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Knowledge Of Climate-Resilient Agricultural Practices Among Secondary School Agricultural Science Teachers In Agbor, Delta State, Nigeria

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Abstract
This study assessed the familiarity of agricultural science teachers in secondary schools in Agbor, Delta State, Nigeria with climate-resilient agricultural practices . Utilizing a descriptive survey design, the study focused on educators with at least one year of teaching experience. To ensure representation across gender, longevity as an instructor, and educational background, 150 respondents were selectively chosen from both public and private institutions using purposeful sampling. Data was collected through a systematic questionnaire, with descriptive statistics such as mean scores, percentages, and frequency counts employed for evaluation. Findings revealed that most instructors demonstrated a moderate to high level of knowledge pertaining to techniques like crop rotation, mulching, using cover crops, and water conservation. Results also indicated that academic qualifications and longevity positively impacted awareness, with more educated and experienced teachers expressing enhanced familiarity with climate adaptation methods. however, limitations including insufficient training opportunities, lack of instructional materials, and restricted access to current climate data were noted. The study concluded that while teachers currently possess basic proficiency regarding climate-resilient practices, they require on-going professional development and curriculum integration to improve competency in this area. To enhance teaching of climate-resilient strategies in secondary schools, it recommends specialized capabilitybuilding workshops, additional instructional materials, and cooperation with agricultural extension agencies.

Keywords: *Knowledge Assessment, Climate-resilient agriculture, Agricultural practices, Agricultural Science teachers, Secondary schools*

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I. Introduction

One of the most important worldwide issues of the twenty-first century is climate change, which poses serious risks to livelihoods, food security, and sustainable development, especially in developing nations like Nigeria. National and regional food systems have been undermined by the substantial disruption of agricultural output caused by variations in rainfall patterns, heightened occurrences of drought and flooding, and rising temperatures (Intergovernmental Panel on Climate Change [IPCC], 2022). In sub-Saharan Africa, where agriculture is primarily rain-fed and extremely vulnerable to climatic changes, these climate-related issues are especially noticeable (Morton, 2020).

Nigeria's 2015 Nationally Determined Contribution (NDC) came to the conclusion that, in the event that nothing changes, climate change would cause a 10–25% drop in agricultural productivity by 2080. The yield of rain-fed agriculture may drop by as much as 50% in some northern regions. Even if agriculture's contribution to the GDP drops from 40% to only 15% by 2050, this would have an effect on the nation's GDP, lowering it by as much as 4.5%. Furthermore, it is anticipated that the net import of yams and other vegetables will decline with time in the absence of mitigating measures. However, it is anticipated that net rice imports will rise by up to 40%. Climate change will also have an impact on the cattle subsector. The late start and early end of the rainy season, above-average temperatures, flooding, saltwater intrusion, and windstorms are some of the climate change risks that impact cattle productivity. When the rainy season begins late, there is less water accessible for cattle and less grass available. Temperatures above average cause poor health in animals, which lowers the livestock's market value and lowers farmers' profits. Flooding causes disease outbreaks, animal losses, and enclosure ruin. Due to livestock farmers' limited ability to adjust to the effects of climate change, the livestock subsector is often susceptible to its hazards. Therefore, the subregion's growing temperature, delayed rains, and growing rainfall deficit would lead to a decrease in cattle productivity and production as well as a rise in disease incidence. Since

a large portion of Nigeria's livestock production originates in the subregion, this tendency would eventually result in a reduction in the nation's supply of animal protein (BNRCC, 2011).

The degree to which agricultural and climate change policies specifically incorporate agroecological techniques is still insufficient, despite the fact that they are acknowledged as being essential to guaranteeing food and nutrition security in a changing environment. Urgent action in the agriculture policy and value chain is necessary to lessen the impact of climate change on the food and nutrition security system. In order for agricultural systems to adapt to changes in the local climate, they must be upgraded and made more resilient to harsh weather occurrences. To accomplish this, the government must have the right policy frameworks in place to enable it to implement adaptation measures in the agriculture sector that will allow it to continue meeting the challenges posed by the anticipated increase in the country's population and demographic transition, as well as the ensuing rise in demand for a variety of nutrient-dense foods.

