

Review paper

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RESEARCH ON AGRICULTURE AND FOOD IN MAURITANIA: A BIBLIOMETRIC ANALYSIS

Hamid EL BILALI^{1*}, Tarek BEN HASSEN²

¹International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM-Bari), Valenzano (Bari), Italy

²Program of Policy, Planning, and Development, Department of International Affairs, College of Arts and Sciences, Qatar University, Doha, Qatar

*Corresponding author: elbilali@iamb.it

ABSTRACT

The transition towards sustainable agriculture and food systems is necessary to address many challenges, such as food insecurity, climate change, and poverty. Research is highly needed to bring about such a transition. However, comprehensive analyses of the research landscape are often lacking, especially in developing countries. In this context, the present review provides a bibliometric analysis of the scholarly literature addressing agriculture and food in Mauritania. It draws upon a systematic review of 44 eligible articles retrieved through a search performed in June 2023 on the Web of Science. The analysis underscores many weaknesses of the research field: the annual output of articles is low; it focuses on environmental sciences to the detriment of social sciences and economics; more than three-quarters of the selected papers, despite dealing with Mauritania, do not involve any Mauritanian scholars; many of the prominent organisations are based outside Mauritania, especially in Europe, North America, and Oceania; the top ten affiliations include only two Mauritanian organisations; the most relevant funding agencies are based abroad; it focuses on crop production agriculture subsector and production stage of the food chain. However, there has been an increase in the number of publications, which might suggest an increase in interest in research on agri-food, and the research field is multidisciplinary. Promoting agri-food research is crucial to address the multiple challenges that Mauritania faces and facilitate the transition towards sustainable and resilient agri-food systems. Research in the field is also essential to unlock the potential of the agri-food sector in Mauritania.

Keywords: *Agronomy, Food system, Sahel, West Africa, Bibliometrics.*

INTRODUCTION

Mauritania has approximately 4.4 million inhabitants, and 41% of the population lives in rural areas. The country is still highly reliant on agriculture for the food security and livelihoods of its population. Indeed, data from the World Bank (2023a) show that agriculture still has a high contribution to the gross domestic product (20.2% in 2020) and employment (31% in 2019). Mauritania produces

only 15 to 20% of the food it consumes, but the agricultural sector has significant development potential. Arable land represents less than 1% of the surface area of Mauritania and is under increasing pressure. Furthermore, evidence shows that the impacts of climate change will be high in West Africa and the Sahel. Predominantly rain-fed agriculture is highly vulnerable to climate variability (Sultan & Gaetani, 2016). Increasing temperatures, shifting rainfall patterns, and an increase in the frequency of extreme weather events threaten food production and disrupt traditional farming methods. The country's vulnerability is worsened by its high degree of poverty and reliance on 'climate change sensitive' sectors such as fisheries, mining, and livestock (World Bank, 2023b). Further, like most countries in the Sahel, malnutrition is a recurring public health problem in Mauritania with an impact on human potential. Indeed, food insecurity and malnutrition are still significant challenges in the country. The State of Food Security and Nutrition in the World 2022 (FAO et al., 2022) shows that the prevalence of undernourishment in the total population is still relatively high (10.1% over the period 2019–21). The situation is even more alarming considering the prevalence of moderate or severe food insecurity, which reached 45.3% over the same period.

Challenges relating to food insecurity, land degradation, and climate change show the urgent need to transition towards a sustainable and resilient food system in Mauritania. To enable the transition to sustainability, while taking serious account of environmental considerations associated with the impact of climate change, many food system activities must be transformed, particularly in the sustainable management of natural resources and the maintenance of biodiversity, and a multitude of actors must be sensitised and trained. There is also a need to act locally, together with the civil society and private sector. Mauritania is fully committed to the transformation of its agri-food system. In its national roadmap for food system transformation (Anonymous, 2021), Mauritania refers to the promotion of agroecology and agro-pastoral practices that respect the environment and organic farming. Furthermore, it highlights the importance of growing and sourcing food locally. Research is crucial to bring about such a transition. However, a recent literature review in West Africa (cf. Burkina Faso and Niger) suggests that, despite the recurring discourse on agroecology, there is a research gap (El Bilali et al., 2022). This gap in research and knowledge might hamper the development of the agroecological movement as well as the documentation and dissemination of agroecological practices, thus slowing down the whole agroecological transition process. Another recent study concludes that organic farming is relatively young in West Africa, and there is a considerable research gap in countries such as Mauritania (El Bilali, 2021). In this context, the present review provides a bibliometric analysis of the scholarly literature dealing with agriculture and food in Mauritania.

