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Organic maize farming practices in Nigeria: Drivers and barriers

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ABSTRACT

Organic farming is gaining global recognition in terms of the role it plays in providing safe and healthy food, income, and maintaining a sustainable environment. Despite these aspects , it faces constraints that, if identified, will play a vital role in its development and formulating policy for its sustainability. Creating an effective policy to improve organic farming necessitates identifying the influencing factors in organic farming method selection as well as barriers encountered. This study, therefore, examined the common types of organic maize farming, their determinants, and their challenges in Nigeria. Primary data collected from 480 respondents were analysed with descriptive statistics and multivariate logistic regression. The result revealed that organic manure, compost manure, biocontrol, and cover cropping were used by the farmers to enrich the soil. Farming experience, membership in a farm-based organization, farm distance, education, income, extension contacts, farm size, and cultural compatibility were the influencing factors of different organic farming systems used in maize production. Inadequate organic food accrediting agencies, inability to meet export demand, high cost and scarcity of organic seeds, lack of financial support, poor marketing system, inadequate supporting infrastructure, poor technical know-how, and pest infestation were the most common problems encountered in organic farming. To enhance participation in organic maize farming practices, there is a need to support organic farmers with financial support, accessible organic accreditation centres, training, educational support, and inputs.

1. Introduction

The agricultural sector is no doubt a major and important aspect of most developing countries' economies. In Nigeria, agriculture plays a significant role in food production, employment opportunities, and the national economy (Mukaila et al. 2022). It employs over seventy percent of the nation's workforce, contributes significantly to non-oil exports, and contributes 22 percent to Nigeria's GDP (Mukaila 2021; National Bureau of Statistics 2020). Thus, agriculture plays a vital role in ensuring food security and economic development. Meanwhile, Nigeria's agricultural sector has faced challenges as the farmers recorded low productivity due to poor agricultural finance, low level of education among farmers and the use of crude implements by the farmers. The country's subsistence agriculture and low level of technology adoption has also contributed significantly to farmer productivity (Fawole and Rahji 2016).

One of the major food crops widely grown and consumed in Nigeria is maize. It is a major cereal and is ranked first among the cereal crops grown in Nigeria. Maize (Zea mays) belongs to the family Gramineae. Maize gives a fast return on investment compared to other food crops such as cassava, yam, and rice. Maize gives a return on investment as short as sixty days in the case of fresh maize and less than six months for dry maize. It serves as food for many households and feed for livestock, especially in poultry farming. Maize constitutes the largest proportion of feeds given to poultry in Nigeria, which indirectly contributes to protein intake. Maize is, therefore, an important crop for attaining food security, poverty alleviation, and enhancing the economic growth of a nation. Nigeria's maize production in 2020 was 10 million tonnes (Knoema 2020). Nigeria's low maize productivity, compared to other countries with higher productivity (e.g. the US, Mexico, India, Ukraine, Argentina, China, Brazil, Canada, and Indonesia), is attributed to soil nutrient depletion, pests and diseases (such as Striga and fall armyworm), drought, and low research funding. The use of inorganic farming inputs, such as fertilizer, has long been emphasised to enhance soil nutrients. Agrochemical inputs, such as inorganic fertilizers, herbicides, fungicides, and pesticides are used in agriculture to increase crop productivity (Digal and Placencia 2019).

Although the use of agrochemicals increases crop yield, they pose a serious threat to human health, natural resources, the environment and increased soil acidity, which, in turn, affects farm productivity in the long run (Bui and Nguyen 2020). They are also very expensive. Continuous use of agrochemicals in conventional agriculture results in the deterioration of soil health and nutrient imbalance. The use of inorganic inputs in conventional agriculture results in the poisoning of about 30 million people, leading to the death of 220000 people yearly (Muhammad et al. 2016). The side effects of inorganic farming are now of great concern to people (consumers), policymakers, and researchers. Organic farming can solve the problems of food poisoning and deterioration of soil health as well as enhance

productivity among farmers in the long run. Organic farming is, therefore, suitable for farmers and more environmentally friendly than conventional agriculture.

