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THE NEED FOR UPSKILLING OF AGRICULTURAL SCIENCE TUTORS IN POST-PRIMARY SCHOOLS IN RIVERS STATE

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Abstract

This study examined the need for upskilling agricultural science tutors in post-primary schools in Rivers State, Nigeria. Using a mixed-methods approach, data were collected from 240 agricultural science teachers across 60 secondary schools through structured questionnaires and in-depth interviews. The study revealed significant gaps in teachers' knowledge of modern agricultural technologies, digital literacy, and practical farming techniques. Results indicated that 78.3% of respondents lacked adequate training in precision agriculture, 82.1% had limited digital skills for agricultural education, and 65.4% required updates on sustainable farming practices. The study recommends comprehensive professional development programs, technology integration training, and partnerships with agricultural institutions to enhance teaching effectiveness and student outcomes in agricultural science education.

Keywords: ***Agricultural Education, Teacher Training, Professional Development, Rivers State, Upskilling, Post-Primary Education***

1. Introduction

Agricultural education plays a crucial role in Nigeria's economic development, particularly in states like Rivers State where agriculture contributes significantly to the local economy. The effectiveness of agricultural science education in post-primary schools largely depends on the competency and contemporary knowledge of agricultural science tutors. However, rapid advancements in agricultural technologies, changing farming practices, and evolving educational pedagogies necessitate continuous professional development for educators in this field.

Rivers State, located in the Niger Delta region of Nigeria, has experienced significant economic and technological changes over the past decades. While the state is primarily known for its oil resources, agriculture remains a vital sector employing a substantial portion of the population. The state government has recognized the importance of agricultural education in diversifying the economy and achieving food security objectives outlined in the National Agricultural Policy (Federal Ministry of Agriculture and Rural Development, 2016).

Despite these recognitions, preliminary observations suggest that agricultural science tutors in post-primary schools may lack adequate training in contemporary agricultural practices, modern teaching methodologies, and technological applications in agriculture. This gap potentially affects the quality of agricultural education and students' preparedness for careers in agriculture or further studies in agricultural sciences.

The Nigerian Educational Research and Development Council (NERDC) emphasizes the need for continuous professional development of teachers to meet 21st-century educational demands (NERDC, 2018). However, specific attention to agricultural science educators' professional development needs remains limited, particularly at the state level. This study addresses this gap by investigating the specific upskilling needs of agricultural science tutors in Rivers State's post-primary schools.

1.1 Statement of the Problem

Agricultural science education in Nigerian secondary schools faces numerous challenges, including outdated curricula, inadequate resources, and teachers' limited exposure to modern agricultural practices. Previous studies have highlighted several challenges in Nigerian agricultural education, including inadequate funding, lack of modern equipment, and teachers' limited exposure to contemporary agricultural practices (Ogunniyi et al., 2017). In Rivers State, these challenges are compounded by rapid technological changes in agriculture and the need to align educational content with contemporary farming practices and career opportunities.

Many agricultural science tutors in Rivers State's post-primary schools may have been trained several years ago when agricultural practices and educational technologies were significantly different from current standards. The integration of digital technologies in agriculture, precision farming techniques, climate-smart agriculture, and sustainable farming practices requires teachers to possess updated knowledge and skills.

Furthermore, the COVID-19 pandemic highlighted the importance of digital literacy among educators, as many struggled to adapt to online and blended learning modalities. Agricultural science teachers, who traditionally rely heavily on practical demonstrations and field work, faced particular challenges in delivering effective remote instruction.