METHODS

The present article 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; Page et al., 2021). A search was performed in June 2023, using the following string: (*agriculture OR agro OR food*) AND (*Mauritania OR "West* Africa"*). Three inclusion/eligibility criteria were considered: geographical coverage (viz., the document deals with Mauritania); thematic focus (viz., the document deals with research on agriculture and/or food); and document type (viz. only journal articles, book chapters or conference papers were selected; editorial materials such as letters to editors, commentaries, notes and/or reviews were excluded). Only documents that met all three previous criteria were considered eligible and included in the review.

The search on WoS Core Collection returned 151 documents (Table 1). However, at first, 7 documents were screened out based on the titles as they do not refer to Mauritania; articles/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. Then, additional 94 documents were excluded based on the abstracts not meeting at least one of the inclusion/eligibility criteria. Finally, 6 reviews (Danzetta et al., 2016; Faye et al., 2017; Hussein et al., 2022; Mastorci et al., 2017; Vincent, 2022; Wuehler et al., 2011) were discarded. Therefore, 44 documents were included in the systematic review; the latter included 40 articles and 4 proceeding papers.

Table 1. Selection of eligible documents.

Selection steps	Number of selected documents	Number of excluded documents and reasons for exclusion
Search on WoS	151	--
Screening of documents based on titles	151	7 documents were excluded because they do not deal with Mauritania, e.g., Algeria, Brazil, Ghana, Guinea-Bissau, India, Mozambique, and South Africa
Screening of documents based on abstracts	144	94 documents excluded: <ul style="list-style-type: none"> • 2 documents that do not deal with Mauritania • 89 documents that do not deal with research on agri-food • 3 documents without abstracts
Scrutiny of full-texts	50	6 reviews excluded
Confirmation of eligibility and inclusion in the systematic review	44	--

The selected articles underwent a bibliometric analysis focusing on sources/journals, research areas, authors, affiliation organisations, and affiliation

countries. Also, analyses of agriculture subsectors [cf. crop production (and main crops addressed), animal/livestock production, and fisheries/aquaculture] and food chain stages (cf. production, processing, distribution/retail/marketing, and consumption) were carried out. All analyses were informed by the methodology used by El Bilali (2021) and El Bilali et al. (2022).

RESULTS AND DISCUSSION

The analysis of the selected documents suggests that the first article dates back to 1991 (Justen & Preuss, 1991). The *annual output* of articles changes a lot from one year to another but remains generally low; it ranges from nil in many years (1992, 1994, 1996, 1998, 1999, 2001, 2004, 2005, and 2010) to a maximum of 4 in 2012, 2019 and 2020. However, in general, there has been an increase in the number of publications, which might suggest that interest in research on agri-food has been increasing in Mauritania.

As for *sources*, the analysis of the results (Table 2) shows that the maximum number of articles was published in *Agricultural Systems* and *Food and Nutrition Bulletin* (3 articles each) and *Marine Policy* and *Remote Sensing* (2 articles each). Nevertheless, the research findings on agri-food in Mauritania were published in 40 journals and sources, which suggests that there are no specific publication outlets. Most of the selected articles can be linked to the *research areas* of *Environmental sciences - Ecology* (13 articles, 29.54%), *Agriculture* (10 articles, 22.73%), *Food science technology* (6 articles, 13.64%), *Water resources* (5 articles, 11.36%), and *Nutrition dietetics, Plant sciences* and *Science technology* (4 articles, 9.09%, each). However, the selected documents can be categorised into 26 research areas – including business economics, engineering, geography, geology, chemistry, mechanics, meteorology, microbiology, paediatrics, and zoology – which suggests that agri-food research in Mauritania is multidisciplinary. Nevertheless, it can be argued that while environmental and biological sciences are sufficiently addressed, social sciences and economics are generally overlooked.

