Analysis of Factors Influencing Adoption of Organic Onion Production by Farmers in Wamakko Local Government Area of Sokoto State, Nigeria

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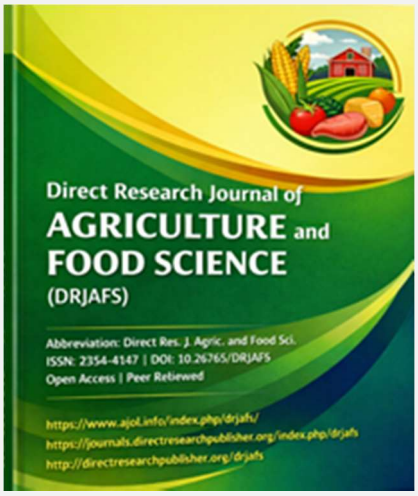
ABSTRACT

This study examined the factors influencing the adoption of organic onion production and the constraints faced by farmers in Wamakko Local Government Area of Sokoto State, Nigeria. A multistage sampling procedure was employed, involving the purposive selection of seven villages (Dundaye, Gumbi, Kwalkwalawa, Kammata, Bini, Kasarawa, and Gatare). From each village, 10 organic onion farmers were randomly selected, yielding a total sample size of 70 respondents. Primary data were collected through structured questionnaires and focus group discussions (FGDs) with the aid of trained enumerators, while secondary data were obtained from relevant literature, including textbooks, journals, reports, and statistical publications. The Small Plot Adoption Technique (SPAT) was used to determine the level of adoption of organic onion production practices by assessing the proportion of cultivated land under organic management by each farmer. Data were analyzed using descriptive statistics such as frequencies and percentages. The results revealed that economic and institutional factors were the most influential drivers of adoption, accounting for 27.5% and 22.5%, respectively, followed by medicinal benefits (14.2%), organic manure use (15%), and extension services (10.0%). The study further identified major constraints affecting organic onion production, including inadequate storage facilities (59.17%), inadequate capital (50.83%), high cost of labour (40.83%), high cost of organic manure (25.00%), limited access to bio-pesticides (23.33%), poor extension services (17.50%), small farm holdings (15.00%), inaccessibility to improved seeds (10.00%), poor market prices (5.83%), inadequate credit facilities (3.33%), and pests and diseases (3.33%). The study concludes that despite the growing adoption of organic onion production, farmers are significantly constrained by infrastructural, financial, and institutional challenges. It is recommended that government and development agencies strengthen extension services, improve access to credit and organic inputs, and support farmer cooperatives to enhance production efficiency and market access. Future studies should consider comparative analyses between organic and conventional onion production systems to better assess yield differentials and economic viability.

Keywords: *Extension Agents, Adoption, C onstraints, Organic onion production*



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INTRODUCTION

Onion (*Allium cepa* L.) is an important vegetable crop belonging to the family Liliaceae (Alibi and Adebayo, 2008). It is believed to have originated in the Near East, particularly in regions encompassing present-day Iran, Afghanistan, and western Pakistan, from where it spread to other parts of the world (Kassam, 2011). Onion has been cultivated in the West African savanna for a long time as both a food and cash crop due to its nutritional, medicinal, and economic importance (Kassam, 2011). According to estimates by the Food and Agriculture Organization (FAO), onion is among the most widely cultivated vegetable crops globally and is produced in more than 170 countries (Kabir, 2007). Recent statistics indicate that global onion production has continued to increase, with China and India remaining the leading producers, followed by countries such as the United States, Turkey, Pakistan, Egypt, Iran, and Indonesia (FAOSTAT, 2024; Sharma et al., 2024). The crop is highly valued for its culinary uses, nutritional composition, and bioactive compounds, including flavonoids and sulfur-containing compounds that contribute to human health (Suleria et al., 2024).

Onion (*Allium cepa* L.) is essentially cultivated under both rain-fed and irrigated production systems, with significant production occurring during the dry season in many tropical and subtropical regions (Anyanwu, 2003). In Nigeria, onion production is concentrated in the northern states, particularly Sokoto, Kebbi, Kaduna, Kano, Jigawa, Katsina, Plateau, and Bauchi States, where suitable climatic conditions and irrigation facilities support commercial production (Anyanwu, 2003). Recent studies have further highlighted the importance of onion production in northern Nigeria for food security, income generation, and rural livelihoods, particularly among smallholder farmers (Afolabi et al., 2024; Yusuf et al., 2025). Given the increasing demand for sustainably produced vegetables, interest in organic onion production has grown due to its potential environmental, economic, and health benefits (Ali et al., 2025).

