



IMPACT OF ORGANIC FARMING ON YIELD AND INCOME OF MAIZE FARMERS IN KATSINA STATE, NIGERIA

Ibrahim, M. M. and Fawole, B. E.

Department of Agricultural Extension and Rural Development, Faculty of Agriculture,
Federal University Dutsin-Ma, Katsina State, Nigeria

Corresponding Author's Email: meslammasomaibrahim@gmail.com, **GSM:** 08061620881

ABSTRACT

This study examined the impact of organic farming practices on the yield and income of maize farmers in Katsina State, Nigeria. Specifically, the study described the socioeconomic characteristics of maize farmers, identified the organic farming practices used by the respondents, assessed their livelihood status, and evaluated the effect of organic farming practices on farmers' yield and income. A multi-stage sampling procedure was employed to select 398 maize farmers for the study. Data were collected using a structured questionnaire and analyzed using frequency counts, percentages, mean scores, livelihood index, and z-test. The results revealed that the majority (89.4% and 78.1%) of the respondents were male and married, while 88.2% had formal education. The mean age and household size of the farmers were 48.8 years and 9 persons, respectively, while the respondents had more than 12 years of farming experience on average. Most (90%) farmers operated farms of less than 5 hectares, and 73.87% had an income exceeding ₦249,000. However, only 33.7% had access to credit facilities, while 11.1% had contact with extension agents. The most widely used organic farming practices were the application of organic fertilizer (89.4%), planting of trees and hedges (84.4%), use of organic pesticides (73.9%), hand-picking of insects (72.4%), and mixed cropping (69.6%). The livelihood index assessment further showed that the livelihood status of the respondents is fairly high. The z-test result indicated a statistically significant increase in farmers' income following the use of organic farming practices, from ₦3,124,597.99 before use to ₦4,747,327.89 after use, representing a mean increase of ₦1,622,729.90 ($Z = 27.63$). Similarly, maize yield increased significantly from 83.56 bags before the use of organic farming practices to 87.32 bags per hectare after use ($Z = 2.66$). The study concludes that the use of organic farming practices contributes positively to maize farmers' income and yield and has the potential to improve their livelihood outcomes. The study therefore recommends increased access to extension services, credit facilities, and technical training to encourage the wider and more effective use of organic farming practices among maize farmers in Katsina State.

Keywords: Organic, Farming, Practice, Maize, Livelihood, Income.

INTRODUCTION

Agriculture is the cornerstone of many economies in developing countries, contributing significantly to employment, income generation, and food security. In Nigeria, the agricultural sector remains a pivotal part of the economy, accounting for about 25% of the gross domestic product (World Bank, 2023) and employs over 35% of the population (National Bureau of Statistics (NBS), 2022). The Nigerian agricultural sector faces numerous challenges, including declining soil fertility, high input costs, and fluctuating market prices (FAO, 2022). These challenges have prompted farmers to seek alternative farming systems that are cost-effective and sustainable. Organic farming practices involve the use of natural inputs, crop rotation, composting, and biological pest control to enhance soil fertility and crop productivity while minimizing environmental harm (International Federation of Organic Agriculture Movements (IFOAM), 2021). In recent years, these practices have been promoted as a strategy to address the dual challenges of food security and environmental sustainability. According to the United Nations Environment Programme (UNEP, 2022), organic farming has the potential to improve soil health, reduce greenhouse gas emissions, and enhance biodiversity. Organic farming practices emphasize the use of natural inputs, crop rotations, and soil fertility management to promote sustainability and reduce environmental degradation (IFOAM, 2021). These practices aim to enhance soil productivity and ensure the production of healthy crops while minimizing reliance on synthetic



chemicals and fertilizers. Globally, organic farming is increasingly recognized for its contribution to environmental conservation, reduction of greenhouse gas emissions, and improvement of farmers' incomes (Parizad & Bera, 2023).