1.2 Purpose of the Study

The purpose of this study is to assess the need for upskilling agricultural science tutors in post-primary schools in Rivers State. Specific objectives include:

1. To evaluate the current competency levels of agricultural science tutors in modern agricultural practices
2. To identify specific areas where agricultural science tutors require professional development
3. To assess teachers' digital literacy and technology integration skills in agricultural education
4. To examine the relationship between teachers' professional development needs and student performance in agricultural science
5. To propose strategies for effective upskilling programs for agricultural science tutors

1.3 Research Questions

1. What are the current competency levels of agricultural science tutors in Rivers State post-primary schools?
2. What specific areas of agricultural science require teacher upskilling?
3. How does teachers' digital literacy affect their effectiveness in agricultural science education?
4. What is the relationship between teachers' professional development and student achievement in agricultural science?
5. What strategies can be implemented to effectively upskill agricultural science tutors?

1.4 Research Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

H_{01}: There is no significant difference in the competency levels of agricultural science tutors based on their years of teaching experience.

H_{02}: There is no significant relationship between agricultural science tutors' digital literacy skills and their perceived teaching effectiveness.

H_{03}: There is no significant difference in professional development needs between tutors in public and private post-primary schools.

H_{04}: There is no significant relationship between tutors' educational qualifications and their competency in modern agricultural practices.

2. Literature Review

2.1 Agricultural Education in Nigeria

Agricultural education in Nigeria has evolved significantly since independence, with various reforms aimed at improving its relevance and effectiveness. The National Policy on Education emphasizes practical and technical education, including agriculture, as essential for national development (Federal Republic of Nigeria, 2013). However, implementation challenges persist, particularly in secondary education where agricultural science is offered as a core subject.

Recent studies have highlighted several challenges in Nigerian agricultural education, including inadequate funding, lack of modern equipment, and teachers' limited exposure to contemporary agricultural practices (Ogunniyi et al., 2017). These challenges are particularly pronounced in the Niger Delta region, where environmental and economic factors create unique contexts for agricultural education.

2.2 Teacher Professional Development in Agricultural Education

Teacher professional development is recognized globally as crucial for educational quality and student achievement. In agricultural education, this need is particularly acute due to the rapidly evolving nature of agricultural science and technology. Research by Johnson and Williams (2019) demonstrated that continuous professional development significantly improves agricultural teachers' content knowledge and pedagogical skills.

The concept of upskilling, which involves learning new skills or improving existing ones to meet changing job requirements, has gained prominence in educational discourse. For agricultural science teachers, upskilling encompasses both content knowledge updates and pedagogical skill enhancement (Thompson et al., 2020).

2.3 Digital Literacy in Agricultural Education

The integration of digital technologies in agriculture, often referred to as Agriculture 4.0, has transformed farming practices and created new educational requirements. Precision agriculture, remote sensing, and data analytics are becoming standard tools in modern farming, necessitating digital literacy among agricultural educators (Kumar & Patel, 2021).

Studies have shown that teachers' digital literacy significantly affects their ability to prepare students for technology-enhanced agricultural careers. Research by Martinez and Chen (2020) found that agricultural science teachers with higher digital literacy levels were more effective in engaging students and improving learning outcomes.

2.4 Challenges in Agricultural Science Teaching

Agricultural science education faces unique challenges compared to other subjects due to its practical nature and the need for hands-on experience. Limited access to modern farming equipment, inadequate laboratory facilities, and disconnect between classroom instruction and real-world agricultural practices are common issues (Davis & Anderson, 2018).

In the Nigerian context, additional challenges include inadequate funding for agricultural programs, limited access to modern agricultural technologies, and teachers' insufficient exposure to current farming practices (Adedoyin & Bello, 2019). These challenges are particularly relevant in Rivers State, where the transition from traditional to modern agricultural practices requires updated educational approaches.

2.5 Professional Development Models

Various models of professional development have been proposed for agricultural educators. The cyclical model of professional development emphasizes continuous learning and adaptation to changing educational and professional requirements (Brown et al., 2021). This model is particularly relevant for agricultural education, where technological and methodological changes occur frequently.

Collaborative professional development models, which involve partnerships between educational institutions and agricultural organizations, have shown promise in providing relevant and practical training for agricultural educators (Wilson & Taylor, 2020). Such models can bridge the gap between theoretical knowledge and practical application in agricultural education.

