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IMPACT OF FARMERS PERCPTION OF USING ORGANIC MANURE ON THE ONION PRODUCTION IN KUDAN LOCAL GOVERNMENT AREA OF KADUNA STATE, NIGERIA

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Abstract

This study assessed the impacts of farmers' perception of using organic manure on the onion production in Kudan Local Government Area (LGA) of Kaduna State, Nigeria. The specific objectives were to: describe the socio-economic characteristics of onion farmers, assess the impacts of using organic manure on income and productivity, and perception of farmers in using organic manure. A multi-stage sampling procedure was employed to select 200 respondents for the study. Primary data were collected using structured questionnaires and analyzed through descriptive and inferential statistics. The findings revealed that the majority of respondents were male (89.5%) with a mean age of 40.76 years, and most households comprised 10-15 members. Compost manure (53%) was the most widely used organic input due to its availability and effectiveness in enhancing soil fertility. The results indicated that the use of organic manure had a positive

Keywords: Impact, farmers, Onion, Organic Manure, and Income

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impact on the productivity and income of onion farmers. Key socio-economic factors influencing productivity and income-included education, access to extension services where farmers received training on organic manure use, farming experience and the quantity of manure applied. For sustainability and continuous use of organic manure in Kudan LGA. Improving access to organic inputs, enhancing transportation infrastructure, and providing targeted education and training on organic farming practices are critical. These recommendations align with recent policies promoting sustainable agriculture in Nigeria.

Introduction

Onion (*Allium cepa L.)* is a globally significant vegetable crop, contributing approximately 24% to total vegetable production worldwide (FAOSTAT, 2023). Renowned for its versatility, onions are used extensively in both raw and cooked forms across diverse cuisines. The pungency of onions, attributed to sulfur-containing compounds, is a distinctive characteristic, although it can cause irritation when chopped (Khan *et al*., 2021). Historically, onions have been cultivated for over 7,000 years. Typically grown as an annual, modern onion varieties reach heights of 15-45 cm with fan-shaped, hollow, cylindrical leaves. The plant's growth culminates in the swelling of the bulb, a process that accumulates food reserves in the leaf bases (Jain *et al*., 2022). For optimal growth, onions require fertile, well-drained soils. Sandy loams are preferable due to their low sulfur content, whereas clayey soils with higher sulfur levels can produce more pungent bulbs. Essential nutrients such as phosphorus, nitrogen, and potash are crucial, with phosphorus often needing to be applied before planting (Zhao *et al*., 2023). Onions also exhibit day length sensitivity, with their bulbing triggered by specific daylight conditions. Stressful conditions, including high temperatures, can lead to bolting, where the plant prematurely develops a flower stem (Khan *et al*., 2023).

Organic manure has been widely studied for its effects on crop performance and soil health. In the context of onion cultivation, organic manure can

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significantly impact both the growth and yield of onion varieties as well as the chemical properties of the soil. Organic manure enhances the growth and productivity of onion crops by providing essential nutrients and improving soil conditions. Studies have shown that onions grown with organic manure generally exhibit improved vegetative growth, larger bulb size, and higher yields compared to those grown with synthetic fertilizers or no manure (Olayinka *et al*., 2021). This is attributed to the slow-release nature of nutrients in organic manures, which provides a steady supply of essential elements such as nitrogen, phosphorus, and potassium throughout the growing season. For instance, the application of compost and farmyard manure has been observed to increase bulb diameter and weight, enhance the overall quality of onions, and reduce the incidence of diseases (Aluko & Olowokere, 2022).

Organic manures also improve soil structure, which benefits onion crops by enhancing root development and nutrient uptake. The increased organic matter in the soil from manures helps to create a more aerated and friable soil environment, facilitating better root penetration and growth. This improved soil structure also contributes to higher water retention, which is particularly beneficial during dry periods (Bello *et al*., 2023). The application of organic manure has a profound impact on the chemical properties of the soil. Organic manures contribute to improved soil fertility by increasing the levels of essential nutrients and enhancing the soil's nutrient-holding capacity. For example, organic manures increase the soil's caution exchange capacity (CEC), which enhances its ability to hold and exchange nutrients. This leads to better availability of nutrients for plant uptake and reduced leaching losses (Olowokere *et al*., 2022).

Organic manures also play a role in improving soil pH, particularly in acidic soils. The decomposition of organic materials in manures can help to neutralize soil acidity, creating a more favourable environment for onion growth. This is crucial for optimal nutrient availability, as certain nutrients become less available in highly acidic or alkaline soils (Ogundele, 2023).

