FUDMA Journal of Agriculture and Agricultural Technology
ISSN: 2504-9496
Vol. 11 No. 2, June 2025 Special Issue: Pp247- 251

https://doi.org/10.33003/jaat.2025.1102.031

HARNESSING ARTIFICIAL INTELLIGENCE IN AGRICULTURAL EDUCATION: A CATALYST FOR CREATIVITY AND PRODUCTIVITY IN BAGWAI LOCAL GOVERNMENT AREA OF KANO STATE, NIGERIA

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ABSTRACT

This study explored the role of Artificial Intelligence (AI) in enhancing creativity and productivity in agricultural education in Bagwai Local Government Area of Kano State, Nigeria. A mixed-methods approach of data collection was employed, using a structured questionnaire and focus group discussions. Data was analyzed using descriptive analysis, Likert scale and regression. The study reveals that AI tools can personalized learning, increase crop yields and learners' creativity, enhance productivity and promote sustainable agricultural practices. The findings concluded that AI has the potential to transform agricultural education, enabling students to develop the skills and knowledge needed to address the complex challenges facing the agricultural sector. Study recommended that Government should make AI facilities available and accessible to the students. Educators should inculcate the knowledge of AI integration to student's curriculum in agricultural education and this will ultimately be promoting intelligent transformation in this industry. There is need for education instructors to track students' perceptions of AI over time, and this will enable educators to identify learning gaps and adjust their teaching strategies accordingly. Government and other stakeholders in education should incorporate AI-powered tools in agricultural education, and this would enhance student's familiarization with these technologies and become better prepared for their future careers.

Keywords: Artificial intelligence, Agricultural education, Creativity, Productivity

INTRODUCTION

Nigeria's agricultural sector has long been a vital component of the country's economy, providing employment opportunities and contributing to food security (Adetuyi et al., 2023). Youth engagement in agriculture is crucial for ensuring food security, economic growth, and sustainable development, particularly in Nigeria, where agriculture plays a significant role in the economy (Osabohien et al., 2020). Agricultural education plays a critical role in shaping the future of farming and food Nevertheless, traditional teaching methods often fail to provide youth with the practical skills and knowledge needed to succeed in the rapidly evolving agricultural sector (Njura et al., 2020). Studies revealed Artificial Intelligence (AI) offers a promising solution, enabling educators to create innovative learning experiences that foster creativity, productivity, and sustainability (Olagunju, 2024; Olorkor and Gideon, 2024; Aijaz et al., 2025). For many decades, there has been significant transformations in agricultural sector, with technology playing an increasingly pivotal role in reshaping traditional practices, couple with the projection of the world's growing population by the 2050 to attain 9.7 billion, there is a crucial need to upsurge food production FAO et al. (2021) cited in (Busari et al., 2024). Consequent to this, engaging youth in agriculture is crucial, as they represent the future of farming and harnessing AI technologies offers opportunities to make agriculture more attractive and efficient for youth, thereby addressing challenges such as aging farmer populations and rural-urban migration (Gikunda, 2024).Though, adoption of AI in agricultural education is still in its infancy, nevertheless, studies conducted in AI in Kano State found in the works of Edo and Edo (2025) focused on the assessment of the role of Artificial Intelligence in reposition to Technical Education (TE) for economic development in Nigeria. Whereas, Kantudu (2025) harnessing AI for educational excellence: transformative strategies for teaching, learning, research, and community engagement in Nigerian higher education. None has studied the use AI on agricultural education and there is a need for further research to explore its potential and challenges. Thus, the paucity of empirical evidence justifies the research.

LITERATURE REVIEW

Numerous studies have highlighted the potential of AI in agricultural education (Hnatiienko et al., 2024; Urbano et al., 2024). In line to this, Lengyel et al. (2024) The use of AI in agricultural education not only aids in understanding complex concepts, but also prepares students for future challenges in the agri-food sector Similarly, Hoffmann et al. (2024) postulated that in courses like domesticated livestock behavior and meat science, AI assignments have been shown to boost creativity and provide unique learning experiences, helping students visualize complex concepts. This corroborates with Taneja et al. (2023) the use of AI in agriculture, such as precision agriculture and predictive analytics, equips students with practical skills relevant to modern agricultural practicesIn the vein, Ahmed et al. (2024) discovered AI-powered tools can improve crop yields, and promote sustainable agricultural practices. Whereas, Zhang et al. (2022) found that AI-powered drones can improve crop yields and reduce pesticide use. Consistence to this, Li et al. (2023) found that AI can facilitate precision agriculture, enabling farmers to make datadriven decisions and improve crop yields.

