

Secondary School Teachers' Knowledge and Utilisation of Agro-Digital Technologies for Perceived Agripreneurship Competency Development in Odogbolu Local Government Area, Ogun State, Nigeria

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Abstract

This study assessed secondary school agricultural science teachers' knowledge and utilisation of agro-digital technologies, and teachers' perceived extent to which such technologies foster agripreneurship competencies among students in Odogbolu Local Government Area (LGA), Ogun State, Nigeria. Anchored on the Technological Pedagogical Content Knowledge (TPACK) framework and the Technology Acceptance Model (TAM), the study adopted a descriptive survey design with correlational elements. A proportionate stratified random sample of agricultural science teachers was drawn across public secondary schools in the LGA; 172 copies of a validated instrument, the Agro-Digital Technologies Knowledge, Utilisation, and Agripreneurship Competencies Questionnaire (ADTKUACQ), were administered, of which 150 were valid for analysis (87.2% response rate). Descriptive statistics and independent samples t-test, Pearson correlation, and one-way ANOVA were used for analysis. Findings revealed generally low knowledge (grand mean = 2.13) and very low utilisation (grand mean = 1.84) of agro-digital technologies among teachers, with correspondingly low perceived development of agripreneurship competencies among students (grand mean = 2.16). Infrastructural deficits, particularly unreliable electricity and poor internet connectivity, alongside inadequate training, emerged as the most severe barriers (grand mean = 3.17). Teachers strongly endorsed systemic interventions, especially in-service training and ICT infrastructure provision (grand mean = 3.45). No statistically significant differences were found across gender, teaching experience, or educational qualification, indicating that the observed

deficits are systemic rather than demographic in nature. The study recommends coordinated investment in rural school infrastructure, curriculum reform, and sustained teacher professional development to strengthen agro-digital integration and youth agripreneurship outcomes.

Keywords: agro-digital technologies, perceived agripreneurship competencies, secondary school teachers, TPACK, Technology Acceptance Model, Odogbolu, Ogun State

Introduction

Global agriculture faces mounting pressure to meet rising food demand amid climate change, population growth, and resource constraints, driving increased reliance on digital innovations such as precision farming, artificial intelligence, drones, and mobile advisory platforms (FAO, 2024). In Sub-Saharan Africa, where agriculture remains central to livelihoods and GDP, digital tools have shown potential to raise yields and improve market access, although adoption remains constrained by infrastructural and educational barriers (Choruma et al., 2024).

In Nigeria, agriculture contributes substantially to GDP and employment, yet youth unemployment remains critical, with tens of millions of young people jobless (Eboesomi, 2025). Agripreneurship – the entrepreneurial application of agricultural knowledge to build innovative, sustainable enterprises – offers a viable pathway to youth economic empowerment (Adeyanju et al., 2023; Mhlana, 2023). Secondary school agricultural science education represents a strategic entry point for cultivating these competencies, yet Nigerian secondary school agricultural science curricula often rely on outdated pedagogies that fail to engage students or adequately prepare them for a digitised agribusiness environment (Bamiro et al., 2024; Nwakile, 2020).

While Ogun State has pioneered several digital agriculture initiatives – including the Ogun State Farmers Information Management System (OGFIMS), the AgriConnect programme and the AKILIMO advisory application (CGIAR, 2025; FMCIDE, 2025) – the extent to which these innovations have permeated secondary school instruction remains unclear. In Odogbolu LGA specifically, despite rich agricultural potential in crops such as cassava, maize, and oil palm, digital resources appear underutilised in classroom settings. This study therefore examines secondary school teachers' knowledge and use of agro-digital technologies and their perceived role in developing agripreneurship competencies among students in Odogbolu LGA.

Conceptual Clarification of Key Constructs

For the purposes of this study, agro-digital technologies are operationally defined as digital tools, platforms, and applications – including mobile apps, GIS/GPS systems, drones, IoT sensors, artificial intelligence tools, blockchain platforms, e-learning resources and digital financial tools – that can be applied to agricultural production, extension, marketing, or agricultural science instruction. Agripreneurship competencies are operationally defined as the entrepreneurial knowledge, skills, and dispositions required to identify, plan, and manage viable agriculture-

based enterprises, encompassing innovation, business planning, risk management, digital marketing, value chain integration, and related capacities. Because this study relies on teachers' self-reported assessments rather than direct measurement of student outcomes (e.g., business plans, test scores, or enterprise simulations), the competency construct is treated throughout as teachers' perceived development of these competencies among their students, not as an objectively verified outcome.