Nisar *et al.* (2011) reported that in Nigeria, commercial onion production is mainly in the north. Sokoto and Kebbi States are important onion producing states where many farmers grow onion in the fadama under irrigation during the dry season. Onion is one of the major cash crops that have been grown in Sokoto State, particularly Wamakko local government where about 80% of the farmers engaged in onion production. Onion production is therefore, a major source of income to farmers in the area. Organic onion production It is a system that begins to consider potential environmental and social impacts by eliminating the use of synthetic inputs, such as synthetic fertilizers and pesticides, veterinary drugs, genetically modified seeds and breeds, preservatives, additives and irradiation (Olowoake 2014). The organic production of onion is technically feasible when using organic materials such as castor cake, that provide all of the nutrients required for its growth (Prabhakar, *et al.,* 2012.). Organic matter has been animal manures Green Manures. Primary source of organic matter and nutrients, particularly for smaller plots of land or gardens is compost. Compost is the end product of biological breakdown of organic matter (Pradeep and Sharanappa, 2014). Composting or breakdown can result from fungal activity at lower temperatures (<90 F) and bacterial activity at higher temperatures (from 120 to 160F). During composting, carbon from the organic matter is lost as carbon dioxide and heat and water are generated. Organic onion production is highest in North America (30%) and Europe (40%) as of 2007 (Saha *et al.,* 2010). Australia, New Zealand, and neighboring islands in the Pacific Ocean have 39% of the total organic farmland, including Australia's 1,180,000 hectares. Europe farms 23 % of global organic farmland (6,900,000 ha), followed by Latin America with 19 percent (5.8 million hectares). Asia has 9.5 percent while North America has 7.2 percent. Africa has 3 percent. African nations are among the countries with the fewest organic farms (World Atlas2018).

The countries with the most developed organic farming in Africa by area are Uganda, Tanzania, Ethiopia, and Tunisia. Other top African countries for organic farming are Egypt, Sudan, DR Congo, South Africa, Madagascar, and Ghana (Yawson 2010).Organic matter has been animal manures Green Manures. Primary source of organic matter and nutrients, particularly for smaller plots of land or gardens is compost (Neubert, 2016). Compost is the end product of biological breakdown of organic matter (Yadav, and Lourduraj, 2007). Composting or breakdown can result from fungal activity at lower temperatures (<90 F) and bacterial activity at higher temperatures (from 120 to 160F). During composting, carbon from the organic matter is lost as carbon dioxide and heat and water are generated (Njoroge, 2000).

The practice of organic agriculture in an organized manner is still new to the country, with less than ten years of application. As of 2007, Nigeria had 3,154 ha under organic agriculture of which 59 ha were fully converted and managed by a few farmers and NGO's, with little government involvement (Yassen and Khalid, 2009). However, it was reported that in 2010, land under organic production increased to 11,979 ha with 517 producers. This is the last year of reliable figures. In spite of the low level of activities in organic agriculture in Nigeria, the practice has great strengths that can be exploited to accelerate development. There are organizations and stakeholders that are involved in the development of organic agriculture in Nigeria (Odhiambo and Magandini, 2008). These main stakeholders are: 1. Dara/Euro bridge Farm, which is the known as the pioneer organic farm in Nigeria and produces lemongrass, turmeric, ginger, plantains and medicinal herbs; 2. Organic Agriculture Project in Tertiary Institutions in Nigeria, which organized a pioneering network in 2004. Its activities focus on

capacity building and networking of academics in organic agriculture; 3.Olusegun Obasanjo Centre for Organic Agriculture Research and Development, which was established in 2007 and is the first of its kind in Nigeria. It focuses on research and development in organic agriculture; 4. Nigerian Organic Agriculture Network and designated to be an umbrella body for organic agriculture activities in Nigeria in August 2008. Its function is to network organic agriculture organizations in Nigeria; 5.Organic Farmers Association of Nigeria, Organic Fertilizer Association of Nigeria, “Nigeria Go Organic", “Ibadan Go Organic", are other organic stakeholders in the country; 6.World Wide Opportunities on Organic Farms is a network of national organizations that help volunteers to live by and learn organic farming properties World Wide Opportunities on Organic Farms has a passionate team who believe in the potential of organic farming in Nigeria.