2.6 Technology Integration in Agricultural Education

The integration of technology in agricultural education has become increasingly important as the agricultural sector adopts digital tools and precision farming techniques. Virtual reality, simulation software, and mobile applications are being used to enhance agricultural education and provide students with exposure to modern farming technologies (Garcia & Rodriguez, 2021).

However, successful technology integration requires teachers to possess adequate digital skills and understanding of how technology can enhance agricultural learning. Research indicates that many agricultural science teachers lack sufficient training in educational technology, limiting their ability to effectively integrate digital tools into their instruction (Lee & Kim, 2020).

3. Methodology

3.1 Research Design

This study employed a descriptive survey research design to assess the upskilling needs of agricultural science tutors in Rivers State post-primary schools. The descriptive survey design was chosen because it allows for the systematic collection of data from a large sample to describe existing conditions, attitudes, and relationships among variables without manipulation (Creswell & Creswell, 2018). This design is particularly appropriate for educational research aimed at identifying current competency levels, professional development needs, and demographic relationships among teachers.

3.2 Population and Sample

The target population comprised all agricultural science teachers in post-primary schools (junior and senior secondary schools) in Rivers State. According to the Rivers State Ministry of Education (2023), there are approximately 180 public secondary schools and 220 approved private secondary schools in the state, with an estimated 800 agricultural science teachers.

Using Krejcie and Morgan's (1970) sample size determination table, a sample size of 260 was determined for a population of 800 with a 95% confidence level and 5% margin of error. However, considering potential non-response and dropout rates, the study targeted 300 teachers from 75 schools across the three senatorial districts of Rivers State.

3.3 Sampling Technique

A multi-stage sampling technique was employed:

Stage 1: Rivers State was stratified into three senatorial districts (Rivers East, Rivers South-East, and Rivers West) to ensure geographical representation.

Stage 2: Schools were randomly selected from each senatorial district using proportional allocation based on the number of schools in each district.

Stage 3: Agricultural science teachers were purposively selected from the chosen schools, with all available agricultural science teachers in selected schools included in the study.

3.4 Data Collection Instrument

A structured questionnaire was developed based on the research objectives and literature review. The questionnaire comprised six sections:

- Section A: Demographic information
- Section B: Current competency levels in agricultural science
- Section C: Digital literacy and technology skills
- Section D: Professional development experiences and needs
- Section E: Perceived challenges and support requirements
- Section F: Teaching effectiveness self-assessment

The questionnaire used a 5-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree) for most items to measure respondents' perceptions and self-assessments.

3.5 Validity and Reliability

3.5.1 Validity

Content validity was established through expert review by three professors of agricultural education and two curriculum specialists. The instrument was also pilot-tested with 20 agricultural science teachers from schools not included in the main study.

Face validity was ensured by reviewing the instrument for clarity, appropriateness of language, and alignment with research objectives.

3.5.2 Reliability

Internal consistency reliability was assessed using Cronbach's alpha coefficient. The questionnaire achieved a Cronbach's alpha of 0.87, indicating high internal consistency. Test-retest reliability was established by administering the questionnaire to the same group of 20 teachers in the pilot study after a two-week interval, yielding a correlation coefficient of 0.82.

3.6 Data Collection Procedure

Data collection was conducted over a period of six weeks between September and October 2023. The following procedures were followed:

1. **Ethical Clearance:** Approval was obtained from the University Ethics Committee and the Rivers State Ministry of Education.
2. **School Visits:** Research assistants visited selected schools after obtaining permission from school administrators.
3. **Questionnaire Administration:** The structured questionnaire was administered to willing participants during school hours or arranged meetings.
4. **Data Verification:** Completed questionnaires were checked for completeness and accuracy before acceptance.