Objectives of the Study

The general purpose of this study was to assess secondary school agricultural science teachers' knowledge and utilisation of agro-digital technologies, and their perceived contribution to students' agripreneurship competency development, in Odogbolu LGA, Ogun State. Specifically, the study sought to:

- i. determine the level of knowledge of agro-digital technologies among agricultural science teachers in Odogbolu LGA;
- ii. assess the extent of utilisation of agro-digital technologies in the teaching of agricultural science;
- iii. examine teachers' perceived development of agripreneurship competencies among students through the use of agro-digital technologies;
- iv. identify barriers to teachers' adoption of agro-digital technologies; and
- v. determine strategies for improving teachers' knowledge and utilisation of agro-digital technologies.

Hypotheses

The following null hypotheses were formulated to guide the study, corresponding to Objectives 1–3:

H₀1: There is no significant difference in agro-digital technology knowledge between male and female teachers.

H₀2: There is no significant relationship between years of teaching experience and agro-digital technology utilisation.

H₀3: There is no significant influence of educational qualification on teachers' perceived agripreneurship competency development.

Methodology

The study employed a descriptive survey design with correlational elements, conducted in Odogbolu Local Government Area (LGA), Ogun State, a predominantly agrarian area cultivating cassava, maize, oil palm, and cash crops. The target population comprised all agricultural science teachers in public secondary schools in the LGA. Private secondary schools were excluded from the sampling frame because agricultural science is not offered as a distinct subject in the private

schools within the LGA at the time of data collection; agricultural content in these schools is typically subsumed under general basic science, making them unsuitable for a study specifically assessing agricultural science teachers.

Using records obtained from the Ogun State Ministry of Education (Odogbolu LGA education office), the population of agricultural science teachers across public secondary schools in the LGA was identified. A proportionate stratified random sampling technique was adopted, with schools serving as strata, to ensure fair representation of teachers across the LGA's public secondary schools. A total of 172 copies of the questionnaire were administered to eligible agricultural science teachers. Of these, 150 were correctly completed and returned, yielding a valid response rate of 87.2%. The 22 excluded responses comprised questionnaires that were not returned ($n = 14$) and those returned with substantial missing data on key sections, rendering them unsuitable for analysis ($n = 8$). All subsequent analyses were based on the 150 valid responses.

Data were collected using the researcher-developed Agro-Digital Technologies Knowledge, Utilisation, and Agripreneurship Competencies Questionnaire (ADTKUACQ), comprising sections on demographics, knowledge (25 items), utilisation (20 items), perceived competency development (20 items), barriers (20 items), and improvement strategies (20 items), rated on 4-point Likert scales. Content and construct validity were established through expert review by three specialists in agricultural education and educational measurement, followed by a pilot test involving 20 agricultural science teachers in a neighbouring LGA (Ijebu North), who were excluded from the main study. Cronbach's alpha reliability coefficients obtained from the pilot data were: knowledge subscale ($\alpha = 0.84$), utilisation subscale ($\alpha = 0.87$), competency subscale ($\alpha = 0.81$), barriers subscale ($\alpha = 0.79$), and strategies subscale ($\alpha = 0.83$), all exceeding the acceptable threshold of 0.70 (Taber, 2018).

Ethical clearance for the study was obtained from the Research Ethics Committee of the Department of Agricultural Science Education, Tai Solarin Federal University of Education, prior to data collection. Participation was voluntary, and informed consent was obtained from all respondents after they were briefed on the purpose of the study and assured of confidentiality and anonymity of their responses. Data collection was carried out over a six-week period between February and April, 2026.

Data were analysed descriptively (means, standard deviations) and inferentially (independent samples t-test, Pearson correlation, one-way ANOVA) using SPSS version 26. Given that the 150 respondents were drawn through stratified random sampling from a larger population of agricultural science teachers in the LGA rather than constituting a full census, the use of inferential statistics is methodologically appropriate for generalising findings to the broader population of agricultural science teachers in Odogbolu LGA. Mean scores were interpreted as High/Very High (≥ 3.50), Moderate (2.50–3.49), or Low (< 2.50) for the

knowledge, utilisation, and competency scales. For the barriers and strategies scales, the same 4-point Likert benchmark was applied, with mean scores of ≥ 3.50 interpreted as “Strongly Agreed,” 2.50–3.49 as “Agreed,” 1.50–2.49 as “Disagreed,” and below 1.50 as “Strongly Disagreed.”