They bring volunteers from around the globe to work on farms in Nigeria and also work to promote organic agriculture among the Nigerian populatio n (World Atlas2018). Despite the ranking of onion as the second most important vegetable in Nigeria, the present organic onion production levels do not meet the demand of the teeming populace (Ayodele, 1996).Inorganic onion productions have a host of toxic effects that range from acute poisonings to subtle subclinical effects from long term, low-dose exposure(Denton and Ojeifo,1990a,b).Chronic exposure among farm workers has been associated with numerous health problems, including respiratory problems, memory disorders, dermatologic conditions and cancer.

Organic produce consistently has lower levels of pesticide residues than does conventionally grown produce and a diet of organic produce reduces human exposure. Several studies have clearly demonstrated that an organic diet reduces children’s exposure to pesticides commonly used in conventional agricultural production. Excessive use of agrochemicals produced from non-renewable sources; disruption of complex soil process, poisoning of food chain due to use of toxic pesticides and, excessive irrigation, leading to soil salinity and ground water depletion. Indiscriminate application of fertilizers has altered the physicochemical properties of the soil, changed the biological balance, and altered the soil pH and structure with detrimental consequences for plant growth. It is against this background that this paper examines the organic inputs and inorganic inputs used by onion farmers in Bodinga local government area of Sokoto state, Nigeria.

Organic onion is consumed in different ways by different people and forms as an essential part of the traditional daily diet. It is a major spice item and ranks among the top 5 vegetables in Nigeria (NIHORT, 1986). It can be eaten raw in salad, fried, boiled or roasted, and also used in flavouring soups, canned food products and other savoury dishes it is used in every home virtually on daily basis (Hussaini *et al*., 2000). The bulb is used traditionally as a medical herb for the treatment of measles, pneumonia, cold and catarrh recent studies have confirmed that onion helps in fighting Osteoporosis or bone loss (Biochemist, 2005). Organic onion production is a viable industry that employs plenty labour and the bulbs are traded in large quantities within and between countries of the world.

Organic farming has the potential to contribute significantly to environmental sustainability, biodiversity conservation, and the reduction of agrochemical pollution when its benefits and challenges are adequately understood and addressed. This recognition provided the motivation for the present study. Consumer perceptions increasingly favor organically produced onions because they are often regarded as healthier as and more nutritious than conventionally produced onions (Balaji et al., 2025). Scientific evidence indicates that organically cultivated crops may contain lower nitrate concentrations and higher vitamin C levels than conventionally grown crops, thereby offering potential health benefits and improved nutritional quality (Nguyen et al., 2025). In addition, organic fertilization practices have been shown to enhance onion growth, yield, bioactive compounds, and soil fertility, contributing to the sustainability of agricultural production systems (Ali et al., 2025). Studies comparing organic and conventional Allium vegetables have further reported higher antioxidant capacity and improved nutritional attributes in organically produced onions (Czech et al., 2022). These environmental and nutritional advantages have stimulated increasing interest among farmers, consumers, and policymakers in the adoption of organic onion production practices.

This study was conducted to analyze the factors influencing the adoption of organic onion production by farmers in Wamakko Local Government Area of Sokoto State and to identify the constraints encountered by farmers in adopting organic onion production practices in the study area.

MATERIALS AND METHOD

This study was conducted in Wamakko Local Government area of Sokoto State. Sokoto State is located between longitude 11^0 to 13^0 east and latitude 4^0 to 6^0 north. Sokoto state is bordered in the north with Niger Republic, Zamfara state is also bordered at the east and Kebbi state to the south and west respectively (Sokoto state Dairy, 2014). The state however is made up of 23 local government areas (LGAs) that include: Binji, Bodinga, Dange/Shuni, Gada, Gudu, Gwadabawa, Illela, Isa, Kebbe, Kware, Rabah, Sabon-Birnin, Shagari, Silame, Sokoto North, Sokoto South, Tambuwal, Tangaza, Tureta, Wamakko, Wurno, and Yabo. Out of the 23 local government areas (LGAs). Sokoto state covered an area of approximately 35, 000 square kilometers with total human population of 4, 392,391 (NPC, 2006). The population is heterogeneous but dominated mostly by Hausa and Fulani especially

among the rural dwellers in the state. Generally, over seventy five percent (75%) of the population of Sokoto state are farmers engaged in both upland and lowland farming activities (Illiya, 2013). Wamakko is a Local Government Area in Sokoto State, Nigeria. Its headquarters is in the town of Wamakko.

