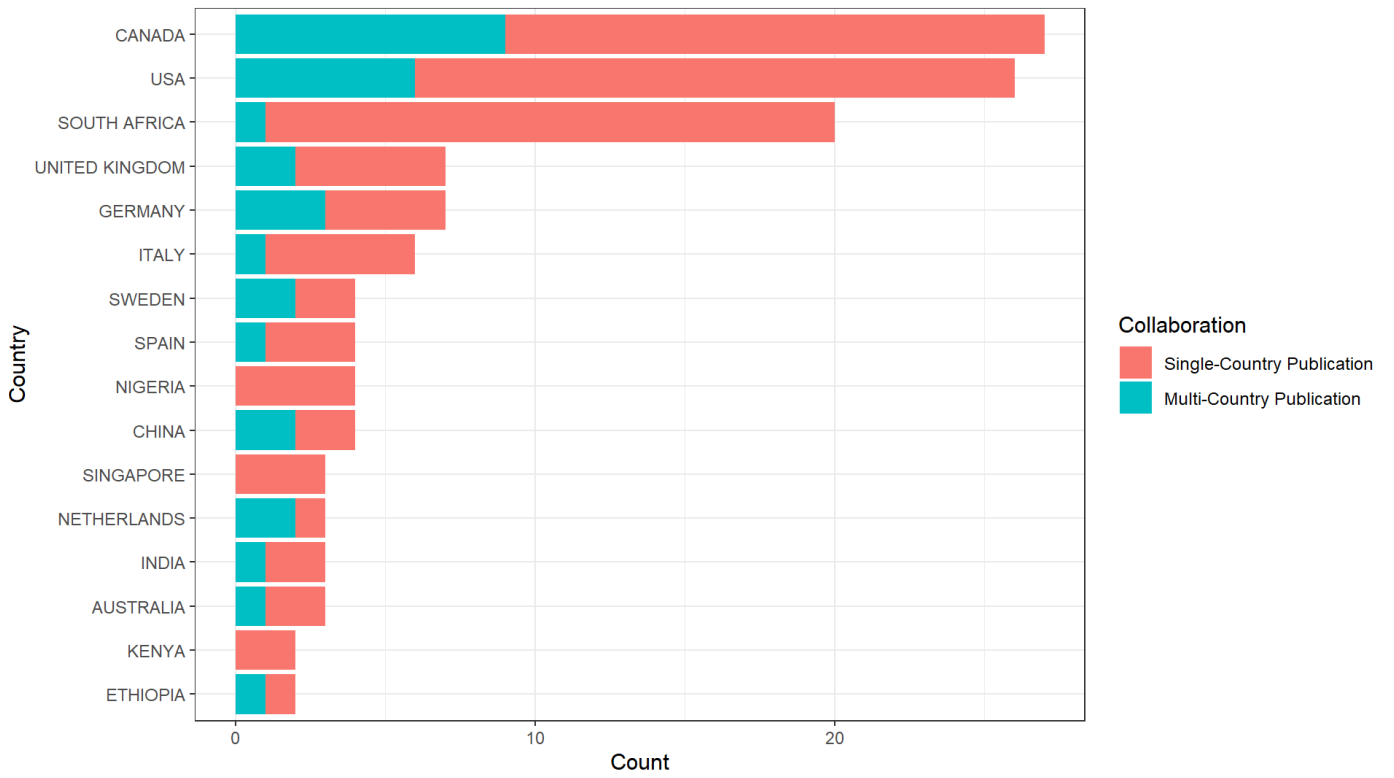
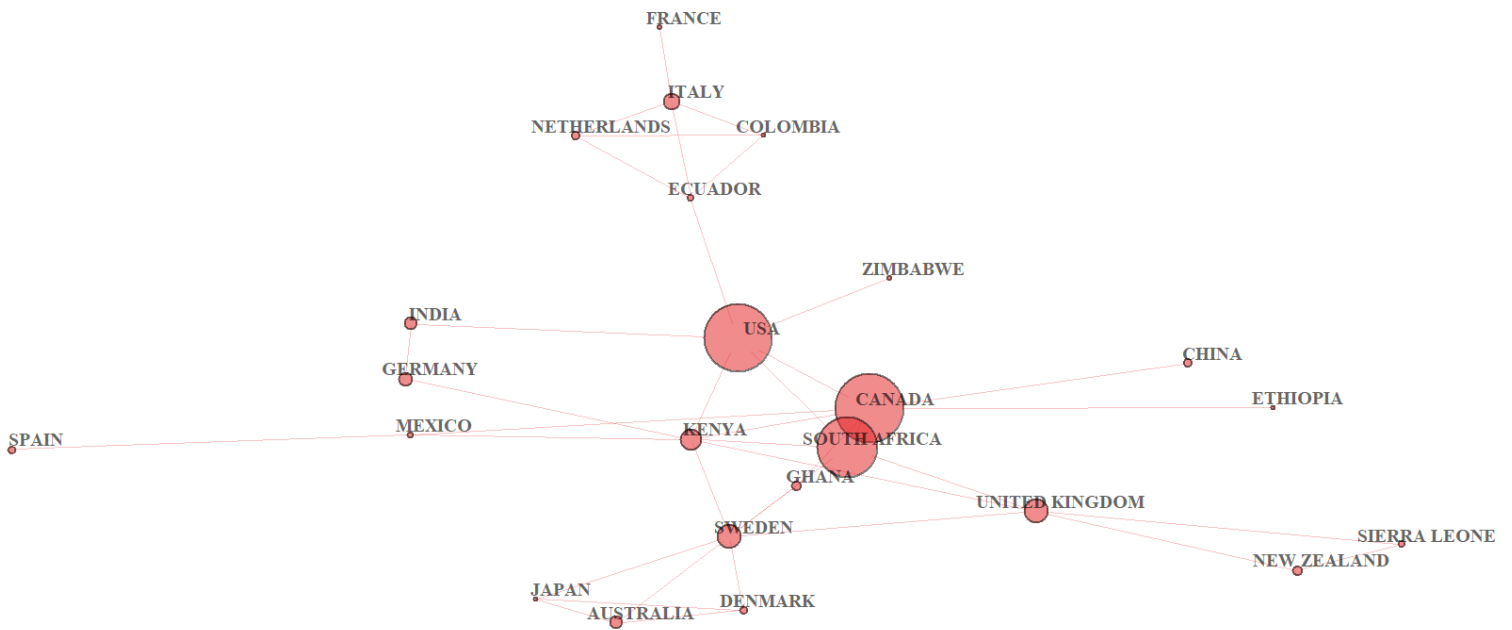


