REVIEW ARTICLE

Organic food and farming in West Africa: A systematic review

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HIGHLIGHTS

- **There is a huge gap in research on organic food and farming in West Africa particularly in Cape Verde, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Liberia, Mauritania, Niger, Sierra Leone and Togo.**
- **The analysed literature indicates that organic agriculture can support climate change mitigation and adaptation, conserve biodiversity, reduce environmental impacts, and enhance livelihoods of farming households.**
- **Different factors hinder the development of organic agriculture in West Africa, e.g. agricultural policy, agronomic research, institutional environment and extension management.**
- **There is a need to strengthen research on organic food and farming in West Africa in order to fill the existing knowledge gap and unlock the sector potential.**

KEYWORDS **agriculture policy, agroecology, biodiversity, climate change, food security, organic agriculture, rural livelihoods, Sahel, sub-Saharan Africa**

Abstract

Organic agriculture can play a pivotal role in addressing different challenges (e.g. poverty, biodiversity loss, climate change). However, organic agriculture is 'knowledge intensive' and its development requires investments in research and innovation. This systematic review casts light on research on organic food and farming (OFF) in West Africa. It draws upon a search performed in April 2020 on the Web of Science. An overview of both bibliometrics and topics addressed in the analysed literature is provided. The analysed literature indicates that organic agriculture can support climate change mitigation and adaptation, conserve biodiversity and reduce environmental impacts. However, the comparative performance of organic farming is site-specific. Similarly, the organic-conventional yield gap depends, inter alia, on crops and cropping practices. Furthermore, different factors hinder the development of OFF in West Africa, which include agricultural policy, agronomic research, institutional environment and extension management, among others. The study concludes that organic agriculture is poorly developed in West Africa. Therefore, it is recommended that awareness on OFF should be raised, organic farmers supported and research on organic farming strengthened to fill the existing knowledge gap and unlock the sector potential.

1 Introduction

Organic agriculture is an important alternative to conventional agriculture that can support the Sustainable Development Goals (SDGs) (Setboonsarng and Gregorio, 2017; de Schaetzen, 2019). There has been an increasing demand for organic agri-food products due to the growing consumers' awareness in recent decades. Recent data show that organic agriculture was practiced worldwide by 2.8 million farmers on 71.5 million hectares in 2018. Meanwhile, the market of organic food and drink was worth about $96 \cdot 10^9$ EUR worldwide (Willer and Lernoud, 2020).

There is a growing body of scientific evidence on the positive effects of organic farming practices in terms of promoting natural resources conservation (Maeder et al., 2002; Gattinger et al., 2012; Gabriel et al., 2013; Tsiafouli et al., 2015; Helm, 2019), reducing emissions (Scialabba and Müller-Linden-

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lauf, 2010; Tuomisto et al., 2012; Muller et al., 2017), decreasing resources (e.g. water and energy) consumption (Tuomisto et al., 2012; de Porras Acuna et al., 2018), and improving the provision of ecosystem services (Sandhu et al., 2010; Robertson et al., 2014; Reganold and Wachter, 2016). Organic agriculture is also associated with the conservation of both natural biodiversity and agro-biodiversity (Bengtsson et al., 2005; Asigbaase et al,. 2019). Furthermore, organic farming performs well in terms of social and economic indicators (Kilcher, 2007; Hammas and Ahlem, 2017) and generates high quality products (Kluger, 2010; Reganold and Wachter, 2016; Seufert et al., 2017). Some studies suggest lower yields in organic farms (Seufert et al., 2012; Tuomisto et al., 2012; Reganold and Wachter, 2016), which may have implications in terms of achieving food security (de Ponti et al., 2012; Seufert et al., 2012; Ponisio et al., 2015; Reganold and Wachter, 2016). Some authors note that organic yields are sometimes higher than conventional ones in developing countries (de Bon et al., 2019). Moreover, the outcomes of comparing organics and conventional agriculture depend on the production context and conditions (Seufert et al., 2012). Indeed, organic farming seems relatively more efficient and productive in developing countries (Gomiero et al., 2011; Niggli, 2015; Hammas and Ahlem, 2017; Jouzi et al., 2017; Lori et al., 2017; Qiao et al., 2018). As a result, organic farming is increasingly promoted as a means to address the problems of food insecurity and poverty among farming households and rural communities in the developing world (Setboonsarng and Gregorio, 2017; Adebiyi et al., 2019). Furthermore, frequent food safety incidents and increased consumers' health awareness are associated with an increase in the consumption of organic foods (Hsu et al., 2016; Zwierzchowski and Ametaj, 2018).