Results

Socio-Demographic Characteristics of Respondents

Of the 172 questionnaires administered, 150 were correctly completed and returned, giving a valid response rate of 87.2%.

Table 1: Socio-Demographic Characteristics of Respondents (N = 150)

Variable	Category	Frequency	Percentage (%)
Gender	Male	93	62.0
	Female	57	38.0
	Total	150	100.0
Age Group	20–29 years	21	14.0
	30–39 years	57	38.0
	40–49 years	48	32.0
	50–59 years	18	12.0
	60 years and above	6	4.0
	Total	150	100.0
Highest Educational Qualification	NCE	36	24.0
	B.Ed / B.Sc (Ed) / B.A (Ed)	78	52.0
	B.Sc / B.A + PGDE	21	14.0
	M.Ed / M.Sc (Ed)	12	8.0
	PhD / Others	3	2.0
	Total	150	100.0
Years of Teaching Experience	1–5 years	33	22.0
	6–10 years	51	34.0
	11–15 years	39	26.0
	16–20 years	18	12.0
	Above 20 years	9	6.0
	Total	150	100.0
Type of School	Public Secondary School	150	100.0
	Private Secondary School	0	0.0
	Total	150	100.0

Variable	Category	Frequency	Percentage (%)
Level of Teaching	Junior Secondary only	27	18.0
	Senior Secondary only	66	44.0
	Both Junior and Senior Secondary	57	38.0
	Total	150	100.0
Training on Agro-Digital Technologies (last 5 years)	Yes	42	28.0
	No	108	72.0
	Total	150	100.0
Frequency of Personal Digital Device Use (Professional)	Daily	54	36.0
	Several times a week	48	32.0
	Once a week	27	18.0
	Rarely	18	12.0
	Never	3	2.0
	Total	150	100.0

Note. Source: Field Survey, 2026

Table 1 shows that male teachers constituted 62.0% of respondents. The most represented age group was 30–39 years (38.0%). Most held B.Ed/B.Sc (Ed) degrees (52.0%). A total of 72.0% had received no training on agro-digital technologies in the preceding five years, while 68.0% reported using personal digital devices daily or several times weekly for professional purposes.

Research Question 1

What is the level of knowledge of agro-digital technologies among secondary school agricultural science teachers?

Table 2: Level of Knowledge of Agro-Digital Technologies Among Secondary School Teachers (N = 150)

Agro-Digital Technology	VHK(4)	HK(3)	LK(2)	NK(1)	Mean	SD	Remark
Mobile apps for farm advisory/extension services	24	42	54	30	2.40	1.01	Low
Mobile apps for market prices/buyer connections	30	45	51	24	2.54	1.02	Moderate
Drones (UAVs) for crop monitoring/pest detection	12	27	60	51	2.00	0.94	Low
GIS and GPS for farm mapping	9	24	57	60	1.88	0.91	Low
IoT sensors for soil/weather/livestock	9	21	54	66	1.82	0.91	Low

Agro-Digital Technology	VHK(4)	HK(3)	LK(2)	NK(1)	Mean	SD	Remark
monitoring							
AI tools for yield prediction/disease diagnosis	12	24	57	57	1.94	0.96	Low
Precision farming software/variable-rate tools	6	18	54	72	1.72	0.87	Low
Blockchain applications for traceability	6	15	51	78	1.66	0.84	Low
E-learning platforms/virtual farm simulations	18	33	57	42	2.18	1.00	Low
Digital financial tools/mobile money platforms	36	51	42	21	2.68	1.01	Moderate
Online videos or tutorials on agro-digital tools	54	57	30	9	3.04	0.92	Moderate
Social media for digital marketing	48	54	36	12	2.92	0.97	Moderate
Data analytics tools (spreadsheets) for yield analysis	33	42	48	27	2.54	1.04	Moderate
Remote sensing apps/satellite imagery	9	21	54	66	1.82	0.91	Low
AI chatbots/virtual assistants	9	18	51	72	1.76	0.91	Low
Online marketplaces in enterprise lessons	27	39	51	33	2.40	1.04	Low
Weather forecasting apps for climate risk management	42	48	39	21	2.74	1.03	Moderate
IoT-based smart farming for sustainability topics	9	18	51	72	1.76	0.91	Low
GIS software for farm site selection projects	6	15	54	75	1.68	0.85	Low
Drone footage for pest management illustrations	15	30	57	48	2.08	0.98	Low
Cloud-based platforms for collaborative planning	12	24	54	60	1.92	0.95	Low
Augmented Reality (AR) apps for crop inspection	6	12	45	87	1.58	0.83	Low
Big data tools for agricultural trend analysis	6	12	42	90	1.56	0.83	Low
Mobile payment systems for simulating transactions	30	42	45	33	2.46	1.06	Low
Online certification courses on agro-digital skills	21	33	51	45	2.20	1.03	Low
Grand Mean					2.13	0.94	Low