FIGURE 5: Network of Regional Collaborations

Plot



Most Influential Publications

To identify the most influential papers in the field, we examine the top manuscripts by citation count and the top cited references in the dataset. By including the top cited references and the reference publication year spectroscopy, our analysis provides more comprehensive and rigorous understanding of the field and its evolution, in contrast to a more traditional literature review.

First, we identified the top five articles in the dataset by citation count (Table 1). As citation counts tend to favour older publications, we also examined any additional publications with a high number of citations per year since publication (Table 2). Notably, no single publication appears on both lists, which might indicate that the influence of the publications in Table 1 is waning. It also suggests that there has been a shift in the main focus of the literature.

TABLE 1: Top Publications by Total Citation Count

Publication	Times cited	Total Google Scholar citations
Guthman J (2008) Bringing good food to others: Investigating the subjects of alternative food practice. <i>Cultural geographies</i> 15(4): 431-447	284	804
Zeza A, Tasciotti L (2010) Urban agriculture, poverty, and food security: Empirical evidence from a sample of developing countries. <i>Food Policy</i> 35(4): 265-273	229	811
Vermeulen, S. et al (2012) Options for support to agriculture and food security under climate change. <i>Environmental Science and Policy</i> 15(1): 136-144	159	399
Short A, Guthman J, Raskin S (2007) Food deserts, oases, or mirages? Small markets and community food security in the San Francisco Bay Area. <i>Journal of Planning Education and Research</i> 26(3), 352-364	112	295
Ellis F, Sumberg, J (1998) Food production, urban areas and policy responses. <i>World Development</i> 26(2): 213-225	98	321

TABLE 2: Top Publications by Citations per Year

Publication	Times cited	Citations per year	Total Google Scholar citations
Opitz I et al (2016) Contributing to food security in urban areas: differences between urban agriculture and peri-urban agriculture in the Global North. <i>Agriculture and Human Values</i> 33(2): 341-358	64	21.3	235
Russo A et al (2017) Edible green infrastructure: An approach and review of provisioning ecosystem services and disservices in urban environments. <i>Agriculture, Ecosystems and Environment</i> 242: 53-66	36	18.0	119
Orsini F et al (2013) Urban agriculture in the developing world: a review. <i>Agronomy for Sustainable Development</i> 33(4): 695-720	75	15.0	433
Badami M, Ramankutty N (2015) Urban agriculture and food security: A critique based on an assessment of urban land constraints. <i>Global Food Security</i> 4: 8-15	58	14.5	194
Warren E, Hawkesworth S, Knai C (2015) Investigating the association between urban agriculture and food security, dietary diversity, and nutritional status: A systematic literature review. <i>Food Policy</i> 53: 54-66	42	10.5	119

These publications provide a guide to the themes that have dominated the literature on urban food security. The first theme is alternative food practice and food networks, which have dominated thinking about urban food issues in North America (Guthman 2008, Short et al 2007). This literature responds to food justice initiatives aimed at increasing food access in African-American communities and food deserts. The two articles show low uptake of these initiatives by communities, reflecting a general disconnect between proponents and recipients. Alternative food practice is still underpinned by whitened cultural perspectives rather than those of the communities being served. Additionally, alternative food sources in low-income communities are unevenly distributed catering more for the needs of immigrant (African, Latino) neighbourhoods. For increased uptake, they argue, cultural politics must be prioritized in alternative food interventions coupled with an understanding of what is culturally acceptable and the purchasing practices of food desert communities. Research and literature on alternative food networks in the Global South has begun to emerge but has had limited impact to date.