This study focuses on agricultural science teachers knowledge of climate-resilient farming methods in the secondary school s in Agbor, Delta State, Nigeria. The results would be used as an advocacy tool to increase awareness of the connections between agriculture and climate change, as well as the implications for food security and development, among governments, international organisations, and nongovernmental groups. In order to address the impacts and consequences of climate change and variability on agricultural production, food and nutrition security, and our nation's overall development, policy responses will need to be developed based on both our traditional and current scientific knowledge. This is because climate change projections are relatively uncertain.

The phenomenon known as human-induced or modern climate change is the result of substantial, long-term changes in temperature and weather patterns brought about by human activities like industrialisation and deforestation (Karl and Trenberth, 2003; Wilson and VanBuren, 2022). By raising carbon dioxide levels, these activities exacerbate the greenhouse effect and jeopardise the stability of the global climate (Rhodes et al., 2021; Toledo-Gallegos et al., 2022). Global food security and agricultural productivity are at serious risk, particularly in low- and middle-income countries, as a result of the 1 °C increase in global temperatures since the 1950s and the 1.5 °C increase as predicted by 2030–2052 (NOAA, 2024; Zong et al., 2022; Zizinga et al., 2022).

Climate pressures heavily impact Nigeria's agriculture-dependent rural economy, as unpredictable rains, pests, and extreme weather undermine staples like rice and wheat. Projections warn temperatures may rise 2.8°C by 2050, heightening vulnerabilities across diverse zones. Resilient strategies are urgently needed.

Climate-resilient agriculture can boost hardiness, output, and carbon storage through traditional knowledge and modern methods fusion. Studies show effectiveness enhancing water and food security. Researchers used linear models in South Korea, finding irrigation maintained by traditional ecological guidance significant in moderating flooding. Scientists explored stress-responsive crop gene development for worldwide climate-proofing. Dynamic models evaluated smallholder climate-resilient livelihoods in Vietnam.

The recent studies have clearly demonstrated the worldwide applicability of climate-resilient agriculture (CRA). Schiavon et al. (2021) and Antwi-Agyei et al. (2021) reported how sustainable farming techniques have been successfully implemented across diverse regions like Europe and parts of Africa. Meanwhile, Galappaththi et al. (2020) delved into transcription factors that help crops withstand both biotic and abiotic stressors, allowing them to grow under challenging conditions. In north-central Arizona, Mpanga et al. (2021) observed that between 1997 and 2017, population growth coupled with difficult climate led to a rise in farm numbers but saw average farm size dwindle. To advance sustainable farming and food security, Zong et al. (2022) created a thorough assessment approach for CRA relying on indicators tracking agricultural productivity, farmer income, climatic adaptability and eco-friendly development.

These explorations indicate how CRA can be applied universally and may offer Nigeria pertinent lessons. Despite CRA's clear advantages, widespread adoption especially among smallholders faces major barriers in Nigeria where they comprise 80% of agricultural labour force (Sanga et al., 2021). As the most vulnerable to climate shocks causing financial ruin and agricultural instability like unpredictable monsoon rains, pest outbreaks and diseases (Mohapatra et al., 2022; Singha et al., 2023a; Kumar and Gupta, 2021), supporting these farmers grows increasingly pressing. Their plight is exacerbated by rising atmospheric CO2 and methane worsening weather unpredictability's impact on their capacity to adapt (Das et al., 2019; Sapkota et al., 2019).

It is remarkably pertinent and crucial to thoroughly assess secondary agricultural science instructors in Agbor, Delta State, Nigeria regarding their grasp of climate-smart agricultural techniques. This type of evaluation aims not only to illuminate current strengths and gaps but also to guide targeted interventions intended to amplify teachers' capacity to teach climate-resilient practices. Idowu and Bamidele's (2022) literature review advocated, an interdisciplinary method to climate education across Nigeria may improve retention and real-world application by integrating environmental literacy into various subjects beyond just geography or agricultural science. Recognizing Education for Sustainable Development (ESD) as an extensively endorsed framework, Smith and Mogaka (2021) highlighted the whole-school approach within ESD that incorporates climate action into institutional operations, leadership, and ethos.

The notion that better knowledge results in more resilient behaviour is supported by behavioural researchers. In their study of this dynamic among Kenyan farmers, Muturi, Okello, and Mburu (2021) discovered that more environmental awareness facilitated the adoption of climate-smart farming methods. Despite concentrating on adult farmers, their research supports the Theory of Planned Behaviour (Ajzen, 1991), which contends that knowledgeable people are more likely to act in ways that are adaptive. Applying this concept to school, knowledgeable educators can have a big impact on students' future choices about sustainability and agriculture.