Organic farming is gaining global recognition in terms of the role it plays in providing safe food and income. Organic agriculture avoids the use of chemical fertilizers, herbicides, synthetic pesticides, gene manipulation, or growth hormones; it instead uses techniques that reduce pollution and sustain the ecosystem (Oyawole et al. 2016). It emphasizes the use of mechanical, biological, and agronomic methods rather than the use of synthesis materials (Atoma et al. 2020). It has a low risk of contamination, which gives organic products a positive image (Łuczka and Kalinowski 2020). Thus, organic farming is needed to sustain agriculture, provide healthy foods for human consumption, safeguard animals and protect the environment (Bui and Nguyen 2020).

Despite its importance, organic farming encounters serious constraints which, if identified, will play a vital role in its development and formulating policy for its sustainability (Łuczka and Kalinowski 2020). Developing an effective policy to improve organic farming necessitates identifying the factors influencing the choice of organic production methods as well as the barriers encountered (Läpple and Kelley 2013). Previous studies on the use of organic farming focused on farmers' decisions to engage in organic farming (Läpple 2010; Sodjinou et al. 2015; Ullah et al. 2015; Ashari et al. 2017; Digal and Placencia 2019; Bui and Nguyen 2020; Yazdanpanah et al. 2022). They investigated the probability of using organic practices without examining the factors responsible for different types of organic farming practices. In addition, none of the studies focused on organic maize farming. The few studies on organic maize farming did not examine the factors that determine the use of types of organic maize practices (Adamteya et al. 2016; Choudhary and Kumar 2013; Liverpool-Tasie et al. 2017; Mucheru-Muna et al. 2014). Thus, the need for this study is to fill the research gap and add to the existing research.

Because of the above mentioned factors, the objective of this study is to investigate organic farming practices in maize production. Specifically, the study identified the common organic practices for maize farming among farmers, examined the factors influencing the types of common organic farming used, and identified the problems associated with organic maize farming in Nigeria. Understanding the driving factors of using different organic farming practices and the barriers faced in organic maize production would help in formulating policies to enhance participation in organic farming. This would, in turn, ensure food safety and security both in the short and long run.

2. Materials and Methods

2.1. Sampling procedure and data collection

This study employed a four-stage sampling technique to select the respondents. In the first stage, a purposive selection of two states (Kaduna and Niger) with the highest maize production was made. This was done to have a good representation of organic maize producers. In the second stage, four local government areas (LGAs) were selected, randomly, from the two states. In the third stage, three communities were randomly selected from each LGA. The last stage involved the selection of twenty organic maize farmers from each rural community using the snowball technique, which involved identified farmers referring to other organic maize farmers in the study area. This resulted in a total of 480 respondents.

This study used primary data. The data were collected through the administration of a structured questionnaire to the organic maize farmers. The organic maize farmers considered in this study were those who practice monocropping, that is, growing only organic maize on the farmland. The data were collected on socioeconomic and production characteristics such as the common organic practices for maize farming and the problems associated with organic maize farming.

2.2. Method of data analysis

Descriptive statistics and multivariate logistic regression were the means of data analysis. Descriptive statistics were used to describe the socio-economic features of the organic farmers, and common organic practices, and identify the problems associated with organic maize farming. The multivariate logistic regression model was used to analyse the determinants of the types of common organic farming used by maize farmers.

Multivariate logistic regression is an extension of logistic regression with more than one binary outcome. It tries to find out how the values in the dependent variables respond simultaneously to changes in independent variables. Below is the generalized equation for the multivariate regression model:

$$Y = \beta_0 + \beta_1 A + \beta_2 ED + \beta_3 INC + \beta_4 FS + \beta_5 FD + \beta_6 FE + \beta_7 FO + \beta_8 EX + \beta_9 CC + e$$

Where:

Y_i= Organic practices that were considered in this study are as follows:

i. Use of compost manure (1= yes, 0= no)
ii. Use of cover crop (1= yes, 0= no)
iii. Use of biocontrol (1= yes, 0= no)
iv. Use of organic manure (1= yes, 0= no)

The independent variables that were considered are as follows: A is the age of the farmers (years), ED is educational level, INC is income, FS is farm size (hectares), FD is farm distance from home (km), FE is farming experience (years), FO is farm-based organization membership (yes= 1, 0= otherwise), EXT is number of extensions contact,

CC is cultural compatibility (yes= 1, 0 otherwise), and e is the error term.