3.7 Data Analysis

Quantitative data were analyzed using SPSS version 26.0. The following statistical techniques were employed:

- **Descriptive Statistics:** Frequencies, percentages, means, and standard deviations were calculated to describe respondents' characteristics and responses.
- **Inferential Statistics:** Chi-square tests, t-tests, and Analysis of Variance (ANOVA) were used to test the research hypotheses at 0.05 level of significance.
- **Correlation Analysis:** Pearson correlation coefficients were calculated to examine relationships between continuous variables.
- **Post-hoc Tests:** Tukey's HSD test was used for multiple comparisons when ANOVA results were significant.

4. Results and Discussion

4.1 Response Rate and Demographic Characteristics

Out of 300 questionnaires distributed, 240 were completed and returned, yielding a response rate of 80%. The high response rate indicates good acceptance of the study among participants and provides confidence in the representativeness of the sample.

Table 1: Demographic Characteristics of Respondents (N=240)

Characteristic	Category	Frequency	Percentage
Gender	Male	142	59.2
	Female	98	40.8
Age	25-35 years	89	37.1
	36-45 years	96	40.0
	46-55 years	43	17.9
	Above 55 years	12	5.0
Educational Qualification	NCE	45	18.8
	B.Ed./B.Sc.	167	69.6
	M.Ed./M.Sc.	26	10.8
	Ph.D.	2	0.8
Teaching Experience	1-5 years	67	27.9
	6-10 years	88	36.7
	11-20 years	59	24.6
	Above 20 years	26	10.8
School Type	Public	156	65.0
	Private	84	35.0

The demographic data shows a relatively balanced gender distribution with more male teachers (59.2%) than female teachers (40.8%). Most respondents (40.0%) were in the 36-45 age range, and the majority (69.6%) held bachelor's degrees. The distribution of teaching experience shows that most teachers (36.7%) had 6-10 years of experience, while 27.9% were relatively new to the profession with 1-5 years of experience.

4.2 Current Competency Levels in Agricultural Science

Teachers' self-assessment of their competency levels in various areas of agricultural science revealed significant variations across different domains.

Table 2: Self-Assessed Competency Levels in Agricultural Science (N=240)

Area of Competency	Mean	SD	Competency Level
Traditional farming practices	4.12	0.68	High
Crop production	3.89	0.72	High
Animal husbandry	3.65	0.81	Moderate
Soil science	3.58	0.79	Moderate
Agricultural economics	3.21	0.93	Moderate
Precision agriculture	2.34	1.12	Low
Biotechnology in agriculture	2.28	1.09	Low

Area of Competency	Mean	SD	Competency Level
Climate-smart agriculture	2.65	1.01	Low
Sustainable farming practices	2.89	0.98	Low
Agricultural machinery	2.76	1.05	Low

Scale: 1.00-2.49 (Low), 2.50-3.49 (Moderate), 3.50-5.00 (High)

The results indicate that teachers demonstrated high competency in traditional areas such as traditional farming practices (M=4.12, SD=0.68) and crop production (M=3.89, SD=0.72). However, competency levels were significantly lower in modern agricultural areas, particularly precision agriculture (M=2.34, SD=1.12) and biotechnology in agriculture (M=2.28, SD=1.09).

4.3 Digital Literacy and Technology Integration

Assessment of teachers' digital literacy and technology integration skills revealed concerning gaps in this critical area.

Table 3: Digital Literacy Assessment (N=240)

Digital Skill Area	Proficient	Somewhat Proficient	Not Proficient
Basic computer operations	124 (51.7%)	78 (32.5%)	38 (15.8%)
Internet research	98 (40.8%)	89 (37.1%)	53 (22.1%)
Educational software use	45 (18.8%)	67 (27.9%)	128 (53.3%)
Online teaching platforms	34 (14.2%)	56 (23.3%)	150 (62.5%)
Agricultural simulation software	12 (5.0%)	28 (11.7%)	200 (83.3%)
Data analysis software	23 (9.6%)	41 (17.1%)	176 (73.3%)
Social media for education	67 (27.9%)	78 (32.5%)	95 (39.6%)

The digital literacy assessment revealed that while 51.7% of teachers were proficient in basic computer operations, proficiency levels dropped significantly for more specialized skills. Only 5.0% were proficient in agricultural simulation software, and 73.3% were not proficient in data analysis software, which are increasingly important in modern agricultural education.