Second, these publications suggest a strong focus in the literature on the potential and shortcomings of urban agriculture in addressing the rising incidence of poverty and food insecurity in cities of the Global South. Two of the five key publications in Table 1 directly address this question (Zezza and Tasciotti 2020, Vermeulen et al 2012) while all five in Table 2 focus on urban agriculture. Urban agriculture is portrayed as capable of contributing to food security in urban areas by supplying high-quality vegetables and animal produce in proximity to poor urban households. However, the publications were more skeptical about how beneficial urban agriculture is for addressing food insecurity and poverty, given that it is generally practiced by established residents and not the newest or poorest urban residents due to lack of access to land or restrictions from municipal bylaws. Zezza and Tasciotti (2010), for example, conducted a comparative analysis of household survey data for 15 developing countries to determine the importance of urban agriculture for the urban poor and food security. They found

that it has a limited correlation to income contribution and overall agricultural production for urban households. Additionally, urban agriculture does not consider the role played by rural-urban interactions in the survival capability of the urban poor (Ellis and Sumberg 1998). The general consensus is that policies should be approached cautiously, contextually, and be backed by livelihood opportunities and growth of the formal economy to ensure the welfare of the urban poor.

From the more recent literature cited in Table 2, the discussion on urban agriculture has also expanded to address this from a Global North perspective and defining peri-urban agriculture as an aspect of urban agriculture (Opitz et al 2016). In recognition of rapidly expanding urban settlements, peri-urban agriculture is described as agriculture on the fringes of urban areas. Although a systematic review of urban-agriculture literature shows a positive correlation with food security in urban households in some studies, others showed no correlation (Warren et al 2015). This is partially because of differences between the Global North and Global South. Apart from contributing to food security, urban agriculture and peri-urban agriculture in the Global North provides a profession, recreation, supplemental income, and health and community development benefit, unlike in the Global South where it is mostly for subsistence (Opitz et al 2016). Badami and Ramankutty (2015) show that in some high-income countries in Europe and North America, devoting less than 3% of urban land to urban agriculture and peri-urban agriculture would produce more vegetables than they require. In contrast, some low-income countries in Sub-Saharan Africa with dense urban populations and high levels of poverty would require more than 100% of the urban land available to grow the required vegetables (Badami and Ramankutty 2015).

A major challenge for urban agriculture identified in both the Global North and Global South contexts is land availability (Opitz et al, 2016, Badami and Ramankutty 2015). Some address this by researching strategies for food supply using rooftop gardening and edible green infrastructure (Orsini et al 2014, Russo et al 2017). Urbanization

drives land-use changes with huge carbon dioxide emissions and rooftop vegetable gardens, and edible green infrastructure typologies (edible urban forests, school gardens, allotment gardens, home gardens) can potentially provide avenues for fresh vegetables and mitigate climate change. For example, Bologna's rooftops could produce about 77% of the city's vegetable requirement (Orsini et al, 2014). These approaches are mostly not applicable in Global South urban contexts, which are characterized by informality and roofing systems incompatible with gardening.

To address one of the limitations of the methodology, the restricted sample and focus on journal articles, we identified the most highly cited publications (including non-journal articles) within the reference lists of articles in the overall sample. Because the overall sample includes publications to 2019, this method helps identify more recent publications that are having a growing impact on the field. Cross-checking with Google Scholar confirms that the publications in Table 3 enjoy considerable influence within and outside the sample as well as in related fields. Notable is the inclusion of Coates et al's methodological report on measuring food security, which reflects an emerging concern

that has continued to the present on how best to measure the different dimensions of food security.

An emerging area of focus evident from Table 3 is on other dimensions of food security, including food access (Crush et al, 2011) (Table 3). This is part of a broader critique of the international policy emphasis on small-farmer agricultural production in food security interventions, rather than the growing implications of urban food insecurity (Crush and Frayne 2011a, 2011b). An important finding is that a key driver of food insecurity in poor urban households is the inaccessibility and unaffordability of food (Battersby 2011, Cohen and Garrett 2010). Food is the largest expenditure item of the urban poor, who access food through informal food systems where food is purchased more frequently and in smaller quantities though with higher prices (Cohen and Garrett 2010, Crush and Frayne 2011a). Additionally, the relationship between expanding formal food systems, such as supermarkets and the informal urban food economy, is beginning to be explored. Research examining the implications of formal-informal food system interaction and urban food security is still limited (Cohen & Garrett 2010, Crush and Frayne 2011a).