Many scholarly publications and technical reports highlight the environmental, social and economic benefits of organic farming, especially in developing countries (Kilcher, 2007; Seufert, 2012; Setboonsarng and Gregorio, 2017). Organic agriculture plays an important role in the development of rural areas in developing countries (IFAD, 2016). In this context, there is a growing interest in the development of organic agriculture across Africa. According to UNCTAD and UNEP (2008), "Organic agricultural systems are making a significant contribution to the reduction of food insecurity and poverty in areas of Africa, and to an improvement in rural livelihoods". Gama and Amudav (2020) suggest that "Organic agriculture (known as ecological organic agriculture in Africa) has gained momentum and grown in recognition among farmers, practitioners, policymakers and other stakeholders for its significant role in addressing food insecurity, land degradation, poverty, and climate change among other benefits" (p. 186).

Many scholars and practitioners highlight the potential of West Africa in organic agriculture (Smith, 2010; De Bon et al., 2018). However, West Africa (viz. Benin, Burkina Faso, Cape Verde, Gambia, Ghana, Guinea, Guinea-Bissau, Ivory Coast, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo) lags behind in terms of organic agriculture development compared with Northern (e.g. Tunisia, Egypt) and Eastern (e.g. Tanzania, Uganda, Kenya, Ethiopia) Africa. Indeed, the share of total agricultural land under organic management in West Africa ranges from between about 0.0001 % in Guinea, Liberia and Niger to 2.5 % in Sierra Leone (*Table 1*).

One of the reasons for such weak development of organic food and farming in West Africa might be the lack of research and development. Indeed, organic farming is often described as being 'knowledge intensive' (Bliss et al. 2019) and its development requires substantial investments in research and innovation. However, there has been no comprehensive assessment of research so far in the region. This paper reviews the scholarly literature on organic food and farming in West Africa indexed in the Web of Science (WoS) to address this deficiency.

TABLE 1
Structure of organic farming in West Africa

Country*	Organic area [ha]	Share of organic area in total agricultural land [%]	Producers [no.]
Benin	16,454	0.4	4,030
Burkina Faso	56,663	0.5	26,627
Cape Verde	495	0.6	NA
Côte d'Ivoire	50,574	0.2	2,776
Gambia	20	0.003	NA
Ghana	29,663	0.2	3,228
Guinea	10	0.0001	NA
Guinea-Bissau	835	0.1	NA
Liberia	2	0.0001	NA
Mali	12,655	0.03	12,272
Niger	254	0.001	2
Nigeria	57,117	0.1	1,091
Senegal	7,989	0.1	18,369
Sierra Leone	99,238	2.5	304
Togo	41,323	1.1	38,414

Source: Adapted by Trávníček et al. (2020) based on a survey of the Research Institute of Organic Agriculture (FiBL).
* No data for Mauritania. NA: No available data.

2 Materials and methods

The assessment reported here draws upon a systematic review of all documents indexed in Clarivate Analytics - Web of Science. The PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) (Moher et al. 2009) were followed. A search was performed on April 4th, 2020, using the following 'Title-Abs'-Key search query: *({organic farming} OR {organic agriculture} OR {organic food}) AND ("West* Africa" OR Sahel OR Benin OR "Burkina Faso" OR "Cape Verde" OR "Cabo Verde" OR Gambia OR Ghana OR Guinea OR "Guinea-Bissau" OR "Ivory Coast" OR "Côte d'Ivoire" OR Liberia OR Mali OR Mauritania OR Niger OR Nigeria OR Senegal OR "Sierra Leone" OR Togo)*. Three inclusion criteria were considered: geographical coverage (viz. the document deals with

one or more countries in West Africa); thematic focus (viz. the main topic is organic food and farming); and document type (viz. only journal articles, book chapters or conference papers were selected; letters to editors, commentaries and/or notes were excluded). Only documents that met all the three criteria were considered eligible and included in the review.