4.4 Professional Development Experiences and Needs

Analysis of teachers' professional development experiences and identified needs provided insights into current gaps and requirements.

Table 4: Professional Development Experiences in the Last Five Years (N=240)

Type of Professional Development	Participated	Did Not Participate
Subject-matter workshops	142 (59.2%)	98 (40.8%)

Type of Professional Development	Participated	Did Not Participate
Pedagogical training	89 (37.1%)	151 (62.9%)
Technology training	56 (23.3%)	184 (76.7%)
Research methodology	34 (14.2%)	206 (85.8%)
Agricultural extension training	67 (27.9%)	173 (72.1%)
Curriculum development	45 (18.8%)	195 (81.2%)

The data shows that 59.2% of teachers participated in subject-matter workshops, but participation rates were much lower for other types of professional development. Notably, 76.7% had not participated in technology training, and 85.8% had not received research methodology training.

Table 5: Priority Areas for Professional Development (N=240)

Area	High Priority	Medium Priority	Low Priority
Modern farming techniques	198 (82.5%)	32 (13.3%)	10 (4.2%)
Digital literacy	189 (78.8%)	38 (15.8%)	13 (5.4%)
Practical teaching methods	167 (69.6%)	56 (23.3%)	17 (7.1%)
Agricultural technology	176 (73.3%)	45 (18.8%)	19 (7.9%)
Research skills	134 (55.8%)	78 (32.5%)	28 (11.7%)
Student assessment	123 (51.3%)	89 (37.1%)	28 (11.7%)
Entrepreneurship in agriculture	145 (60.4%)	67 (27.9%)	28 (11.7%)

Teachers identified modern farming techniques (82.5%) and digital literacy (78.8%) as the highest priority areas for professional development. These findings align with the competency assessment results showing low levels in these areas.

4.6 Hypothesis Testing

4.6.1 Hypothesis One

H_{01}: There is no significant difference in the competency levels of agricultural science tutors based on their years of teaching experience.

A one-way ANOVA was conducted to test this hypothesis using overall competency scores across four experience groups (1-5 years, 6-10 years, 11-20 years, and above 20 years).

Table 6: ANOVA Results for Competency Levels by Teaching Experience

Source	Sum of Squares	df	Mean Square	F	Sig.

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	847.23	3	282.41	4.87	0.003*
Within Groups	13,691.45	236	58.02		
Total	14,538.68	239			

p < 0.05

The ANOVA results showed F(3,236) = 4.87, p = 0.003 < 0.05. Therefore, the null hypothesis was rejected. Post-hoc analysis using Tukey's HSD revealed that teachers with 1-5 years of experience had significantly lower competency levels (M = 45.67, SD = 7.82) compared to those with 11-20 years (M = 51.34, SD = 8.45) and above 20 years (M = 53.21, SD = 6.98).

4.6.2 Hypothesis Two

H_{02}: There is no significant relationship between agricultural science tutors' digital literacy skills and their perceived teaching effectiveness.

Pearson correlation analysis was conducted between digital literacy scores and teaching effectiveness self-assessment scores.

Table 7: Correlation Between Digital Literacy and Teaching Effectiveness

Variables	Mean	SD	r	Sig.
Digital Literacy Skills	2.67	0.89	0.542**	0.000
Teaching Effectiveness	3.78	0.72		

**p < 0.01*

The correlation analysis revealed a significant positive relationship (r = 0.542, p < 0.01) between digital literacy skills and perceived teaching effectiveness. Therefore, the null hypothesis was rejected.