TABLE 3: Top Cited References by Articles in the Overall Sample

Publication	No. of articles citing publication	Total Google Scholar citations
Zeza A, Tasciotti L (2010) Urban agriculture, poverty, and food security: Empirical evidence from a sample of developing countries. <i>Food Policy</i> 35(4): 265–273	14	811
Coates J, Swindale A, Bilinsky, P (2007) <i>Household food insecurity access scale (HFIAS) for measurement of household food access: Indicator guide</i> (Version 3). Washington, D.C.: Food and Nutrition Technical Assistance Project	11	1352
Crush J, Frayne B (2011a) Supermarket expansion and the informal food economy in Southern African cities: Implications for urban food security. <i>Journal of Southern African Studies</i> 37(4): 781–807	9	232
Battersby J (2011) Urban food insecurity in Cape Town, South Africa: An alternative approach to food access. <i>Development Southern Africa</i> 28(4): 545–561	8	145
Cohen M, Garrett J (2010) The food price crisis and urban food (in)security. <i>Environment and Urbanization</i> 22(2): 467–482	8	439
Crush J, Hovorka A, Tevera D (2011) Food security in Southern African cities: The place of urban agriculture. <i>Progress in Development Studies</i> 11(4): 285–305	8	243
Crush J, Frayne B, Pendleton W (2012) The crisis of food insecurity in African cities. <i>Journal of Hunger & Environmental Nutrition</i> 7(2-3): 271–292	8	116
Crush J, Frayne B (2011b) Urban food insecurity and the new international food security agenda. <i>Development Southern Africa</i> 28(4): 527–544	8	206

Content Analysis

To evaluate how the conceptual building blocks of the field have evolved over time, we began with a simple keyword analysis of articles in the sample, based on the authors’ own keywords. Figure 6 shows some notable clusters of keywords. Most obvious is the focus on urban agriculture once again. Also relatively important are keywords relating to food systems, a perspective of increasing importance in the urban context. Other notable keywords relate to poverty and nutrition. Finally, there is a distinctly African focus in the sample, with a regional focus on South Africa and Nigeria.

We also analyzed the article abstracts for two-word combinations (excluding combinations such as food security and food insecurity, which are ubiquitous) to give greater nuance to the content analysis (Figure 7). Poverty – in the form of low-income and poor households – were particularly common, confirming that much of the literature on urban food security is focused on the broader context of the drivers of urban poverty. Nutrition – in the

form of dietary diversity – was also important. The geographical focus of the literature was also evident with sub-Saharan Africa, global south and southern Africa most common.

A keyword co-occurrence network of the entire sample (Figure 8) maps the top 80 keywords based on the relative frequency they occur and clusters the key words using multiple correspondence analysis (MCA) to draw out underlying structures of common concepts. The MCA identifies several prevalent clusters: (1) food security related to food supply, production, malnutrition, and obesity in the urban and South African contexts; (2) agriculture in relation to policy, management, and food systems; and (3) poverty in the context of urbanization, vulnerability, and gender.

To take the analysis further, we turned to strategic diagrams that parse key words based on their relative importance to the topic (Cobo et al 2011). Thematic trends are categorized based on their word centrality (how important a word is to the research field) and word density (how developed the word is in the research field).

