

AGRICULTURAL TECHNOLOGY ADOPTION AND CROP PRODUCTIVITY IN IKOLE LOCAL GOVERNMENT AREA OF EKITI STATE

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Abstract

This study investigated the influence of agricultural technology adoption on crop production among food crop farmers in Ikole Local Government Area of Ekiti State, Nigeria. The study adopted a descriptive survey design, with a population of 262 registered food crop farmers as obtained from the Agricultural Development Programmes (ADP) 2024 records. A sample size of 158 farmers was selected through simple random sampling. Data were collected using a validated questionnaire titled Technological Advancement and Crop Production Questionnaire (TACPQ), with a reliability coefficient of 0.86 obtained via the test-retest method. Descriptive statistics (mean, percentages and standard deviation) were used to answer the research questions. Findings revealed that several technological advancements, including mechanized equipment, improved seed varieties, irrigation facilities, and mobile-based agricultural information systems, were available to farmers in the area. These technologies had a positive impact on crop yield, farm efficiency, and income generation. Challenges such as high costs of equipment, inadequate technical knowledge, and limited access to credit facilities hindered optimal adoption. The study concluded that agricultural technology improves seed varieties, saves time and reduces post-harvest loss, however adoption is constrained by high cost, lack of credit, inadequate training and weak extension services. The study recommended that the government and private sector should encourage agricultural technologies through subsidies, capacity-building programmes, and improved rural infrastructure to enhance technology adoption among farmers.

Keywords: Agricultural Technology, crop production, food crop farmers, Technology Adoption, Farm Productivity

Introduction

Agriculture remains a backbone of Nigeria's economy, accounting for a significant portion of employment, rural livelihoods, and food security. Despite its relevance, crop productivity continues to lag behind global standards due to limited mechanization, low adoption of modern farming practices, and climate-related challenges. Crop production being referred to as the process of cultivating plants such as cereals, vegetables, legumes, fruits, and cash crops on farms or agricultural land for human

consumption, animal feed, or industrial use, involves a series of agricultural activities including land preparation, planting, irrigation, fertilization, pest and disease control, harvesting, and post-harvest management. Thus, crop production is the entire process of growing and harvesting crops to provide food, raw materials, and income for farmers and society. Gavrilova and Denisova (2020) opined that crop production is a critical contributor to national food security and rural. Accordingly, its potential is hindered by

structural and operational challenges, such as limited access to agricultural innovations, poor financing, weak infrastructure, and low use of information technologies. In response to these constraints, technological advancement in agriculture has gained prominence as a strategic means of increasing productivity, ensuring sustainability, and enhancing the livelihoods of smallholder farmers.

The adoption of technology is the process of developing and applying new tools, systems, methods, or innovations that improve efficiency, productivity, and problem-solving capabilities across various fields. According to Sunday (2024), technological advancement is referred to as the strategic application of modern innovations to solve long-standing agricultural problems such as low productivity, inefficiency, and unsustainable practices in Nigeria's farming system. These adoption aimed to enhance yield, reduce production costs, and improve access to markets and agricultural information, though their effectiveness is often limited by factors such as high costs, poor internet access, and lack of technical know-how. As Okpeke (2024) affirmed technological advancement in agriculture through tools like mechanized farming equipment, improved seed varieties, and precision technologies has become essential for addressing traditional agricultural challenges in Nigeria. These innovations directly enhance crop production by improving efficiency in planting, reducing post-harvest losses, and increasing yield per hectare. For instance, mechanized equipment speeds up land preparation and planting, while improved seed varieties are more resistant to pests and diseases, ultimately resulting in better harvest outcomes, these impacts brought about efficiency in crop production.

Mechanized farming involves the use of machines and mechanical equipment such as tractors, planters, harvesters, threshers and power tillers to perform agricultural operations that were traditionally carried out manually. Olatunji et al. (2022), reported that agricultural mechanization significantly improved agricultural production and farmers' economic well-being by enhancing operational efficiency and increasing farm productivity in Nigeria. The adoption of mechanized farming has become an important strategy for improving agricultural productivity because it reduces labour requirements, shortens production time and increases the efficiency of farm operations. For smallholder farmers, mechanization facilitates timely land preparation, planting, weeding and harvesting, thereby minimizing production delays and reducing post-harvest losses. In farming communities such as the Ikole Local Government Area of Ekiti State, where labour shortages and high labour costs often limit agricultural production, mechanization has the potential to improve crop output and farm profitability.