The initial literature search yielded 1,032 documents that were published between 1990 and 2020. However, at first 90 documents were screened out based on the titles not relevant to West Africa. A further 835 documents were excluded based on the abstracts not meeting at least one of the inclusion criteria and, finally, 62 documents were excluded after the analysis of full texts. Therefore, 45 documents were included in the systematic review and underwent bibliometric and topical analyses. *Figure 1*, *Table 2* and *Table 3* summarise the selection process, the list of the selected documents, and the topics addressed in the review process.

This review was not without limitations. Indeed, the review results were affected by the search process (viz. considering only articles published in sources indexed on the Web of Science thus excluding publications in journals not indexed on Web of Science as well as the grey literature, e.g. reports) and the choice of the search terms.

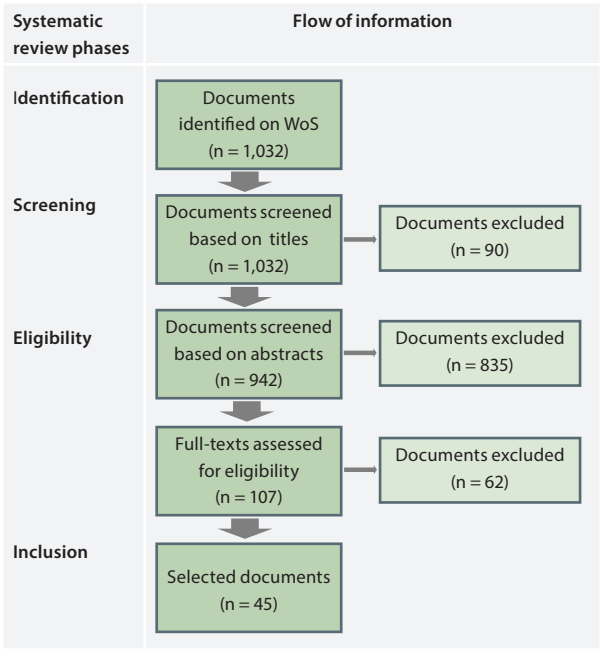

FIGURE 1
Systematic review: Articles selection process

TABLE 2
List of the selected documents

Year	Documents number	References
2020	1	Avadí et al. (2020)
2019	9	Adebiyi et al. (2019); Amfo et al. (2019); Asigbaase et al. (2019); Babalola (2019); Bonouzin et al. (2019); de Bon et al. (2019); Emeana et al. (2019); Nicolay (2019); Ukeh et al. (2019)
2018	3	Andriamampianina et al. (2018); Bello and Abdulai (2018); Métouolé Méda et al. (2018)
2017	2	Djokoto and Afari-Sefa (2017); Van den Broeck et al. (2017)
2016	3	Bello and Abdulai (2016a); Bello and Abdulai (2016b); Issaka et al. (2016)
2015	3	Binta and Barbier (2015); Glin et al. (2015); Vidogbéna et al. (2015)
2014	2	Kleemann et al. (2014); Kloos and Renaud (2014)
2013	13	Adebayo and Oladele (2013g); Adebayo and Oladele (2013e); Adebayo and Oladele (2013a); Adebayo and Oladele (2013b); Adebayo and Oladele (2013c); Adebayo and Oladele (2013f); Adebayo and Oladele (2013d); Glin et al. (2013); Kleemann and Abdulai (2013); Onumah et al. (2013); Ouma et al. (2013); Owusu and Anifori (2013); Somé (2013)
2012	7	Adejuyigbe et al. (2012); Aiyelaagbe et al. (2012); Alao et al. (2012); Atungwu et al. (2012); Glin et al. (2012); Mensah et al. (2012); Probst et al. (2012)
2011	1	Osei et al. (2011)
2010	1	Probst et al. (2010)