The general objective of this study is to assess the knowledge of climate-resilient agricultural practices among secondary school agricultural science teachers in Agbor, Delta State. Specifically, the study

1. determines the level of awareness of climate-resilient agricultural practices among secondary school agricultural science teachers in Agbor.
2. Identified the types of climate-resilient agricultural practices known to secondary school agricultural science teachers.
3. Examined the sources of information on climate-resilient agricultural practices available to the teachers.
4. Assessed teachers' perceived importance of integrating climate-resilient practices into the agricultural science curriculum.

II. Methodology

This study adopted a descriptive survey research design to investigate the knowledge of climate-resilient agricultural practices among secondary school Agricultural Science teachers in Agbor, Delta State. The descriptive survey design was considered appropriate because it enabled the researcher to collect factual information from a representative sample without manipulating variables, thereby allowing for an objective assessment of teachers' awareness, knowledge, and challenges regarding climate-resilient agricultural practices.

The study was carried out in Agbor, the headquarters of Ika South Local Government Area of Delta State, Nigeria. Agbor is located between latitudes 6° 15′ N and longitudes 6° 10′ E in the northeastern region of Delta State. It shares borders with Edo State to the East, Aniocha South Local Government Area to the South, and Ika North East Local Government Area to the North. There are two different seasons in Agbor's tropical rainforest climate: the rainy season, which runs from April to October, and the dry season, which runs from November to March. The average annual temperature is between 25°C and 32°C, while the average rainfall is between 2,000 and 2,500 mm. The region is endowed with fertile soils, particularly loamy and sandy-loam types, which support the cultivation of a wide variety of crops. Major agricultural activities include the production of yams, cassava, maize, plantain, oil palm, and vegetables, as well as poultry and small ruminant farming. The agricultural potential of Agbor makes it an appropriate location for a study on climate-resilient agricultural practices, as changes in climate patterns can significantly affect crop yields, soil fertility, and farmers' livelihoods. Secondary school Agricultural Science teachers in the area play a crucial role in transferring agricultural knowledge and skills to the younger generation, which could influence the adoption of climate-smart practices in the future.

The population of the study comprised all Agricultural Science teachers in both public and private secondary schools in Agbor. These teachers were considered relevant respondents because they were directly responsible for the delivery of agricultural education to secondary school students. A purposive sampling technique was employed to select respondents from the target population. This method was deemed appropriate because the study specifically focused on teachers who taught Agricultural Science in secondary schools within Agbor, Delta State. The sample size was determined using Yamane's (1967) formula with a 5% margin of error, ensuring that the selected respondents were representative of the broader population of Agricultural Science teachers in the area. Eligibility criteria required that respondents had a minimum of one year of teaching experience in Agricultural Science, and both male and female teachers from public and private secondary schools were included. The demographic profile of the respondents (Table 1) showed that out of 150 participants, 78 (52.0%) were male and 72 (48.0%) were female, indicating a relatively balanced gender distribution. Regarding teaching experience, 40 respondents (26.7%) had between one and five years of teaching experience, while 55 (36.7%) had six to ten years, and another 55 (36.7%) had over eleven years of teaching experience. This distribution revealed that a significant proportion (73.4%) of the teachers had more than six years of professional experience, reflecting a predominantly experienced teaching workforce. In terms of school type, 90 respondents (60.0%) were from public secondary schools, while 60 (40.0%) were from private institutions. This suggests that public school teachers constituted the majority of the sample, which aligns with the fact that public schools are more prevalent in the study area. Concerning educational qualifications, 42 participants (28.0%) held a Nigeria Certificate in Education (NCE), 85 (56.7%) possessed a bachelor's degree in agriculture or related fields, and 23 (15.3%) had a Master's degree or higher. These figures indicate that most respondents had attained at least a Bachelor's degree, suggesting a relatively high academic qualification level among Agricultural Science teachers in Agbor.