Improved seed varieties on the other hand are genetically enhanced or selectively bred crop varieties developed to produce higher yields, resist pests and diseases, tolerate adverse climatic conditions and mature within shorter periods than conventional seed varieties. Olasehinde et al. (2023), found that improved maize varieties significantly enhanced production efficiency among Nigerian farmers by reducing technological gaps and increasing overall farm productivity. Their adoption enables farmers to maximize the productive potential of available farmland while improving the quality and quantity of harvested crops. Farmers who adopt

improved seeds are more likely to obtain higher yields because these varieties utilize available nutrients more efficiently and respond better to improved agronomic practices. This position is supported by

Irrigation systems involve the artificial application of water to crops to supplement rainfall and ensure adequate soil moisture throughout the growing season. The adoption of irrigation technology has become increasingly important in improving agricultural productivity, particularly in regions where rainfall is seasonal or unpredictable. Irrigation enables farmers to cultivate crops during the dry season, reduces the risks associated with climate variability and promotes multiple cropping, thereby increasing annual crop output and farm income. Improved irrigation systems can enhance production continuity and reduce dependence on rain-fed agriculture. Recent technological innovations have further improved irrigation efficiency through the integration of artificial intelligence and renewable energy, enabling farmers to optimize water use and reduce production costs. In support of this, Akanbi et al. (2024) reported that AI-powered smart irrigation systems integrated with solar energy provide a sustainable approach to enhancing agricultural productivity in Nigeria by improving water management efficiency, conserving resources and increasing crop yields.

Technological adoption in farming has contributed to increased crop yield through the use of improved planting materials and mechanization. Afodu et al. (2021) revealed that among plantain farmers in Nigeria, the adoption of technologies such as improved suckers, fertilizer application, and mechanized land clearing led to a notable increase in

productivity. This finding is echoed by Yu et al. (2024), who emphasized that innovations in crop breeding and automated irrigation systems contribute to yield improvements and reduced input wastage. Both studies highlight how integrating modern tools into traditional farming systems can substantially raise output levels, suggesting that similar benefits could be achieved in Ikole LGA if such technologies are effectively adopted. Integrating technology in farming system enhances decision-making and farm management through integrating technological advancements in crop production. Chandio et al. (2023) demonstrated that integrating ICT tools empower farmers to make informed decisions, thereby improving cereal production across ASEAN countries. These insights are relevant for rural communities in Nigeria, like those in Ikole LGA, where the growing availability of ICT tools may not yet be matched by active or informed usage in crop production. Added to these, the adoption of technology plays a critical role in climate adaptation, which is increasingly important due to the unpredictability of weather patterns. Baig et al. (2024) analyzed wheat farming in India and found that adaptive technologies such as drought-resistant seed varieties and smart irrigation help mitigate the negative effects of climate variability. Given the reliance on rain-fed farming in Ikole LGA, the application of these adaptive technologies could offer local farmers a way to stabilize their crop production despite climatic challenges.

Crop productivity is a key indicator of agricultural performance and a major determinant of food security, rural livelihoods and economic development, particularly in developing countries where smallholder farming predominates. In Nigeria, increasing crop

productivity remains a priority due to the growing demand for food and the need to improve farmers' incomes. However, crop yields remain below their potential because of challenges such as declining soil fertility, limited access to improved technologies and inadequate agricultural support services. In Ekiti State, where crops such as cassava, maize, yam and rice are widely cultivated, improving crop productivity is essential for sustainable agricultural development. Okonji and Awolu (2021) reported that the adoption of improved agricultural technologies significantly enhanced maize production among farmers in Ekiti State, while Banji et al. (2025) found that effective farm systems and soil fertility management practices contributed significantly to higher crop yields among smallholder farmers in the state.

Agricultural technologies such as improved crop varieties, mechanization, fertilizer application and information and communication technologies have become important tools for enhancing crop productivity by improving farmers' production efficiency and decision-making. In particular, mobile phone technologies have facilitated access to extension services, weather information, input availability and market opportunities, thereby supporting increased agricultural output. Filusi et al. (2026) observed that the utilization of mobile phone technologies improved cassava production among farmers in Ekiti State by enhancing access to agricultural information, although challenges such as poor network coverage, limited digital literacy and financial constraints affected their utilization. These findings underscore the importance of promoting agricultural technology adoption as a means of improving crop productivity among farmers in Ikole Local Government Area

of Ekiti State. In Ikole Local Government Area of Ekiti State, crop production constitutes the major economic activity and the primary source of livelihood for most rural households. Farmers in the area cultivate crops such as cassava, maize, yam and vegetables; however, crop productivity remains constrained by the continued use of traditional farming practices, declining soil fertility, unpredictable rainfall and limited access to modern agricultural technologies. These challenges reduce production efficiency and prevent farmers from achieving optimum yields. Consequently, the adoption of technologies such as improved seed varieties, mechanized farming operations, irrigation facilities and digital agricultural information systems has become increasingly important for improving crop output, enhancing resource use efficiency and reducing production losses.