TABLE 3
Topics addressed in the systematic review

Item	Description
Bibiliographical metrics and research geography	Bibliometrics: sources/journals, subject areas, authors, institutions/affiliations. Research geography: West African countries considered
Topical focus of research on OFF in West Africa	Agriculture subsectors: crop production (and main crops addressed), animal production and fisheries
	Stages of the food chain (viz. production, processing, distribution/ retail/marketing, consumption)
	Climate change: adaptation and mitigation
	Environmental impacts and biodiversity conservation: biodiversity and resilience of farming systems; environmental impacts of organic farming vs. conventional farming
	Food security and nutrition: food security, nutrition and diets, food safety, quality of organic agro-food products
	Sustainable rural livelihoods: livelihoods (cf. income), women and gender, socio-economics of organic farming
	Barriers to and proposals for the development of organic food and farming in West Africa

3 Results and discussion

3.1 Bibliographical metrics and research geography

The analysis of the selected documents indicates that research on organic food and farming (OFF) is rather young in West Africa. The first document that specifically deals with OFF dates back to 2010. The annual output of articles in the period 2010-2020 ranges from one (2010, 2011) to a maximum of 13 in 2013. The average *annual output* in the period 2010-2019 is less than 5 documents. The peak of the number of publications in 2013 might suggest that interest in research on organics is decreasing and/or that such research has been over the last years labelled differently (e.g. agroecology) so that it was not identified through the initial search.

As for *sources*, the analysis of the results shows that the maximum number of articles was published in the 'Journal of Food, Agriculture & Environment' (4 articles) and 'Asia Life Sciences' (3 articles). The findings of the research on OFF in West Africa were published in 38 further sources and journals. Most of the selected articles can be linked to the *research areas* of agriculture (21 out of 45 articles) followed by business economics (9 articles), environmental sciences - ecology (6 articles), food science technology (6 articles) and science technology (6 articles). The selected publications can be categorised in 17 research areas (e.g. biomedicine, anthropology, engineering, geography, sociology, entomology), which shows that OFF research draws on a range of disciplines. It can be argued that while biological and environmental sciences as well as economics are sufficiently addressed, social sciences are generally overlooked.

The bibliometric analysis shows that the most prominent, productive authors are Sijuwade Adebukola Adebayo (7 articles), Oladimeji Idowu Oladele (7 articles) and Awudu Abdulai(5 articles). The fact that 105 other authors have only one article dealing with OFF in West Africa indicates the presence of a wider range of researchers who are not especially committed to OFF as a research field. This might be due to the absence of structured research projects/programmes because of the lack of investments in research on organic farming and agro-ecology in African countries because the bulk of investments still goes to industrial, conventional agriculture (Biovision Foundation for Ecological Development and IPES-Food, 2020).

The analysis of *countries* and *affiliations* suggests that, surprisingly, the most active country in the research field is Ghana (9 articles). West African countries mentioned in affiliations also include Nigeria (6 articles), Benin (6 articles), Senegal (2 articles), Burkina Faso (1 article) and Mali (1 article). However, a large share of publications is authored by researchers based outside West Africa. These are either in Africa (e.g. South Africa, Kenya, Morocco), Europe (e.g. Germany, England, France, Netherlands, Austria, Belgium, Switzerland), North America (e.g. USA) or Oceania (e.g. Australia). This might be considered as an indicator of the weakness of the research systems in West Africa and/or lack of attention to organic food and farming in the region. Many of the prominent *institutions* in the research field are based outside West Africa. These organisations include the North West University South Africa, University of Kiel (Germany), CIRAD (France), Universite de Montpellier (France), Wageningen University and Research (Netherlands), Coventry University (UK), Michigan State University (USA), University of Natural Resources and Life Sciences (BOKU, Austria). However, many domestic organisations are active in research on OFF in Nigeria (e.g. Federal University of Agriculture Abeokuta, Michael Okpara University of Agriculture), Ghana (e.g. University of Ghana, University for Development Studies, Kwame Nkrumah University of Science and Technology), Benin (e.g. University of Abomey-Calavi, National Institute of Agricultural Research of Benin, Parakou University), and Burkina Faso (e.g. University Ouaga II).