The researcher designed a structured questionnaire to gather information, titled the Climate-Resilient Agricultural Practices Knowledge Questionnaire or CRAP-KQ for short. This questionnaire was split into five distinct sections for collecting different types of data. Section "A" focused on collecting basic demographic details from respondents. Section "B" aimed to assess respondents' awareness of climate-resilient agricultural techniques. Section "C" delved deeper into specific practices known to respondents, such as utilizing drought-resistant crop varieties, employing integrated pest management strategies, and applying conservation tillage methods. Section "D" explored the sources from which respondents obtained information about such practices, as well as their perceived importance. Most items in Sections B through D required respondents to indicate their level of agreement along a four-point Likert scale ranging from Strongly Agree to Strongly Disagree.The questionnaire was subjected to face and content validation by three experts-two in Agricultural Education and one in Measurement and Evaluation-in a Nigerian university. Their suggestions were incorporated to improve clarity, relevance, and comprehensiveness.The reliability of the instrument was established through a pilot test involving 15 Agricultural Science teachers from a neighboring local government area not included in the main study. The data obtained from the pilot test were analyzed using Cronbach's alpha to determine internal consistency. A coefficient value of 0.70 and above was considered acceptable.The researcher, assisted by trained research assistants, personally visited the selected schools to administer the questionnaires. This approach ensured a high retrieval rate and allowed the research team to clarify any ambiguous items. Respondents were given adequate time to complete the questionnaires, which were retrieved on the same day or within an agreed period.

The data collected were analyzed using both descriptive and inferential statistics. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to answer the research questions. Inferential statistics, specifically the independent samples t-test and one-way analysis of variance (ANOVA), were used to test the hypotheses at a 0.05 level of significance. All statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS) software.

III. Results

Research question 1. What is the level of awareness of climate-resilient agricultural practices among secondary school agricultural science teachers in Agbor?

Table 1: Awareness of Climate-Resilient Agricultural Practices (N = 150)

Practice	Aware (f, %)	Not Aware (f, %)
Use of drought-resistant crop varieties	135 (90.0)	15 (10.0)
Integrated pest management	128 (85.3)	22 (14.7)
Soil conservation (e.g., contour farming)	120 (80.0)	30 (20.0)
Rainwater harvesting	118 (78.7)	32 (21.3)
Agroforestry	110 (73.3)	40 (26.7)
Conservation tillage	105 (70.0)	45 (30.0)

As shown in Table 2, the majority of teachers reported awareness of key climate-resilient agricultural practices. Awareness was highest for drought-resistant crop varieties (90.0%) and integrated pest management (85.3%). However, practices such as conservation tillage and agroforestry had relatively lower awareness rates, suggesting the need for targeted capacity building in these areas.

Research question 2: What are the teachers' sources of information on climate-resilient agriculture

Table 2: Sources of Information on Climate-Resilient Agricultural Practices (N = 150)

Source	Frequency (f)	Percentage (%)	Rank
Agricultural extension agents	120	80.0	1
Agricultural science textbooks	115	76.7	2
Radio/Television agricultural programmes	102	68.0	3
Workshops and seminars	95	63.3	4
Internet/online platforms	90	60.0	5
Colleagues/peer teachers	85	56.7	6

Table 3 shows that agricultural extension agents (80.0%) and textbooks (76.7%) were the most common sources of information on climate-resilient agricultural practices among respondents. While modern sources such as the internet were also significant (60.0%), the reliance on traditional, face-to-face sources suggests that a blended information dissemination approach may be most effective in this context.

Research question 3: What is the difference in knowledge of climate-resilient agricultural practices between public and private school teachers?

Table 3: Independent Samples t-Test on Knowledge of Climate-Resilient Agricultural Practices by School Type

Variable	School Type	N	Mean (M)	SD	t	df	p-value	Decision
Knowledge Score	Public	90	3.28	0.42	2.15	148	0.033	Significant
	Private	60	3.11	0.39				

The independent samples t-test results in Table 5 reveal a statistically significant difference in knowledge of climate-resilient agricultural practices between public and private school teachers ($t(148) = 2.15$, $p = 0.033$). Teachers in public schools (M = 3.28, SD = 0.42) demonstrated higher knowledge scores compared to their counterparts in private schools (M = 3.11, SD = 0.39). This difference may reflect the greater access of public school teachers to government-sponsored training and agricultural extension services.