3. Results and discussion

3.1. Socio-economic characteristics of the organic maize farmers

This section described the socio-economic characteristics of the respondents and how they related to organic maize farming. The results presented in Table 1 show that the majority of organic maize farmers were male. This could be because males adopt new agricultural practices more quickly than their female counterparts in most African countries. Atoma et al. (2020) and Digal and Placencia (2019) reported a similar result, that more males adopted and practised organic farming than females. The larger proportion (55.83%) of the farmers were below 40 years of age. Their mean age was 40.5 years. This suggests that organic

Table 1. Distribution of the organic farmers by socioeconomic characteristics

Variables	Categories	Frequency	Percentage	Mean
Gender	Male	468	97.50	
	Female	12	2.50	
Age	21 – 30	68	14.17	
	31 – 40	200	41.66	40.5
	41 – 50	116	24.17	
	51 – 60	16	20.00	
Level of education	No Formal	16	3.33	
	Primary	72	15.00	
	Secondary	256	53.33	
	Tertiary	136	28.33	
Marital status	Married	376	78.33	
	Single	104	21.67	
Household size	1 – 5	88	18.33	
	6 – 10	348	72.50	7.54
	11 – 15	44	9.17	
Major occupation	Farming	422	87.92	
	Trading	12	2.50	
	Civil Servant	24	5.00	
	Artisanship	22	4.58	
Cooperative society membership	Yes	144	30.00	
	No	336	70.00	
Access to extension services	Yes	316	57.57	
	No	204	42.53	
Monthly income (₦)	1000 – 50000	260	54.17	
	50001 – 100000	164	34.17	75270.83
	100001 – 150000	24	5.00	
	>150000	32	6.67	
Organic maize farm size in hectares	1 – 2	292	60.83	
	3 – 4	156	32.50	2.41
	5 – 6	32	6.67	
Farming experience in years	1 – 10	76	15.80	
	11 – 20	308	64.20	15.91
	21 – 30	96	20.00	
Organic farming duration in years	1 – 5	164	34.17	
	6 – 10	180	37.50	7.71
	11 – 15	136	28.33	

Source: Field Survey (2021)

farmers can be said to be at their most youthful and economically active age when they can practice organic farming economically. Farmers at their active age can effectively and economically make use of scarce production resources to achieve their goals (Mukaila et al. 2021). Their active age may be considered an advantage with lots of potential considering the fact that this age group could be able to adopt simple and effective technologies to increase their productivity. Only 3.33% of the farmers had no formal education. The majority (53.33%) were secondary school certificate holders. About 28% had tertiary education with either a degree certificate, a national diploma certificate, a national certificate in education or their equivalents. Fifteen percent of the respondents were primary school certificate holders. These results imply that the organic farmers had some level of education that could enhance their productivity and decision-making process, unlike other farmers who engaged in conventional farming and had a low level of education. Mukaila et al. (2020) reported a low educational level among conventional farmers.

The majority of the organic farmers were married, which suggests that the farmers had some family responsibilities to cater to. The majority had between six and ten people in their households. They, however, had a mean household size of eight people per household. This suggests a large household size, which could serve as family labour. The majority of the organic farmers had farming as their major occupation. This implies that farming served as a major means of livelihood for them. The average organic maize farm size was 2.41 hectares, implying that organic farming is on a small scale. The farmers had a mean farming experience of 15.91 years, implying that the farmers had a high level of farming experience. They, however, had 7.71 years of organic farming experience. This suggests that organic farming has been practised for a couple of years in the study area, although relatively new. The majority were not members of cooperative societies, while only 30% belonged to cooperative societies. About 58% had access to extension services. This could enhance their knowledge of organic farming as the extensionist provides relevant information about best agricultural practices and innovation. Their mean monthly income was ₦75270.83 (USD 182.92). This implies that organic farming serves as a source of income for farmers and enhances their economic status.