There are large differences between West African countries in terms of research on organic food and farming. The analysis of the geography of research in the region suggests that it is mainly performed in Nigeria (18 out of 45 selected documents). This is quite normal, and somehow expected, since Nigeria is the largest and most populous country in the region. Indeed, it is essential to take into account the countries' sizes, which is often associated to their research systems (e.g. number of scientific articles per million inhabitants is used to assess country research performance). Interestingly, Ghana (12 out of 45) and Benin (6 out of 45) are also active in the research field. They are followed by Benin (6 documents), Burkina Faso (3 documents), Mali (2 documents) and Senegal (2 documents). There is no article that deals specifically with OFF in Cape Verde, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Liberia, Mauritania, Niger, Sierra Leone or Togo. This suggests a lack of research activity in these countries. Furthermore, there is no single study that addresses OFF in the whole West Africa but there are some multi-country studies. For example, Andriamampianina et al. (2018) assess the capacity of organic agriculture to address food insecurity in sub-Saharan Africa with experts from Senegal, Burkina Faso and Cameroon. Meanwhile, Probst et al. (2012) investigate the marketing potential of organic vegetables in Benin, Ghana and Burkina Faso.

3.2 Agriculture subsectors and food chain stages

Almost all the selected documents deal with crop production whereas animal production is overlooked. The majority of papers focuses on fresh products, such as fruit (Owusu and Anifori 2013) and vegetables (Probst et al., 2010, 2012; Adebayo and Oladele, 2013c, f, d; Owusu and Anifori, 2013; de Bon et al., 2019; Amfo et al., 2019; Adebiyi et al., 2019). A number of articles deals with organic pineapple (Osei et al., 2011; Aiyelaagbe et al., 2012; Kleemann and Abdulai, 2013; Kleemann et al., 2014), mango (Ouma et al., 2013) and cocoa (Onumah et al., 2013; Glin et al., 2015; Djokoto and Afari-Sefa, 2017; Asigbaase et al., 2019). As for organic vegetables, some papers focus on specific crops such as tomato (Babalola, 2019) and cabbage (Vidogbéna et al., 2015). Apart from food crops, some articles focus on industrial crops such as cotton (Mensah et al., 2012; Glin et al., 2012; Somé, 2013; Kloos and Renaud, 2014; Métouolé Méda et al., 2018; Nicolay, 2019;

Bonou-zin et al., 2019; Avadí et al., 2020). In general, staple crops, especially grains that are destined to the domestic market, are overlooked and only a few examples such as rice (Van den Broeck et al., 2017), maize (Adejuyigbe et al., 2012), soybean (Atungwu et al., 2012) and sesame (Glin et al., 2013) are analysed. Other articles deal with organic farming in general and without focusing on any specific crop (Adebayo and Oladele, 2013b, g, e, a; Binta and Barbier, 2015; Bello and Abdulai, 2016b, a, 2018; Issaka et al., 2016; Andriamampianina et al., 2018; Ukeh et al., 2019; Emeana et al., 2019). A few articles address mixed systems; for example, Alao et al. (2012) focus on forages that are relevant for crop production and animal husbandry.