However, the adoption and effects of organic farming practices vary widely across regions, depending on factors such as climate, socio-economic conditions, and institutional support. Organic farming is increasingly seen as a viable solution to these issues. Despite the perceived benefits of organic farming, its adoption remains relatively low in Nigeria. Factors such as lack of awareness, limited access to organic inputs, and insufficient institutional support hinder its widespread implementation (Olawuyi & Oyewole, 2021). And hence could affect crop production in the Country. Maize production is a major component of Nigeria's agricultural landscape, serving as a staple food and a source of income for farmers. However, conventional farming practices, which often rely heavily on synthetic inputs, have raised concerns about environmental degradation, soil fertility depletion, and long-term sustainability (Food and Agriculture Organization (FAO), 2021). In response, organic farming practices have gained attention as a viable alternative that emphasizes ecological balance, biodiversity conservation, and sustainable resource use. The adoption of sustainable agricultural practices is increasingly recognized as a viable strategy for improving productivity, environmental sustainability, and farmers' livelihoods (Ogunniyi *et al.*, 2023). In Nigeria, particularly in Katsina State, maize farming is a critical agricultural activity that contributes significantly to household income, food security, and rural development. However, the sector faces challenges such as declining soil fertility, pesticide misuse, and the escalating costs of synthetic inputs, which threaten its sustainability (Olugbemi *et al.*, 2019). Organic farming practices, characterized by the use of natural fertilizers, crop rotation, and integrated pest management, have the potential to address these challenges while enhancing the livelihood outcomes of farmers.

Agriculture in Katsina State, like in many other parts of Nigeria, is predominantly small-scale and subsistence oriented. Maize production, a critical component of the state's agricultural activities, is increasingly threatened by declining soil fertility, erratic rainfall patterns, and the rising costs of synthetic inputs. These challenges exacerbate rural poverty and food insecurity, particularly among smallholder farmers who lack the resources to adopt modern farming technologies. Alternatively, organic farming practices have been identified as a sustainable alternative to conventional farming systems. It offers potential benefits such as improved soil fertility, reduced production costs, and enhanced resilience to climate change. Despite its potential benefits, the adoption of organic farming practices among maize farmers in Katsina State remains limited. Fawole *et al.*, (2025) found that while maize farmers in Batagarawa Local Government Area of Katsina state showed interest in organic farming practice, major constraints hindering its adoption included inadequate information, poor extension services, limited access to credit, and high cost of organic inputs. The absence of comprehensive studies as well as limited empirical evidence on the impact of organic farming practices on the livelihood of farmers especially on their income levels, particularly in Katsina State has left a critical gap in agricultural policy and practice. Moreover, there is a paucity of empirical evidence on the socio-economic and environmental impacts of organic farming in the State, particularly concerning maize farming. This study will therefore contribute to the body of knowledge by providing insights into how organic farming practices influence income levels, food security, and overall well-being of maize farmers in the region. Based on the above, it is pertinent to find answers to the following research questions: The broad objective of the study was to assess the effect of usage of organic farming practices on livelihood of maize farmers in Katsina State, Nigeria. The specific objectives of the study were to:

- i. describe the socio-economic characteristics of maize farmers in the study area;
 - ii. identify the types of organic farming practices used by maize farmers;
 - iii. ascertain the of usage of organic farming practices among the maize farmers;
 - iv. determine the factors influencing the usage of organic farming practices by maize farmers;
- assess the livelihood status of maize farmers;
- v. determine the impact of the usage of organic farming practices on farmers' yield and income;
 - vi. identify the constraints associated with the usage of OFP among maize farmers in the study area.



METHODOLOGY

The Study Area

The study was conducted in Katsina State, located in the North-West geopolitical zone of Nigeria. Its capital is Katsina. The state is bounded by Kano and Jigawa States to the east, Zamfara State to the west, Kaduna State to the south, and the Niger Republic to the north. The projected population of the state was 10,368,500 in 2022, based on the 2006 population of 5,792,578 and a reported growth rate of 3.7% per annum (National Population Commission [NPC], 2006). The state has a total area of 23,938 km², of which approximately 2.8 million hectares is devoted to crop cultivation. It lies entirely within the tropics, approximately between latitudes 11°08'N and 13°22'N and longitudes 6°52'E and 9°20'E. The rainy season generally occurs from May to October, while the dry season occurs from November to April. The northern part lies within the Sahel and Sudan savannah zones, while the southern part falls within the Northern Guinea savannah. The state is predominantly agrarian, with more than 800,000 farming families and extensive areas under cultivation. It is also a major producer of maize and other crops in Nigeria.