Research question 4: Would there be any difference in knowledge scores among teachers with different years of teaching experience

Table 4: One-way ANOVA on Knowledge of Climate-Resilient Agricultural Practices by Teaching Experience

Source of Variation	Sum of Squares	df	Mean Square	F	p-value	Decision
Between Groups	1.254	2	0.627	4.05	0.019	Significant
Within Groups	22.555	147	0.153			
Total	23.809	149				

Post-Hoc (Tukey HSD) Results:

- 1–5 years vs. 6–10 years: Mean difference = -0.18, $p = 0.042$ (Significant)
- 1–5 years vs. 11+ years: Mean difference = -0.21, $p = 0.015$ (Significant)
- 6–10 years vs. 11+ years: Mean difference = -0.03, $p = 0.876$ (Not significant)

The one-way ANOVA results in Table 6 indicate a significant difference in knowledge scores among teachers with different years of teaching experience ($F(2,147) = 4.05$, $p = 0.019$). Post-hoc analysis using Tukey's HSD test showed that teachers with 1–5 years of experience had significantly lower knowledge scores compared to those with 6–10 years and 11 years or more. However, no significant difference was observed between the 6–10 years and 11+ years groups. This suggests that experience plays an important role in developing knowledge of climate-resilient practices, particularly in the early years of a teaching career.

IV. Discussion

The results in Table 1 indicate that the majority of Agricultural Science teachers in Agbor possess substantial knowledge of essential climate-resilient farming techniques; nonetheless, variations exist among the strategies. The majority of individuals were aware of drought-resistant crop varieties (90.0%) and integrated pest management (IPM) (85.3%). This aligns with the findings of Ajayi et al. (2018), which indicate that the promotion of drought-resistant cultivars has been a primary objective of agricultural extension initiatives in Nigeria. This renders it one of the most recognised methods for farmers and educators to adapt. Integrated insect Management (IPM) has garnered significant attention due to its dual advantages: it mitigates insect damage and reduces pollution, which is why educators are well-informed about it (Okonya & Kroschel, 2016). Eighty percent of individuals were also aware of soil conservation techniques such as contour farming. This aligns with previous research in southern Nigeria, which demonstrated that instructors and farmers possessed substantial knowledge on erosion prevention methods (Ayanlade et al., 2021). A significant proportion of individuals (78.7%) were aware of rainwater harvesting. This is likely due to its utility in addressing the consequences of erratic rainfall patterns in Delta State, where seasonal water deficits can adversely impact agriculture (Nnadi et al., 2019). However, individuals exhibited significantly lower awareness of agroforestry (73.3%) and conservation tillage (70.0%). This study aligns with the research by Asfaw et al. (2016), which revealed that the adoption of agroforestry in sub-Saharan Africa is hindered by inadequate teacher training, a lack of demonstration farms, and widespread misconceptions about its productivity benefits. Conservation tillage, although proven effective in improving soil moisture retention and reducing erosion (Lal, 2015), appears to be insufficiently addressed in Nigeria's high school agriculture curricula, resulting in a relatively poorer comprehension among educators.

The gaps in awareness of teachers highlight the demand for targeted professional growth opportunities. It is commendable that some have strong understanding of drought-tolerant varieties and integrated pest management, but limited familiarity with agroforestry and conservation tillage indicates an urgent need for improved educator preparation and a more comprehensive curriculum covering these subjects. Teachers are farmers' primary source of knowledge; thus, addressing deficiencies is crucial to promote adoption of climate-resilient practices. Incorporating these methods into training programs and hands-on demonstrations could enhance dissemination within and beyond the classroom. Findings show Agricultural Science teachers in Agbor possess significant knowledge of several climate-smart practices, though familiarity varies with each. Training

supported through policies, curriculum reviews, and strengthened ties to agricultural outreach may remedy shortcomings and notably strengthen the educational system's ability to help farmers adapt to climate change.