Note. Source: Field Survey, 2026

The overall level of knowledge remains low, with a grand mean of 2.13. Only six items reached the moderate knowledge threshold, while advanced agriculture-specific tools such as big data tools ($M = 1.56$), augmented reality ($M = 1.58$), and blockchain ($M = 1.66$) recorded the lowest scores.

Research Question 2

What is the extent of utilisation of agro-digital technologies in teaching among teachers?

Table 3: Extent of Utilisation of Agro-Digital Technologies in Teaching (N = 150)

Agro-Digital Technology	Always(4)	Often(3)	Rarely(2)	Never(1)	Mean	SD	Remark
Mobile apps for farm advisory/extension services	15	30	57	48	2.08	0.97	Low
Mobile apps for market prices/buyer connections	18	33	54	45	2.16	1.00	Low
Drones for demonstrating crop monitoring	3	12	42	93	1.50	0.76	Low
GIS/GPS for farm mapping activities	3	9	39	99	1.44	0.72	Low
IoT sensors for soil/weather monitoring	3	9	36	102	1.42	0.72	Low
AI tools for yield prediction/disease lessons	3	12	42	93	1.50	0.76	Low
Precision farming software simulations	3	6	33	108	1.36	0.67	Low
Blockchain examples for traceability	3	6	30	111	1.34	0.66	Low
E-learning platforms/virtual farm simulations	9	21	51	69	1.80	0.91	Low
Digital financial tools for agribusiness finance	21	36	51	42	2.24	1.03	Low
Online videos or tutorials for	42	51	39	18	2.78	1.01	Moderate

Agro-Digital Technology	Always(4)	Often(3)	Rarely(2)	Never(1)	Mean	SD	Remark
demonstrations							
Social media for digital marketing teaching	30	42	48	30	2.48	1.05	Low
Data analytics tools for yield analysis	15	27	54	54	2.02	1.00	Low
Remote sensing apps for land use planning	3	9	36	102	1.44	0.72	Low
AI chatbots for student queries	3	9	33	105	1.40	0.70	Low
Online marketplaces in enterprise lessons	12	24	54	60	1.92	0.96	Low
Weather forecasting apps for climate risk teaching	27	39	48	36	2.38	1.05	Low
IoT-based smart farming for sustainability	3	9	33	105	1.40	0.70	Low
GIS software for farm site selection projects	3	6	30	111	1.34	0.66	Low
Drone footage for pest management illustrations	6	18	48	78	1.68	0.86	Low
Grand Mean					1.84	0.84	Low

Note. Source: Field Survey, 2026

Utilisation is very low across all 20 items (grand mean = 1.84). Only online videos/tutorials reached moderate use (M = 2.78); GIS software (M = 1.34) and blockchain examples (M = 1.34) were the least utilised.

Research Question 3

To what extent do teachers perceive that students' agripreneurship competencies are developed through agro-digital technology use?