Sampling procedure and Sample size

The study adopted an exploratory research design approach was used. A total of 70 farmers were purposively selected from 7 different villages in Wamakko, local government area (LGA) of Sokoto state. A multistage sampling procedure was used. The target population of the study are organic onion producers. These villages are Dundaye, Kwalkwalawa, Bini, Kasarawa, Gumbi, Kammata and Gatare. 10 organic onion farmers from each of the villages, thus giving a total of 70 farmers as sample size farmers in the study area (Table 1).

Table 1: Distribution of Sampled organic onion farmers in the study area.

S/N	Selected Village	Sample Size
1	Dundaye	10
2	Gumbi	10
3	Kwalkwalawa	10
4	Kammata	10
5	Bini	10
6	Kasarawa	10
7	Gatare	10
Total		**70**

Research Instrument

The instruments used for the study comprises focus grou p discussion and questionnaire was distributed to farmers using small plot adoption techniques (SPAT) in the study area.

Method of Data collection

Both primary and secondary data were used for this study. Primary data were collected through a field survey using structured questionnaires and focus group discussions (FGDs). The questionnaires were administered to sampled organic onion farmers in the study area with the assistance of trained enumerators to ensure consistency, accuracy, and reliability of the information obtained. Data collected included farmers' socioeconomic characteristics, level of adoption of organic onion production practices, factors influencing adoption, and constraints associated with organic onion production. Focus group discussions were conducted with selected farmers and key stakeholders to obtain qualitative information and validate data obtained through the questionnaire survey. This approach facilitated a deeper understanding of farmers' perceptions, experiences, and challenges regarding organic onion production practices. The Small Plot Adoption Technique (SPAT) was employed to assess the adoption level of organic onion production technologies among farmers. Under this approach, respondents were asked to indicate the proportion of their cultivated onion plots on which recommended organic production practices were implemented. The adoption level was determined by comparing the area under organic onion production practices with the total area cultivated by each farmer. Farmers were subsequently classified according to their degree of adoption based on the proportion of land allocated to organic onion production practices. The SPAT approach was considered appropriate because it provides a more objective measure of adoption intensity than simple binary adoption indicators.

Secondary data were obtained from relevant published and unpublished sources, including peer-reviewed journal articles, textbooks, review papers, conference proceedings, project reports, government publications, statistical bulletins, and other relevant documents. These materials provided background information and empirical evidence to support the study.

RESULTS AND DISCUSSION

The data collected through focus group discussion from the farmer's, trial on the small plot adoption techniques (SPAT) and questionnaire administration was subjected to description and explanation of the findings.

Factors Influencing Adoption of Organic Onion Production in the Study Area

The above (Table 2), indicates that, (27.5%) farmers agrees that the Economic factors as major factors influencing organic onion production, followed by (22.5%) agreed to be Institutional factors. While (14.2%) and 13(10.8%) farmers said are Medicinal factors and Organic Manure are the factors influencing organic onion production respectively. (15%) and (10%) showed that Azadirachtin and Extension services are also factors influencing organic onion production respectively.

Table 2: Factors Influencing Adoption of Organic onion production in the Study Area.

Factors Influencing	Frequency	Percentage (%)
Economic Factors	33	27.5
Institutional Factors	27	22.5
Azadirachtin	13	10.8
Medicinal Factors	17	14.2
Organic Manure	18	15
Extension Services	*12*	10
Total	120	100

Constraints Faced by Organic Onions Farmers

Table 3 reveals that 59.20% complained of inadequate storage facilities, which in turn affected the income of a farmer negatively, as onion is a perishable product that if not marketed early can easily be spoiled. While 40.80%,25.00%,23.30%, 10.00%, 15.00%, 17.50%, 5.80% and 50.80%, 3.30% complained of high cost of labour, high cost of fertilizer, high cost of agro chemicals, inaccessibility to improved seeds, small farm holding, poor extension services, poor market price, inadequate capital and inadequate credit facilities respectively.

Table 3: Distribution of the farmers according to constraints faced in the onion production practices.