FIGURE 6: Author Keyword Indexed Terms

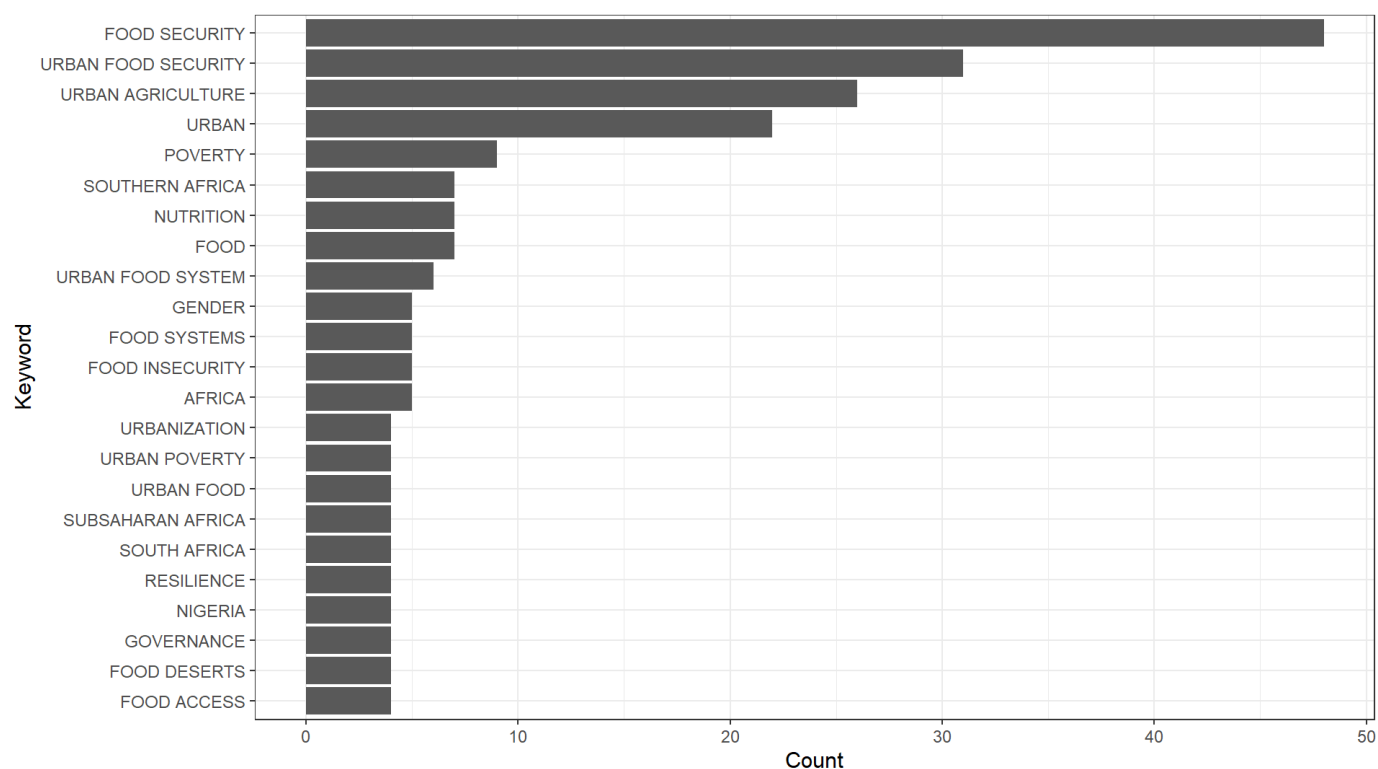


FIGURE 7: Top Combinations of Words in Abstracts

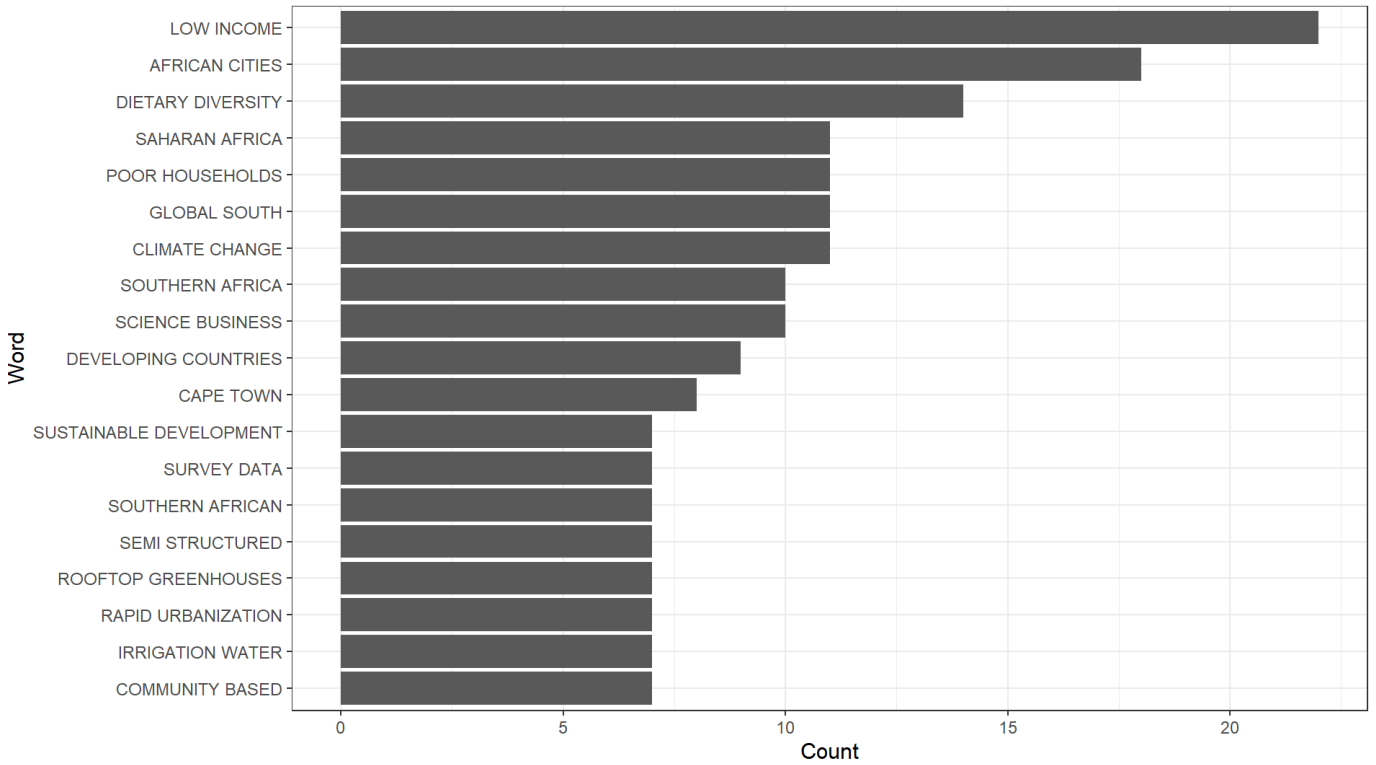
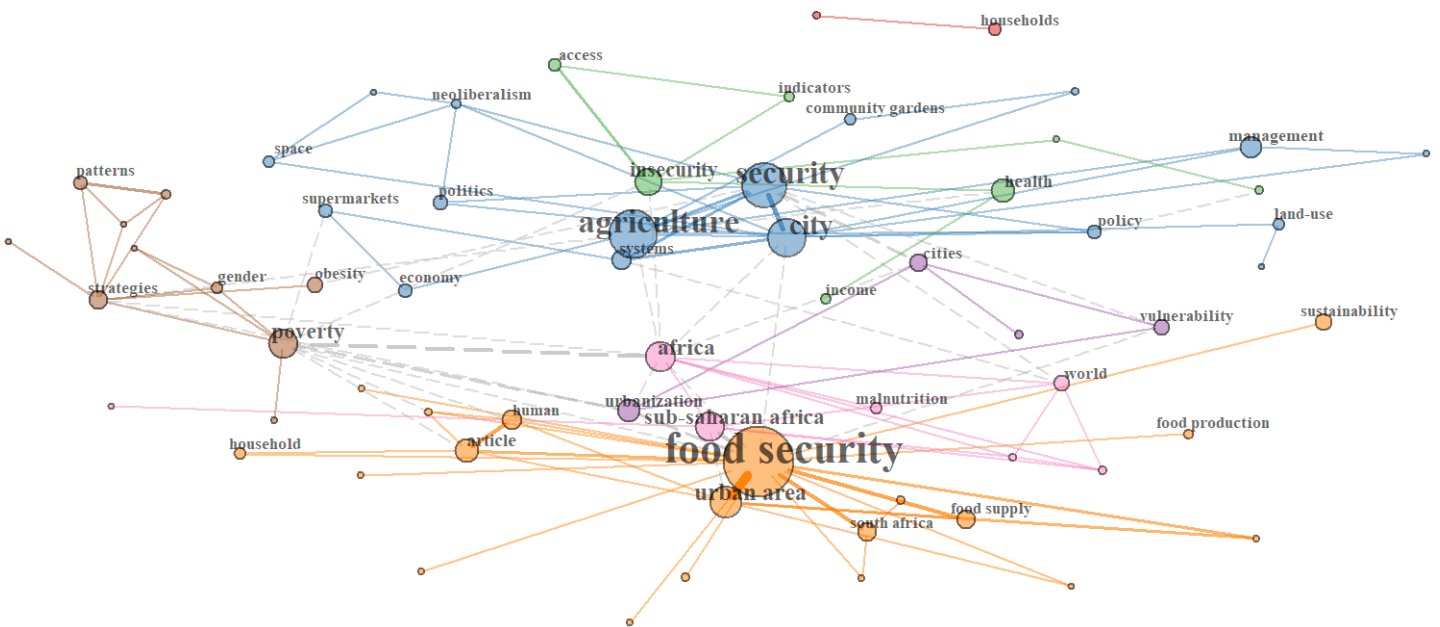


FIGURE 8: Keyword Clusters



The strategic diagrams can also be used to examine the evolution of the field over time. Figure 9 shows the strategic diagram for publications prior to 2014. In the upper left quadrant are highly developed but isolated themes. Here, for example, we find specialized literature on consumption. In the bottom-left quadrant are weakly developed and marginal themes, such as topics around health and cities. Notably, clusters may also include other keywords – for example, other words in the “city” cluster include politics, government, systems, and security. In this strategic diagram, these words are among the least important to the field of research. To the bottom

right are basic and transversal themes, which are important to the development of the research field but are not sufficiently developed. Notably, topics of food security in relation to nutrition and income are found here. This quadrant alludes to opportunity for future research as highly relevant to the body of literature, but could be further developed as the nascent field matures. Finally, to the top right are motor clusters, which are both well developed and important to the field of research. We find here that themes related to agriculture, food supply, urban areas, and poverty are highly specialized and foundational to the literature.