The relationship between agricultural technology adoption and crop productivity has received considerable attention in agricultural research. Farmers who embrace improved production technologies generally achieve higher crop yields because these technologies improve farm management practices, enhance input efficiency and minimize production constraints. This pattern was observed by Afodu et al. (2021), who found that the adoption of improved production technologies significantly increased the productivity and crop output of plantain farmers in Nigeria. Similarly, the ability of modern agricultural technologies to cushion the adverse effects of climate variability has been recognized as an important factor in sustaining agricultural production. In agreement with this position, Amankwah (2023) reported that the adoption of agricultural technologies enhanced crop productivity among rural

farmers by strengthening their resilience to climate variability. Furthermore, improved irrigation technology enables farmers to cultivate crops beyond the rainy season, thereby increasing production intensity and overall farm output. This corroborates the findings of Adebayo et al. (2018), who established that the use of irrigation technology significantly improved crop yield, crop income and household food security among Nigerian farmers. Collectively, these studies suggest that increasing the adoption of appropriate agricultural technologies could substantially improve crop productivity among farmers in Ikole Local Government Area of Ekiti State.

The adoption of these technologies has the potential to reduce production inefficiencies, minimize post-harvest losses and improve overall farm performance. This position is supported by Onomu and Aliber (2024), who argued that increased technology use is fundamental to transforming Nigeria's agricultural sector through improved production efficiency, although its adoption is still constrained by structural and institutional challenges. Similarly, Oyekunle (2025) emphasized that precision agriculture technologies enhance food production by enabling farmers to make timely and efficient management decisions, thereby improving production efficiency and resource utilization.

Beyond improving production efficiency, agricultural technology adoption contributes significantly to increased crop production and farm income generation. Higher crop yields resulting from improved technologies provide farmers with larger marketable surpluses, increased household earnings and greater financial capacity to reinvest in agricultural production. In addition, technological innovations improve

production sustainability by enabling farmers to cope with changing climatic and economic conditions while maintaining agricultural output. Adeyemo et al. (2024) observed that technological innovation exerts a positive influence on agricultural productivity in Nigeria by stimulating higher agricultural output and supporting long-term sectoral growth. Likewise, Abraham and Jankowska (2025) noted that improving agricultural productivity through technology adoption is essential for unlocking Nigeria's agricultural potential and achieving sustainable food production. Furthermore, increased agricultural productivity translates into better income-generating opportunities for farming households, as higher yields often result in increased farm revenue and improved livelihoods. This aligns with the findings of Kayode et al. (2026), who reported that effective agricultural extension services enhanced income-generating activities among crop farmers by facilitating the adoption of improved agricultural practices and technologies. This implies that the adoption of technology in farming system has significantly influenced crop productivity.

Despite these benefits, several challenges hinder the effective use of technology in crop production, especially in rural areas. Afodu et al. (2021) noted that limited access to credit, training, and infrastructure can discourage the adoption of farm technologies, even when they are available. Similarly, Yu et al. (2024) observed that affordability and lack of awareness remain major barriers to utilizing advanced systems like real-time monitoring and precision farming. These findings suggest that while technology holds promise for improving agricultural outcomes in Ikole LGA, significant investments in farmer education, infrastructure, and policy

support are needed to bridge the gap between innovation and implementation. In light of these studies, it becomes imperative to assess how technological advancement ranging from physical inputs to digital innovations has impacted crop production in Ikoe LGA of Ekiti State. This assessment will provide evidence-based insights into the effectiveness, challenges, and level of adoption of agricultural technologies within the area, which in turn can guide future policy and extension strategies for sustainable rural development.

Statement of the Problem

Crop productivity remains a major concern in agricultural development because it determines the ability of the agricultural sector to meet the increasing demand for food, improve farmers' incomes and contribute to national economic growth. In Nigeria, the continuous increase in population has intensified the demand for food, thereby placing greater pressure on farmers to increase agricultural output. However, despite the vast agricultural potential of the country and various interventions aimed at improving agricultural production, crop productivity among many smallholder farmers appears to remain below expectation. This situation may contribute to inadequate food supply, rising food prices, reduced farm income and increasing concerns about household food security, particularly in rural communities where agriculture serves as the primary source of livelihood.