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Additionally, the application of organic manures can enhance soil microbial activity, which further benefits soil health. The increased microbial population aids in the decomposition of organic matter, resulting in the formation of humus, which improves soil fertility and structure (Fakorede & Ibrahim, 2021). The enhanced microbial activity also supports the breakdown of organic materials into plant-available nutrients, promoting better crop growth and yield. The long-term use of organic manure contributes to the sustainable management of soil fertility. Unlike synthetic fertilizers, which may lead to soil degradation and environmental pollution, organic manures help to build and maintain soil organic matter levels over time. This sustained improvement in soil health supports ongoing agricultural productivity and reduces the reliance on chemical inputs (Nehrling, 2021).

Purpose and Objectives of the Study

A study on the onion farmers' perception of using organic manure is needed to analyze whether the farmers have a positive or negative view toward onion production techniques. This perception is assumed to be a determinant of the onion farmers' willingness to be agricultural enterprise. Therefore, the study was set to assess the Impact of Farmers Perception of Using Organic Manure on the Onion Production in Kudan local government area Kaduna State Nigeria. The specific objective were to: describe the socio-economic characteristics of onion farmers in the study area: determine the impact of using organic manure on the income and productivity of onion farmers, and describe the perception of farmers using organic manure.

Methodology

The study was conducted in Kudan Local Government Area of Kaduna state. Kudan Local Government Area (LGA) is located in the northern part of Kaduna State, Nigeria. It is one of the 23 LGAs in the state and is geographically situated between latitudes 11° 28' and 11° 55' North and longitudes 7° 45' and 8° 07' East. The LGA shares borders with Makarfi LGA to the north, Soba LGA to the east,

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Zaria LGA to the west, and Giwa LGA to the south. It spans an estimated area of approximately 400 square kilometers (National Population Commission, 2006). According to the 2006 population census, Kudan LGA had a population of 138,000 people. Using an annual population growth rate of 3.2%, the estimated population in 2024 is projected to be approximately 222,897 people (National Population Commission, 2006; United Nations, 2022). This increase in population has implications for land use and agricultural practices, as the majority of the inhabitants depend on farming as their primary livelihood.

A multistage sampling procedure was used to select the sample size for this study. In the first stage, Kudan LGA was purposively selected due to its prominence in onion farming within Kaduna State. The LGA is well-known for onion production, making it an ideal location for this study. In the second stage, three wards were purposively selected based on the high concentration of onion farmers. These wards are Hunkuyi, Likoro, and Kudan. In the third stage, communities within each ward were proportionately selected based on their population of onion farmers. In Hunkuyi ward, six out of eighteen communities were randomly selected: Unguwan Sako, Danzanka, Unguwan Barebari, Unguwan Sarki, Bayan Kamfa and Kofar Arewa. In Kudan ward, four out of fourteen communities were randomly selected: Kofar arewa, Kuka Kofar fada and Matarawa. In Likoro ward, five out of sixteen communities were randomly selected: Bakin Kasuwa, Kakaki, Unguwan Dankali, Kurna and Rafin kira, making a total of fifteen communities. In the final stage, a list of 381 onion farmers was obtained through reconnaissance survey from Kaduna Agricultural Development Agency (KADA) which form the sample frame for the study, from which 52.4% were selected as the sample size. Using the Yamane (1967) formula for determining sample size, the sample size was calculated with the desired confidence level of 95%.

Descriptive (frequency, mean, standard deviation ranking) and inferential statistics (Multiple Regression analysis) was used to achieve the specific objectives. Multiple Regression analysis will be employed to address objective

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(ii), identifying the impact of organic manure on onion productivity and income. The model specification for the multiple regression is as follow;

$$i = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \text{------} + \beta_{10}X_{10} + e \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where:

= Productivity of onion farmers (measured as onion yield per hectare in kilograms)

The independent variables are specified as follows:

Sex (male=1, female=0)

Age (years)
Educational level (years of schooling)
Type of Manure (Farmyard =1, Compost =2, Poultry manure=3, Cow dung manure= 4)
Quantity of Manure (Kg)
Application Method (categorical variable with dummy coding, e.g., broadcasting, incorporation)
Farm Size (ha)
Experience (years)
X_9 = Household Size
X_{10} = Access to credit (No=0, Yes= 1)
X_{11} = Access to extension services (No=0, Yes=1)
E = error term

