

Review paper

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URBAN AND PERI-URBAN AGRICULTURE IN BURKINA FASO AND NIGER: A BIBLIOMETRIC ANALYSIS

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ABSTRACT

Urban and peri-urban agriculture (UPA) has been recently put forward as a means to address many challenges such as food insecurity, climate change and poverty. This is particularly relevant in developing countries, facing the dramatic consequences of these challenges, such as Burkina Faso and Niger in Sahelian West Africa. Research is needed for the development of UPA. However, comprehensive analyses about the landscape of research dealing with UPA are oftentimes lacking especially in developing countries. In this context, the present review provides a bibliometric analysis of the scholarly literature addressing UPA in Burkina Faso and Niger. It draws upon a search performed in June 2022 on the Web of Science. The bibliometric analysis focuses on sources/journals, research areas, authors and organisations/affiliations. It suggests that while interest in research on UPA is increasing, the annual output of articles remains low. Furthermore, the research field is quite multidisciplinary but mainly falls under the area of agriculture thus focusing on biological and environmental sciences, while social sciences and economics are generally overlooked. The analysis also shows that a large share of studies on UPA is carried out by scholars affiliated with universities and research centres based outside Burkina Faso/Niger and even West Africa, especially in Germany. This might denote the weakness of the research system and the lack of structured research projects/programs on UPA in both countries. Investments in research, development and innovation are needed to bridge the existing knowledge gap and unlock the potential of UPA in addressing the challenges that both countries face. Since challenges and opportunities are quite similar, multi-country and regional research programmes on UPA would be highly beneficial in the Sahel and West Africa.

Keywords: *urban agriculture, urban food systems, Sahel, West Africa, bibliometrics.*

INTRODUCTION

Urban and peri-urban agriculture (UPA) can be defined as “an industry that produces, processes and markets food and fuel, largely in response to the daily demand of consumers within a town, city or metropolis, on land and water dispersed throughout the urban and peri-urban area, applying intensive production methods, using and reusing natural resources and urban wastes, to yield a diversity of crops and livestock” (UNDP, 1996). Several studies suggested that UPA can contribute to addressing many challenges. Indeed, UPA has several environmental, social and economic benefits. From the socio-economic point of view, it contributes to food and nutrition security (El Bilali et al., 2013; Levasseur et al., 2007; Orsini et al., 2013), livelihoods and income generation (Levasseur et al., 2007; Orsini et al., 2013) as well as social inclusion and reduction of gender inequalities (El Bilali et al., 2013; Orsini et al., 2013). From the environmental standpoint, UPA has positive effects in terms of waste reduction and recycling (Orsini et al., 2013), biodiversity conservation (Orsini et al., 2013), air quality improvement (El Bilali et al., 2013; Orsini et al., 2013) as well as the reduction of the environmental impacts related to food transport and storage (Orsini et al., 2013). However, several constraints hamper the development of urban agriculture in developing countries; these relate, inter alia, to insufficient government support, difficult market access, insecure land tenure, limited access to production factors/inputs, and inequality issues (Houessou et al., 2020).

The multifaceted benefits of UPA are particularly relevant for developing countries facing different sustainable development challenges such as Burkina and Niger, two landlocked countries in Sahelian West Africa. Both countries have low human development (UNDP, 2019) and are affected by multiple forms of malnutrition (FAO et al., 2021). Agriculture, with a significant contribution to the gross domestic product (GDP) and employment (World Bank, 2021), is extensive, poorly mechanized and vulnerable to climate change (El Bilali, 2021b). Climate change represents a challenge for agriculture (Mainardi, 2011; USAID, 2017) and is also an important driver of poverty, livelihoods vulnerability and food insecurity (El Bilali, 2021a).

Research is needed for the development of UPA. Nevertheless, despite its numerous benefits and recognised potential to help addressing several challenges, comprehensive analyses about the landscape of research dealing with UPA are oftentimes lacking especially in developing countries. In this context, the present review provides a bibliometric analysis of the literature on UPA in Burkina Faso and Niger.

METHODS

The paper draws upon a systematic review of all documents indexed in the Web of Science (WoS) and follows the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) (Moher et al., 2009). A search was performed in June 2022, using the following search string: (*urban OR city OR town OR ville OR urbain*) AND (*agriculture OR farming OR garden OR horticulture OR*

growing OR animal OR élevage OR pastoralism) AND (Burkina OR Niger OR Sahel OR “West Africa” OR “Afrique occidentale” OR “Afrique de l’Ouest”).* Three inclusion/eligibility criteria were considered: geographical coverage (viz. the document deals with Burkina Faso and/or Niger); thematic focus (viz. the main topic is UPA); and document type (viz. only journal articles, book chapters or conference papers were selected; letters to editors, commentaries, notes and/or reviews were excluded). Only documents that met all three criteria were considered eligible and included in the review.