As for the *stages of the food chain*, most of the analysed literature deals with either the upstream (e.g. production) or downstream (e.g. marketing/consumption) of the food chain; intermediate stages (e.g. packing, processing) are often overlooked. As for production, the selected articles focus on soil fertility management (Alao et al., 2012; Aiyelaagbe et al., 2012; Adejuyigbe et al., 2012; Adebayo and Oladele, 2013b, a, g, e; Bonou-zin et al., 2019) or pest management (Osei et al., 2011; Mensah et al., 2012; Atungwu et al., 2012), among other topics. Articles addressing consumption deal with the attitude of consumers towards organic products and/or their willingness to pay premium prices for them (Probst et al., 2010, 2012; Owusu and Anifori, 2013; Ouma et al., 2013; Vidogbéna et al., 2015; Bello and Abdulai, 2016b, 2018; Amfo et al., 2019). Some articles take a holistic approach in dealing with organic food and farming. For example, papers that analyse certification (Kleemann and Abdulai, 2013; Kleemann et al., 2014) often address production rules as well as access to market and communication with consumers. Similarly, papers that adopt a life-cycle assessment approach analyse different stages. For instance, Avadí et al. (2020) assess the environmental impacts of Malian cotton during the agricultural and the ginning (cf. post-harvest processing) phases.

3.3 Topical analysis

3.3.1 Climate change

The analysed literature suggests that organic agriculture can mitigate the effect of climate change in West Africa. Avadí et al. (2020) argue that Malian organic cotton products are similar to literature values in terms of greenhouse gas (GHG) emissions. Bonou-zin et al. (2019) found that organic cotton causes less GHG emission than conventional cotton in Northern Benin. Likewise, Binta and Barbier (2015) show that carbon emissions are lower in organic horticultural farms than in conventional ones in Senegal (Niayes region). This indicates that increasing organic farming can be regarded as a GHG mitigation measure.

Organic agriculture is also considered to support adaptation to climate change. For instance, Kloos and Renaud (2014) found that organic cotton production reduced the risks of extreme climate events thus contributing to the reduction of economic risks at household level in Benin. However, Adebiyi et al. (2019) pointed out that the perceived vulnerability to the yield and financial losses from heavy precipitation hindered the adoption of organic farming in Nigeria.

3.3.2 Environmental impacts and biodiversity

Some papers analyse the relationship between organic farms and the conservation of *biodiversity*. Asigbaase et al. (2019) show that organic cocoa farms conserve more native floristic diversity when compared with conventional farms in the Eastern Region of Ghana. Adebayo and Oladele (2013d) show that vegetable farmers in South Western Nigeria believe that organic farming improves soil structure and fertility as well as its biological activity.

Other papers highlight the lower *environmental impacts* of organic farms compared to conventional ones. Following their life-cycle assessment (LCA) of conventional and organic cotton in Mali, Avadí et al. (2020) suggest that despite comparatively lower yields, organic cotton products feature lower impacts than conventional ones due to lower input intensity. The main drivers of environmental impacts for organic cotton are organic fertilisers and natural pesticides (Avadí et al., 2020). However, Bonou-zin et al. (2019) show that "although organic cotton producers contribute less to GHG emission, they are environmentally inefficient compared to their conventional counterparts" (p. 14) in the cotton belt of Northern Benin. This clearly shows that the comparative performance of organic farming is site-specific and depends on the practices used in organic and conventional farms in each context.

3.3.3 Food security, food safety and nutrition

It is widely believed that *productivity* is lower in organic farming, which might have negative implications in terms of f*ood security*. For example, de Bon et al. (2019) report that cabbage and tomato yields are lower in organic farms. Likewise, the elicitation of expert knowledge carried out by Andriamampianina et al. (2018) suggests that "the yields of organic systems are about 41 % lower than the yields of conventional systems" in sub-Saharan Africa. However, de Bon et al. (2019) note that organic yields are sometimes higher than conventional ones among vegetable producers in Senegal. Beyond yields, Issaka et al. (2016) suggest that organic farming has the potential to achieve a higher increase in total factor productivity in Northern Ghana compared with conventional agriculture.