Constraints	Frequency	Percentage
Inadequate Storage Facilities	71	59.17
Inadequate Capital	61	50.83
High cost of Labour	49	40.83
High Cost of Organic Manure	30	25.00
Bio-pesticides	28	23.33
Poor Extension Services	*21*	17.50
Small Farm Holding	18	15.00
Inaccessibility to Improved Seeds	12	10.00
Poor Market Price	7	5.83
Inadequate Credit Facilities	4	3.33
Pests and Diseases	4	3.33

In the same vein, Kudi et *al.* (2008) reported that, the major problems emphasized by his respondents were high cost of farm inputs like fertilizer, herbicides and pesticides. Another major area of concern was postharvest problems, the respondents (64%) complained of poor storage facilities and 36% of the respondents complained of poor marketing. In the same vein, Nisar *et al*. (2011) in their paper titled onion production potential and prospect for improvement in the farming systems of Punjab Pakistan reported that there were many factors affecting low yield mainly due to high input prices followed by poor accessibility to quality seed and water shortages. Similarity, Mofoke *et al*. (2003) observed that vegetable production in Nigeria is characterized by use of crude implements, non- availability of inputs, illiteracy, expensive and complex technologies. In the same vein (Adesope, *et al.,* 2012) revealed that absence of storage facilities was the major problem expressed by 91.23% of onion growers. The findings of this research work is in line with the findings of (Adesope, *et al.,* 2012) who stated that, due to unavailability of storage go downs, lack of government price for marketing, the farmers were forced to dispose their produce at the lowest possible price, non- availability of adequate institutional credit facilities at right time, compels them to lend money from lenders and middlemen at exorbitant rate of interest which forced to sell at a predetermined price to the traders. Besides social obligations (marriage and other ceremonies) which usually occur after harvest season, were other reasons for early disposal of the products at a lower price. Shah (1999) also concluded that due to poor storage conditions in terms of ventilation, majority of the onion producers were seemed to market produce immediately after harvesting, various marketing intermediaries had certainly taken advantage of this situation. This situation has undoubtedly resulted in low and unprofitable prices for the majority of onion producers. Moreover, Satendra Kumar et al. (2000) found that, high fluctuations in market prices, unavailability of suitable variety, resource poor farmers, inadequate of cold storage and ware - housing facility in the study area coupled with high cost of inputs were the major constraints experienced by the turmeric growers. Waman and Patil (2000) reported that high cost of onion seed and fertilizers was considered as major constraints for onion growers.

The results in Table 3 revealed that inadequate storage facilities (59.17%) constituted the most severe constraint faced by organic onion farmers in the study area. The finding suggests that many farmers lack appropriate storage structures, leading to post-harvest losses and forcing them to sell their produce immediately after harvest when market prices are often low. This result agrees with the findings of Yeshiwas et al. (2025), who reported that inadequate storage facilities remain a major challenge in onion production systems, contributing significantly to post-harvest losses, reduced marketable output, and lower farm income. The authors further noted that limited storage capacity compels farmers to dispose of onions quickly, thereby reducing profitability and increasing market gluts. Inadequate capital (50.83%) and high labour cost (40.83%) were also identified as major constraints affecting organic onion production. Limited financial resources reduce farmers' ability to purchase production inputs, hire labour, and invest in improved technologies, while the labour-intensive nature of organic farming increases production costs. Other constraints identified included the high cost of organic manure, limited availability of bio-pesticides, poor extension services, small farm holdings, and inaccessibility to improved seeds. These findings are consistent with Lagad et al. (2025), who reported that high labour charges, inadequate advisory services, and limited access to production information constitute major barriers to the adoption of improved onion production technologies among onion growers. The study emphasized that strengthening extension services, improving farmers' access to production information, and reducing production costs are essential for enhancing onion productivity and profitability.

Conclusion

Organic onion farmers encountered inadequate storage facilities, inadequate capital and high cost of labour as the three major problems faced by the farmers. This suggests the onion farmer's inability to expand their current level of

organic onion production. Due to poor storage conditions in terms of ventilation, majority of the organic onion producers were seemed to market produce immediately after harvesting, various marketing intermediaries had certainly taken advantage of this situation. This had undoubtedly led to unremunerative prices offer for most onion producers. Besides social obligations (marriage and other ceremonies) which usually occur after harvest season, were other reasons for early disposal of the products at lower price. This suggests that government should construct good stores, well-ventilated and provide it based on the richness of the farmers to ensure all year-round availability of organic onion in the study area that could be used to export to other regions where onion is not adequately produced. The NACB (Nigerian Agricultural Cooperative Bank) should provide loan to the organic onion farmers to boost their level of productivity in the study area.

Recommendations

i. It was found that education is an important factor in the organic onion production. It is therefore, recommended that adult education and mass literacy campaign should be organized by Federal, States and Local governments so as to disseminate information with regards to improved organic onion production.

ii. It is recommended that Government, Non-governmental organizations and well to do individuals should build or construct good organic onion storage facilities that are well ventilated in order to ensure all year round supply of the product and with high economic value.

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