The search on WoS returned 524 documents. However at first, 190 documents were screened out based on the titles as they do not refer to Burkina Faso and/or Niger; documents covering wider geographical areas (e.g. Sahel, West Africa, Sub-Saharan Africa,) or those where the geographical scope is not reported in the title were kept for further scrutiny. Secondly, additional 256 documents were excluded based on the abstracts not meeting at least one of the inclusion/eligibility criteria. Finally, 8 documents were discarded after the analysis of full texts, including reviews. Therefore, 70 documents were included in the systematic review.

The selected articles underwent a bibliometric analysis focusing on sources/journals, research areas, authors, affiliation organisations and affiliation countries. Also an analysis of the geography of research on UPA (cf. where research was performed) was carried out. Both analyses were informed by the methodology used by El Bilali (2021).

RESULTS AND DISCUSSION

The analysis of the selected documents suggests that the annual output of articles fluctuates a lot from one year to another; in the considered period (2001-2022), it ranges from nil in some years (2003, 2004) to a maximum of 12 in 2019 followed by 10 in 2012. Meanwhile, the average annual output in the period 2001-2022 is very low viz. about 3 documents per year. The peak in the number of publications in 2019 might suggest that interest in research on UPA is increasing.

As for *sources*, the analysis of the results (Table 1) shows that the maximum number of articles was published in *Nutrient Cycling in Agroecosystems* (7 articles) followed by the *Journal of Plant Nutrition and Soil Science* (4 articles) and *Landscape and Urban Planning* (4 articles). Nevertheless, the findings of the research on UPA in Burkina Faso and Niger were published in 45 further sources and journals, which suggests that there are no specific publication outlets. The majority of the selected articles (40 articles, 57.1%) can be linked to the *research area* of agriculture. Further important research areas include environmental sciences - ecology (22 articles, 31.4%), science technology (8 articles), urban studies (8 articles) and geography (6 articles). However, the selected documents can be categorized in 27 research areas – including public administration, veterinary sciences, food science technology, physical geography, plant sciences, anthropology, sociology, biotechnology, business economics, development studies, forestry, nutrition dietetics, parasitology and zoology – which shows that research on UPA is multidisciplinary. It can be argued that while biological and

environmental sciences are sufficiently addressed, social sciences and economics are generally overlooked. The bibliometric analysis shows that the most prominent, productive *authors* in the research field are Andreas Buerkert (29 articles, 41.4%), Eva Schlecht (18 articles, 25.7%), Désiré Jean-Pascal Lompo (10 articles, 14.3%) and Luc Hippolyte Dossa (7 articles, 10.0%). However, the fact that many authors have only one article dealing with UPA in Burkina Faso and/or Niger might indicate a lack of consistency in the research field i.e. even authors dealing with the topic do that in a sporadic rather than a systematic way. This, in turn, might be due to the absence of structured research projects/programs on UPA in both countries.

The analysis of *affiliation countries* suggests that the most active country in the research field is Germany (42 articles, 60.0%). Interestingly, slightly more than half of the selected documents (36 articles, 51.4%) are authored by Burkinabe researchers. Affiliation West African countries also include Ghana (10 articles), Benin (6 articles), Nigeria (3 articles), Mali, Niger and Senegal (2 articles each). However, many publications are authored by researchers based outside West Africa; either in Africa (e.g. Cameroon, Kenya, Madagascar, Tanzania, Zimbabwe), Europe (e.g. Austria, Belgium, England, France, Italy, Netherlands, Sweden, Switzerland), North America (e.g. USA, Canada) or Oceania (e.g. Australia). This shows, on the one side, that there is a network of researchers working on UPA from different countries but might be, on the other side, considered an indicator of the weakness of the agricultural knowledge and innovation system (AKIS) in Burkina Faso and, especially, Niger.

Many of the prominent *organisations* in the research field are based outside Burkina Faso/Niger and even West Africa, especially in Germany. These organisations include the University of Kassel (Germany), University of Gottingen (Germany), Ruhr University Bochum (Germany), Université Catholique Louvain (Belgium), Wageningen University and Research (Netherlands), INRAE (National Research Institute for Agriculture, Food and Environment - France), University of Freiburg (Germany), University of Natural Resources and Life Sciences (Austria) and CIRAD (Agricultural Research Centre for International Development - France). The most relevant funding agencies are also based in Germany (e.g. Federal Ministry of Education Research – BMBF, German Research Foundation - DFG, Volkswagen, Federal Ministry for Economic Cooperation and Development - BMZ, German Academic Exchange Service - DAAD). There are also some international organisations and regional research centres dealing with research on UPA such as CGIAR (Consultative Group on International Agricultural Research), *Centre International de Recherche-Développement sur l'Élevage en Zone Subhumide* (CIRDES) and International Water Management Institute (IWMI). However, many organisations in Burkina Faso/Niger or West Africa are active in research on UPA in Burkina Faso (e.g. *Institut de l'Environnement et de Recherches Agricoles* – INERA, University Ouaga I Pr Joseph Ki-Zerbo, Univ. Polytech Bobo Dioulasso, Univ. Dedougou), Benin (e.g. University of Abomey Calavi), Ghana (e.g. University for Development Studies, University of Ghana) and Nigeria (e.g. Ahmadu Bello University).