Table 4: Perceived Agripreneurship Competencies Developed (N = 150)

Agripreneurship Competency	VHE(4)	HE(3)	LE(2)	NA(1)	Mean	SD	Remark
Innovation and creativity in developing new products/processes	18	33	60	39	2.20	1.00	Low
Business planning and financial	24	39	54	33	2.36	1.04	Low

Agripreneurship Competency	VHE(4)	HE(3)	LE(2)	NA(1)	Mean	SD	Remark
management skills							
Risk assessment and management in agribusiness	21	36	54	39	2.26	1.03	Low
Digital marketing and e-commerce skills	27	39	51	33	2.40	1.06	Low
Value chain integration (handling, processing, packaging)	18	33	57	42	2.18	1.01	Low
Sustainable and climate-smart farming practices	24	36	51	39	2.30	1.06	Low
Leadership, networking, and partnership-building	15	30	60	45	2.10	0.99	Low
Access to and use of digital financial services	21	36	51	42	2.24	1.05	Low
Market research and analysis using digital tools	18	33	54	45	2.16	1.02	Low
Problem-solving in agricultural enterprises using data	18	30	57	45	2.14	1.01	Low
Supply chain management and traceability skills	12	24	54	60	1.92	0.96	Low
Resource efficiency and waste reduction techniques	21	33	54	42	2.22	1.04	Low
Entrepreneurial mindset and self-reliance	27	42	48	33	2.42	1.06	Low
Collaboration and teamwork in agribusiness projects	24	39	51	36	2.34	1.05	Low
Adaptation to technological changes in agriculture	18	33	54	45	2.16	1.02	Low
Ethical practices in digital agribusiness	15	27	54	54	2.02	1.00	Low
Data interpretation for decision-making in farming	15	30	54	51	2.06	1.01	Low
Branding and customer engagement	21	33	51	45	2.20	1.05	Low
Climate resilience planning using predictive tools	15	27	51	57	2.00	1.01	Low
Value addition through digital processing simulations	12	24	51	63	1.90	0.96	Low
Grand Mean					2.16	1.02	Low

Note. Source: Field Survey, 2026

No competency reached the moderate threshold. Entrepreneurial mindset ($M = 2.42$) and digital marketing ($M = 2.40$) scored highest; value addition through digital processing ($M = 1.90$) scored lowest.

Research Question 4

What are the barriers to teachers' adoption of agro-digital technologies?

Table 5: Barriers to Adoption of Agro-Digital Technologies ($N = 150$)

Barrier	SA(4)	A(3)	D(2)	SD(1)	Mean	SD	Remark
Unreliable electricity supply in school	93	42	12	3	3.50	0.74	Strongly Agreed
Poor or no internet connectivity in school	90	45	12	3	3.48	0.75	Agreed
Lack of functional ICT devices	87	42	15	6	3.40	0.84	Agreed
High cost of data bundles/internet subscription	84	45	15	6	3.38	0.83	Agreed
Inadequate personal knowledge/training	81	48	15	6	3.36	0.83	Agreed
Lack of relevant in-service training/workshops	87	45	12	6	3.42	0.80	Agreed
Technologies are too complex or difficult to learn	54	51	33	12	2.98	0.97	Agreed
Tools not relevant to current curriculum	42	48	42	18	2.76	1.01	Agreed
Lack of time to learn and prepare digital lessons	66	54	21	9	3.18	0.91	Agreed
No technical support/maintenance in school	78	48	18	6	3.32	0.84	Agreed
Low student access to smartphones/internet at home	72	45	24	9	3.20	0.93	Agreed
School management does not encourage integration	57	48	33	12	3.00	0.99	Agreed
Cultural resistance from colleagues/students	42	51	42	15	2.80	0.99	Agreed
High cost of acquiring agro-digital tools/software	75	48	21	6	3.28	0.87	Agreed
Lack of policy guidelines on digital integration	66	51	24	9	3.16	0.92	Agreed
Security concerns with digital data	39	48	45	18	2.72	1.00	Agreed
Limited local-language agro-digital content	60	51	27	12	3.06	0.97	Agreed
Overloaded teaching schedule	69	48	24	9	3.18	0.93	Agreed
Poor integration of agro-digital	78	45	18	9	3.28	0.90	Agreed

Barrier	SA(4)	A(3)	D(2)	SD(1)	Mean	SD	Remark
topics in teacher training							
Geographical isolation limiting access to training	72	48	21	9	3.22	0.92	Agreed
Grand Mean					3.17	0.89	Agreed

Note. Source: Field Survey, 2026

All 20 barrier items were agreed with (grand mean = 3.17). Unreliable electricity (M = 3.50), poor internet connectivity (M = 3.48), and inadequate in-service training (M = 3.42) were the most severe barriers.