MATERIALS AND METHODS

The study was carried out at Bagwai Local Government of Kano State. It is geographically between latitude 100^0 33' South to 120^0 37' North and longitude 70^0 34' West to 900^0 25' East. It is located in the Northern part of Kano State and covers an area of 1720 sq km. It has one district head and 10 ward heads. The area has a total population of 387,061 (Census, 2006). Agriculture plays a vital role in the socio-economic well-being of the people in the area, as 80% of the people are engaged in farming activities, while other occupations include local blacksmiths, weavers, dyers, trading, and local craft. The major religion of the people is Islam, while Hausa and Fulfulde are the predominant languages spoken (Umar et al., 2021). This study employed a concurrent transformative mixed-methods design to evaluate the integration of Artificial Intelligence (AI) in agricultural education. Quantitative data were collected from 100 respondents selected via simple random sampling, utilizing a structured 5-point Likert scale instrument. Statistical analysis was performed using frequency counts, percentages, and simple linear regression to determine the predictive relationship between the primary independent variable (X) and the dependent variable (Y), expressed as: $Y = \beta_{0+} \beta_1 X + €$

Where Y is the perceived integration of AI, β_0 is the constant, β_1 is the regression coefficient, X is the predictor variable (e.g., AI Literacy), and ϵ represents the error term. To supplement the quantitative findings with "thick description," Focus Group Discussions (FGDs) were conducted with 20 purposively selected educators and agricultural experts. Qualitative data were processed through thematic analysis to identify systemic barriers and pedagogical opportunities. This dual-strand approach ensures a robust triangulation of broad perception trends with nuanced professional insights.

RESULTS AND DISCUSSION:

Table 1 shows that a large number of the respondents (60%) strongly agreed that AI enhances creativity in agricultural education, 20% agree, 10% were neutral. Whereas, (5%) (5%) disagreed and strongly (5%) (5%) disagreed and strongly disagreed that AI enhances creativity in agricultural education, respectively. AI creativity enhancement in agricultural education concurred with Tzachor et al. (2022), who noted that students who are exposed to AI in the classroom are more likely to think critically and creatively. Also, they can learn how to create novel solutions to challenging issues in agriculture, like reducing the effects of climate change and optimizing resource use. Table 1 shows that a large number of the respondents (60%) strongly agreed that AI enhances creativity in agricultural education, 20% agree, 10% were neutral. Whereas, (5%) (5%) disagreed and strongly disagreed that AI enhances creativity in agricultural education, respectively. AI creativity enhancement in agricultural education concurred with Tzachor et al. (2022), who noted that students who are exposed to AI in the classroom are more likely to think critically and creatively. Also, they can learn how to create novel solutions to challenging issues in agriculture, like reducing the effects of climate change and optimizing resource use.

Furthermore, the results of the role of AI in improving productivity in agricultural education revealed that the highest (55%) strongly agreed with the pronouncement, (25%) agreed, on the other side, (10%) belongs to neutral and (5%) (5%) disagreed and strongly disagreed with the assertion correspondingly.

AI efficacy in improving productivity in agricultural education as viewed by the majority, is in tandem with Shafik et al. (2025) affirmed that AI has benefited agriculture, with the ability to address food security, improve production processes and productivity, and pave the path for future agriculture. More so, the result of the analysis on the role of AI in promoting sustainable agricultural practices unveiled that large majority (65%) strongly agree, (20%) agree, on the other hand, (5%) were neutral and (5%) (5%) disagreed and strongly disagreed separately.

The finding is supported by Kumar et al. (2019) noted that AI can facilitate personalized learning and promote sustainable agricultural practices. Additionally, the high percentage of respondents who strongly agreed that AI enhances creativity, improves productivity, and promotes

sustainable agricultural practices was further buttressed by the Regression analysis that showcased statistical significance, evidenced by the p-values ($P < 0.01$, $P < 0.05$, $P < 0.001$), indicating statistical significance on the role of AI in enhancing creativity and productivity in agricultural education.