Sampling Technique and Sample Size

A multistage sampling technique was used to select respondents. The first stage involved the purposive selection of Dutsin-Ma and Funtua agricultural zones because of the high concentration of maize production in the zones. The second stage involved the purposive selection of three Local Government Areas from each zone. Dutsin-Ma, Kankia, and Matazu were selected from Dutsin-Ma zone, while Bakori, Kurfi, and Malumfashi were selected from Funtua zone because of the prevalence of maize production. The third stage involved the purposive selection of three major maize-producing villages from each of the six Local Government Areas. In the fourth stage, lists of registered maize farmers were obtained from the Katsina State Agricultural and Rural Development Authority (KTARDA) and used to establish the sampling frame. Yamane's (1973) formula was then used to determine the required sample size, resulting in 398 respondents selected from 33,100 registered maize farmers in the selected villages. Primary data were used for the study.

Data Collection and Analysis

Data were collected using a structured questionnaire complemented by an interview schedule between August and October 2025. The data were analyzed using descriptive statistics and inferential statistics. The descriptive statistics used include frequency counts, percentages, mean scores, standard deviations, and ranking. While the inferential used were livelihood index and Z-test.

RESULTS AND DISCUSSION

Socioeconomic Characteristic of the Respondents

The socioeconomic characteristic of the respondents is presented in Table 1. The results revealed that respondents were predominantly within the economically active age categories, with the largest concentrations between 35 and 54 years and a mean age of 48 years. This indicates a relatively mature farming population with considerable production experience. Similar age distributions have been reported in previous Nigerian studies of organic and sustainable agricultural practices. Adebisi (2020) and Mbah and Okoye (2021), for example, reported that organic-practice adopters in southern and eastern Nigeria were predominantly middle-aged farmers with accumulated farming experience. Adejumo and Olorunfemi (2020) also reported a similar age structure among adopters of sustainable soil-fertility practices in Kwara State. Middle-aged farmers may be more responsive to soil-improving practices because of their accumulated experience and exposure to changes in soil productivity.

Similarly, majority (89.4%) of the respondents were male, reflecting the gender structure of agricultural decision-making and field production in northern Nigeria. This finding is consistent with studies that have reported male dominance in surveys of organic and sustainable farming practices. The gender distribution highlights the need for gender-responsive extension programmes because women contribute substantially to agricultural production but may have more limited access to land, information, and decision-making opportunities. A high proportion of the respondents (78.1%) were married, suggesting relatively large households and potential access to family labour. Previous adoption studies have similarly reported high proportions of married farmers among adopters of environmentally



friendly agricultural practices. Larger households may provide labour for practices such as mulching, compost preparation, manual weed control, and other labour-intensive organic farming activities.

The results further showed that many households had between 5 and 9 members, reflecting the relatively large household structures common in northern Nigeria. Larger households may facilitate adoption of labour-demanding organic practices because family labour can reduce reliance on hired workers. The results also revealed that most respondents had upto secondary education (42.5%). This indicates a moderate level of formal education among the respondents. Limited formal education may constrain understanding of technically demanding practices such as compost formulation and botanical pesticide preparation, while targeted extension training could improve farmers' technical knowledge.

The results revealed that the majority of respondents had more than 12 years of farming experience. Farming experience can influence adoption because experienced farmers are more likely to recognize changes in soil fertility, pest pressure, and productivity over time and may therefore appreciate the longer-term benefits of organic soil and pest-management practices. Most (90.2%) of the respondents operated farms smaller than 5 ha, which is consistent with the predominance of smallholder farming in Nigeria. Smallholder farmers may favour organic practices that rely on locally available resources and require relatively low levels of external expenditure. Only 33.7% of respondents had access to credit, with most reported sources of finance being informal. The low level of access to formal credit may constrain farmers' capacity to expand organic farming activities or invest in inputs and equipment. Reliance on informal sources of finance may limit the scale and sustainability of organic farming activities. Only 11.1% of respondents had contact with extension officers, indicating limited extension coverage in the study area. This is important because several organic farming practices require technical knowledge, training, and demonstrations. Strengthening extension delivery could therefore improve farmers' access to information and technical support.

Majority (84.70%) of the respondents were members of cooperative societies. Cooperative membership may provide an institutional platform for accessing extension services, technical training, credit, market information, and collective bargaining opportunities. The high level of cooperative membership therefore suggests that farmer organizations could be important channels for promoting organic farming and improving livelihood outcomes.