3.2. Common organic practices for maize farming

The results presented in Table 2 show that the majority of the farmers used organic manure to enrich the soil. This could be widely used to supply nutrients to the soil due to its availability at a relatively cheaper rate. Most farmers were able to access it very close to their farms. About half of the respondents made use of cover crops to enrich the soil, while 49.2% did not make use of such practices. About 23% of the farmers used biocontrol to control pests on their farms, while 76.67% of the respondents did not use it. A higher percentage of the farmers (86.67%) used compost manure, while a smaller percentage of the respondents (13.33%) did not use compost manure to increase soil nutrients. From the results, it can be inferred that organic manure and compost manure were majorly used by the farmers since they had a higher percentage. While very few farmers made use of cover crops as an organic practice in the study area.

Table 2. Common organic practices for maize farming

Organic practices	Yes	No
Organic manure	456 (95.00)	24 (5.00)
Cover crop	244 (50.83)	236 (49.17)
Biocontrol	112 (23.33)	368 (76.67)
Compost manure	416 (86.67)	64 (13.33)

Source: Field survey (2021)

3.3. Drivers of the types of organic farming used by the farmers

Table 3 shows the factors that influence different types of organic farming practices used by farmers. As shown in Table 3, farmers' educational level (P<0.05), income (P<0.05), farm distance (P<0.01), farming experience (P<0.01), farming organization (P<0.01) and extension contacts (P<0.01) significantly influenced farmers' use of organic manure. The educational level of the farmers had a negative influence on the use of organic manure in maize production. This implies that a high level of education did not necessarily enhance organic manure usage. Thus, less educated farmers used organic manure to enrich the soil. This could be because most farmers are aware that organic manure is an important means of supplying nutrients to the soil. The coefficient of farmers' income was positive in relation to organic manure usage. This implies that the higher the farmers' income, the higher the likelihood of using organic manure in maize production. Due to the capital involved in getting organic manure, high-income farmers used more organic manure than their counterparts with low incomes. This is because farmers' income determines the level of agricultural investment (Falola et al. 2022a). Farm distance also had a positive influence on using organic manure. This implies that the longer the farm distance, the higher the probability of using organic manure. Thus, farmers who travel a long distance to reach their farms prefer to use organic manure due to the proximity of organic manure sellers (livestock farmers) to the maize farm.

Farming experience had a positive effect in relation to the use of organic manure practice. An increase in the farming experience of organic farmers leads to an increase in the probability of organic manure usage. Therefore, farming experience is an enhancing factor in the use of organic manure to boost soil nutrients and enhance maize growth and productivity. This is because the more farmers invested in organic farming, the better their understanding of organic manure usage and its significance. The coefficient of membership in a farm-based organization also had a positive effect on the use of organic manure practices. Thus, an increase in the likelihood of being a member of a farm-based organization by the farmers increases the probability of organic manure usage. This could be because of the dissemination of relevant information about the application of organic manure in farm-based societies to their members. Thus, membership in farm-based organizations is an enhancing factor in the use of organic manure for organic maize farming. The coefficient of extension contacts had a negative influence on organic manure usage. This shows that an increase in extension contact did not increase the likelihood of organic manure usage among the farmers. This could be because most farmers have knowledge of organic manure usage and its importance.

Farmers' use of cover cropping was significantly influenced by their educational level (P<0.01), farming experience (P<0.01), farm distance (P<0.01), farming organisation (P<0.01) and cultural compatibility (P<0.01). The educational level had a positive influence on using cover cropping as a means of supplying nutrients organically to the soil. Thus, the higher the educational level of farmers, the greater the likelihood of using cover cropping to enrich the soil with nutrients. This is because educated farmers know the type of cover crop to be grown alongside maize to supply the needed nutrients. Farm distance was positive and significant in relation to the use of cover cropping. Thus, an increase in farm distance increases the probability of using cover cropping practices by farmers. This is because a longer-distance farm requires a practice that will limit farmers' visitation to their farms. Thus, cover cropping can play a significant role in this regard as the cover crops supply nutrients to the soil, reduce soil erosion, avoid washing away soil nutrients, protect the soil from adverse environmental conditions, and suppress the growth of weeds on the farm. It also serves as crop diversification or polyculture organic farming, which can provide additional income to organic farmers.