Research Question 5

What are the strategies for improving teachers' knowledge and use of agro-digital technologies?

Table6: Strategies for Improving Teachers' Knowledge and Use of Agro-Digital Technologies (N = 150)

Strategy	SA(4)	A(3)	D(2)	SD(1)	Mean	SD	Remark
Regular in-service training/workshops	114	30	6	0	3.72	0.53	Strongly Agreed
Provision of functional ICT infrastructure	111	33	6	0	3.70	0.55	Strongly Agreed
Supply of solar power systems	108	33	6	3	3.64	0.64	Strongly Agreed
Curriculum revision to include agro-digital technologies	99	39	9	3	3.56	0.70	Strongly Agreed
Public-private partnerships for subsidized tools/data	102	36	9	3	3.58	0.68	Strongly Agreed
School-based digital agriculture resource centres/labs	105	36	6	3	3.62	0.64	Strongly Agreed
Incentives for teachers who integrate digital tools	87	42	15	6	3.40	0.82	Agreed
Mentoring and peer-learning programmes	84	48	15	3	3.42	0.77	Agreed
Government subsidies for device purchase/data costs	93	42	12	3	3.50	0.73	Strongly Agreed
Agro-digital modules in initial teacher education	99	39	9	3	3.56	0.69	Strongly Agreed
Collaboration with agricultural extension services	90	45	12	3	3.48	0.74	Agreed
Local language agro-digital content and apps	78	51	15	6	3.34	0.83	Agreed
Regular monitoring and evaluation of integration	75	54	18	3	3.34	0.80	Agreed

Strategy	SA(4)	A(3)	D(2)	SD(1)	Mean	SD	Remark
Community involvement to support ICT infrastructure	66	57	21	6	3.22	0.87	Agreed
Online self-paced courses for teachers	81	48	15	6	3.36	0.83	Agreed
Awards for best agro-digital integrated lesson plans	69	51	24	6	3.22	0.89	Agreed
Partnerships with universities for mentorship	84	45	15	6	3.38	0.83	Agreed
Free Wi-Fi hotspots in rural schools	108	33	6	3	3.64	0.63	Strongly Agreed
Agro-digital proficiency in performance appraisals	66	54	24	6	3.20	0.87	Agreed
Funding for field trips to demonstration farms	81	48	15	6	3.36	0.83	Agreed
Grand Mean					3.45	0.74	Agreed

Note. Source: Field Survey, 2026

All 20 strategies were endorsed (grand mean = 3.45), led by regular in-service training (M = 3.72), ICT infrastructure provision (M = 3.70), and free rural Wi-Fi/solar power supply (M = 3.64 each).

Test of Hypotheses

Hypothesis One: No significant difference in agro-digital technology knowledge between male and female teachers.

Table 7: Independent-Samples *t* Test of Gender Differences in Knowledge (N = 150)

Group	N	Mean	SD	t-value	Df	p-value	Decision
Male	93	2.09	0.42				
Female	57	2.19	0.46	-1.34	148	0.182	Fail to Reject Ho

Note. Significance level = 0.05. Source: Field Survey, 2026

There is no statistically significant difference in agro-digital technology knowledge between male and female teachers ($t = -1.34$, $df = 148$, $p = 0.182 > 0.05$).

Hypothesis Two: No significant relationship between years of teaching experience and technology utilisation.

Table 8: Pearson Correlation Between Teaching Experience and Utilisation (N = 150)

Variable	Mean	SD	r-value	p-value	Decision
Years of Teaching Experience	2.46	1.09			
Agro-Digital Technology Utilization	1.84	0.84	0.09	0.273	Fail to Reject Ho

Note. Significance level = 0.05. Source: Field Survey, 2026

The correlation is weak and non-significant ($r = 0.09$, $p = 0.273 > 0.05$), indicating no meaningful relationship between experience and utilisation.

Hypothesis Three: No significant influence of educational qualification on agripreneurship competency development.