The bibliometric analysis suggests that the most prominent, productive *authors* in the research field are Luciano Mateos (4 articles, 9.09% – *Consejo Superior de Investigaciones Científicas*, Córdoba, Spain) and Jordi Comas (3 articles, 6.82% – *Universitat Politècnica de Catalunya*, Castelldefels, Spain). However, the fact that most of the authors, actually 208 out of 218, have only one article 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 structural, long-term research projects/programs in Mauritania.

The analysis of *affiliation countries* suggests that Mauritania is the most active country in the research field (10 articles, 22.73%). Nevertheless, this also implies that more than three-quarters of the selected papers (77.27%), despite dealing with Mauritania, do not involve any Mauritanian scholar. This might denote the weaknesses of the research field in the country. Many of the prominent *organisations* in the research field are based outside Mauritania, especially in

Europe (*Consejo Superior de Investigaciones Cientificas* – Spain, *Universitat Politècnica de Catalunya* – Spain, *Consiglio Nazionale delle Ricerche* – Italy, University of Bonn – Germany), North America (Helen Keller International – USA, New Mexico State University – USA, South Dakota State University – USA, University of Ottawa – Canada) and Oceania (University of Melbourne – Australia). Indeed, the top ten affiliations include only two organisations from Mauritania, namely the University of Nouakchott and the Ministry of Rural Development. This result shows, on the one side, that there is a network of researchers working on agri-food in Mauritania 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 Mauritania. Likewise, the most relevant funding agencies are based abroad, especially in the USA (e.g., United States Agency for International Development, USAID).

Table 2. Bibliometrics of the analysed literature on agri-food research in Mauritania: top-ten journals, research areas, authors, countries and organisations.

Journals/sources (a*)	Research areas (b*)	Authors (c*)	Countries and territories (d*)	Organisations (e*)
Agricultural Systems (3)	Environmental sciences – Ecology (13)	Mateos L. (4)	Mauritania (10)	<i>Consejo Superior de Investigaciones Cientificas</i> – CSIC (8)
Food and Nutrition Bulletin (3)	Agriculture (10)	Comas J. (3)	USA (8)	Consultative Group for International Agricultural Research – CGIAR (3)
Marine Policy (2)	Food science technology (6)	Beibou E. (2)	Canada (6)	<i>Universitat Politècnica de Catalunya</i> (3)
Remote Sensing (2)**	Water resources (5)	Connor D. (2)	Germany (6)	University of Melbourne (3)
	Nutrition dietetics (4)	Diallo Y. (2)	Italy (6)	University of Nouakchott (3)
	Plant sciences (4)	Gomez-Macpherson H. (2)	Spain (6)	<i>Consiglio Nazionale delle Ricerche</i> – CNR (2)
	Science technology (4)	Hanan N. P. (2)	France (5)	Helen Keller International (2)
	International relations (3)	Samasse K. (2)	Senegal (5)	<i>Ministère de Développement Rural</i> (2)
	Business economics (2)	Schiller E. J. (2)	Australia (3)	New Mexico State University (2)
	Engineering, Geography, Geology (2)	Venema H. D. (2)	England, Mali, Morocco (3)	South Dakota State University, University of Bonn, University of Ottawa (2)