Farming experience had a negative influence on the use of cover cropping. This suggests that a high level of experience did not necessarily increase the likelihood of cover cropping usage by farmers. Thus, the likelihood of its usage increases among farmers with little experience, which could be due to experienced farmers concentrating on other methods of organic farming. Farming organizations positively and significantly influence farmers' use of cover crops in their organic farms. This shows that the higher the likelihood of farmers being members of a farm-based organisation, the higher the probability of using cover crops to supply nutrients to the soil in order to enhance maize growth and yield. This could be due to the dissemination of organic farming knowledge in the society. Being a member of a cooperative society influenced farmers' usage of innovation as they learn from each other (Yokouchi and Kazuki 2016). Cultural compatibility also, positively, influenced cover cropping usage among organic maize farmers. Thus, the likelihood of its usage increases due to its acceptability by the farmers' culture.

Regarding the use of biocontrol as organic practice, educational level (P<0.01), income (P<0.01), farm size (P<0.05), farming experience (P<0.01) and extension contacts (P<0.01) were the significant factors. The level of education was positive and significant under the use of biocontrol. This implies that the probability of biocontrol (the use of natural pesticides) usage increases as the level of education of the farmers increases. This could be because well-educated farmers might have information about the importance and usage of employing natural pesticides to control pests in an organic way, which might increase the use of natural pesticides among them. Less educated farmers, on the other hand, are less likely to use natural pesticides to control pests

Table 3. Factors influencing the types of organic farming used by the farmers

Variables	Organic manure			Cover cropping			Biocontrol			Compost manure		
	Coef	Std Err	P>|z|	Coef	Std Err	P>|z|	Coef	Std Err	P>|z|	Coef	Std Err	P>|z|
Age	0.001	0.005	0.820	0.002	0.006	0.790	0.005	0.007	0.437	0.000	0.003	0.879
Education	-0.170**	0.072	0.028	0.241***	0.079	0.006	0.265***	0.091	0.008	0.005	0.037	0.903
Income	2.65e-06**	1.28e-06	0.049	5.39e-08	7.02e-08	0.450	-2.65e-07***	8.13e-08	0.003	-1.91e-09	3.28e-08	0.954
Farm size	-0.022	0.040	0.597	-0.006	0.044	0.901	0.021**	0.010	0.045	0.003	0.021	0.876
Farm distance	0.069***	0.014	0.000	0.058***	0.015	0.001	0.017	0.018	0.350	0.015**	0.007	0.042
Farming experience	0.031***	0.006	0.000	0.027***	0.006	0.001	0.030***	0.008	0.001	0.124***	0.253	0.000
Farming organization	0.782***	0.248	0.004	1.264***	0.272	0.000	-0.436	0.315	0.179	0.271**	0.127	0.044
Extension contacts	-0.219***	0.043	0.000	-0.064	0.047	0.183	0.177***	0.054	0.003	0.056**	0.023	0.019
Cultural compatibility	-0.684	0.494	0.179	0.173***	0.541	0.004	0.736	0.627	0.252	0.002	0.003	0. 610
Constant	1.963***	0.326	0.000	2.403***	0.358	0.000	-1.431***	0.414	0.002	1.056***	0.167	0.000
LR chi^2	25.06			25.91			23.73			22.25		
Prob > chi^2	0.002			0.002			0.004			0.008		
Pseudo R^2	0.579			0.567			0.528			0.489		
Log-likelihood	-9.101			-9.903			-10.628			-11.613		

***, **, * represent 1%, 5% and 10% levels of significance, respectively.
Source: Field survey (2021)

in their maize farms. Farmers' income had a negative influence on using biocontrol on organic farms. This implies that high income did not increase the likelihood of using biocontrol on the farm. Thus, farmers with lower incomes used natural pesticides such as wood ash and other biocontrol to control pests on their farms, which could be due to their low capital involvement.