Table 9: Descriptive Statistics for Perceived Competency Development by Educational Qualification (N = 150)

Qualification Group	N	Mean	SD
NCE	36	2.04	0.44
B.Ed / B.Sc (Ed) / B.A (Ed)	78	2.18	0.47
B.Sc / B.A + PGDE	21	2.21	0.50
M.Ed / M.Sc (Ed) or above	15	2.36	0.56

Table 10: One-Way ANOVA of the Influence of Educational Qualification on Perceived Competency Development (N = 150)

Source	Sum of Squares	df	Mean Square	F-value	p-value	Decision
Between Groups	2.11	3	0.703	1.42	0.239	Fail to Reject H_0
Within Groups	24.06	146	0.165			
Total	26.17	149				

Note. Significance level = 0.05. Source: Field Survey, 2026

Although teachers with higher qualifications recorded marginally higher competency-development scores, the ANOVA result, $F(3, 146) = 1.42$, $p = 0.239$, is not statistically significant. The null hypothesis is retained.

Discussions

Knowledge of Agro-Digital Technologies

The finding that agricultural science teachers in Odogbolu LGA possess a low overall level of knowledge of agro-digital technologies (grand mean = 2.13) is consistent with a broader pattern in Nigerian secondary education: teachers generally demonstrate stronger self-efficacy in individual technology, pedagogy or content components than in the integrated technological pedagogical content knowledge needed to teach with digital tools. A large-scale survey of 711 Universal Basic Education teachers across Lagos, Oyo, and Ogun States found above-average self-efficacy in the separate TPACK components but a below-average overall TPACK self-efficacy score ($M = 2.48$), indicating that fragmented digital competencies – not an absence of digital exposure – are what constrain effective integration (Olawale et al., 2026). The relatively stronger knowledge of social media platforms and weather forecasting apps observed in the present study aligns with Ogboru's (2025) finding that digital tools with direct consumer utility and smartphone accessibility tend to be more familiar to educators than specialised agro-digital

platforms – a divide that mirrors the broader rural-urban digital gap documented by Olanrewaju et al. (2021).

The deficit in blockchain, augmented reality, big data, IoT, and precision farming software is particularly concerning given that these technologies sit at the centre of Nigeria's agricultural development agenda under the Nigeria Digital Agriculture Strategy 2020–2030 (NITDA, 2020). Mishra and Koehler's (2006) TPACK framework offers a direct explanation: teachers cannot integrate technologies they do not understand, which makes the knowledge gaps identified here a foundational barrier to agripreneurship competency development rather than an incidental one. Olawale et al.'s (2026) finding of fragmented TPACK among Southwest Nigerian teachers more broadly supports this reading, since it shows the same integration failure occurring even where basic technological exposure exists.

Utilisation and the Knowledge-Practice Gap

Utilisation was markedly lower than knowledge (grand mean = 1.84 vs. 2.13), with only online video tutorials reaching a moderate level. This gap is the more instructive finding of the two: it shows that awareness alone does not translate into classroom practice. The Technology Acceptance Model explains this directly: even where some knowledge exists, low perceived ease of use and weak facilitating conditions suppress actual adoption (Davis, 1989). Teachers who reported moderate familiarity with weather apps and social media still rarely used them in instruction, suggesting that curricular irrelevance, time pressure, and the absence of institutional encouragement are doing more to suppress utilisation than lack of awareness is. Choruma et al. (2024) describe the same pattern among smallholder-focused digital agriculture programmes in sub-Saharan Africa: access and awareness are necessary but not sufficient without a supportive ecosystem around them.

Perceived Agripreneurship Competency Development

The uniformly low perceived development of agripreneurship competencies (grand mean = 2.16) follows from the knowledge and utilisation gaps documented above, though this should be read as an association rather than a demonstrated causal chain, given the cross-sectional design and the reliance on teachers' perceptions rather than measured student outcomes. Competencies most dependent on specialised tools – supply chain traceability, value addition through digital processing and predictive climate planning – scored lowest, while entrepreneurial mindset ($M = 2.42$) and digital marketing ($M = 2.40$) scored comparatively higher, likely reflecting the modest reach of social media familiarity among some teachers. This is consistent with Nwibo et al., (2016) argument that agripreneurship development requires genuine technological fluency, not entrepreneurial orientation alone. It also stands in contrast to Adeyanju et al.'s (2023) finding, across Kenya, Nigeria, and Uganda, that youth in structured agripreneurship programmes with mobile-based training and digital market linkages showed significantly stronger innovation and

risk-management outcomes – underscoring what schools in Odogbolu LGA are currently failing to realise, rather than what is unattainable in principle. Direct evidence of the payoff from well-designed digital extension in Nigeria specifically comes from Arouna et al. (2021), whose randomised trial found that personalised digital advisory delivery raised rice yields by roughly 7% and profits by roughly 10% among Nigerian farming households – a scale of benefit that remains inaccessible to Odogbolu LGA students under current levels of teacher utilisation.