Results and Discussion

Table 1: Distribution of onion farmers according to Socio-economic characteristics

Variable	Frequency (n = 200)	Percentage	Mean (x)
Age			
20-29 years	53	26.50	
30-39 years	38	19.00	
40-49 years	49	24.50	**40.76**
50-59 years	43	21.50	

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60 years and above	17	8.50	
Marital status			
Married	148	74.00	
Single	52	26.00	
Household size			
2-5	26	13.00	
6-9	17	8.50	
10-15	89	44.50	
16-19	25	12.50	**18.05**
20 and above	43	21.50	
Farm size			
0.5-2.0 ha	173	86.450	**1.37**
2.1-2.5 ha	7	3.50	
2.6-3.0 ha	18	9.00	
3.1 and above	2	1.00	
Years of Experience			
1-5	50	25.00	
6-10	53	26.50	**10.73**
11-15	43	21.50	
16 and above	54	27.00	
Access to Credit			
No	111	54.50	
Yes	90	45.00	
Access to Extension service			
No	103	51.50	
Yes	97	48.50	

Socio-economic characteristics of Onion farmers

Age is a critical factor in agricultural productivity, influencing energy, innovation adoption, and labor availability. The age distribution reveals that

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the largest group of onion farmers (24.5%) is aged between 40–49 years, with a mean age of 40.76 years. This indicates that middle-aged farmers dominate onion production, which is consistent with findings by Yusuf *et al*. (2020), who reported that younger individuals are less attracted to farming, preferring urban employment. In contrast, Chinedu and Ajiboye (2019), observed a shift towards youth engagement in agriculture, especially in areas where financial and technical support programs target young entrepreneurs. This suggests that age distributions in farming could vary based on regional policies and economic opportunities.

Marital status often influences family labor availability and household decision-making in farming. The table indicates that 74% of onion farmers are married, a trend typical in rural agricultural communities. This is in line with Adegoke *et al*. (2018), who found that over 70% of smallholder farmers were married, as family labor is essential in small-scale farming operations. However, a growing trend is seen in studies like Badmus and Ishola (2021), where single farmers, particularly those supported by youth agribusiness programs, are entering the agricultural sector, signaling a potential shift towards individual entrepreneurship in farming.

Household size is a key determinant of labor availability for small-scale farmers. According to the data, 44.5% of onion farmers have households of 10–15 members, with an average size of 18.05. Large household sizes are common in rural areas, where family labor plays a crucial role in farm operations. Ojo *et al*. (2019) similarly observed that large households contribute significantly to onion farming activities, particularly where mechanization is minimal. However, Bello and Ali (2016) noted slightly smaller households of 7–9 members in earlier studies, indicating a possible demographic shift towards larger households, likely due to cultural norms and economic needs.

Farm size is a crucial indicator of production capacity and income potential for farmers. The majority of onion farmers (86.45%) cultivate small plots of land between 0.5 and 2 hectares, with an average farm size of 1.37 hectares. This predominance of small-scale farming limits productivity and economic viability.

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Adewale and Musa (2018) reported similar findings, where small landholdings constrained growth in vegetable farming. However, Onuoha and Obasi (2022) identified a growing interest in expanding farm sizes through cooperative arrangements and government initiatives, though the overall impact remains limited in many rural areas.

Access to financial and technical support plays a vital role in agricultural success. According to the data, 54.5% of onion farmers do not have access to credit, and 51.5% do not have access to extension services. Olanrewaju and Bala (2017) also found that limited access to these resources constrains agricultural productivity among smallholder farmers. More recent studies by Mohammed *et al*. (2020) show that farmers with access to credit and extension services are better equipped to adopt modern farming techniques, leading to improved productivity and profitability

Table 2 The Impacts of using organic manure on productivity of onion farmers.

Variables	Coefficient	Standard Error	T-value
Constant	350.256	90.124	3.888
Gender	12.125	8.356	1.451
Age	-1.024	0.567	-1.806
Marital status	5.786	3.259	1.776
Education	3.1455	0.854	3.682***
Farming experience	-1.856	0.453	-4.097***
Household size	2.632	0.981	2.683*
Farm size	65.452	12.365	5.292**
Access to Extension	14.265	6.234	2.288**
Access to credit	-9.423	4.156	-2.267
Quantity of manure used	0.876	0.305	2.872**
F-value	4.72		
Prob > F	0.0000		

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R-squared	0.682		
Adjusted R-squared	0.521		

*Note: ***, ** and * represent 1%, 5% and 10% levels of probability*

Impacts of using organic manure on productivity of onion farmers.