4.6.3 Hypothesis Three

H_{03}: There is no significant difference in professional development needs between tutors in public and private post-primary schools.

An independent samples t-test was conducted to compare professional development needs scores between public and private school teachers.

Table 8: t-test Results for Professional Development Needs by School Type

School Type	N	Mean	SD	t	df	Sig.
Public	156	4.23	0.64	3.18	238	0.002*

School Type	N	Mean	SD	t	df	Sig.
Private	84	3.89	0.71			

p < 0.05

The t-test results showed t(238) = 3.18, p = 0.002 < 0.05. Public school teachers reported significantly higher professional development needs (M = 4.23, SD = 0.64) compared to private school teachers (M = 3.89, SD = 0.71). Therefore, the null hypothesis was rejected.

4.6.4 Hypothesis Four

H_{04}: There is no significant relationship between tutors' educational qualifications and their competency in modern agricultural practices.

Pearson correlation analysis was conducted between educational qualification levels (coded numerically) and modern agricultural practices competency scores.

Table 9: Correlation Between Educational Qualifications and Modern Agricultural Competency

Variables	Mean	SD	r	Sig.
Educational Qualification	2.93	0.58	0.387**	0.000
Modern Agricultural Competency	2.58	0.96		

**p < 0.01*

The correlation analysis revealed a significant positive relationship (r = 0.387, p < 0.01) between educational qualifications and competency in modern agricultural practices. Therefore, the null hypothesis was rejected.

4.5 Relationship Between Teacher Characteristics and Professional Development Needs

Statistical analysis was conducted to examine relationships between teacher characteristics and professional development needs.

Table 10: Correlation Between Teacher Characteristics and Professional Development Needs

Variable	Digital Literacy Need	Modern Techniques Need	Technology Integration Need
Age	-0.32**	-0.28**	-0.35**
Teaching Experience	-0.29**	-0.25**	-0.31**
Educational Level	-0.18*	-0.22*	-0.19*

Variable	Digital Literacy Need	Modern Techniques Need	Technology Integration Need
School Type	0.15*	0.12	0.17*

*p < 0.05, *$p < 0.01$*

The correlation analysis revealed significant negative relationships between age, teaching experience, and professional development needs, indicating that younger and less experienced teachers perceived greater needs for upskilling. Educational level showed weak negative correlations, while school type showed positive correlations for private school teachers.

4.6 Challenges in Agricultural Science Teaching

Analysis of responses regarding challenges in agricultural science teaching revealed several critical issues.

Table 11: Major Challenges in Agricultural Science Teaching (N=240)

Challenge	Frequency	Percentage
Inadequate teaching materials	201	83.8
Lack of practical equipment	194	80.8
Insufficient laboratory facilities	187	77.9
Limited access to modern farms	178	74.2
Outdated curriculum content	165	68.8
Lack of professional development opportunities	159	66.3
Poor funding for agricultural programs	156	65.0
Students' lack of interest	142	59.2
Large class sizes	134	55.8
Limited administrative support	128	53.3

The most frequently cited challenge was inadequate teaching materials (83.8%), followed by lack of practical equipment (80.8%) and insufficient laboratory facilities (77.9%). These findings highlight the resource constraints facing agricultural science education in Rivers State.

4.7 Discussion

The findings of this study reveal significant upskilling needs among agricultural science tutors in Rivers State post-primary schools. The results align with previous research highlighting challenges in agricultural education in Nigeria (Ogunniyi et al., 2017) while providing specific insights into the Rivers State context.

4.8.1 Competency Gaps in Modern Agriculture

The study found that teachers demonstrated adequate competency in traditional agricultural practices but significant gaps in modern agricultural areas. This pattern reflects the historical focus of agricultural education on conventional farming methods while neglecting emerging technologies and practices. The low competency in precision agriculture (M=2.34) and biotechnology (M=2.28) is particularly concerning given the increasing importance of these areas in modern agriculture.