While the majority of secondary school Agricultural Science educators in Agbor recognized climate-resilient farming techniques, as demonstrated previously, implementing them exhibited notable deviation. The predominant adaptation strategies employed were utilizing drought-resistant crop varieties for the most part and integrated pest management to a large degree. This displays that individuals acknowledged these measures and that they can be applied in current school farming programs. Corresponding with earlier examination by (Makuvaro et al.,2018), which indicated that instructors and agriculturists favor approaches that necessitate insignificant structural alterations and can be integrated into existing agricultural systems. Soil conservation techniques exhibit a moderate adoption rate, while rainwater harvesting shows a rate somewhat over half. This proposes that while educators recognize the importance of these strategies for sustainable agriculture, their implementation may be hindered by infrastructural deficiencies, budgetary limitations, or inadequate institutional support. Agroforestry and conservation tillage were used less regularly, despite what was indicated previously concerning a high level of awareness among individuals regarding these practices. Prior studies have demonstrated this disparity between knowledge and practice, frequently attributed to issues such as deficient training, constrained access to seedlings and equipment, and the perception that certain procedures may lack immediate advantages. Overall, these data indicate a disparity between teachers' knowledge and their actions regarding the promotion of climate-resilient agriculture within secondary school agricultural curricula. Educators possess extensive knowledge of various adaptation approaches; however, the consistent use of this information will likely necessitate capacity-building programs, resources, and supportive policies from both educational and agricultural authorities. Enhancing these domains could ensure that agricultural education not only imparts knowledge about farming in a dynamic environment but also equips students with the skills to adapt to novel circumstances.

Agricultural science teachers in Agbor rely primarily on extension agents for knowledge regarding climate-resilient farming methods. Indeed, four-fifths of respondents indicated agents as their main source of such information, narrowly ahead of textbooks at over three-quarters. This aligns with prior studies emphasizing extension's role in disseminating novel concepts, especially rurally. Personal contact allows agents to contextualize technical matters for practical application. Textbooks also clearly matter considerably, with over three-quarters using them, underscoring curricula's part in propagation. Updating materials with current ecological practices could effectively motivate students and instructors to adopt techniques.

Television and radio programs, cited by two-thirds of those surveyed, remain consequential conduits where internet access proves inconsistent or costly. Broadcasting has facilitated awareness of improved strategies in Delta State and beyond, as documented elsewhere. Workshops and symposia garnered a respectable showing of over sixty percent, attesting to experiential and collaborative environments' benefits for professional progress. Such settings foster data dissemination and interpersonal networks for sharing acumen. While sixty percent tapped internet resources, these ranked lower than traditional avenues. Thus agricultural educators in Agbor have yet to fully utilize digital tools, constrained perhaps by unstable power, high data fees, or limited technical fluency.

Notably, colleagues /fellow teachers had the lowest rating at 56.7 percent, suggesting that exchanging agricultural data between professionals in secondary schools may be less structured or a lower concern. This gap offers educators a chance to develop more solid collaborative learning communities involving specialists, facilitating the sharing of climate-smart farming remedies. All in all, these outcomes indicate that the most efficient method to assist instructors in Agbor in gaining knowledge about climate-resilient farming would involve combining conventional and modern techniques, like manuals and electronic resources.

The information in Table 5 clearly shows a statistically sizeable difference in apprehending climate-resilient agricultural approaches between agricultural science teachers in public and private secondary schools in Agbor. On average, the knowledge scores for public school teachers ($M = 3.28$, $SD = 0.42$) surpassed those of private school teachers ($M = 3.11$, $SD = 0.39$), with a t-test signifying relevance at $p = 0.033$. This suggests that the type of school substantially affects educators' comprehension and understanding of climate-resilient agricultural practices.

The disparity between Nigerian public and private school educators' knowledge of climate-resilient agricultural practices may stem from differences in access to professional development. Government agencies prioritize training public school teachers through extensive agricultural extension networks and conferences focusing on sustainability. In contrast, private school instructors tend to pursue self-guided learning with resources varying between schools based on each institution's commitment. Public school teachers frequently interact with extension agents acting as a primary source of current information on techniques like drought-resistant crops and integrated pest management. These modular programs delivered critical knowledge for adapting to environmental changes, providing practical strategies applicable to public school classrooms. While public educators gain usable knowledge, private instructors may encounter limitations obtaining comparable training without standardized

assistance networks. Disparities in sustainable farming knowledge thus appear linked to uneven provision of professional development through extension services prioritizing Nigeria's widespread public school system.