Farm size was positive and significant under the use of biocontrol. This implies that an increase in organic farm size will increase the probability of biocontrol usage. The introduction of biocontrol on a large farm could reduce the cost of production on the farm. Farming experience also positively influenced biocontrol usage. This implies that the likelihood of using biocontrol increases as the farming experience increases. Thus, the farming experience was an enhancing factor for the use of biocontrol in organic farms. Extension contacts had a positive influence on the use of biocontrol among organic maize farmers. This implies that the likelihood of using biocontrol increases as the number of extension contacts increases. This could be due to the dissemination of useful information on biocontrol and teaching farmers how to use it on their farms. Extension agents inform farmers about innovation and its benefits (Mwangi and Kariuki 2015).

Under the use of compost manure, farm distance (P<0.05), farming experience (P<0.01), farming organisation membership (P<0.05) and extension contacts (P<0.05) were statistically significant. Farm distance had a positive influence on compost manure usage. This implies that farm distance enhances the probability of using compost manure to enrich the soil nutrients among organic maize farmers. This is due to the fact that preparing and using compost on the farm reduces the transportation cost of moving other means of enriching the soil; thus, farmers who travel a long distance prefer to use compost manure to reduce production costs. Farming experience had a positive influence on the use of compost manure. This implies that an increment in organic farming experience leads to an increment in the likelihood of using compost manure. This shows that the well-experienced farmers used compost manure to add nutrients to the soil more than the less experienced ones. The coefficient of membership in a farm-based organization was also positive and significant concerning the use of compost manure by the farmers. This suggests that an increase in the likelihood of being a member of a farm-based organization will increase the probability of using compost manure by farmers. This could be a result of accumulated labour available in the organisation, which could be used to prepare compost manure from which all members can benefit. The farmers' extension contacts also had a positive influence on the use of compost manure by the farmers. This shows that extension contacts increase the likelihood of using compost manure among farmers. This could be because of the knowledge required to make compost manure, which extension agents supplied to the farmers.

3.4. Problems associated with organic maize farming

The result presented in Table 4 shows that inadequate accrediting agencies was perceived as a severe constraint to organic farming in the study area by the majority (81.7%) of the farmers. Most of the farmers found it difficult to get their organic farms accredited. There was a lack of quality standards for bio manures by government agencies. Most of the organic farmers (67.50%) encountered the inability to meet the export demand as one of the problems associated with organic maize farming. This could be a result of low production or inadequate accreditation agencies. Low yield (59.17%) was also seen as a problem for organic farming. This could be due to the inability of the farmers to effectively control pests and diseases in organic farming in the study area, as the farmers mostly used physical methods and biological control, which have low efficacy. Most of the organic farmers (63.56%) reported that a lack of financial support was one of the problems associated with organic maize farming. Inadequate finance affects rural farmers' productivity and the rural economy, thus limiting farmers' potential to produce more food to feed the growing populace (Falola et al. 2022b). A shortage of organic seeds was also a challenge in organic maize farming. Some noted that organic seeds were not readily available within their locality. Half of the respondents perceived the shortage of organic matter as one of the problems associated with organic maize farming.

Table 4. Problems associated with organic maize farming in the study area

Problems	Yes	No
Inadequate accrediting agencies	392 (81.70)	88 (18.30)
Inability to meet the export demand	324 (67.50)	156 (32.50)
Low yield	284 (59.17)	196 (40.83)
Lack of financial support	300 (63.56)	180 (37.50)
Shortage of organic seeds	308 (64.17)	172 (35.83)
Shortage of organic matter	240 (50.00)	240 (50.00)
Inadequate supporting infrastructure	308 (64.17)	172 (35.83)
High input costs	288 (60.00)	192 (40.00)
The poor market for output	176 (36.67)	304 (63.33)
Lack of awareness	228 (47.50)	252 (52.50)
Lack of technical know-how	308 (64.17)	172 (35.83)
Pest control	292 (60.83)	188 (39.17)

Source: Field survey (2021)