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

** Other 36 journals/sources contain only one article.

As for the *agriculture subsectors*, many selected articles do not refer to any specific subsector. This is particularly the case of studies that deal with food (in)security, livelihoods, diets and food consumption patterns. Similarly, articles dealing with the effects of climate change do not generally refer to a specific subsector. Articles dealing with a particular subsector mainly address crop production, whereas fisheries/aquaculture (Carlson et al., 2020; Doumbouya et al., 2017; El Mahmoud-Hamed et al., 2019; Touron-Gardic et al., 2022; Vázquez-Rowe et al., 2012) and, especially, animal production/livestock are generally overlooked. Many articles addressing crop production deal with water scarcity (Boulay et al., 2019) and irrigation (Borgia et al., 2012; Comas et al., 2012; Connor et al., 2008; Khatib et al., 2019) as well as pest management (Jeger et al., 2018; Showler, 2002). As for crop production, crops analysed include date (Mint Abdelaziz et al., 2020; Zehdi-Azouzi et al., 2015), fruits and vegetables (Ganry, 2009), pearl millet (Pucher et al., 2015), quinoa (Bazile et al., 2016), rice (Becker et al., 2003), sorghum (García-Ponce et al., 2013) and wheat (Kebe & Nadarajah, 2023; Tidiane Sall et al., 2019). Therefore, the research focuses mainly on staple crops and cereals.

Production is the most-addressed *food chain stage*, but there is a few papers that deal with processing (Touron-Gardic et al., 2022; Vázquez-Rowe et al., 2012), marketing, distribution and trade (Tidiane Sall et al., 2019; Touron-Gardic et al., 2022), and consumption (Ganry, 2009; Hess et al., 2013; Tidiane Sall et al., 2019; Touron-Gardic et al., 2022). Some authors adopt a broader approach and deal simultaneously with different stages of the food chain. For instance, Touron-Gardic et al. (2022) analyse the value chain of small pelagic fish in Mauritania and, in doing so, deal with fishing, processing, distribution and fish consumption. Likewise, Tidiane Sall et al. (2019) shed light on the production, marketing and consumption of durum wheat. Meanwhile, Ganry (2009) investigates the production and consumption of fruits and vegetables in francophone African countries and casts light on the potential health impacts.

CONCLUSIONS

This seems to be the first paper that provides a comprehensive overview of the landscape of agri-food research in Mauritania by analysing the bibliometrics of the research field. The analysis shows that the annual output of articles varies a lot from one year to another but remains generally low. There has been an increase in the number of publications, which might suggest that interest in research on agri-food has been increasing in Mauritania. The high number of research areas suggests that agri-food research in Mauritania is multidisciplinary. Nevertheless, the overemphasis on environmental sciences at the expense of social sciences and economics highlights the need for a more balanced and complete approach to exploring agricultural and food systems in the country. Most of the authors have only one article, which might indicate a lack of consistency in the research field. This, in turn, might be due to the absence of structural research projects/programs in the country. The analysis of affiliation countries suggests that more than three-

quarters of the selected papers, despite dealing with Mauritania, do not involve any Mauritanian scholar/author. This might denote the weaknesses of the research field in the country. Indeed, many of the prominent organisations in the research field are based outside Mauritania, especially in Europe, North America and Oceania. The top ten affiliations include only two organisations from Mauritania, namely the University of Nouakchott and the Ministry of Rural Development. This result might be considered a further indicator of the weakness of the agricultural knowledge and innovation system (AKIS) in Mauritania. Likewise, the most relevant funding agencies are based abroad. As for the agriculture subsectors, the literature mainly addresses crop production, whereas fisheries/aquaculture and, especially, animal production/livestock are generally overlooked. When it comes to crop production, the focus of the research is mainly on staple crops and cereals. Production is the most-addressed stage of the food chain; only a few papers deal with processing; marketing, distribution and trade; and consumption. However, some authors adopt a broader approach and deal simultaneously with different stages of the food chain.

Promoting research on agri-food in Mauritania is crucial to face the multiple current challenges, such as food insecurity, climate change and poverty, and pave the way towards sustainable and resilient agri-food systems. Research in the field is also essential to unlock the potential of the agri-food sector and make it a significant contributor to sustainable development and inclusive growth in Mauritania.

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