These findings support the arguments of Kumar and Patel (2021) regarding the need for agricultural educators to understand Agriculture 4.0 concepts. The competency gaps identified in this study suggest that students are not receiving adequate exposure to modern agricultural practices, potentially limiting their career prospects and agricultural sector contribution.

4.8.2 Digital Literacy Challenges

The digital literacy assessment revealed significant deficiencies that impede effective technology integration in agricultural education. With only 5.0% of teachers proficient in agricultural simulation software and 9.6% proficient in data analysis software, the findings highlight a critical gap in technological competency.

These results align with research by Martinez and Chen (2020) demonstrating the importance of teachers' digital literacy for student engagement and learning outcomes. The COVID-19 pandemic has further emphasized the need for digital competency in education, making these gaps even more critical.

4.8.3 Professional Development Participation

The low participation rates in professional development activities, particularly technology training (23.3%) and research methodology (14.2%), indicate systemic issues in teacher support and development. This pattern suggests that professional development opportunities are either unavailable, inaccessible, or not aligned with teachers' needs.

The high priority placed on modern farming techniques (82.5%) and digital literacy (78.8%) by teachers demonstrates their awareness of these gaps and willingness to engage in professional development if opportunities are available.

4.8.4 Hypothesis Testing Implications

The rejection of all four null hypotheses provides important insights into the factors influencing agricultural science teachers' competency and professional development needs. The significant difference in competency levels based on teaching experience suggests that newer teachers may lack practical experience but could be more receptive to modern agricultural practices. This finding contradicts the assumption that experience always correlates with higher competency.

The strong positive correlation between digital literacy and teaching effectiveness (r = 0.542) underscores the importance of technology skills in modern agricultural education. This relationship suggests that investing in teachers' digital literacy could significantly improve their teaching effectiveness.

The higher professional development needs among public school teachers compared to private school teachers may reflect resource disparities and different support systems between school types. This finding has implications for targeted professional development programs.

The positive relationship between educational qualifications and modern agricultural competency indicates that higher education levels contribute to better understanding of contemporary agricultural practices, supporting the need for continuous learning and advanced training.

4.8.5 Demographic Influences

The demographic analysis reveals important considerations for professional development programs. The negative correlations between age, experience, and professional development needs suggest that older, more experienced teachers may be less aware of their knowledge gaps or less willing to acknowledge them. This finding has implications for designing age-appropriate professional development programs that address varying comfort levels with technology and change.

4.8.6 Resource Constraints

The identification of inadequate teaching materials (83.8%) and lack of practical equipment (80.8%) as major challenges highlights the resource constraints that compound teacher competency issues. Even if teachers receive adequate training, the lack of resources to implement new knowledge may limit the effectiveness of professional development efforts.

5. Conclusion

This study provides compelling evidence for the need to upskill agricultural science tutors in Rivers State post-primary schools. The findings reveal significant gaps in teachers' knowledge of modern agricultural practices, digital literacy, and contemporary teaching methodologies. These gaps have implications for the quality of agricultural education and students' preparedness for careers in the agricultural sector.

The research demonstrates that while teachers possess adequate knowledge of traditional agricultural practices, they lack competency in emerging areas crucial for modern agriculture. The digital divide among agricultural science teachers is particularly concerning, given the increasing integration of technology in agricultural practices and education.

The study also reveals systemic challenges that hinder teacher professional development, including limited opportunities, resource constraints, and inadequate support systems. These

findings suggest that addressing teacher upskilling needs requires comprehensive approaches that go beyond individual teacher training to include systemic reforms and resource allocation.

The high motivation for learning demonstrated by teachers provides a positive foundation for implementing upskilling programs. However, the success of such programs depends on addressing the identified challenges and providing appropriate support systems.

6. Implications of the Study

The findings of this study have several important implications for various stakeholders in agricultural education in Rivers State and Nigeria as a whole.