The results of the multiple regression analysis illustrate the key factors affecting the productivity and income of onion farmers. The variables with significant impacts at the 1%, 5%, and 10% levels of probability are discussed below:

The coefficient for education is positive and statistically significant at the 1% level, with a coefficient of 3.1455 and a T-value of 3.682. This indicates that higher levels of education are associated with increased productivity among onion farmers. Educated farmers are more likely to adopt improved agricultural practices, utilize resources efficiently, and manage their farms better. Similar findings were reported by Adeyemi and Akinwale (2020), who found that education significantly improved the income and productivity of smallholder farmers. The positive impact of education emphasizes the need for agricultural training and literacy programs to enhance farmers' capacity to adopt innovative farming techniques.

Farm size is another critical factor that significantly influences productivity, with a coefficient of 65.452 and a T-value of 5.292, statistically significant at the 5% level. Larger farm sizes allow for economies of scale, leading to higher output and greater income. This result aligns with the findings of Bello *et al*. (2019), who noted that larger farm sizes directly contributed to improved farm productivity in vegetable farming. The positive relationship between farm size and productivity highlights the importance of supporting farmers to expand their landholdings for enhanced agricultural output.

Household size is significant at the 5% level, with a positive coefficient of 2.632 and a T-value of 2.683. Larger households provide more labor, which can increase farm productivity. This result is consistent with the findings of Ojo *et al*. (2019), who observed that family labor is a crucial resource in small-scale

farming operations, where access to hired labor is often limited. The availability of more hands in larger households helps reduce labor costs, thereby enhancing productivity and income. As noted by Adamu and Olatunde (2017), older and more experienced farmers may be more resistant to change, relying on traditional methods that are less efficient than modern techniques. This finding underscores the need for continuous education and training for experienced farmers to keep up with evolving agricultural practices.

Access to extension services is positively associated with productivity, with a coefficient of 14.265 and a T-value of 2.288, significant at the 5% level. Extension services provide critical support in the form of training, information, and technical assistance, enabling farmers to improve their farming practices. Adekunle and Oyeleke (2019) also found that farmers who regularly received extension services were more likely to adopt modern farming techniques, leading to increased productivity. The positive impact of extension services highlights the importance of strengthening agricultural extension programs to reach more farmers.

Access to credit shows a negative relationship with productivity, with a coefficient of -9.423 and a T-value of -2.267, significant at the 10% level. This suggests that farmers who accessed credit may not have used it effectively to enhance their productivity, possibly due to high-interest rates, improper loan utilization, or insufficient loan amounts. This result contrasts with studies like Adesina *et al*. (2020), which reported that access to credit usually boosts agricultural productivity by allowing farmers to invest in inputs and technologies. The negative impact here could indicate challenges in the credit market, emphasizing the need for better credit support systems and financial education for farmer.

Table 3 Distribution of onion farmers according to their perception on using organic manure

S/N	Perceptions	SD	D	N	A	SA	WS	WMS	%
1	I believe that organic manure improves the quality of my soil over time.	6	39	42	79	34	696	3.48**	69.6
2	Organic manure is more cost-effective than inorganic fertilizers.	2	29	51	83	35	720	3.6***	72

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3	Organic manure produces higher yields compared to inorganic fertilizers.	6	43	44	69	38	690	3.45**	69
4	Using organic manure reduces my dependency on synthetic fertilizers.	3	32	39	74	53	745	3.72***	74.5
5	I am satisfied with the availability of organic manure in my area.	3	38	35	79	46	730	3.65***	73
6	I believe that organic manure can help improve onion production in the long term.	3	44	39	78	36	700	3.50***	70
7	Organic manure is difficult to apply on my farm.	3	82	40	33	42	629	3.14**	62.9
8	I am likely to recommend organic manure to other farmers.	32	41	43	85	31	738	3.69***	73.8
9	Organic manure improves the sustainability of my farm practices.	5	45	37	79	35	697	3.48**	69.7
10	The use of organic manure is environmentally friendly compared to chemical fertilizers.	3	43	34	82	36	699	3.49**	69.9
11	Organic manure application leads to better quality produce (e.g., better taste, size).	2	43	37	82	46	757	3.78***	75.7
12	I find it challenging to store organic manure for long periods.	5	46	38	78	33	688	3.44**	68.8
13	Organic manure takes longer to show results compared to inorganic fertilizers.	5	34	41	74	46	722	3.61***	72.2
14	Organic manure provides more consistent results season after season.	3	44	37	79	2	528	2.64***	52.8
15	The government and agricultural institutions should promote organic manure use more actively.	2	27	34	96	42	752	3.76***	75.2
	Grand mean							**3.49****	