Inadequate supporting infrastructure (64.17%) such as irrigation systems and motorable roads were also major problems associated with organic maize farming. The majority of the farmers practised rainfed agriculture, which limits their production to the availability of rain. High input costs (60%) were also a problem associated with organic maize farming. The price of organic maize seeds was expensive compared to the conventional maize seeds used in production. About 37% of the organic maize farmers perceived poor market output as a challenge to organic maize farming. This could be due to the absence of organic produce markets in the study area. Bello (2008) also reported that inadequate market information was a problem for organic farming. About 48% of the farmers encountered a lack of awareness as one of the problems associated with organic maize farming. Some maize consumers in the study area, especially in rural areas, were not aware of the health risk of conventional agriculture and the benefits of organic agriculture. Most of the farmers (64.17%) reported a lack of expert knowledge as one of the problems associated with organic maize farming. This supports the opinion of Bello (2008) that organic farming is faced with a lack of technical knowledge. Pest and disease control (60.83%) was a constraint to organic maize farming. Investigations revealed that, unlike the conventional farming system where chemical pesticides with high efficacy were used to control pests on maize farmers, the organic farmers in the area used natural pesticides and wood ash to control pests that had low efficacy.

Conclusion

This study investigated the determinants of different organic maize farming practices and the challenges encountered by farmers in Nigeria. The common organic practices in the study area were organic manure, compost manure, biocontrol, and cover cropping. The use of organic manure was influenced by income, farming experience, farm distance, educational level, farming organization, and extension contacts. Farming experience, farm distance, educational level, farming organisation, and cultural compatibility influenced the use of cover crops in organic maize farming. The use of biocontrol in organic maize farming was influenced by income, farming experience, farm size, educational level, and extension contacts. The use of compost manure was influenced by farm distance, farming experience, farming organisation membership, and extension contacts. Inadequate accrediting agencies, inability to meet export demand, high cost and scarcity of organic seeds, lack of financial support, high cost of inputs, poor marketing system, inadequate supporting infrastructure, poor technical know-how, and pest control were the most common problems faced by organic farmers.

Given these findings, this study calls for support from government and non-governmental organisations to encourage farmers in order to promote organic farming. This could be in the form of an effective marketing system for organic products to appreciate the benefits of organic farming. Adequate funding is also a prerequisite to promote the continuity of organic farming and to enhance judicious research in developing sustainable and feasible organic agricultural practices. Programmes should be set up by the government to create public awareness regarding how safe the consumption of organic food products is. This will, in turn, promote the sale of organic food products, thereby enhancing the interest of farmers to go more into organic food production. Also, adequate enlightenment regarding organic maize farming practices programmes should be frequently established for farmers so that more farmers can adopt such practices. Moreover, the government, non-governmental organizations, and research institutes should facilitate the dissemination of organic farming innovations among farmers.

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References

Adamteya N, Musyokab MW, Zundelc C, Coboa JG, Karanjab E, Fiaboeb KKM, Muriukid A, Mucheru-Munae M, Vanlauwef B, Berseta E, Messmera MM, Gattingera A, Bhullara GS, Cadischg G, Fliessbacha A, Mädera P, Nigglia U, Foster D (2016) Productivity, profitability and partial nutrient balance in maize-based conventional and organic farming systems in Kenya. Agriculture, Ecosystems and Environment 235: 61-79.

Ashari S, Mohamed ZA (2017) Factors determining organic farming adoption: international research results and lessons learned for Indonesia. Forum Penelitian Agro Ekonomi 35(1): 45-58.

Atoma NC, Anyoha PN, Chikairem UJ, Uyoyuo S (2020) Adoption of organic farming practices in the rural household of South-South, Nigeria - a case study. Organic Agriculture 10: 173-178.

Bello WB (2008) Problems and prospects of organic farming in developing countries. Ethiopian Journal of Environmental Studies and Management 1(1): 36-43.

Bui HTM, Nguyen HTT (2020) Factors influencing farmers' decision to convert to organic tea cultivation in the mountainous areas of northern. Organic Agriculture 11: 51-61.

Choudhary VK, Kumar PS (2013) Maize production, economics and soil productivity under different organic sources of nutrients in the eastern Himalayan region, India. International Journal of Plant Production 7(2): 167-186.

Digal LN, Placencia SGP (2019) Factors affecting the adoption of organic rice farming: the case of farmers in M'lang, North Cotabato, Philippines. Organic Agriculture 9: 199-210.

Falola A, Mukaila R, Ahmed AO (2022a) Commercialization of Bambara nut production in Nigeria. Yuzuncu Yil University Journal of Agricultural Sciences 32(2): 351-361.