Table 1. Bibliometrics of the analysed literature: top ten journals, research areas, authors, countries and organizations.

Journals/sources (a*)	Research areas (b*)	Authors (c*)	Countries and territories (d*)	Organisations (e*)
Nutrient Cycling in Agroecosystems (7)	Agriculture (40)	Buerkert A. (29)	Germany (42)	University Kassel (36)
Journal of Plant Nutrition and Soil Science (4)	Environmental sciences - Ecology (22)	Schlecht E. (18)	Burkina Faso (36)	University Gottingen (19)
Landscape and Urban Planning (4)	Science technology (8)	Lompo D. J. P. (10)	Ghana (10)	INERA (12)
Cahiers Agricultures (3)	Urban studies (8)	Dossa L. H. (7)	Belgium (7)	Univ. Joseph Ki-Zerbo (12)
Sustainability (3)	Geography (6)	Diogo R. V. C. (6)	Benin (6)	Ruhr University Bochum (8)
Agricultural Systems (2)	Public administration (5)	Marschner B. (6)	France (6)	CGIAR (7)
Environment and Urbanization (2)	Veterinary sciences (5)	Stenchly K. (6)	Netherlands (6)	University Abomey Calavi (6)
Human Ecology (2)	Food science technology (4)	Abdulkadir A. (5)	Austria (3)	Univ. Polytech Bobo Dioulasso (6)
International Journal of Agricultural Sustainability (2)	Physical geography (4)	Akoto-danso E. K. (5)	England (3)	Univ. Dev. Studies (5)
Land Use Policy, Outlook on Agriculture, Tropical Animal Health and Production (2)	Plant sciences (4)	Compaore E., Nyarko G. (5)	Kenya, Nigeria, Switzerland, USA (3)	Université Catholique Louvain, Wageningen University (5)

* Figures in brackets refer to the number of documents by a journal (a), research area (b), author (c), affiliation country (d), or affiliation organization (e).

The analysis of the geography of the research on UPA shows that the lion's share of the documents deals with Burkina Faso; indeed, 59 out of the 70 selected documents (84.2%) deal with Burkina Faso, either separately or with other countries. Meanwhile, only 13 documents (18.5%) address urban agriculture in Niger. Only a few documents deal with UPA in both countries (Brinkmann et al., 2012; Cissé et al., 2005). There are also some regional studies that encompass different West African countries: Benin, Burkina Faso and Ghana (Probst et al., 2012); Benin, Burkina Faso, Côte d'Ivoire, Mali, Mauritania, Niger and Senegal (Cissé et al., 2005); Burkina Faso and Ghana (Akoto-Danso et al., 2019; Manka'abusi et al., 2020); Burkina Faso, Ghana and Mali (Bellwood-Howard et al., 2021); Burkina Faso, Mali and Nigeria (Dossa et al., 2015); and Burkina Faso, Mali, Niger and Nigeria (Brinkmann et al., 2012). In the case of Burkina Faso, the

focus is mainly on the two largest cities in the country viz. Ouagadougou and Bobo-Dioulasso.

CONCLUSIONS

To the best of our knowledge, this is the first paper that provides a comprehensive overview of the landscape of research on UPA in Burkina Faso and Niger by analysing the bibliometrics of the research field. The analysis of the selected literature suggests that interest in research on UPA in Burkina Faso and Niger is increasing but the annual output of articles remains low. While research on UPA is mainly within the research area of agriculture, it is linked to 27 research areas, which shows that it is rather multidisciplinary. However, the focus is mainly on biological and environmental sciences, while social sciences and economics are generally overlooked. The scrutiny of authors, affiliation countries and affiliation organisations suggests that a large share of studies on UPA is carried out by researchers affiliated with universities and research centres based outside Burkina Faso/Niger and even West Africa, especially in Germany (e.g. University of Kassel, University of Göttingen, Ruhr University Bochum). This might denote the weakness of the research system in Burkina Faso and, especially, Niger. Moreover, the funding of the research on UPA is dominated by foreign agencies, especially from Germany. This, in turn, might indicate the absence of structured research projects/programs on UPA in both countries. Meanwhile, the analysis of the geography of the research on UPA shows that the lion's share of the selected documents deals with Burkina Faso. Only a few documents address UPA in both countries or West Africa. In the case of Burkina Faso, the focus is mainly on Ouagadougou and Bobo-Dioulasso.

So that UPA contributes to addressing the many challenges that both countries face – such as food insecurity and malnutrition, climate change and poverty – investments in research, development and innovation are needed. In this regard, the present paper sets the table and prepares the ground for such an endeavour as it provides a baseline for future research in the field. It shows the research gaps but also the institutions and researchers that have been active in the field and that can be approached and involved in future research programmes. In general, since challenges and opportunities are quite similar, regional programmes on UPA would be highly beneficial in the Sahel and West Africa regions.

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