*Note: * Disagree (WMS of less than 2.50), ** Neutral (WMS between 2.5 to 3.49) and *** Agree (WMS of 3.50 and above) WS = weighted score, WMS= weighted*

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mean score, SDA=strongly agree, DA=disagree, UN=undecided, A=Agree, SA=strongly agree

Perception of farmers using organic manure

The table presents the distribution of onion farmers based on their perceptions regarding the use of organic manure. The perceptions are ranked using a weighted mean score (WMS), with a grand mean of 3.49, indicating that most farmers generally have a positive perception of organic manure. The perceptions with significant agreement (WMS of 3.50 and above) are discussed below.

Farmers strongly agree that organic manure leads to better-quality produce (e.g., better taste, size), with a weighted mean score of 3.78 and 75.7% of farmers agreeing or strongly agreeing. This perception underscores the belief that organic manure not only improves crop yields but also enhances the physical attributes of the produce, making it more appealing in the market. These findings are consistent with studies by Hassan and Bala (2018), who noted that crops grown with organic inputs tend to have better consumer appeal. The belief that organic manure improves product quality may encourage its continued use among farmers.

The WMS for the statement "I am likely to recommend organic manure to other farmers" is 3.69, with 73.8% of farmers agreeing or strongly agreeing. This high level of recommendation suggests that the majority of farmers have had positive experiences using organic manure and are likely to share their success with others. This finding is in line with Adekunle and Oyeleke (2019), who observed that peer recommendations play a critical role in the adoption of sustainable farming practices. Encouraging farmer-to-farmer knowledge transfer could further boost the uptake of organic manure use in agricultural communities.

Farmers generally expressed satisfaction with the availability of organic manure, as indicated by a WMS of 3.65 and 73% agreement. This perception suggests that organic manure is relatively accessible to farmers, which

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supports its widespread use. However, it is important to ensure consistent supply chains for organic manure to meet future demand, especially as more farmers adopt it for sustainable farming. According to Bello *et al*. (2019), accessibility to organic inputs is crucial for sustained agricultural productivity, which aligns with the farmers' views in this study.

A significant portion of farmers (74.5%) agreed that using organic manure reduces their dependency on synthetic fertilizers, with a WMS of 3.73. This perception aligns with the global shift towards reducing chemical inputs in farming due to environmental concerns and the rising cost of synthetic fertilizers. The positive attitude towards reducing chemical fertilizer dependency through organic inputs is supported by Adesina *et al*. (2020), who highlighted the benefits of organic manure in promoting long-term soil health and reducing environmental degradation.

Farmers perceive that organic manure improves the sustainability of their farm practices, with a WMS of 3.48 and 69.7% agreement. This view emphasizes the role of organic manure in enhancing soil health and maintaining long-term farm productivity. Organic manure contributes to the restoration of soil fertility, making farming more sustainable in the long run, as highlighted by Adeyemi and Akinwale (2020). The adoption of sustainable farming practices is crucial for food security, and the positive perception of organic manure's role in this highlights its importance in farming systems.

With a WMS of 3.49 and 69.9% agreement, farmers perceive that organic manure is environmentally friendly compared to chemical fertilizers. This perception aligns with the growing awareness of the environmental impacts of synthetic inputs, such as soil degradation and water contamination. The belief that organic manure is safer for the environment is supported by studies like Hassan and Bala (2018), who noted that organic inputs help preserve natural ecosystems while maintaining crop productivity.

Farmers agree that organic manure is more cost-effective than inorganic fertilizers, with a WMS of 3.66 and 72% agreement. The lower cost of organic manure, combined with its ability to improve soil health and crop yields, makes

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it an attractive option for many farmers. As highlighted by Ojo *et al*. (2018), cost-effectiveness is a key factor in the adoption of organic inputs, particularly for smallholder farmers who face financial constraints.

Conclusion

The study concludes that the majority of onion farmers (53%) in Kudan Local Government Area make use of compost manure, primarily due to its availability and its effectiveness in enhancing soil fertility. The study also finds that the use of organic manure has a positive effect on both the productivity and income of onion farmers. Factors such as access to extension services play a crucial role, as many farmers have received training on how to produce and effectively use organic manure, further enhancing their productivity.

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