FIGURE 9: Strategic Diagram 1988-2014

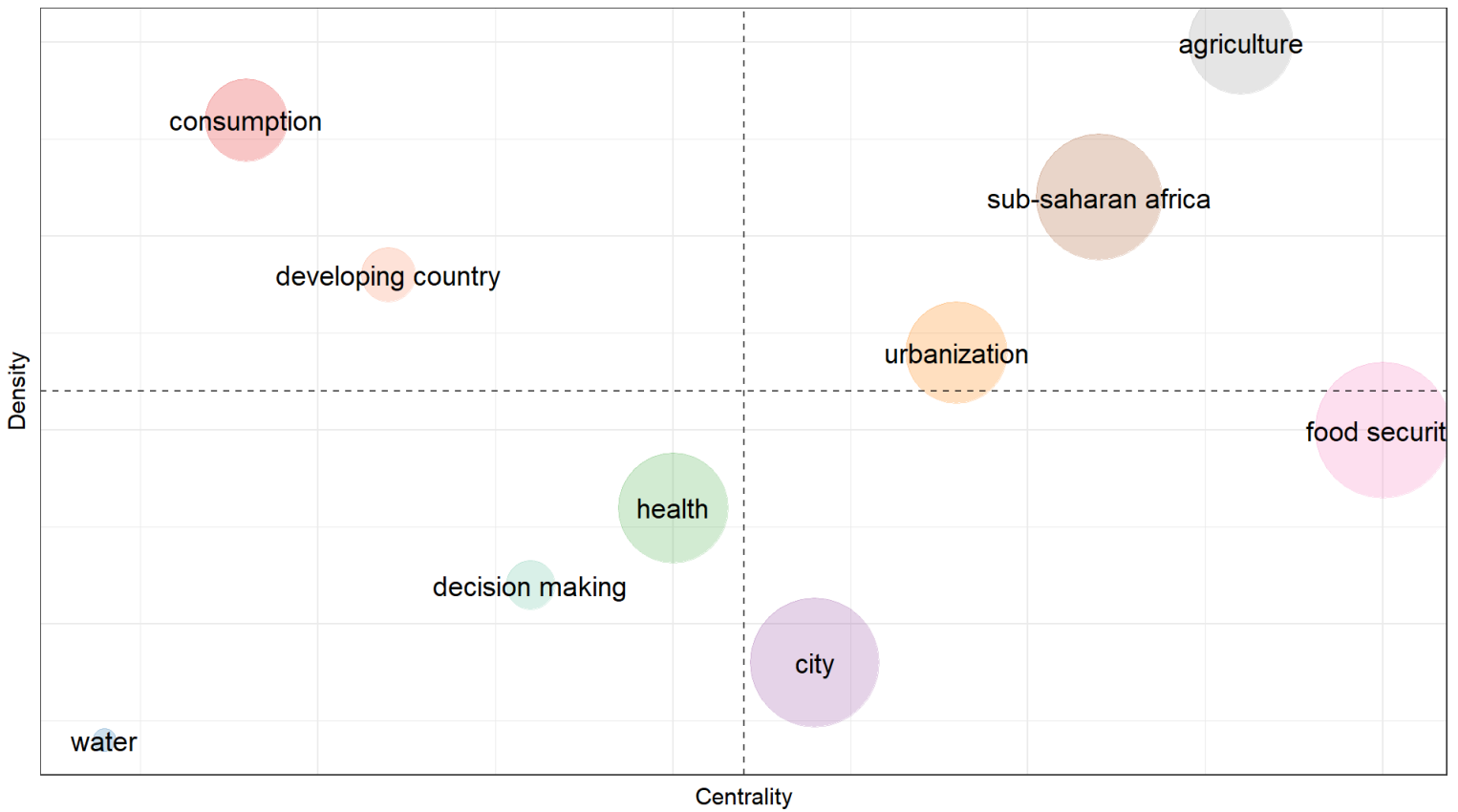


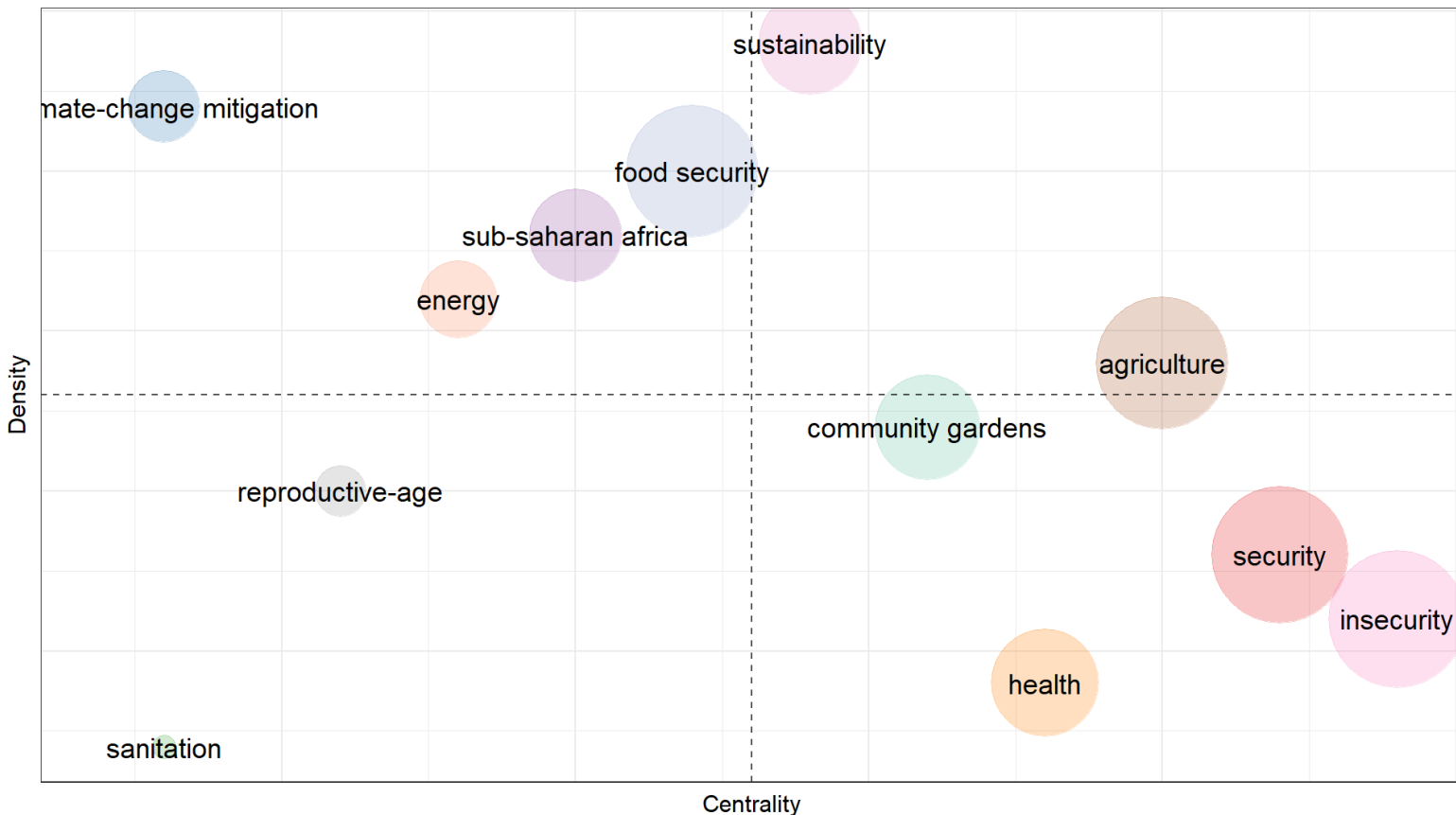
Figure 10 presents the strategic diagram for publications from 2014 to 2019 and shows that there has been a substantial evolution in the importance of select topics. Topics related to food security (such as food availability, food safety, and urbanization) have developed considerably in terms of centrality and density. The topic of agriculture (in relation to access and management) has in contrast, fallen in density. New clusters like community gardens have risen, attesting to a potential shift in urban agriculture discourse from developing countries to developed countries. Finally, discourse around sustainability has proved to be increasingly important to the field of urban food security.

in recent years. Until recently, most of the literature focused on urban agriculture although with a geographical shift from urban agriculture in the South to peri-urban agriculture and community gardening in the North. Recent shifts indicate a growing concern with other dimensions of urban food security including food access, nutrition, and poverty with cross-cutting themes of gender, climate change, and sustainability. This shift may recognize a greater alignment between SDG2 (Zero Hunger) and SDG11 (Sustainable Cities) in the Sustainable Development Goal framework. In other words, urban food system approaches to food security are becoming more common and being increasingly analyzed through a sustainability lens (linking urban food security to broader discussions of sustainable urban development). Potential emerging key research clusters concern urban food supply and health, poverty and vulnerability, and food system approaches.

Conclusion

The analyses provided by this paper document the rapid growth of urban food security literature

FIGURE 10: Strategic Diagram 2015-2019



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