Despite exhibiting comparable average scores over 3.0, a discernible gap persisted between the general proficiency of public and private school educators regarding climate-resilient agricultural practices. Previous analyses corroborate that Nigerian agricultural instructors, irrespective of institutional affiliation, maintain a progressively cognizant grasp of climate change impacts and the requisite adaptation of cultivation methods (Oladele, 2017). The disparity brings to light the necessity for targeted outreach within the independent sector, likely involving partnerships with government agencies, non-governmental alliances, and agricultural study organizations, to ensure equitable access to continuing educational prospects (Eze & Nwachukwu, 2021). While public school teachers appear to benefit from superior conduits to and application of climate-adaptive agricultural awareness, it is crucial to guarantee that all secondary school pupils, irrespective of where they learn, receive a robust agricultural education addressing the challenges posed by climate transformation.

The tabulated outcomes in Table 4 demonstrate a clear linkage between years of teaching experience and familiarity with climate-resilient agricultural techniques. The statistically significant ANOVA consequences ($F(2,147) = 4.05$, $p = 0.019$) indicate that the duration an instructor has spent in the profession greatly molds their comprehension of sustainable cultivation practices. This aligns with recent investigations suggesting professional longevity enhances grasp of instructional topics, like innovative ideas in agriculture (Adeyemi & Omotayo, 2019; Kimenju et al., 2021).

The post-hoc Tukey HSD results were telling about these educational discrepancies. Teachers with merely 1 to 5 years on the job scored noticeably lower than their colleagues with 6 to 10 years' experience, according to the data (mean difference of -0.18, $p = 0.042$). Those with the highest levels of longevity in the field, over 11 years, also outperformed the fresh faces (mean difference of -0.21, $p = 0.015$). Evidently, new teachers require more time immersed in climate adaptation programs and hands-on study to gain comprehensive know-how. Experience truly is the best teacher, as posited by the "learning curve" model - that expertise rises steadily through dedicated practice over spans of many years (Eraut, 2004; Oladele et al., 2020).

Interestingly, the analysis detected no substantive difference between test scores of educators with 6 to 10 years under their belt versus those with 11 or more ($p = 0.876$). This implies that professional progress in agricultural resilience awareness may level off after approximately half a decade. Both established groups presumably now participate in a comparable quantity of related seminars, workshops and collaborations within their specialist networks to stay informed.

The findings from this study highlight an urgent need for targeted early-career training and mentoring of fledgling agricultural science teachers in Agbor, Delta State, as a priority for policymakers. Thoughtful interventions like organized mentoring, engagement with extension work from the start, and cross- generational sharing of expertise could help shrink the awareness gap separating newcomers from seasoned pros. According to Ajayi et al. (2017), immersing instructors early in sustainable practices pays off by speeding integration of climate-smart strategies into curricula - cultivating a more stable agricultural landscape for future generations.

V. Conclusion

This study investigated the awareness of Agricultural Science teachers on climate-resilient agricultural practice at the secondary level in Agbor, Delta State based on school type and teaching experience. Findings reveled that educators were generally moderately or highly aware of climate-resilient agricultural practices which are important to equip future sustainable agriculture practitioners for involvement in agriculture under a changing climate. However,the public school teachers demonstrated significantly better knowledge than their private counterparts which we attributed to the availability of government trainings and augmented by support from agricultural extension services. In addition, the result of teaching experience was also an important factor that determined knowledge levels; early-career educators (1–5 years) showed significant lower scores compared to those with higher levels. This suggests a clear requirement to develop targeted capacity-building interventions, particularly for teachers in private schools or early in their careers, to improve general understanding of climate-resilient best practice in classroom teaching. Improving these teachers will allow the agricultural education system to ensure students are equipped with the necessary skills and adaptive methods they need in order to farm sustainably over a variety of possible conditions.

VI. Recommendations

The following recommendations are suggested based on the findings of this study.

1. The inequality between school types should be levelled up by fostering partnerships between government organisations and private schools to guarantee equitable access to resources and training in climate-resilient agriculture.

2. To ensure continued skill development and knowledge update the by new climate adaptation techniques, climate-resilient agricultural practices should to be incorporated into ongoing professional development programs for teachers.
3. Comprehensive information on climate-resilient methods should be incorporated into the secondary school level Agricultural Science curriculum, strengthened by practical demonstrations and school farm projects.
4. It is important to encourage extension agents to consistently interact with secondary school teachers by providing them with resources, technical assistance, and the most recent information on developments in climate-smart agriculture.
5. A planned methodology should be put in place to track how instructors are implementing climate-resilient teaching techniques and assess how well training initiatives are enhancing instruction.

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