Barriers and Strategies

The barriers identified were pervasive rather than isolated: all 20 items were agreed upon (grand mean = 3.17), led by unreliable electricity ($M = 3.50$), poor internet connectivity ($M = 3.48$), and absence of in-service training ($M = 3.42$). This matches evidence that infrastructure deficits and skill gaps are the primary impediments to digital literacy in Nigerian secondary education (Olanrewaju et al., 2021) and that rural infrastructure constraints in sub-Saharan Africa create a baseline deprivation that prevents other enabling factors – training, curriculum reform and incentives – from taking effect at all (Choruma et al., 2024). The near-unanimous endorsement of all 20 proposed strategies (grand mean = 3.45), led by in-service training, ICT infrastructure, solar power, and free rural Wi-Fi, indicates that teachers see this as a systemic problem requiring systemic solutions rather than isolated fixes. Ogun State’s own AgriConnect and AKILIMO initiatives, which combine public-private collaboration with locally adapted advisory content, offer a template already proven at the farmer level that could plausibly be adapted for secondary schools (FMCIDE, 2025; CGIAR, 2025). This is consistent with the federal government’s own July 2025 commitment to a youth-focused 10-year agricultural strategic action plan built around training, mentorship, and monitoring in agro-technology (Nairametrics, 2025), suggesting that teachers’ strategy preferences in this study align with the direction of national policy rather than running ahead of it. The strong endorsement of curriculum reform to integrate agro-digital technologies (mean = 3.56) supports recent calls for systematic agripreneurship curriculum development in Nigerian higher and secondary institutions that explicitly embeds digital competencies rather than treating them as an add-on (Bamiro et al., 2024).

Test of Hypotheses

None of the three hypothesised demographic effects were supported: knowledge did not differ significantly by gender ($t = -1.34$, $p = 0.182$), utilisation was not significantly correlated with years of teaching experience ($r = 0.09$, $p = 0.273$), and qualification level did not significantly predict perceived competency development ($F = 1.42$, $p = 0.239$). Read alongside the barrier data, this pattern is coherent rather than incidental: the top-rated barriers were structural (electricity, connectivity, device availability, absence of training) rather than individual, and structural constraints apply uniformly across a school regardless of a given teacher’s sex, years of service, or degree. A teacher with fifteen years’ experience and an M.Ed. is not meaningfully

better positioned to use IoT sensors or drones in a classroom with no electricity than a first-year NCE graduate in the same building. Olawale et al.'s (2026) large-sample UBE study offers a partial parallel: they similarly found no significant gender difference in TPACK self-efficacy, even while experience and institutional support did produce significant differences in their sample – suggesting that gender specifically, rather than demographic variables in general, may be the more consistently non-explanatory factor across Nigerian contexts, while experience and support effects may depend on how uniformly infrastructure is distributed within a given study area. In Odogbolu LGA's case, the near-total absence of infrastructure across schools plausibly flattens any experience or qualification effect that might otherwise emerge.

Conclusion

Agricultural science teachers in Odogbolu LGA exhibit low knowledge and markedly lower utilisation of agro-digital technologies, resulting in minimal development of agripreneurship competencies among students. These deficits are driven primarily by infrastructural deprivation and inadequate professional development rather than individual teacher characteristics. Given the study's cross-sectional design and reliance on self-reported data, findings should be interpreted with appropriate caution.

Recommendations

Based on the findings, the following are recommended:

- i. Curriculum revision to embed agro-digital content in secondary school agricultural science instruction.
- ii. Investment in rural school electricity and internet connectivity to address the most severe infrastructural barriers identified.
- iii. Establishment of school-based digital agriculture resource centres/labs.
- iv. Sustained, TPACK-grounded in-service training and mentoring for teachers.
- v. Expansion of public-private partnerships, building on existing models such as AgriConnect and AKILIMO, to extend digital agriculture infrastructure into secondary education.
- vi. Further longitudinal, multi-LGA, and mixed-methods research to build a more generalisable evidence base.

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