Table 1. Distribution of Respondents According to Socioeconomic Characteristics (n = 398)

Characteristics	Frequency	Percentage	Mean
Age			
25-34	37	9.30	48 Years
35-44	108	27.14	
45-54	153	38.44	
55-64	91	22.86	
65-74	9	2.26	
Sex			
Male	356	89.4	
Female	42	10.6	
Marital Status			
Single	35	8.8	
Married	311	78.1	
Divorced	44	11.1	
Widow	6	1.5	
Widower	2	0.5	
Household size			
0-4	56	14.1	66.33
5-9	164	41.2	
10-14	104	26.1	
15-19	51	12.8	
20-24	21	5.3	
25-29	2	0.5	
Educational Status			
No formal education	34	8.5	
Primary education	164	41.2	
Secondary education	169	42.5	
Tertiary education	18	4.5	
Non formal education	13	3.3	
Farming Experience			
2-11	130		
12-21	217		
22-31	41		
42-51	1		
Farm Size			
<5	359	90.20	132.7
5-9	37	9.30	
>9	2	0.50	
Income			
<100,000	6	1.50	79.6
100,000-149,000	20	5.02	
150,000-199,000	40	10.05	
200000-249,000	38	9.56	
> 249,000	294	73.87	
Access to credit			
Yes	134	33.7	
No	264	66.3	
Extension officer contact			
Yes	44	11.1	
No	354	88.9	
Membership of cooperative			
Yes	337	84.70	
No	61	15.30	
Sources of credit			
Bank	29	7.3	
Cooperative	22	5.5	



Friends/Relatives	172	43.2
Personal savings	123	30.9
Government agencies	2	0.5
Money lender	47	11.8
Non-government organization	3	0.8

Source: Field Survey, (2025)

Types of Organic Farming Practices Used by Maize Farmers

The types of organic farming practices used by respondents are presented in Table 2. The most widely used practices included organic fertilizer (89.4%), tree/hedge planting (84.4%), organic pesticide use (73.9%), and hand-picking of insects (72.4%). These practices may be relatively accessible because they can rely on locally available resources and familiar farm-management techniques. Composting had a comparatively low reported use (14.1%), which may be associated with its labour requirements and the technical knowledge needed for effective preparation and application.

Table 2. Types of Organic Farming Practices Used

Organic Farming Practices	Frequency	Percentage	Rank
Crop rotation	276	69.3	7th
Mixed cropping	227	69.6	6th
Mixed farming	271	68.1	8th
Zero/hoe Tillage	268	67.3	9th
Green manure	191	48.0	10th
Composting	56	14.1	14th
Hand picking of insects	288	72.4	5th

Livelihood Outcomes of Maize Farmers

The results presented in Table 3 describe the livelihood status of maize farmers using organic farming practices across five major livelihood-asset categories of the Sustainable Livelihood Framework: human, social, natural, physical, and financial capital. The reported scores indicated moderate to high levels across the livelihood dimensions. The livelihood indicators suggest improvements in human capital, particularly the ability to acquire skills in the use of OFPs (79.70%), improved health-care services (77.04%), and increased access to labour (73.22%). These results suggest that participation in organic farming may be associated with opportunities for learning and skill acquisition and may reduce exposure to some synthetic agrochemicals. Social-capital indicators, including increased access to farmer associations (74.82%), access to extension agents (74.22%), and increased social interaction (74.92%), were also relatively high. Farmer groups can facilitate collective learning, information exchange, access to services, and cooperation among producers. Natural-capital indicators such as access to farmland (77.69%), adaptation to organic farming (76.83%), and erosion control (74.42%) also recorded relatively high scores. Organic farming practices that emphasize soil fertility management and conservation may contribute to improved soil-management conditions. Nevertheless, direct measurements of soil properties would be required to establish environmental effects conclusively. This finding is consistent with the broader evidence that organic amendments can improve selected physical and chemical properties of soils. Agim *et al.* (2020), for example, reported improvements in soil properties following the application of organic amendments. The present study, however, measured farmers' livelihood perceptions rather than soil properties directly. Physical-capital indicators, including purchase of equipment (75.03%), ownership of vehicles or bicycles (76.03%), household equipment (77.24%), and access to storage facilities (74.67%), also showed relatively high scores. These outcomes may reflect increased investment capacity associated with improved farm income and reduced expenditure on some external inputs; however, the study does not establish a causal relationship between OFP use and asset acquisition. Financial-capital indicators, including access to farm income (80.00%), ability to save (76.94%), access to credit (76.94%), and ability to pay children's school fees (77.14%), were among the highest reported indicators. Overall, the reported livelihood



indicators suggest that farmers using organic farming practices experienced moderate-to-high livelihood outcomes across the five livelihood-asset categories.