6.1 Policy Implications

The significant gaps identified in teachers' competency levels in modern agricultural practices have important policy implications. The Rivers State Ministry of Education and the Federal Ministry of Education need to prioritize agricultural teacher professional development in their budget allocations and policy frameworks. The finding that public school teachers have higher professional development needs than their private school counterparts suggests the need for targeted interventions in the public education sector.

The strong relationship between digital literacy and teaching effectiveness implies that educational policies should mandate digital literacy training for all agricultural science teachers. This is particularly crucial as Nigeria moves toward digital transformation in education and agriculture.

6.2 Institutional Implications

Teacher training institutions, particularly Colleges of Education and Universities offering agricultural education programs, need to revise their curricula to include contemporary agricultural practices and digital literacy components. The positive correlation between educational qualifications and modern agricultural competency suggests that higher-level training programs could significantly impact teaching quality.

Schools need to invest in infrastructure and resources that support modern agricultural education. The high percentage of teachers citing inadequate teaching materials and equipment as major challenges indicates the need for institutional commitment to resource provision.

6.3 Professional Development Implications

The study reveals that current professional development programs are inadequate and poorly aligned with teachers' needs. The low participation rates in technology training and research methodology indicate the need for more accessible, relevant, and mandatory professional development programs.

The relationship between teaching experience and competency suggests that professional development programs should be differentiated based on teachers' experience levels, with newer teachers receiving foundational support and experienced teachers focusing on contemporary updates.

6.4 Economic Implications

Investment in agricultural teacher upskilling has economic implications for Rivers State and Nigeria. Better-trained agricultural science teachers can produce graduates who are better prepared for careers in agriculture, potentially contributing to food security and economic diversification goals. The findings support the economic argument for investing in teacher professional development as a means of developing human capital in the agricultural sector.

6.5 Social Implications

The competency gaps identified among agricultural science teachers have social implications for rural development and food security. Students who receive inadequate agricultural education may be less likely to pursue careers in agriculture or may lack the skills needed for modern farming practices. This could perpetuate rural poverty and limit agricultural productivity.

6.6 Technological Implications

The low levels of digital literacy among agricultural science teachers have implications for Nigeria's agricultural modernization efforts. As the country seeks to adopt precision agriculture and other digital farming technologies, having teachers who can educate the next generation of farmers in these technologies becomes crucial.

7. Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. The Rivers State Ministry of Education should establish a comprehensive professional development program specifically designed for agricultural science teachers, focusing on modern farming techniques, precision agriculture, and biotechnology applications in agriculture.
2. Educational authorities should implement mandatory digital literacy training for all agricultural science teachers, including proficiency in educational software, online teaching platforms, and agricultural simulation tools.
3. Teacher training institutions should revise their agricultural education curricula to include contemporary agricultural practices, technology integration, and modern pedagogical approaches to ensure new teachers are adequately prepared.
4. The government should establish partnerships with agricultural research institutions, universities, and private agricultural companies to provide practical training opportunities and exposure to modern farming practices for teachers.

5. School administrators should allocate adequate budgets for agricultural science programs, including modern teaching materials, laboratory equipment, and technology infrastructure to support effective instruction.
6. A mentorship program should be established pairing experienced teachers with agricultural extension officers and university researchers to facilitate knowledge transfer and continuous learning.
7. The Rivers State government should create incentive programs, including financial support and career advancement opportunities, to encourage teachers' participation in professional development activities.
8. Educational technology centers should be established in each senatorial district to provide ongoing technical support and training for agricultural science teachers in technology integration.
9. Regular assessment and evaluation systems should be implemented to monitor teachers' competency levels and the effectiveness of professional development programs, with adjustments made based on feedback and outcomes.
10. Collaborative networks should be established among agricultural science teachers to facilitate peer learning, resource sharing, and the dissemination of best practices in agricultural education.

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