Food safety is one of the determinants of the consumption of organic foods. Organic products are perceived by consumers as being safer (Amfo et al., 2019). Williamson et al. (2008) showed that there is a contrast between the increasing attention to food safety and pesticide restrictions in export horticulture to Europe and food crops grown for domestic markets. Amfo et al. (2019) show that food safety consciousness affects organic vegetables expenditure and consumption in Tamale (Ghana). Meanwhile, Owusu and Anifori (2013) pointed out that, beside socioeconomic characteristics, product cleanness and freshness have a positive effect on the willingness of consumers to pay a premium for organic watermelon in urban Kumasi (Ghana). Likewise, Probst et al. (2010) found that attributes such as freshness and healthy appearance were central to vegetable choices in

Kumasi and Accra (Ghana), although consumers were mostly unaware of agro-chemical risks.

3.3.4 Livelihoods

It is widely acknowledged that organic agriculture can increase the income and improve the livelihoods of farming households and rural communities in developing countries, such as those of West Africa. Indeed, premium prices may increase the income of small-scale farmers. In this respect, an elicitation of the knowledge of experts in Burkina Faso, Senegal and Cameroon (Andriamampianina et al., 2018) shows that **"the prices of organic products are 34% higher than prices of products from conventional agriculture"**. Kleemann et al. (2014) conclude that organic-certified pineapple yields a significantly higher return on investment (ROI) than GlobalGAP-certified pineapple in Ghana, mainly due to the price premium. Similarly, Kleemann and Abdulai (2013) found that there is a positive relationship between the intensity of the use/adoption of agro-ecological practices and ROI among pineapple producers in Ghana. Moreover, the use of organic amendments is cheaper than synthetic agrochemicals in West African countries (Osei et al. 2011), which affects positively the farm gross margin and, consequently, farmer's income. In this context, Adebayo and Oladele (2013d) argue that organic agriculture holds a great potential for effectively contributing to local food security and increased family health at low cost compared to conventional agriculture. Using gross margin as economic indicator, Binta and Barbier (2015) suggest that organic agriculture is more attractive for horticultural producers in the Niayes region (Senegal) only where premium prices are available. Kloos and Renaud (2014) argue that organic agriculture supports sustainable livelihoods even in the context of changing climate. However, the high cost of certification may negatively affect the adoption and ROI of certified organic farming (Kleemann et al., 2014). Furthermore, organic certification and, consequent, premium prices may limit the affordability of organic products (Probst et al., 2010).

Organic agriculture can contribute to the empowerment of different socio-economic groups such as youth and women (Somé, 2013; Kloos and Renaud, 2014). Adebiyi et al. (2019) conclude that *gender* is one of the variables that shape the adoption of organic horticulture (e.g. leafy vegetables) in Ibadan (Oyo State, Nigeria). Many authors consider gender as a factor that affects the adoption of organic agriculture practices such as minimum tillage (Adebayo and Oladele, 2013b) and crop rotation and intercropping (Adebayo and Oladele, 2013a) in Nigeria. The literature also suggests that the attitude towards OFF is influenced by gender. For example, Vidogbéna et al. (2015) show that women in southern Benin pay more attention to the safety of products so that they are more likely to pay premium prices for organic products.

3.3.5 Barriers to and proposals for the development of organic farming in West Africa

Different factors hinder the development of organic food and farming in West Africa. These relate, among others, to agricultural policy, agronomic research, institutional environment and extension management.