Table 3. Livelihood Dimensions of Respondents

Livelihood Assets	Maximum Obtainable Scores	Obtained Score	Status (%)
HUMAN CAPITAL			
Ability to acquire more skills on the use of OFPs	1990	1586	79.70
Ability to seek for knowledge on OFPs	1990	1481	74.42
Acquire more sources of labour	1990	1457	73.22
Good health care services	1990	1533	77.04
SOCIAL CAPITAL			
Increased access to farmers association	1990	1489	74.82
Membership of maize farmers association	1990	1462	73.47
Increased access to extension agent	1990	1477	74.22
Increased social interaction	1990	1491	74.92
NATURAL CAPITAL			
Access to farmland	1990	1546	77.69
Access to water for crop production	1990	1465	73.62
Erosion control	1990	1481	74.42
Adaptation to organic farming	1990	1529	76.83
PHYSICAL CAPITAL			
Bought Lorry/car/motor cycle/bicycle for personal and commercial	1990	1513	76.03
Affordability of buildings	1990	1493	75.03
Purchase of household equipment such as furniture, fan, generator, etc	1990	1537	77.24
Purchase farm inputs/ equipment	1990	1493	75.03
Purchase /rent more farm land	1990	1514	76.08
Access to storage facilities	1990	1486	74.67
Good sanitation system	1990	1479	74.32
Own a poultry House	1990	1491	74.92
Affordability of ICT equipment such as radio, television, mobile phone and computer	1990	1468	73.77
FINANCIAL CAPITAL			
Access to farm income	1990	1592	80.00
Access to regular income	1990	1504	75.58
Availability of assets such as Livestock for income	1990	1542	77.49
Ability to pay children school fees	1990	1535	77.14
Ability to save	1990	1531	76.94
Access to credit	1990	1513	76.94
Access to insurance	1990	1478	74.27
Increase in maize production	1990	1589	79.85
Livelihood Status	57710	43755	75.82 (Hgh)

Source: Field Survey, 2025

Effect of Organic Farming Practices on Yield and Income of Maize Farmers

The results in Table 4 showed a substantial and statistically significant increase in farmers' income after the use of organic farming practices, rising from ₦3,124,597.99 before use to ₦4,747,327.89 after use. The mean difference was ₦1,622,729.90, with a calculated Z-value of 27.63 compared with a tabulated value of 1.96. The result therefore indicates a statistically significant difference between the reported before- and after-use income values. However, the statistical procedure and assumptions underlying the before–after comparison should be reported in greater detail in the final manuscript.



Table 4. Effect of Organic Farming Practices on Farmers' Income

Income	After	Before
Mean	4747327.89	3124597.99
Mean difference	1622729.90	
Calculated Z	27.63	
Tabulated Z	1.96	

Source: Field Survey, 2025

Table 5 also showed that mean maize yield increased from 83.56 bags before the use of OFPs to 87.32 bags after their use, representing a mean difference of 3.76 bags. The calculated Z-value was 2.66, compared with a tabulated value of 1.96, indicating a statistically significant difference at the reported decision criterion. The magnitude of the increase is modest, and interpretation should distinguish statistical significance from practical or economic significance.

Table 5. Effect of Organic Farming Practices on Maize Yield (bags/ Hectare)

Yield (Bags)	After	Before
Mean	87.32	83.56
Mean difference	3.76	
Calculated Z	2.66	
Tabulated Z	1.96	

Source: Field Survey, 2025

CONCLUSION AND RECCOMEDATIONS

The study concludes that organic farming has positive and significant impact on yield and income of maize farmers in the study area. Also, maize farmers widely use organic farming practices, particularly organic fertilizer, tree and hedge planting, organic pesticides, and hand-picking of insects. The findings also indicates generally favourable livelihood outcomes across the human, social, natural, physical, and financial capital dimensions. However, limited access to credit and extension services remains a major constraint. In view of the constraints highlighted the study recommends the need to strengthen extension support, credit access, and technical training in order to promote the effective and sustainable use of organic farming practices among maize farmers in the study area.

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