In Ekiti State, and particularly in Ikole Local Government Area, crop farming remains the dominant agricultural enterprise, with farmers cultivating crops such as cassava, maize, yam and vegetables. Nevertheless, many farmers still depend largely on traditional production practices, which may limit

production efficiency and reduce crop output. Although agricultural technologies such as mechanized farming, improved seed varieties and irrigation systems have been introduced to enhance agricultural productivity, their adoption among farmers may not be widespread or sufficiently effective to produce the desired improvements in crop production. Consequently, farmers may continue to experience low production efficiency, limited marketable surplus, reduced income and difficulties in meeting the increasing demand for agricultural produce. While previous studies have examined agricultural technology adoption and productivity in different parts of Nigeria, there is limited empirical evidence on how the adoption of specific agricultural technologies relates to crop productivity among farmers in Ikole Local Government Area of Ekiti State. This gap in knowledge underscores the need for the present study to examine the influence of agricultural technology adoption on crop productivity in the study area.

Purpose of the Study

The purpose of this study is to examine the influence of agricultural technology adoption on crop productivity in Ikole Local Government Area of Ekiti State. The study specifically seeks to:

1. identify the types of agricultural technology adopted by farmers
2. determine the influence of agricultural technology adoption on crop production among farmers in Ikole

Research Questions

The following research questions were raised to guide the study

1. What types of agricultural technology are currently available to

farmers in Ikole Local Government Area of Ekiti State?

2. How do these agricultural technology adoption influence crop production in Ikole LGA?

Methodology

This study employed a descriptive survey design to examine the impact of technological advancement on crop production in Ikole Local Government Area of Ekiti State. The population comprised all 262 registered food crop farmers in the area, as recorded by the Agricultural Development Programmes (ADP) in 2024. A sample size of 158 farmers was determined. Simple random sampling was adopted to ensure equal representation. Data were collected using a structured questionnaire titled Technological Advancement and Crop Production Questionnaire (TACPQ), comprising three sections: demographic information, availability and use of technological advancements, and their perceived impact on crop yield and productivity. Items were rated on a four-point Likert scale: Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1). A decision rule was set using a cut-off mean of 2.50, which is the midpoint of the scale. Any item with a mean score of 2.50 or above was

interpreted as “Agree,” while items with a mean score below 2.50 were interpreted as “Disagree.” This decision rule was applied in the “Decision” column of the results tables to summarize respondents’ general position on each statement

The instrument’s validity was established through expert review by two lecturers from the Department of Vocational and Technical Education and one from the Department of Test and Measurement in Ekiti State University. Reliability was determined using the test-retest method on 20 farmers from a neighbouring local government area, with the Pearson Product Moment Correlation producing a coefficient of 0.86. The researcher, assisted by two trained field workers, administered the questionnaires directly to respondents, providing clarification where necessary, and retrieved all copies immediately after completion. Data analysis using descriptive statistics (such as mean, percentages and standard deviation) were used to answer the research questions.

Results

Research Question1: What types of agricultural technology are currently available to farmers in Ikole Local Government Area of Ekiti State?

Table 1: Technological Advancement Available to farmers in Ikole Local Government Area

S/N	Items	SA (%)	A (%)	D (%)	SD (%)	Mean	Std. Dev.	Decision
1	Access to improved seed varieties	78 (49.4)	60 (38.0)	12 (7.6)	8 (5.1)	3.32	0.81	Agree
2	Use of mechanized tools (tractors, planters)	52 (32.9)	46 (29.1)	40 (25.3)	20 (12.7)	2.82	1.02	Agree
3	Application of modern irrigation systems	28 (17.7)	38 (24.1)	52 (32.9)	40 (25.3)	2.34	1.05	Disagree
4	Use of fertilizers/pesticides from tech recommendations	88 (55.7)	54 (34.2)	10 (6.3)	6 (3.8)	3.42	0.78	Agree
5	Access to agricultural information via phone/internet	66 (41.8)	50 (31.6)	28 (17.7)	14 (8.9)	3.07	0.97	Agree
6	Participation in training on new technologies	48 (30.4)	56 (35.4)	36 (22.8)	18 (11.4)	2.85	0.99	Agree

The results in Table 1 show that improved seed varieties (Mean = 3.32), fertilizer/pesticide use from technology recommendations (Mean = 3.42), and access to agricultural information via phones or the internet (Mean = 3.07) were rated as the most available agricultural technologies among farmers in Ikole LGA. Mechanized tools (Mean = 2.82) and participation in training on new agricultural technologies (Mean = 2.85) were also reported as available, but to a lesser extent. Modern irrigation systems had the lowest availability rating (Mean = 2.34), suggesting that water

management technology is still underutilized in the area. The overall pattern indicates that while crop input technologies and information access are relatively widespread, infrastructure-heavy innovations such as mechanization and irrigation are less prevalent, possibly due to high costs and limited technical support.