It seems that one of the weaknesses of OFF is that it relies on support from a wide range of stakeholders and institutions. In fact, Nicolay (2019) suggests that organic farming "depends much more on societal support for extension, technology development and policy coherence than commercial farms" (p. 86). In this context, extension and advisory services can play a central role in the agro-ecological transition towards organic farming (Adebayo and Oladele, 2013d; Métouolé Méda et al., 2018; Emeana et al., 2019) as they are important sources of information on organic farming in West Africa. Indeed, Adebayo and Oladele (2013c) show that extension agents represent a chief source of information for organic vegetable producers in southwest Nigeria. Emeana et al. (2019) stress that factors such as research and extension management impede organic farming transition in Nigeria and call for an ambitious organic agriculture policy that supports organic agricultural research and information dissemination to farmers by extension services. Also, Issaka et al. (2016) argue that the major constraints confronting organic farmers relate to access to extension and farm inputs. Kloos and Renaud (2014) report the insufficient availability of organic material as one of the obstacles to the development of organic farming among cotton farmers in Benin. Likewise, Adebiyi et al. (2019) point out that the lack of financial resources to hire labour or access organic inputs constrains the adoption of organic farming in Nigeria. Organic producers face many technical problems and that might explain why Onumah et al. (2013) conclude that the organic cocoa production system is less technically efficient than the conventional system in Ghana. Indeed, the Ghanaian organic cocoa sector is young and needs a lot of education so that farmers become familiar with the new practices to bridge the gap with conventional cocoa producers.

Many scholars stress the importance of the *education* of both consumers and producers for the development of organic farming and organic food market in West Africa (Métouolé Méda et al., 2018; Ukeh et al., 2019; Bonou-zin et al., 2019). Adebiyi et al. (2019) suggest that "exposing farmers to information about the economic viability of organic farming, the potential health effects of chemical pesticides and herbicides, and to the knowledge of organic pest and soil fertility management can motivate adoption" (p. 16) of organic production in Nigeria. Bonou-zin et al. (2019) argue that there is a need for more technical support and education to improve the environmental efficiency of organic cotton in Benin. There is also a need to raise the awareness of extension agents and improve their attitude towards organic farming. For that, Adebayo and Oladele (2013d) recommend that extension agents' training should include more messages on organic agriculture techniques.

Some authors call for paying more attention to organic food and farming in agricultural policies (Probst et al., 2012; Emeana et al., 2019). Probst et al. (2012) argue that market mechanisms and processes are not enough to develop organic farming in West Africa so that public commitment is vital to facilitate the change towards organic food and farming. Some papers also stress the need to improve the

governance of the whole organics sector, as institutional factors affect the adoption of organic farming (Glin et al., 2012; Métouolé Méda et al., 2018; Adebiyi et al., 2019). For instance, Adebiyi et al. (2019) suggest that institutional environment affects the adoption of organic horticulture (e.g. leafy vegetables) in Nigeria. Nicolay (2019) puts forward the view that organic agriculture is nested in socio-economic and political networks, which makes its development challenging particularly for countries with poorly developed institutions and weak organisations. Glin et al. (2015) found that the Organic Cocoa Network in Ghana is moving towards hybrid governance arrangements in which the state, which is still a major player, is involved along with NGO networks and businesses. It is evident from the analysed literature that NGOs have been playing a prominent role in the development of organic farming in West Africa (Glin et al., 2012).

4 Conclusions

The paper reviews in a comprehensive way research on organic food and farming (OFF) in West Africa published in sources indexed in the Web of Science. The study concludes that OFF is relatively young in West Africa and there is a huge research gap in the region in general and in Cape Verde, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Liberia, Mauritania, Niger, Sierra Leone and Togo in particular. Indeed, only Ghana, Nigeria and Benin have done few research studies on OFF. Most of the research outputs are authored by researchers outside West Africa. There is also a lack of regional and cross-country studies. The review shows clearly the potentials and prospects of organic agriculture in West Africa as well as factors limiting its adoption. Factors hindering the development of OFF in West Africa relate, among others, to agricultural policy, agronomic research, institutional environment and extension management. The study, therefore, recommends that awareness of OFF should be raised, organic farmers supported, and research and extension on OFF strengthened in West Africa. It is paramount to raise awareness about the multiple and multifaceted environmental (e.g. climate change mitigation and adaptation, biodiversity conservation, sustainable soil management, reduction of chemicals use) and socio-economic (e.g. products quality and safety, consumer health, poverty eradication, gender empowerment) benefits of organic farming. The paper also stresses the need to improve the governance of the whole organic agriculture sector. There is also a need for an ambitious organic agriculture policy that supports organic agricultural research and information dissemination to farmers by extension services.

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