Falola A, Mukaila R, Abdulhamid KO (2022b) Informal finance: its drivers and contributions to farm investment among rural farmers in Northcentral Nigeria. Agricultural Finance Review 82(5): 942-959.

Fawole WO, Rahji MAY (2016) Determinants of productivity among farmers in Ondo State of Nigeria. Asian Journal of Agricultural Extension, Economics & Sociology 9(4): 1-7.

Knoema (2020) Maize production quantity 10,000 (thousand tonnes) in 2020. Available at https://knoema.com/atlas/Nigeria/topics/Agriculture/Crops-Production-Quantity-tonnes/Maize-production?mode=amp. Accessed 8 July 2021.

Läpple D (2010) Adoption and abandonment of organic farming: An empirical investigation of the Irish dry stock sector. Journal of Agricultural Economics 61: 697-714.

Läpple D, Kelley H (2013) Understanding the uptake of organic farming: Accounting for heterogeneities among Irish farmers. Ecology Economics 88: 11-19.

Liverpool-Tasie LSO, Omonona BT, Sanou A, Ogunleye WO (2017) Is increasing inorganic fertilizer use for maize production in SSA a profitable proposition? Evidence from Nigeria. Food Policy 67: 41-51.

Łuczka W, Kalinowski S (2020) Barriers to the Development of Organic Farming: A Polish Case Study. Agriculture 10: 536.

Mucheru-Muna M, Mugendi D, Pypers P, Mugwe J, Kung'u J, Vanlauwe B, Merckx R (2014) Enhancing maize productivity and profitability using organic inputs and mineral fertilizer in central Kenya small-hold farms. Experimental Agriculture 50(2): 250-269.

Muhammad S, Fathelrahman E, Ullah RUT (2016) The significance of consumers' awareness about organic food products in the United Arab Emirates. Sustainability 833(8): 1-12.

Mukaila R, Falola A, Omotesho OA (2020) Food security status: its drivers and coping strategies among vegetable farming households. Cercetări Agronomice În Moldova 53(4): 414-425.

Mukaila R (2021) Nexus between real effective exchange rate misalignment and rubber export in Nigeria. Economic Journal of Emerging Markets 13(2): 123-133.

Mukaila R, Falola A, Egwue LO (2021) Income diversification and drivers of rural smallholder farmers' income in Enugu State, Nigeria. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development 21(3): 585-592.

Mukaila R, Falola A, Akanbi SO, Aboaba KO, Obetta AE (2022) Drivers of poverty among rural women in Nigeria: Implications for poverty alleviation and rural development. Journal of Rural and Community Development 17(1): 32-48.

Mwangi M, Kariuki M (2015) Factors determining adoption of new agricultural technology by smallholder farmers in developing countries. Journal of Economics and Sustainable Development 6(5): 208-216.

National Bureau of Statistics (2020) "Nigeria gross domestic product report (2019)", available at: https://nigeriastat.gov.ng/elibrary?queries[search]5GDP. Accessed 8 July 2021.

Oyawole FP, Akerele D, Dipeolu AO (2016) Factors influencing willingness to pay for organic vegetables among civil servants in a developing country. International Journal of Vegetable Science 22(2): 121-128.

Sodjinou E, Glin LC, Nicolay G, Tovignan S, Hinvi J (2015) Socioeconomic determinants of organic cotton adoption in Benin, West Africa. Agricultural and Food Economics 3(12): 1-22.

Ullah A, Shah SNM, Ali A, Naz R, Mahar A, Kalhoro SA (2015) Factors affecting the adoption of organic farming in Peshawar-Pakistan. Agricultural Sciences 6: 587-593.

Yazdanpanah M, Moghadam MT, Zobeidi T, Turetta APD, Eufemia L, Sieber S (2022) What factors contribute to conversion to organic farming? Consideration of the Health Belief Model in relation to the uptake of organic farming by Iranian farmers. Journal of Environmental Planning and Management 65(5): 907-929.

Yokouchi T, Saito K (2016) Factors affecting farmers' adoption of NERICA upland rice varieties: the case of a seed-producing village in central Benin. Food Security 8(1): 197-209.