Research Question 2: How do these agricultural technology adoption influence crop production in Ikole LGA

Table 2: Influence of Agricultural technology on crop production

S/N	Items	SA (%)	A (%)	D (%)	SD (%)	Mean	Std. Dev.	Decision
1	Improved seeds increase yield	94 (59.5)	52 (32.9)	8 (5.1)	4 (2.5)	3.49	0.72	Agree
2	Mechanization saves time/energy	70 (44.3)	60 (38.0)	20 (12.7)	8 (5.1)	3.22	0.86	Agree
3	Technology reduces post-harvest loss	62 (39.2)	54 (34.2)	28 (17.7)	14 (8.9)	3.04	0.97	Agree
4	Fertilizers/pesticides enhance quality	86 (54.4)	58 (36.7)	10 (6.3)	4 (2.5)	3.43	0.76	Agree
5	Access to tech info improves decisions	80 (50.6)	52 (32.9)	16 (10.1)	10 (6.3)	3.28	0.88	Agree
6	Technology improves overall productivity	92 (58.2)	50 (31.6)	10 (6.3)	6 (3.8)	3.44	0.79	Agree

From Table 2, respondents agreed across all items that technological advancements have a positive influence on crop production. The strongest impacts were seen in the use of improved seeds to increase yield (Mean = 3.49), the use of fertilizers and pesticides to enhance crop quality (Mean = 3.43), and overall improvement in productivity (Mean = 3.44). Farmers also reported that mechanization helps save time and energy (Mean = 3.22) and that access to technological information improves farming decisions (Mean = 3.28). Reduction of post-harvest losses (Mean = 3.04) was also acknowledged, though with slightly lower agreement, possibly

indicating that post-harvest technologies are not as effectively adopted as production-enhancing ones. These results suggest that the technologies in use are perceived to be beneficial, especially in yield and quality improvement.

Discussion of Findings

The findings of this study show that agricultural technology such as improved seed varieties, fertilizer/pesticide recommendations, and mobile-based agricultural information services are widely accessible in Ikole LGA, while infrastructure-dependent technologies like mechanized tools and

modern irrigation systems are less common. This aligns with the observation of Afodu et al. (2021), who reported that Nigerian farmers tend to adopt low-cost, input-based technologies more readily than capital-intensive machinery due to financial and infrastructural constraints. Similarly, Gavrilova and Denisova (2020) highlighted that the diffusion of innovation in Nigerian smallholder agriculture often follows a gradual path, with simpler technologies spreading faster than those requiring high investment.

The positive influence of technology on crop yield, productivity, and decision-making reported in this study supports the findings of Okpeke (2024) and Sunday (2024), both of whom emphasized that adoption of improved agricultural technologies leads to measurable gains in output and efficiency in Nigerian farming systems. These findings are consistent with Yu et al. (2024), who found that modern agricultural technologies enhance food production by improving crop quality, resource efficiency, and farm management practices. The challenges identified particularly high costs, limited training, and inadequate infrastructure mirror the constraints reported in Chandio et al. (2023), who noted that access to information and physical infrastructure remains a bottleneck in agricultural technology adoption in many developing regions. Baig et al. (2024) also observed that without addressing cost and accessibility barriers, the potential of technological innovations to improve crop production may remain underutilized, particularly in rural areas.

Conclusion

Based on the findings, it was concluded that while certain agricultural

technologies, particularly improved seed varieties and fertilizer application tools, are widely available in Ikole LGA, other critical technologies such as irrigation systems and mechanized equipment remain less accessible. Farmers perceive significant benefits in yield improvement, time savings, and post-harvest loss reduction from technology use. However, adoption is constrained by high costs, lack of credit, inadequate training, and weak extension services.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. Government and non-governmental organizations should encourage agricultural technologies by providing subsidies or low-interest credit schemes to make agricultural technologies more affordable to farmers.
2. Since farmers perceive significant benefits of agricultural technologies, regular training workshops and demonstrations should be organized by stakeholders to equip farmers with technical skills for effective technology use.
3. Agricultural extension agents should be adequately trained, motivated, and deployed to rural communities to provide hands-on guidance on technology adoption by offering incentives for motivation and fostering community engagement for effective technology transfer.

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