Table 1: Respondents' Perceptions of AI Relevance in Enhancing Creativity, Productivity and Sustainable Agricultural Practices in Agricultural Education

S/No	Statement	SA (%)	A (%)	N (%)	D (%)	SD (%)	Total (%)
1	AI enhances creativity in agricultural education	60	20	10	5	5	100
2	AI improves productivity in agricultural education	55	25	10	5	5	100
3	that AI promotes sustainable agricultural practices.	65	20	5	5	5	100

Note: SA = Strongly agreed, A = Agreed, N = Neutral, D = Disagreed, SD = Strongly disagreed
Source: Field survey 2025

Moreover, to elicit more information, buttress or counter respondents' responses, and to draw inferences in the multi-dimensional roles of AI in agricultural education, experts in the field of education and agriculture were drawn and engaged in an in-depth interview via Focus Group Discussion (FGD) on the potential benefits of AI. The questions that dominated the session were: efficacy of AI in facilitating learning and creativity, crop yield increase, and sustainable agriculture. Result in Table 2 on the potential benefits of AI in agricultural education inferred that (90%) believed that AI can facilitate personalized learning, and (75%) had a strong conviction that AI can improve crop yields. Similarly, (85%) asserted that AI served as a cornerstone to sustainable agricultural practices; consequently, (80%) deduced that AI can enhance creativity. The findings of the focus group discussion supported the earlier results of the majority, which documented that AI enhances creativity, improves productivity, and promotes sustainable agricultural practices. This is consistent with other empirical evidence postulated by Victoire et al. (2023), Ziesche et al. (2023), Agboola et al (2025), Enakpodia (2024), Holzinger et al. (2024), Arogundade and Njoku (2024), Chavan et al. (2024), Kumari et al. (2025), and Aijaz et al. (2025).

Table 2: Results of Educators and Agricultural Experts' Focus Group Discussion on the Potential Benefits of AI in Agricultural Education

S/No	Potential benefits of AI	Frequency	Percentage
1	Facilitated personalized learning	16(20)	90%
2	Improved crop yields	15(20)	75%
3	Promoted sustainable agricultural practices	17(20)	85%
4	Enhanced creativity	16(20)	80%

Source: Field survey 2025

Table 3 shows that the overall model was statistically significant ($F = 32.45$, $p < 0.001$).
Individually:
AI and creativity: $\beta = 0.52$, $p < 0.01$
AI and productivity: $\beta = 0.47$, $p < 0.05$
AI and sustainability: $\beta = 0.39$, $p < 0.01$
These results indicate that AI has a strong positive and statistically significant effect on both creativity and productivity in agricultural education.
Interpretation

The findings imply that increased integration of AI tools significantly enhances students' creative abilities and productivity levels. The high explanatory power of the model further confirms that AI is a critical driver of innovation in agricultural education.

Table 3: Multiple Regression Analysis of the influence of Artificial Intelligence on Creativity and Productivity in Agricultural education

Variable	Coefficient (β)	Std. Error	t-value	p-value
Constant	1.25	0.32	3.91	0.000
AI & Creativity	0.52	0.11	4.73	0.001
AI & Productivity	0.47	0.14	3.36	0.012
AI & Sustainability	0.39	0.10	3.90	0.002
$R^2 = 0.68$				
F-value = 32.45 ($p < 0.001$)				

Source: Field survey 2025

CONCLUSION AND RECOMMENDATIONS

The study concluded that both the respondents and agricultural educators believe that AI can enhance creativity, improve productivity, and promote sustainable agricultural practices. However, the adoption of AI in agricultural education is still in its infancy, and there is a need for further research to explore its potential and challenges in order to bridge the gaps. It is recommended that it is significant for educational institutions understand how students perceive AI integration in agricultural education, which will be conducive to adapting their curricula to cultivate researchers and practitioners. By investigating students' attitudes to the benefits of AI in agricultural education, it is possible to assess whether the current educational system is able to adapt to these changes and promote necessary educational reforms. By tracking students' perceptions over time, educators can identify learning gaps and adjust their teaching strategies accordingly. By integrating AI-powered tools in agricultural education, students can familiarize themselves with these technologies and become better prepared for their future careers. Understanding students' knowledge toward this integration can offer significant references for the cultivation and development of experts with AI technology in agricultural education, thereby, ultimately promoting intelligent transformation in this industry. The government should provide AI facilities available and accessible to the students.

The model produced an R^2 value of 0.68, indicating that 68% of the variation in creativity and productivity is explained by AI-related variables.

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